MEMOIRS

OF THE

TORREY BOTANICAL CLUB

VOLUME VI

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CONTENTS.

MEMOIRS

OF THE

TORREY BOTANICAL CLUB.

VOL. VI. NO. 1.

AN ENUMERATION

—OF THE—

PLANTS COLLECTED IN BOLIVIA

BY MIGUEL BANG,

WITH DESCRIPTIONS OF NEW GENERA AND SPECIES

BY HENRY H. RUSBY.

PART 3.

ISSUED NOVEMBER 17, 1896.

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MEMOIRS

OF THE

TORREY BOTANICAL CLUB.

Vol. VI. No. 1.

On the Collections of Mr. Miguel Bang in Bolivia.—Part III.

BY HENRY H. RUSBY.

CORRECTIONS, ADDITIONS AND NOTES REFERRING TO PARTS I. AND II.*

226. (Omitted in Part II. of my Enumeration) is *Euphorbia pilulifera* L. Yungas, 1890.

230. (Missed in Part I.) is *Polygala Bangiana* Chodat, sp. n. Bull. Herb. Boiss. 4: 234. Yungas, 1890.

256b. (Missed in Part II.) is *Siphocampylos corymbiferus* Pohl, Fl. Bras. Ic. 2: 112. *pl. 175.* Yungas, 1890.

384. (Missed in Part I.) is *Sabicea cinerea* Aubl. Pl. Gui. 1: 192. *pl. 75.* Yungas, 1890.

430. (Enumerated as *Tibouchina stenopetala* Cogn.). Of this M. Cogniaux writes as follows:

En examinant attentivement cette plante, il me semble que ce n'est pas le *T. stenopetala*, mais bien l'une des formes du très variable *T. longifolia* Baill. Le *T. stenopetala* est une plante plus grêle, moins velue ; les soies du calice sont *étalés* et *glanduleuses*, les étamines sont plus inegales, les plus grandes ayombant le connectif notablement plus long, etc.

500. (Enumerated as *Centropogon Surinamensis* (L.) Presl), is a new species shortly to be published by A. Zahlbruckner in Bull. Torr. Bot. Club.

520. (Published as *Lisianthus ovalis* R. & P.) is being studied by Dr. Gilg, who thinks the determination wrong.

* Mem. Torr. Bot. Club, 3: Part 3, and 4: Part 3.

698. (Published as *Monnina cestrifolia* H. B. K.) is *Monnina Autraniana* Chodat, Bull. Herb. Boiss, 3: 543.

738. (Published as *Siphocampylos giganteus latifolius* Britton) is a new species of *Centropogon*, shortly to be published by A. Zahlbruckner in Bull. Torr. Bot. Club.

843. *Erythroxylon Bangii* Rusby has been examined in the chemical laboratory of Messrs. Parke, Davis & Co., for the presence of cocaine in its leaves, with negative results.

969. (Published as *Cacabus parviflorus* Rusby) is *Physalis viscosa* L., as kindly pointed out by Mr. Rydberg.

Enumeration of Nos. 1001-1769.

RANUNCULACEAE.

Clematis sericea H. B. K. Nov. Gen. 5: 37. Espirito Santo, near Cochabamba, 1891 (1271).

Thalictrum podocarpum H. B. K. Nov. Gen. 5: 38. Vic. Sorata, May, 1892 (1314) = 758 and 893 and Rusby's 501 and 502.

Anemone triternata Vahl, Symb. 3: 74. *pl. 65*. Near snow line, Mt. Tunari, 1891 (1041) = Rusby's 1753.

DILLENIACEAE.

Davilla rugosa Poir. Encyc. Meth. Supp. 2: 457. Var. (?) CAPITATA n. var. Distinguished from all specimens of the type by its very abundant capitate clustered flowers. Apparently intermediate between *D. rugosa* and *D. elliptica*.

Between Mapiri and Tipuani, July–Aug., 1892 (1524). Also collected by Pearce at Chailla.

DAVILLA LECHLERI sp. n.

Finely papillose-scabrous throughout, the branches of the inflorescence sparsely coarse-hairy; branches elongated, terete; petioles 1–1.5 cm. long, margined, with dilated base, blades 9–13 cm. long, 5–7 cm. broad, oval, with base very abruptly contracted into the petiole, apex abruptly produced into an obtusish point 3–6 mm. long and broad, and margin serrate with rather distant, erect teeth spinulose toward the apex, obsolete toward the base, pale, membranaceous, the 13–15 pairs of primaries distinctly impressed above; floral leaves scarce, obovate, 2 cm. long or less; panicles terminal and in the upper axils, 8–16 cm. long, 5–12 cm. broad, the branches distant and lax, the flowers rather densely clustered, sessile to sub-sessile; mature buds 3–3.5 mm. in diameter; petals 2 or 3, strongly veined.

Espirito Santo, 1891 (1249).

The same as Lechler's 2316 from Peru. Nearly Jenman's Guiana no. 2146, but that has short thick petioles and thick sharply ribbed blades.

DAVILLA PARVIFLORA sp. n.

Scabrous throughout, the branches rather stout, flexuous, terete, or obscurely angled above, brown, the internodes very unequal; petioles 5–10 mm. long, margined, dilated at the base; blades 6–12 cm. long, 3–6 cm. broad, oval to oval-obovate, with base abruptly contracted into the petiole, apex rounded and very slightly obtusely pointed, and margin sinuate-serrate with mucronate teeth, especially toward the apex; thickish, rigid, midrib impressed above, the 13–16 pairs of primaries parallel, slightly curved, angle about 60°, obscure above, finely and sharply prominent underneath, connected by fine secondaries, which are reticulate; panicles terminal, the branches in the axils of the floral leaves mostly short-peduncled, about 4 cm. long, loosely flowered; bracts oblong, gray-hairy, about 1 mm. long; flowers on short stout angled pedicels; buds globose, 2.5 mm. in diameter; petal one, or a second small one; filaments but little thickened above, style very thick, one-half longer than the stamens.

Between Guanai and Tipuani, April–June, 1892 (1377).

DOLIOCARPUS FERRUGINEUS sp. n.

Coarse, the branches thick but weak, angled, below sparsely, above densely ferruginous-hirsute, the hairs divaricate or slightly retrorse, internodes mostly less than 3 cm. long; petioles very thick, 1–2 cm. long, hirsute like the upper parts of branches; blades 1–3 dm. long, 6–12 cm. broad, irregularly oval with subcuneate base, acute or slightly acuminate apex, and sinuately serrate margin, the teeth distant, coarse, mucronate; membranaceous and thin, above dark, nearly smooth except upon the scabrous impressed midrib and 12–14 pairs of primaries, which are nearly straight, diverging at about 45°, underneath pale yellowish green, sparsely hirsute, densely so with retrorse hairs upon the midrib and sharply prominent primaries, which are connected by the numerous fine secondaries; flowers in simple or slightly compound sessile axillary clusters, the pedicels 3–10 mm. long, slightly thickened at the apex, hirsute; mature buds globose-obovoid, 4 or 5 mm. long; filaments only slightly thickened above.

Espirito Santo, 1891 (1261 and part of 1266).

ANONACEAE.

Guatteria eriopoda DC. Syst. 1: 505 (?). Espirito Santo, 1891 (1176).

Specimen more ferruginous than either Matthew's 3054 or my 1240, and the leaves and flowers much larger.

MENISPERMACEAE.

Cissampelos Pareira L. Sp. Pl. 1031. Mapiri, July–August, 1892 (1552a and 1553) = Rusby's 1444, etc.

BERBERIDEAE.

Berberis Agapatensis Lechl. Berb. Austr. 44 (?). A little above Cochabamba, 1891 (1091).

Spines larger (some 5-parted) and leaves broader than in the type.

BERBERIS PHYLLACANTHA sp. n.

Stout, densely branched and densely leafy, the branches at an angle of about 45 degrees, slender, nearly straight; branches nearly terete, blackish or dark brown with grooved fissures; branchlets terete, not fissured, scurfy-puberulent; spines phylloid, 12–24 mm. long, with well-differentiated petioles and veins, of one or two pairs of lateral and a terminal division, all similar, triangular-subulate and very pungent, yellowish-brown; branchlets about 6-leaved, the scales blackish, of similar form and markings to the petioles of the spines, closely appressed; petioles distinct but mostly concealed by the scales, 2–5 mm. long, dilated downward, orange-colored, 5–7-costate; blades 1–2.5 cm. long, 5–15 mm. broad, obovate with cuneate base, pungent broad apex and about 3 pairs of large triangular pungent teeth with obtuse sinuses, margin slightly revolute; very thick and rigid, glabrous, above bright or pale green and shining, underneath yellowish, the veins prominent on both sides, especially underneath; flowers mostly solitary, from reddish bracts 7 mm. long by 10–12 mm. broad, on scabrous upwardly thickened pedicels 6–7 mm. long, the sepals orange-yellow with a red middle portion; fruit black, glaucous, globose, 8 mm. in diameter, tipped by the style and large stigma.

Sorata, Nov., 1892 (1614).

The same as Mandon's no. 862.

CAPPARIDEAE.

Cleome glandulosa R. & P. ex DC. Prod. 1: 238. Espirito Santo, 1891 (1197) = Rusby's 734.

Cleome aculeata L. Syst. Ed. 12, 3: 232. Guanai, July, 1892 (1585.)

CAPPARIS BANGII sp. n.

Minutely scabrous throughout, the sepals light gray outside; branchlets terete, flexuous, the internodes about 1–2 cm. long; stipules setaceous, caducous; petioles 5–7 mm. long, broad; blades 5–8 cm. long, 2–4 cm. broad, ovate with rounded base and short-pointed obtusish apex, coarsely sinuate-dentate toward the apex, coriaceous and rigid, above dark green and finely lepidote, underneath pale, venation inconspicuous above, the midrib and 5 or 6 pairs of primaries somewhat prominent underneath; flowers solitary in the axils, on stout angled gray peduncles 1.5 cm. long; bud oblong, obtuse; sepals valvate, free, 2 cm. long, linear-oblanceolate, obtuse, gray without, reddish (?) and scurfy within; petals a little exceeding the sepals, apparently rose-colored; stamens very numerous, shorter than the pistil; fruit not seen.

Tipuani, Jan., 1893 (1642).

VIOLARIEAE.

Viola veronicaefolia Pl. et. Lind. Ann. Sci. Nat. (IV.) **17**: **121**. Vic. Mapiri, 12,000 ft., Sept., 1892 (1578) = 823.

Viola pygmaea Juss.; Poir. in Lam. Encyc. **8**: 630. Vic. Mapiri, 12,000 ft., Sept., 1892 (1579 and 1579a). Also collected by Mandon and by Pearce in the Andes of Yungas.

VIOLA BANGII (= *V. nivalis* Benth. Pl. Hartw. 160, not R. & S.). Sorata, Nov., 1892 (1616) = Mandon's 940, and collected by Jameson and others in Ecuador.

RINOREA VIRIDIFOLIA sp. n.

Glabrous, fruticose, much branched, the branches and branchlets slender, ascending, grayish-brown; leaves opposite; petioles 3–10 mm. long, dark, stout; blades of the pair slightly unequal, 4–10 cm. long, 1.5–5 cm. broad, oblong to oval or obovate, with sub-rotund or blunt base, abruptly pointed obtuse apex and slightly sinuately serrate margin, the teeth rounded; bright green both sides, membranaceous; racemes terminal, about 2.5–4 cm. long exclusive of the peduncle, which is one-half as long, loosely flowered; bracts scarious, two-fifths the length of the pedicels, broadly ovate, keeled; pedicels erect, stout, thickened above, dark, 2–3 mm. long; mature bud lance-ovoid, obtuse, nearly 5 mm. long; sepals one-fourth as long as the petals, nearly semicircular, whitish; petals lanceolate, yellowish with whitish recurved rounded apex; stamens entirely distinct; scale at back of filament nearly as long as the filament, oval, with rounded apex; anther as long as filament; appendage of connective triangular-acuminate, acute, forming two broad wings to the anther, the terminal subulate portion as long as the anther, not equalling the petals; ovary coarsely hirsute; style slenderly conical, pubescent, slightly exceeding the anther-appendages; fruit not seen.

Between Guanai and Tipuani, April–June, 1892 (1337).

The same as Spruce's 1855b, from Tarapota, Peru. Probably the same as Rusby's 2493 in advanced fruit, but that specimen is too poor for determination.

Sauvagesia erecta L. Sp. Pl. 203. Espirito Santo, 1891 (1216) = Rusby's 1076.

BIXINEAE.

Bixa Orellana L. Sp. Pl. 512. Espirito Santo, 1891 (1174). The white-flowered form = Rusby's 1310.

POLYGALEAE.

(Communicated by Dr. A. Chodat.)

Polygala Boliviensis A. W. Bennett, Journ. Bot. **8**: (1879) 171. Vic. Cochabamba, 1891 (1010).

Polygala acuminata (Willd.) Chodat, Mon. Polyg. **2**: 45. Vic. Guanai, July, 1892 (1588).

Monnina aestuans (L.) DC. Prod. **1**: 338. Vic. Sorata, May, 1892 (1305).

Monnina herbacea DC. Prod. **1**: 340.

Habita, forma sepalorum, appendicibus auriculariformibus, styli cum *M. macrostachya* R. et P. convenit, differt stipulis spiniformibus deficientibus, staminibus 6 (loco 8), duobus utraque parte coaliti et formam fructu (deficiens).

Vic. Sorata, May, 1892 (1309).

MONNINA RUSBYI Chodat sp. n.

Subherbacea ad 30 cm. longa, radice subsimplice; caule supra basin vel superne ramoso, ramis tenuibus ut tota planta glanduloso-pilosis, inde leviter rufescens. Folia linearia breviter petiolata. Racemi suproaxillares demum elongati, laxiflori. Rachis post defloriam glandulis spiniformibus remotis asperata. Flores ad 3–4 mm. longi. Sepala 3 libera lanceolata. Alae longe et distincte unguiculatae limbo late suborbiculari. Antherae in tubo staminoli sessiles vel subsessiles. Ovarium anguste ellipticum; stigma inferius biappendiculatum inde emarginatum. Fructus samaroideus, ala parva.

Ab omnibus hujus generis indumento, alis unguiculatis et forma stigmatis recedit.

Vic. Cochabamba, 1891 (1002).

VOCHYSIACEAE.

Vochysia Mapirensis sp. n.

Glabrous, or the peduncles, etc., sparsely puberulent; branches blackish, sub-terete; petioles 5–10 mm. long, blackish, stout and broad; blades (only the upper seen) 8–16 cm. long, 2.5–5 cm. broad, oblong-elliptical, with acute base, minutely retuse apex and entire strongly revolute margin; thick and rigid, pale, midrib strongly impressed above, very prominent and terete underneath, veins prominent both sides, especially beneath, finely and strongly reticulate, the primaries very numerous and unequal; panicles terminal and axillary, 1.5–3 dm. long including the peduncle, 2.5–5 cm. broad, the peduncle and rhachis stout; branchlets mostly 2-flowered, their stout peduncles and pedicels each about 4 mm. long; flower about 12 mm. long, exclusive of the obtuse spur which is 10 mm. long, each falcately curved, in opposite directions, the spur a little more strongly; calyx cylindrical-hemispherical with oblique mouth, 3 mm. long, 2 mm. broad, the smaller lobes semicircular or broader, unequal; larger sepal about twice the length of the corolla, ciliate; large petal 6.5 mm. long, 5 mm. broad, obovate with rounded apex, the others 5.5 mm. long, obcordate; anther about equalling the strongly clavate stigma; staminodia none; fruit not seen.

Between Guanai and Tipuani April–June, 1892 (1382). The same as Rusby's 610. Differs from *V. divergens* in form of leaf-base and spur and in the obtuse bud.

Qualea parviflora Mart. Nov. Gen. 1: 135. *pl. 81.* Between Tipuani and Guanai, Dec., 1892 (1663). The glabrate form.

CARYOPHYLLEAE.

Cerastium arvense L. Sp. Pl. 438. Near snow line, Mt. Tunari, 1891 (1036).

Drymaria cordata (L.) Willd. in R. and S. Syst. Veg. 5: 406. Turedon, 1891 (1136)=Rusby's 1182.

PORTULACEAE.

Portulaca elongata sp. n.

Densely pilose on the younger parts by the capillary divided stipules; stems ascending, much branched from the base, the branches erect or ascending, slender, 1–2.5 dm. long, irregularly angled, gray-green; stipules reduced to tufts of hair, persistent; leaves terete, obtuse, 8–12 mm. long; flowers sessile, the bud 1 cm. long; sepals nearly as long as the corolla, very broad, completely enclosing the flower except the apex, hyaline, light-purple, adnate (or agglutinate?) to the base of the petals; corolla deep purple; capsule hyaline, 1.5 mm. broad; seeds black or blackish, muricate.

Turedon, 1891 (1140).

HYPERICINEAE.

Hypericum struthiolaefolium Juss. Ann. Mus. Par. **3**: 161. *pl. 16. f. 2.* Near snow line, Mt. Tunari, 1891 (1026) = Mandon's 790.

Caopia tomentosa (R. & P.) Kuntze, Rev. Gen. Pl. 59. Vic. Sorata, Nov., 1892 (1724) = Rusby's 719.

Caopia Guyanensis (Aubl.) Kuntze, Rev. Gen. Pl. 58. Between Tipuani and Guanai, Dec., 1892 (1695) = Rusby's 722.

GUTTIFERAE.

? *Clusia*—species apparently undescribed, and near *C. cuneata;* but I have only pistillate flowers in a young state, and the material does not warrant a description. Between Tipuani and Guanai, Dec., 1892 (1718).

TERNSTROEMIACEAE.

Norantea anomala H. B. K. Nov. Gen. **8**: 218. *pl. 6. f. b.*? Espirito Santo, 1891 (1194). Mapiri, July–Aug., 1892 (1544). Because of the doubtfulness of this determination and the incompleteness of the description cited above, a complete description is here appended.

Glabrous; stems elongated, gray-brown, terete; petioles stout, 5–10 mm. long; blades 5–10 cm. long, 2–4 cm. broad, obovate, with rounded apex, cuneate base continued into the petiole and entire margin, coriaceous, above light-green, the midrib slightly elevated and veins obscure, underneath ferruginous, the midrib prominent, veins obscure, the primaries very numerous; glands rather small, in two somewhat irregular rows, the inner a little nearer to the margin than to the midrib, its glands a little larger than those of the outer row; spike (only one seen) 5.5 dm. long, the rhachis terete, very stout, loosely flowered; bracts entire, if of full size about 2 cm. long, including the pedicel which is about 1 cm. long and gradually broadened into the obovate strongly concave and slightly galeate, verrucose hood; flowers sessile, the bud globose or broader, 3 mm. in diameter; calyx whitish, about one-third as long as the red-brown corolla; petals coherent at the base, thick and dry; stamens 5, the filaments flattened, very short and equally as broad, the imbricated anthers nearly circular, including the broad yellowish-white wings.

This differs from the type in texture, apex and surface of leaves, but is in other respects exactly the same. It is probably distinct and the two may form the basis of a distinct genus.

Erotium subintegrifolium Rusby, Mem. Torr. Bot. Club, **3**: Part 3, 9.
Mapiri, July–Aug., 1892 (1489) = 386.

Saurauja Rusbyi Britton, Bull. Torr. Bot. Club, **16**: 64. Vic. Mapiri, 8000 ft. Jan., 1893 (1742) = Rusby's 482.

KIELMEYERA PANICULATA sp. n.

Glabrous; branches stout, reddish-brown, leafy; petioles 5–10 mm. long, stout, broad; blades 6–10 cm. long, 2.5–6 cm. broad, obovate with very abruptly contracted base, rounded or obscurely pointed apex and entire margin, coriaceous, pale, midrib channelled above, prominent beneath, veins slightly reticulate above, more so beneath; panicles terminal, short-peduncled, 1 dm. long, 6 cm. broad, loosely flowered, naked; pedicels proper 5 mm. long, stout, thickened above, striate; sepals 5, ovate, blunt, 5 mm. long, 3–4 mm. broad; corolla in bud broadly ovoid, minutely apiculate, when expanded 2 cm. broad, cream-colored (?); fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1731).

MARILA LAXIFLORA sp. n.

Glabrous except the pedicels, etc.; branches stout, soft, gray-brown, terete, the internodes about 4 cm. long; petioles 12–20 mm. long, becoming reflexed; blades 1–2.5 dm. long, 6–10 cm. broad, ovate-oval, with rounded base, abrupt short obtuse point and entire margin, above dark green, the midrib and 10–15 pairs of primaries slightly impressed, underneath yellowish-green, the midrib and primaries strongly prominent and terete, the secondaries connecting the latter with one another and, on the upper side with the midrib, the primaries inter-arching near the margin; racemes axillary, 1.5–2 dm. long including the peduncle, loosely flowered; rhachis and pedicels angled, minutely ferruginous-puberulent; pedicels divaricate, about 3 mm. long, stout, enlarged at base and apex; flowers campanulate; the calyx and corolla 1 cm. long, the stigma exserted to about one-third their length; sepals thick, keeled; petals delicate, the inner sub-contorted; stamens in 4 dense clusters; gland of the connective one-half as long as the anther, oblong, inflexed, light yellow with a black tip; style angled, clavate; stigma capitate, black, slightly 2-lobed; fruit immature, ascending, tipped with the slightly accrescent and glutinous stigma.

Between Tipuani and Guanai, Dec., 1892 (1648). Also collected by Pearce.

MALVACEAE.

Sida urens L. Sp. Pl. ed. 2, 963. Between Guanai and Tipuani, Apr.–June, 1892 (1446) = Rusby's 1454 and 1454a.

SIDA BAKERIANA sp. n.

Erect, stout, much branched, the branches elongated, straight, nearly horizontal, pilose, the hairs mostly yellowish; stem terete, the internodes about 3 or 4 cm. long; stipules of the stem-leaves 15–20 mm. long, 1.5 mm. broad at the base, from which they taper regularly to an acute point, 3- or 5-ribbed; petioles 6 mm. long, very stout; blades 8–13 cm. long, 2.5–5 cm. broad, regularly ovate with rounded base, acute apex and serrate margin, the teeth numerous, small, slightly irregular; thickish, pilose below, somewhat strigose above; stipules and leaves of the branches similar, but regularly smaller and slightly narrower; flowers solitary in the axils of leaves or bracts of short branchlets, the pedicels one-half the length of the calyx or more; bracteoles none; calyx 8–10 mm. long, strongly angled, cleft more than half way to the base, the lobes broadly triangular with acuminate and acute apex; petals light purple, about the length of the calyx; style-branches 10, stigmas capitate, rather large; ovary conical-ovoid; ovules pendulous; fruit not seen.

Mapiri, July–Aug., 1892 (1477).

Species near *S. achrantha*. Dedicated to Mr. Edmund Baker, who has contributed much to our knowledge of this difficult order.

SIDA GRACILIPES sp. n.

Stems numerous, erect or ascending from a long stout woody tap-root, very slender, 1.5–4 dm. long, terete, scabrous; stipules narrowly subulate, 5–7 mm. long, herbaceous; petioles 7–10 mm. long, slender; blades 2–4 cm. long, 1–2 cm. broad, ovate, tapering from the cordate base to the obtusish apex, with coarsely serrate margins, 5–7-ribbed, membranaceous, very finely silky hairy both sides, especially above; peduncles mostly exceeding the leaves, 1-flowered or bearing a second flower near the summit, slender; bracteoles none; calyx, in flower, 8 mm. long, strongly angled, cleft to below the middle, long-hirsute on the angles, the lobes acuminate, ciliate, 3–5-nerved; petals light purple, slightly exceeding the calyx; style 5-cleft; ovary spheroidal, strongly 5-lobed upon apex and sides; fruit sharply 10-beaked.

Vic. Cochabamba, 1891 (1146).

This is the same as No. 747, from La Granga, March, 1891, missed in Part I. of my enumeration.

Wissadula rostrata (Schum. et Thoun.) Hook. Nig. Flor. 229 (*Sida rostrata* Sch. et Th. Beskr. 306). Mapiri, July–Aug., 1892 (1512).

Wissadula periplocaefolia (L.) Griseb. Cat. Pl. Cub. 25. Between Guanai and Tipuani, Apr.–June, 1892 (1411) = Rusby's 1860 and 1861.

Wissadula spicata (H. B. K.) Presl, Rel. Haenk. 2: 117. Between Guanai and Tipuani, Apr.–June, 1892 (1416) = Rusby's 1862 and 1957.

Abutilon ramiflorum A. St. Hil. Fl. Bras. Mer. 1: 199. Between Guanai and Tipuani, Apr.–June, 1892 (1451).

Pavonia paniculata Cav. Diss. 3: 135. *pl. 46. f. 2.* Mapiri, July, 1892 (1496) = Rusby's 1789.

Pavonia malacophylla (Nees et Mart.) Britton, Bull. Torr. Bot. Club, 16: 154. Between Guanai and Tipuani, Apr.–June, 1892 (1456) = Rusby's 1462.

Pavonia diuretica St. Hil. Plant. Us. *pl. 53.* A little below Cochabamba, 1891 (1053) = Rusby's 1459.

Gossypium maritimum polycarpum Todaro, Rel. Cult. Cot. *pl. 8.* Espirito Santo, 1891 (1201) = Rusby's 659.

Chorisia sp. Espirito Santo, 1891 (1175). Flowers only.

CEIBA BOLIVIENSIS Britten sp. n. Journ. Bot. Apr., 1896. Vic. Cochabamba, 1891 (1154).

Ochroma Lagopus Swz. Fl. Ind. Occ. 2: 1144. Mapiri, July–Aug., 1892 (1501) = Rusby's 1927.

STERCULIACEAE.

Helicteres Barnensis Jacq. Amer. 236. *pl. 147.* Between Guanai and Tipuani, Apr.–June, 1892. (1362 and 1401.) The same form collected by Pearce in Scarlet Valley, below Coroico.

Waltheria Americana L. Sp. Pl. 673. Between Guanai and Tipuani, Apr.–June, 1892 (1418) = Rusby's 1405 and 1458.

CHAETAEA LANCEOLATA (Sesse).

Buettneria lanceolata Sesse; DC. Prod. 1: 487. Between Guanai and Tipuani, Apr.–June, 1892 (1369).

TILIACEAE.

Triumfetta semitriloba L. Mant. 1: 173. Vic. Guanai, July, 1892 (1597) = Rusby's 715, 718, 1236a and 1450.

Triumfetta grandiflora Vahl, Ecl. 2: 34. Mapiri, July–Aug., 1892 (1499).

Heliocarpus Americanus L. Sp. Pl. 448. Between Guanai and Tipuani, Apr.–June, 1892 (1455) = Rusby's 1492 and 1493.

Heliocarpus Popayannensis H. B. K. Nov. Gen. 5: 341. Mapiri, July–Aug., 1892 (1491).

LUEHEA SPLENDENS sp. n.

Branches and branchlets very stout, the latter 3 mm. or more in diameter, ferruginous-tomentellate; stipules 2 cm. long, 8 mm. broad, inequilaterally ovate from the base, obtusish, coriaceous, velvety, many-nerved or costate; petioles very stout, about 2 cm. long; blades 1–3 dm. long, 5–15 cm. broad, ovate to obovate with inequilateral cordate base, short-acuminate and acute apex, and sharply serrate-dentate margin, the sinuses rounded; coriaceous, above dark green and very minutely cinereous, the midrib and 8 or 10 pairs of primaries slightly prominent, the former slightly channelled, underneath densely ferruginous-tomentellate, the veins very prominent, the secondaries connecting the primaries and rather crooked; flowers racemose-paniculate at the summit and solitary in the upper axils, rather few; pedicels 1–2 cm. long, 5 mm. broad, terete or subquadrilateral; bracteoles 5 (dividing when older?), valvate, two-thirds the length of the sepals and as long as the petals, acute, coriaceous, densely ferruginous-tomentose without and pinkish-velvety within; sepals 5, valvate, 6 cm. long, lanceolate, coriaceous, densely ferruginous-tomentose without, within crimson, 7–9-nerved, glabrous except the midrib and margins, which are silky-pilose toward the base; petals imbricate, crimson, membranaceous, strongly nerved, obovate, short-acuminate and very acute, entire, the base somewhat narrowed, each bearing about 5 partly coherent, thick glands nearly 5 mm. in length, at the base on the inner side; stamens very numerous, equalling the sepals, the outer somewhat shorter and anantherous, collected in 5 phalanges, white-villous or pubescent at the base; ovary oblong-ovoid, 5-angled, 2 cm. long, ferruginous; style very stout, equalling the sepals, thickened at the apex; stigma capitate, 8 mm. broad; fruit oblong, inequilateral and slightly falcate, strongly 5-lobed (dehiscence?), apparently not mature; seeds strongly imbricate, the oblong apical wing 4 or 5 times as long as the angular body.

Between Guanai and Tipuani, April–June, 1892 (1339).

Collected also by Pearce below Coroico. Fendler's no. 1915, from Trinidad, lacks the cordate leaf-base and has a shorter fruit.

Apeiba Tibourba Aubl. Pl. Guian. 1: 538. Between Tipuani and Guanai, Dec., 1892 (1701) = Rusby's 613 and Gardner's 1476x.

Apeiba membranacea Spruce; Benth. Journ. Linn. Soc. 5: Supp. 61. Between Tipuani and Guanai, Dec., 1892 (1703) = Rusby's 612.

Prockia completa Hook. Ic. Pl. 1: *pl. 94.* Guanai, Dec., 1892 (1633) = Rusby's 1491.

Vallea stipularis Mutis; L. f. Supp. 266. Near snow-line, Mt. Tunari, 1891 (1112).

LINEAE.

ERYTHROXYLON PAUCIFLORUM sp. n.

Glabrous; branches slender, gray-brown; stipules 5–7 mm. long, triangular-subulate, very acute, membranaceous, brown; petioles 3 mm. long, stout; blades 6–12 cm. long, 3–7 cm. broad, regularly oval, obtuse, entire, thickish, veins obscure above, the midrib and 12–15 irregular pairs of primaries slightly prominent beneath; flowers not seen; fruiting pedicels sheathed at the base by 5–7 bracts similar to the stipules, but shorter, the pedicels 5–8 mm. long, upwardly thickened, strongly and sharply angled; calyx 3–4 mm. broad, the sepals very broadly obovate, strongly apiculate, striate; fruit blackish, oblong, 7–8 mm. long, 4 mm. broad, tipped with the persistent styles.

Between Tipuani and Guanai, Dec., 1892 (1639).

MALPIGHIACEAE.

BYRSONIMA BIACUMINATA sp. n.

Arborescent, the branchlets slender, striate, the younger channelled and ferruginous; stipules entire, thickish, broadly ovate, obtuse, concave, gray-tomentose without, bright brown within, about 2 mm. long and broad; leaves attenuate into a short petiole, 6–12 cm. long, 1.5–3 cm. broad, oblong, about equally acuminate at both ends, obtusish or barely acute, thick reticulate and shining above, beneath compactly ferruginous-tomentose; racemes rather dense, ovoid-oblong, 3 cm. long by 2 cm. broad, on peduncles 1.5–2 cm. long; bracts small, ovate, like the peduncles, etc., ferruginous; pedicels about 8 mm. long, grooved, recurved; bud broadly ovoid with rounded apex; petals 6 mm. long; glands white and shining; anthers 2 mm. long, brown; fruit not seen.

Tipuani, Dec., 1892 (1643). Also collected by Pearce at Yungas. Species near *B. spicata*.

STIGMATOPHYLLON COLORATUM sp. n.

Stems strongly twining, slender, slightly channeled, pubescent, some of the hairs retrorse; leaves of the pair nearly equal; petioles 2.5–8 cm. long, rather stout,.pubescent, the blackish broadly spheroidal closely sessile glands near the summit; blade 5–15 cm. long, 4–12 cm. broad, regularly cordate-ovate, with nearly closed sinus, with very abrupt slight acute apical prolongation, and obscurely denticulate margin, the veins with short aristiform prolongations; glabrous both sides, bright green above, rich purple underneath, except for the green margins; primaries about 8 pairs, slender, rather crooked, prominent underneath, connected by the secondaries and forked-reticulate near the margin; peduncles axillary, 4–8 cm. long, slender, pubescent, 2–4-angled, compressed at the summit, about 20-flowered, bearing among the pedicels several glands like those of the petioles; pedicels very unequal, many times shorter than the peduncles; bud obovoid, with a broad summit; calyx hemispherical, 5 mm. broad, the sepals broadly ovate with rounded summit, the blackish glands oblong, appressed, two-thirds the length of the calyx, petals 12–15 mm. long; stigmatic appendage conspicuous, green, puberulent; samaras (in my specimen) 1–3, 2.5–3.5 cm. long, about 13 mm. broad at the base, the wing abruptly contracted at the back, near the base, to 1 cm., the apex blunt or rounded, the ventral margin irregularly sinuate above, the surface sparsely gray-pilose, finely very many nerved.

Between Guanai and Tipuani, Apr.–June, 1892 (1366).

Bannisteria sp., near *B. argentea* (H. B. K.) Spreng., but in bud only. Between Guanai and Tipuani, Apr.–June, 1892 (1365).

Bannisteria, apparently an undescribed species intermediate between *B. Martiana* and *B. lucida*, but fruit is lacking. Mapiri, July–Aug., 1892 (1531).

Tetrapterys papyracea Tr. & Pl. Ann. Sci. Nat. (IV) **18**: 334. Between Guanai and Tipuani, Apr.–June, 1892 (1356).=Rusby's 513 but not 731.

Tetrapterys calophylla A. Juss. Monog. Malpigh. 271. Var. (?) BOLIVIANA. n. var.

The younger portions puberulent or canescent; branchlets reddish, stout, the internodes 5–7 cm. long; petioles 1–1.5 cm. long, stout; blades 1–1.5 dm. long, 5–8 cm. broad, oval-obovate, the base subcordate and mostly inequilateral, the apex with a very short blunt point, revolute, thin but rigid, somewhat shining on both sides, sparsely pubescent on the veins beneath, the primaries 5 or 6 pairs, strongly falcate-ascending, connected by the numerous slender crooked secondaries, the reticulation elongated and rather coarse; panicles axillary and terminal, sessile or short-peduncled, leafy, the floral leaves mostly more than 1 cm. long, oval-orbicular, wavy, emarginate, sessile; pedicels 3–5 mm. long, 2-bracted, a gland between the bracts on one side; calyx cup-shaped, 7 or 8 mm. broad, the sepals white, fleshy, entire, broadly oval with rounded apex, strongly appressed to the stamens and two-thirds of their length; glands 8, large, oblong; petals 7 mm. long, strongly clawed and concave, entire; stamens 10, anthers uniform, the filaments a little more than 3 mm. long, the alternate longer, lanceolate, outwardly arched above the base, connivent above and the apices again curved outward; anthers 1 mm. long, not appendaged; ovary densely pilose, the gynobase very slightly pyramidal-elevated; ovaries 3, the cristae low, obtuse; styles stout, a little exceeding the stamens; stigmas oval, oblique, green, 1 mm. long; fruit not seen.

Between Guanai and Tipuani, April–June, 1892 (1338).

Apparently the same as Rusby's, No. 731, but not 513.

Hiraea chlorocarpa A. Juss. Ann. Sci. Nat. (II) **13**: 259. Espirito Santo, 1891 (1192).

ZYGOPHYLLEAE.

PORLIERA ARIDA sp. n.

Fructicose, divaricately much branched, the branchlets short and stout, some of them spinose, blackish, the youngest tomentellate and grayish; spines (stipules) of variable length, about 1 mm. long, stout, rigid, pungent, spreading; leaves papillose-glandular, light green, about 1 cm. long on a very short petiole, rhachis stoutish, the leaflets about 9 pairs, sessile, 2 to 3 mm. long by 0.6 mm. broad, oblong or slightly broader near the rounded apex, thick and coriaceous; flowers not seen; fruiting peduncle 5 to 7 mm. long, clavate; fruit obcordate, 2-celled (always?), 5 mm. long by 8 mm. broad, blackish.

Turedon, 1891 (1124).

Very near *P. hygrometrica* R. and P., but differs in form of leaflets and of fruit. Mandon's no. 861 with about 15 pairs of narrower leaflets, 7 mm. in length, shining above, and with fruit almost identical with *P. arida*, is quite distinct and is apparently undescribed.

GERANIACEAE.

Tropaeolum tuberosum R. and P. Fl. Per. **3**: *pl. 314*. Vic. Cochabamba, 1891 (Cult.) (1102)=789.

TROPAEOLUM MACULATUM sp. n.

Glabrous; stems very slender, the internodes about 5 cm. long; petioles slender, nearly 1 dm. in length; stipules none; leaves

3–8 cm. broad, 2–5 cm. long, the basal margin sub-truncate, the remainder divided one-third of the way to the petiole into five lobes which are roundish-quadrilateral and obscurely sinuate, separated by narrowly ovate obtuse or rounded sinuses, veins 7 to 9, slender; pedicels solitary, in flower about 8 cm. long; flower about 2 cm. long, yellow or light scarlet with large deep indigo spot and a light scarlet stout spur 1 cm. long.

Vic. Cochabamba, 1891 (1066).

Hypseocharis pimpinellifolia Remy, Ann. Sci. Nat. (III.) **8**: 238. Near snow-line, Mt. Tunari, 1891 (1043) = Rusby's 2553.

Oxalis tuberosa Mol. Stor. Nat. Chil. 132. Turedon, 1891. Cult. as "Oca." (1104).

Oxalis filiformis H.B.K. Nov. Gen. **5**: 245. *pl. 469*. Near snow-line, Mt. Tunari, 1891 (1037) = Mandon's 847.

Oxalis dendroides H. B. K. Nov. Gen. **5**: 250. Between Guanai and Tipuani, Apr.–June, 1892 (1397) = Rusby's 856 and 1752.

OXALIS ERYTHROPODA sp. n.

Stems erect or ascending, straight, stout, simple, red or purple at least at the base, puberulent; internodes very unequal, mostly 1–2 cm. long; petioles 2.5–3.5 cm. long, slender, strongly ascending, pubescent; leaflets 3, the lateral petiolules 1 or 2 mm., the terminal 4 or 5 mm. long; leaflets 2–3 cm. long, 1–2 cm. broad, the lateral oval or slightly obovate, with rotund apex and subrotund base, the terminal obovate with cuneate base and subtruncate slightly retuse apex, all very thin, densely sericeo-pubescent and pale underneath, less sericeous above; peduncles solitary in the axils, 5–7 cm. long, otherwise similar to the petioles, the (about 10) flowers umbelled or capitate at the summit; pedicels mostly present, at most 3 or 4 mm. long; flowers bright yellow, about 8 mm. long; calyx one-half as long as the corolla, the sepals ovate, tapering, acute; capsule nearly or quite 1 cm. long, two-thirds as broad, turgid, ovoid, with truncate broad base and broad apex, tipped by the purple styles 1 mm. long, and enclosed for two-thirds of its length by the accrescent calyx; seed 2.5 mm. long, oval-ovoid, short-beaked, light brown, coarsely reddish muricate.

Vic. Guanai, July, 1892 (1598). Near *O. Sepium*.

RUTACEAE.

Erythrochiton Brasiliense Nees et Mart. Nov. Act. Cur. **11**: 166. Between Guanai and Tipuani, Apr.–June, 1892 (1367) = Rusby's 2615.

Citrus acida Roxb. Fl. Ind. **3**: 390. Vic. Guanai (naturalized) 1892 (1611).

Benjamina Peruviana (Planch.) Kuntze, Rev. Gen. Pl. 103. (*Dictyoloma Peruviana* Planch. in Hook. Lond. Jour. Bot. **5**: 583). Between Guanai and Tipuani, Apr.–June, 1892 (1385) = Rusby's 738 and Spruce's 3888.

OCHNACEAE.

CESPEDESIA EXCELSA sp. n.

Glabrous, arborescent, the branchlets stout, terete; stipules 6–8 cm. long, 1 cm. broad, oblong-spatulate with rounded apex, the margin above slightly crumpled-crenate; petioles .75–1 dm. long, 8 mm. broad, semi-cylindrical, the upper side hollow with very acute edges; blades 5–7.5 dm. long, 2–2.5 dm. broad, obovate-spatulate with regularly rounded apex, sinuate-serrate, the very small teeth strongly inflexed, scarcely mucronate; coriaceous, rigid, the primaries 35 to 45 pairs, parallel, straight, connected by very numerous straight secondaries which meet at about the middle point; panicle 2.5–3 dm. long, exclusive of the stout peduncle, which is two-thirds as long, sparsely branched, and few-flowered; pedicels 1 cm. long, stout; calyx saucer-shaped, about 7 mm. broad, mostly lobed to about the middle, the lobes broad and rounded, the tube lightly costate; bud 1.25–1.5 cm. long, slightly and obtusely pointed; petals deep yellow, broadly obovate with rounded crumpled margin, thick; stamens shorter than the corolla, pistil a little longer, the ovary slightly falcate; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1723). Distributed as 1658 or 1658a.

MELIACEAE.

GUAREA RUSBYI (Britton). (*Sycocarpus Rusbyi* Britton, Bull. Torr. Bot. Club, **14**: 143).

Since referred to *G. trichilioides* L., but the latter species is really a West Indian shrub. Specimens of *Guarea* in herbaria are very badly named, and the limits of the species are difficult to trace. This species is nearest to *G. Aubletii*, but differs especially in the denseness and stoutness of the more compound inflorescence, the shorter and broader bud, and the deeper thicker more wooly, erect calyx, which closely clasps the base of the corolla. It appears intermediate between *G. Aubletii* and *G. purgans*.

Between Guanai and Tipuani, Apr.–June, 1892 (1373) = Rusby's 463 and 1296.

MOSCHOXYLON PACHYPODUM sp. n.

Flowering branchlets very thick, tomentose; petioles 4 or 5 cm. long, a little shorter than the internodes of the rhachis; leaflets about 9, the upper, except perhaps the terminal, successively larger, imperfectly opposite, on stout petiolules 3 or 4 mm. in length, .5–1.5 dm. long, 3–7 cm. broad, oblanceolate, with rounded or blunt base and abruptly short-pointed and obtuse apex, entire, revolute, coriaceous, glabrous above with pubescent midrib and slightly impressed primaries (16 to 20 pairs), underneath downy on the veins; panicles terminal, irregularly much branched, short and broad; buds globose-ovoid, obtuse, 2.5–3 mm. long; calyx nearly plane, 2.5–3 mm. broad, divided midway; petals purplish-red, 3.5 mm. long; fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1454).

MOSCHOXYLON VIRIDE sp. n.

Branches stoutish, grayish-red, terete; petioles (the upper) 3–5 cm. long, the internodes of the rhachis a little shorter; leaflets 7, the upper successively larger, 6–12 cm. long, 3–5 cm. broad, obovate, the cuneate base tapering into a very short petiole, and, especially the uppermost, inserted into a dilated portion of the rhachis, the apex abruptly contracted into a short broad obtuse point; entire, membranaceous, bright green, glabrous on both sides, venation slender, the primaries about 10 or 12 pairs; panicles solitary in the axils and terminal, about 1 dm. long exclusive of the long or short peduncle, pyramidal, lax; flowers not seen; fruiting pedicels 3–5 mm. long and like the branches of the panicle, slightly cinereous; calyx plane, 3 mm. broad, lobed to the middle; fruit (mature?) ellipsoidal, 8 or 9 mm. long, 6 mm. broad, tomentose, yellowish, bluntly triangular, the sides lightly grooved, imperfectly 3-celled through the abortion of all but one ovule.

Between Guanai and Tipuani, Apr.–June, 1892 (1370).

Possibly a *Trichilia*, though the habit is that of *Moschoxylon*. It is apparently near *M. gracile*.

OLACINEAE.

HEISTERIA BIFLORA sp. n.

Glabrous; branches slender, strongly ascending, slightly angled, the internodes 2.5–3 cm. long; petioles half as long as the internodes; blades .7–1 dm. long, 3–4 cm. broad, oblong, the base cuneate, the apex abruptly short- and blunt-pointed; dark green, coriaceous but not thick, the venation indistinct, strongly reticulate, the primaries about 15 pairs, communicating very near the margin; pedicels geminate, 4 mm. long; flowering calyx saucer-shaped, 2.5 mm. broad, divided half-way to the base, the lobes triangular, acute; petals 3 mm. long, ovate-oval, acutish;

stamens 10, shorter than the petals, the alternate ones longer, the filaments flattened, pilose; ovary broad, 5-lobed; style stout, conical-cylindraceous; fruiting calyx 1.5–2 cm. broad; fruit 1 cm. long, spheroidal, light-brown, coarsely many-striate.

Between Guanai and Tipuani, Apr.–June, 1892 (1407).

Heisteria—species probably undescribed, but farther comparison is required. Between Tipuani and Guanai, Dec., 1892 (1677).

Schoepfia obliquifolia Turcz. Bull. Soc. Imp. Nat. Mosc. 31: Part 1, (1858) 249. Guanai–Tipuani, Apr.–June, 1892 (1409).

DENDROBANGIA gen. nov.

Flowers perfect; calyx 5-parted, the segments coherent at the base, imbricated, unequal, the outer larger; petals 5, coriaceous, valvate, the apices inflexed and bearing bearded appendages, which in the bud are entangled with the anthers, in anthesis strongly recurved; stamens 5 and alternate, or 10, the filaments naked, dilated at the base, adnate to the corolla-tube, the anthers short, 2-celled, cells connected only at the point of attachment to the filament, not appendaged; disk none or inconspicuous; ovary compressed, inequilateral, 1-or (mostly) 2-ovuled, the ovules pendulous; stigma minute, nearly sessile, situated unilaterally; fruit not seen.

A tree, with alternate exstipulate coriaceous leaves, and nodal and intranodal inflorescence, the flowers sessile and crowded at the ends of the short branchlets of the small clustered panicles; bracts and bracteoles present.

Although in its calyx-characters this genus is related to *Villaresia*, its corolla is in all its general features like that of *Poraqueiba* or *Emmotum*.

I am indebted to Mr. Oliver for having kindly pointed out the affinities of the plant.

DENDROBANGIA BOLIVIANA sp. n.

Branchlets stoutish, terete, glabrate, the internodes 1–1.5 cm. long; petioles .5–1 cm. long, very stout; blades .75–1.5 dm. long, 4–5 cm. broad, obovate, the base obtuse, the apex abruptly short-pointed, acutish; entire, rigid, dark green, glabrous, venation inconspicuous, the primaries about 6 pairs, strongly falcate-ascending, somewhat crooked; panicles 2 or 3 cm. long, loose, granular-scurfy, the bracts ovate, 2 mm. long, thick and rigid, gray, the bracteoles similar, closely appressed to the calyx; calyx thick and coriaceous, the sepals lightly imbricated, nearly 2 mm. long, ovate, the margins lighter colored; corolla dark purple, 3 mm. long, broadly campanulate, lobed two-thirds of the way to the base, the ovate acute lobes strongly recurved, the appendages oblanceolate, densely bearded; stamens about half as long as the corolla-lobes, exclusive of their appendages.

Between Tipuani and Guanai, Dec., 1892 (1694).

ILICINEAE.

ILEX AMPLIFOLIA sp. n.

Glabrous; branches stout, much wrinkled in drying, light gray-brown; petioles very broad and stout, 1–1.5 cm. long; blades .75–1.5 dm. long, 4–8 cm. broad, oval-elliptical or the base slightly produced, the margin obsoletely serrate, and slightly revolute, coriaceous and very thick, dark-green or the older pale; on the upper surface midrib broad, slightly prominent, longitudinally wrinkled, veins inconspicuous; underneath the very stout midrib and 10–12 non-opposite primaries very prominent, the latter forked and anastomosing near the margin; bracts light brown, 3–4 mm. long, broadly ovate, acuminate and acute, sheathing the base of the peduncle, the bractlets similar but smaller; peduncles proceeding irregularly from the upper internodes, about 2 cm. long, slender, blackish, bearing 3–5 umbels on secondary peduncles less than half as long; umbels about 5–10-flowered, occasionally compound, the pedicels 3–4 mm. long; buds globose, about 3 mm. in diameter, rather loosely seated in the calyx, which is crateriform and very slightly lobed, the lobes broad and rounded; petals 3–3.5 mm. long and broad, white, thickish; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1682).

Very near *I. crassifolia* and perhaps the same as Lechler's no. 2624.

CELASTRINEAE.

MAYTENUS FLAGELLATA sp. n.

Glabrous, much branched, the branches and branchlets elongated and very slender, the former gray-brown, the latter green and sharply angled or narrowly winged, very leafy, the internodes about half the length of their leaves; leaves subsessile, 1.5–3 cm. long, 2–4 mm. broad, oblong-oblanceolate with tapering base and acutish or abruptly pointed apex, faintly serrate with brownish cartilaginous teeth, thick and rigid, pale green, the midrib and about 6 pairs of ascending primaries rather prominent on both sides; flowers sessile, mostly geminate, greenish-yellow with purple center, 4 mm. in diameter; fruit globose-pyriform, 7–8 mm. long, light brown, 2-carpelled.

Turedon, 1891 (1128).

RHAMNEAE.

Gouania Blanchetiana Miq. Linnaea, **22**: (1849) 797. (*G. sepiaria* Mart. ex Britt. Bull. Torr. Bot. Club, **16**: 189.) Espirito Santo, 1891 (1187). = Rusby's 1486.

Gouania tomentosa Jacq. Amer. 263. Espirito Santo, 1891 (1270) = Rusby's 1758.

AMPELIDEAE.

Vitis sicyoides canescens (Lam.) Baker, in Mart. Fl. Bras. **14**: Part 2, 202. Espirito Santo, 1892 (1265) = 321.

Vitis ovata (Lam.) Baker, in Mart. Fl. Bras. **14**: Part 2, 203. Between Guanai and Tipuani, Apr.–June, 1892 (1389) = Rusby's 2087.

SAPINDACEAE.

Determined by Dr. L. Radlkofer.

Serjania sufferruginea Radlk. Mon. Sap. 299. Espirito Santo, 1891 (1258).

Serjania leptocarpa Radlk. Mon. Sap. 112. Espirito Santo, 1891 (1262).

Serjania meridionalis Camb. in St. Hil. Fl. Bras. **1**: 366. *pl.* *76*. Espirito Santo, 1891 (1266a).

Serjania marginata Casar. Decad. Stirp. Nov. Bras. **5**: 44. Vic. Mapiri, 12,000 ft., Sept, 1892 (1587). Ad forma *S. pluridentata* Radlk., foliis depauperatis = Rusby's 525.

Serjania Mansiana Mart. Flora **23**: (1839) in Bibliog. 1, 9. Vic. Mapiri, 8,000 ft., Sept., 1892 (1583).

Serjania confertiflora Radlk. Serj. Monogr. 117; Suppl. 89, 162; Fl. Bras. fasc. 113, 262) Var. DASYCEPHALA Radlk. Fructus (juvenilis) truncatus, puberulus, loculis subcristatis dense rufidulo-pubescentibus; foliola punctis lineolisque pellucidis nervis lateralibus parallelis undulato-flexuosis eleganter notata. Espirito Santo, 1891 (1262a). Between Guanai and Tipuani, Apr.–June, 1892 (1357, flor.)=Rusby's n. 1754 (flor. et fruct. juvenil.) and Bang's 421a.

Serjania dumicola Radlk. Conspect. Serj. 4. Between Guanai and Tipuani, Apr.–June, 1892 (1450).

Allophylus punctatus (Poepp.) Radlk. (*Schmidelia punctata* Poepp. Nov. Gen. **3**: 38. *pl. 244*). Mapiri, July–Aug., 1892 (1520).

Allophylus petiolulatus Radlk. Erganzungen Mon. Sap. 181. Between Tipuani and Guanai, Dec., 1892 (1638). = Rusby's 2086.

ANACARDIACEAE.

Quebrachia Lorentzii Griseb. Symb. Bot. Fl. Arg. 95? Turedon, 1891 (1129). Presents differences in foliage and size of flowers from the type, but fruit is lacking.

TAPIRIRA PEARCEI sp. n.

Branches stout, brown, hoary, striate; petioles 6–10 cm. long, stout, striate, glabrate, the internodes of the rhachis about half as long; leaflets 7–9, the upper larger; the petiolules .5–1 cm. long, stout; leaflets .8–1.5 dm. long, 3–5 cm. broad, narrowly ovate, with subrotund but highly unequal base and acuminate apex, coriaceous, dark-green above, ferruginous but glabrous underneath, midrib prominent both sides, strongly so below, like the 10 to 15 pairs of primaries; panicles fascicled at the summit, 2–3 dm. long, decompound, lax, open and sparsely flowered; bracts subulate, twice the length of the pedicels; flowers very shortly and stoutly pedicelled; calyx 2 mm. broad, deeply lobed; petals twice the length of the calyx, white, oblong-obovate; fruit not seen, except as stated below.

Vic. Mapiri, July–Aug., 1892 (1543). Collected also by Pearce at Sandillani and Chailla. His specimens show fruit blackish, broadly ovoid, obliquely truncate, granular, 11 mm. long, 6 mm. broad.

LEGUMINOSÆ.

Crotalaria Pohliana Benth. Tayl. Ann. Nat. Hist. 3: 428. Between Guanai and Tipuani, Apr.–June, 1892 (1442)=Rusby's 580.

Indigofera Anil L. Mant. 272. Guanai, Apr.–June, 1892 (1460).

Barbiera polyphylla DC. Mem. Leg. 242. Between Guanai and Tipuani, Apr.–June, 1892 (1363) = Rusby's 2356.

GLIRICIDIA MICHELII sp. n.

Apparently a climbing or reclining shrub, the younger growth puberulent; branches much elongated and slender, coarsely angled, glabrous, the internodes unequal, mostly about 8 cm. long; stipules lanceolate or subulate, 3 mm. long; petioles 1–1.5 cm. long, angled, internodes of the rhachis nearly 1 cm. long, stipellae none; leaflets about 7 or 8 pairs, on very short petiolules, 1.5–3 cm. long, .8–1.5 cm. broad, slightly inequilateral, oblong-ovate, the base rounded, the apex blunt and minutely cuspidate, entire; lightly revolute, membranaceous, bright-green, minutely black-dotted underneath, finely reticulate, the primaries about 8 on each side, not opposite, crooked; racemes axillary, in reality solitary but appearing as though 2–3-fascicled, 8–10 cm. long inclusive of the peduncle, which is 1–2 cm. long, interrupted, the flowers mostly 2 or 4 together, the bracts similar to the stipules; calyx broadly campanulate, 4 mm. long and broad, divided about one-third of the way to the base; corolla purple, exceeding the calyx by 5 or 6 mm.; vexillum indistinctly auricled; style naked; youngest legumes only seen, apparently coriaceous, about 5-seeded.

Vic. Sorata, Nov., 1892 (1621). Kindly determined by M. Micheli.

Astragalus Mandoni Rusby, Mem. Torr. Bot. Club, **3**: Part 3, 19. Near snow-line, Mt. Tunari, 1891 (1022).

Chaetocalyx Brasiliense (Vogel) Benth. in Mart. Fl. Bras. **15**: Part 1, 75. Between Guanai and Tipuani, Apr.–June, 1892 (1348) = Rusby's 2398.

AMICIA PARVULA sp. n.

Herbaceous, the stems much elongated, very slender, only the younger portions minutely puberulent, purplish below, terete, the internodes 3 or 4 cm. long; stipules withering-persistent, broadly sheathing, somewhat decurrent, about 5 mm. long; petioles filiform, 1–2.5 cm. long; leaflets 2 pairs, subsessile, about 1 cm. long and broad, triangular, obcordate, the lobes entire, rounded, the large sinus (about 90°) varying from acute to rounded, very sparsely pubescent and rather sparsely beset below with rather large brown glands; racemes solitary in the axils and terminal-panicled, the peduncles 1–2 cm. long, filiform but rigid, erect-spreading, the flowers about .75–1 cm. apart, their bracts 2 mm. long, 1 mm. broad, obovate with rounded apex, herbaceous, the pedicels 5–7 mm. long, filiform; calyx about 8 mm. long, strongly nerved, pubescent, sparsely beset with large bright red glands, the tube 2 mm. long, campanulate, the upper lobes 5 or 6 mm. long, 2 mm. broad, obovate with short-acuminate and obtuse point, the lateral lobes 3 mm. long, oblong, obtuse, the lower lobe nearly equalling the upper, broader, folded to form a keel; petals subequal; vexillum 8 mm. long, 6 mm. broad, obovate, scarcely emarginate; alae 8 mm. long, slightly oblique, obtuse, free, auricled; stamens 9 mm. long, monadelphous, the sheath cleft upon the upper side, the anthers uniform; style slightly exceeding the stamens, the apex recurved, the stigma ovoid, oblique; ovary sessile, 3 mm. long, 4- or 5-ovuled; fruit about 1 cm. long, 3 mm. broad, 4- or 5-seeded, both sutures intruded, the lower more deeply; segments circulo-quadrilateral, the margin thickened and wavy or tuberculate, 2-winged upon the inferior side along the middle portion, thickened, crenate; pericarp cartilaginous, thickened; seed 2 mm. long, strongly reniform, moderately flattened, smooth.

Vic. Cochabamba, 1891 (1068). It is possible that when the fruit and seed characters of *Amicia* are better known, it will be found that this is generically distinct.

PATAGONIUM GRANDIDENTATUM sp. n.

Hoary-pubescent; root vertical, stout; stems numerous from a perennial crown, ascending, elongated, slender, sparingly branched, the branches similar; stipules 2–3 mm. long, two-thirds as broad, inequilateral, ovate, acute or acuminate; leaves conspicuously but unequally petioled, bearing mostly about 10 leaflets on each side, these unequally distributed but approximately about the length of their internodes; leaflets subsessile, 5–7 mm. long, 3–5 mm. broad, obovate, or the larger inclining to truncate and triangular-obovate, about 8-toothed, the teeth large and rounded with acute sinuses, thick, the venation obscure and impressed above; racemes terminal, the lowest flowers in the axils of small leaves; bracts similar to the stipules; pedicels about as long as the flowers, 5 mm. or in fruit about a half longer; legume (exclusive of pedicel and beak) about 2 cm. long, 3.5 mm. broad, tipped with a subulate or filiform beak of variable length, of about 7 joints, beset with small dark green glands; sinuses of the articulations extending less than half way across; seed rich brown, lenticular, one-half to two-thirds as broad as the legume.

Vic. Cochabamba, 1891 (1012).

Stylosanthes Guyanensis subviscosa Benth. in Mart. Fl. Bras, **15**: Part 1, 192. Between Guanai and Tipuani, Apr.–June, 1892 (1459). Determined by Dr. P. Taubert.

Meibomia cajanaefolia (DC.) Kuntze, Rev. Gen. Pl. 195. Guanai, Apr.–June, 1892 (1417) = Rusby's 964.

Lathyrus pubescens H. and A. Bot. Beech. 21. Near snow-line, Mt. Tunari, 1891 (1023) = Rusby's 1011.

Bradburia Plumiera (Turp.) Kuntze, Rev. Gen. Pl. 164. (*Centrosema Plumiera* Turp. Ann. Mus. Vind. **2**: 110.) Espirito Santo, 1891 (1273).

Erythrina rubinervia H. B. K. Nov. Gen. **6**: 434. Mapiri, July–Aug., 1892 (1515).

Styzolobium rostratum (Benth.) Kuntze, Rev. Gen. Pl. 208 (*Mucuna rostrata* Benth. in Mart. Fl. Bras. **15**: Part 1, 171.) Vic. Guanai, July, 1892 (1599.)

No. 1257 is also apparently a form of the same species.

Stizolobium ellipticum Pers. Syn. 2: 299. Between Guanai and Tipuani, Apr.–June, 1892 (1353).

STIZOLOBIUM MAPIRENSE sp. n.

Sparingly ferruginous-pubescent throughout, except the gray-tomentose calyx; stems very slender, the internodes 3–5 dm. long or more; petioles 5–7 cm., rhachis 1.5–2 cm., and petiolules 1 cm. long, the last thickened, blackish; lateral leaflets 1–1.5 dm. long, 6–8 cm. broad, the lower lateral half about twice the breadth of the upper, ovate, the base rounded or inclined to cordate, the apex abruptly and very slenderly acuminate; entire, very thin, dark, sparingly strigose; terminal leaflet nearly a half longer, very little broader, obovate-oval, the base slightly contracted, otherwise similar; venation reticulate, inconspicuous, very slender, yellowish; peduncles very slender, nearly a meter long, thickened toward the panicle; pedicels flattened, 2–4 cm. long; bud ellipsoidal; calyx campanulate, 2 cm. long and nearly 3 cm. broad at the oblique mouth, the teeth short and broad, the longest 1 cm. long; vexillum 3 cm., the other petals 4 cm. longer than the calyx, the keel barely exceeding the wings, not beaked, obtuse or scarcely acute, with a yellowish apex, the apices of keel and standard separated by 3–3.5 cm.; fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1413).

Calopogonium galactioides Benth. ex. Hemsl. Biol. Cent. Am. 1: 301. Espirito Santo, 1891 (1276) = Fendler's 274.

Calopogonium coeruleum (Benth.) Britt. Bull. Torr. Bot. Club, 16: 262. Between Guanai and Tipuani, Apr.–June, 1892 (1452).

DIOCLEA PAUCIFLORA sp. n.

Branchlets, petioles, rhachis and pedicels harshly puberulent; petioles .6 to 1 dm. long, the rhachis 2–3 cm. long; petiolules 5–8 mm. long, stout; lateral leaflets .75–1 dm. long, 5–8 cm, broad, oval-ovate, slightly inequilateral, the base rounded, the apex abruptly short-acuminate and obtusish; entire, scarcely revolute, thin and membranaceous, pale, glabrous, primaries 5–7 pairs, not opposite, slightly prominent and slender, the veins finely reticulate; terminal leaflet oval-obovate, otherwise similar; panicles about 3 dm. long, peduncled, very loosely flowered, narrow and raceme-like, the branches 3–5 mm. long, very stout, at length about 10-flowered; pedicels about 3 mm. long, slender, 2-bracted at the summit, the bracts broadly ovate and acuminate, 1.5 mm. long, clasping the calyx; calyx campanulate, 1 cm. long, the lower lobe 4 mm. long; corolla nearly thrice the length of the calyx, the keel not rostrate, light purple; anthers uniform; fruit not seen.

Espirito Santo, 1891 (1190.)

Canavalia ensiformis (L.) DC. Prod. 3: 404. Espirito Santo, 1891 (1272) = Rusby's 1328, 2368 and 2858.

Dolichos Lablab L. Sp. Pl. 725. Espirito Santo, 1891 (1274).

Phaseolus prostratus Benth. in Mart. Fl. Bras. 15: Part 1, 192. A little below Cochabamba (1011).

Pachyrhizus tuberosus (Lam.) Spreng. Syst. 4: Cur. Post. 281. Between Guanai and Tipuani, Apr.–June, 1892 (1430).

Rhynchosia minima (L.) DC. Prod. 2: 385. Between Guanai and Tipuani, Apr.–June, 1892 (1433).

Amerimnon Spruceanum (Benth.) Kuntze, Rev. Gen. Pl. 159 (*Dalbergia Spruceana* Benth. in Mart. Fl. Bras. 15: Part 1, 223.) (?) Between Guanai and Tipuani, Apr.–June, 1892 (1408). M. Micheli, who kindly compared this for me with the specimens at Kew, thought that it did not exist there, but I subsequently found it to agree so closely with one of the two specimens (not the one from Santarem) thus marked by Mr. Bentham, that I think it may be thus referred.

Amerimnon—in fruit only and not determinable. Vic. Mapiri, July–Aug., 1892 (1471).

Platymiscium Cochabambense sp. n.

Glabrous; brancnes short and stout, light-gray, verrucose; petioles 2.5 or 3 cm. long, stout, the internodes of the rhachis, except the terminal, about as long, both stipules and stipellae wanting; leaflets 7, the petiolules 3 or 4 mm. long, stout; blades 5–8 cm. long, 3–4 cm. broad, the upper larger, oval, occasionally slightly ovate or obovate, the base rounded, the apex abruptly very short and obtusely pointed; entire, very thick, finely and inconspicuously reticulate-veined, the primaries about 7–9 pairs, alternating with shorter ones; racemes solitary in the axils and several at the summit, sessile or unequally peduncled, 8–10 cm. long, simple, rather densely flowered, the flowers mostly solitary, the pedicels about 2 mm. long, bearing a sheathing semicircular thickened gland near the base of the calyx, both bracts and bractlets wanting; calyx obliquely campanulate, 5 mm. long and broad, thick, the teeth short, triangular-ovate, obtuse; corolla 1 cm. long, the petals subequal, the standard slightly the longest; stamens unequal, slightly shorter than, style slightly exceeding, the petals; stipe stout, about as long as the ovary, fruit not seen.

Espirito Santo, 1891 (1181).

Sclerolobium Radlkoferi sp. n.

Lightly ferruginous or blackish-tomentose, except the glabrous and shining upper leaf-surfaces; branchlets and petioles strongly angular; stipules and stipellae not seen; petioles 3 or 4 cm. long, dilated at the base, the internodes about 2 or 2.5 cm. long; leaflets mostly 15, the petiolules 4 or 5 mm. long, dilated, blackish-tomentose, the blades .5 to nearly 1 dm. long, 3.5–6 cm. broad, the upper larger, oval-ovate, the base slightly cordate and very oblique, the apex very short-pointed; entire, revolute, thick, coriaceous, the midrib and 6–8 pairs of primaries impressed above, very stout and prominent beneath; panicles terminal, mostly about 2 dm. long, open, the peduncle and branches very stout and strongly angled, the latter erect; flowers sub-sessile, about 5 mm. long and broad; calyx, and especially the corolla, gray-tomentose, the filaments and ovary densely bright ferruginous-hirsute; fruit not seen, apparently glabrate.

Between Tipuani and Guanai, Dec., 1892 (1690). Dedicated to Prof. Dr. L. Radlkofer, who kindly determined the genus.

Caesalpinia pulcherrima (L.) Swz Obs. 166. Between Guanai and Tipuani, Apr.–June, 1892 (1386).

Cassia trachypus Mart. Fl. Bras. 15: Part 2, 122. Between Guanai and Tipuani, Apr.–June, 1891 (1345) = Rusby's 986.

Cassia hirsuta L. Sp. Pl. 378. Vic. Guanai, July, 1892 (1605).

Cassia bicapsularis L. Sp. Pl. 376. Espirito Santo, 1891 (1188).

Cassia versicolor Meyen in Vog. Syn. Cass. 29. Espirito Santo, 1891 (1171).

Cassia racemosa Mill. Dict. ed. 8, no. 19. Vic. Guanai, July, 1892 (1610).

Cassia bacillaris L. f. Supp. 231. Mapiri, July–Aug., 1892 (1561) = Rusby's 2400.

Cassia—sp. in flower only, not represented at Kew, but fruit is necessary for identification. Below Cochabamba, 1891 (1090).

Bauhinia inermis (Cav.) Pers. Syn. 1: 455 ? Between Guanai and Tipuani, Apr.–June, 1892 (1342). The legume is rather shorter and broader than in the type.

Tamarindus Indica L. Sp. Pl. 34. Between Tipuani and Guanai, Dec. 1892 (1736).

Copaiba Langsdorffii (Desf.) Kuntze, Rev. Gen. Pl. 172 (*Copaifera Langsdorffii* Desf. Mem. Mus. Par. 7: 377. *pl. 14*)? Vic. Mapiri, July–Aug. 1892 (1508). The fruit appears rather too large and the leaflets too broad, inequilateral and falcate for the species, but the specimen is in fruit only.

Piptadenia communis Benth. in Hook. Lond. Jour. Bot. **4**: 337. Guanai, Apr.–June, 1892 (1361) = Rusby's 1307.

Mimosa Soratensis Benth. Trans. Linn. Soc. **30**: 427. Vic. Sorata, May, 1892 (1317 = Rusby's 1299.

Mimosa rufescens Benth. in Mart. Fl. Bras. **15**: 362. Guanai, Apr.–June, 1892 (1505) = Rusby's 1304.

Mimosa albida Kunth, Mim. *pl. 1*. Guanai, Apr.–June, 1892 (1435) = Rusby's 1297.

Acacia Bonariensis Gill. in Hook. Bot. Misc. **3**: (1833) 207. Espirito Santo, 1891 (1168).

Acacia riparia H.B.K. Nov. Gen. **4**: 276. Between Tipuani and Guanai, Dec., 1892 (1671).

ACACIA MICHELII sp. n.

Much and flexuously branched, the branchlets stout, reddish-brown, striate and finely tuberculate, the internodes 1.5–2 cm. long; spines recurved-spreading, 2–4 cm. long, slender, very pungent, bluntly keeled, the older whitish and minutely black-dotted, the younger light-brown; leaves mostly petioled, 5–6-jugate, 3–5 cm. long, 2–3 cm. broad, the pinnae sub-sessile, 15–20-jugate, the leaflets sessile, 4–5 mm. long, .5–1 mm. broad, oblong, with sub-cordate base and rounded apex, pale, thickish, glabrous, the veins very obscure; peduncles solitary, erect, slender, about 2 cm. long; heads globose. Fruit about 5 or 6 cm. long, 1 cm. broad, blunt, moderately flattened, lightly constricted between the 5 or 6 seeds, brown.

Vic. Cochabamba, 1891 (1095). Near *A. constricta.*

Calliandra Boliviana Britton, Bull. Torr. Bot. Club, **16**: 327. Guanai, July, 1892 = Rusby's 1314 and 1315.

CALLIANDRA INAEQUILATERA sp. n.

Branchlets slender, light gray-brown, striate, the younger puberulent, the internodes 3–4 cm. long; stipules indurated, 5 mm. long, ovate, abruptly contracted near the middle and tapering above, obtuse or acutish, strongly many-nerved; common petioles 1–1.5 cm. long, stout, puberulent, bearing a single pair of very short-petioled unequal pinnae; stipellae similar to the stipules; leaflets 4–7 pairs, subsessile, 2–4 cm. long, .7–1.4 cm. broad, the upper larger, lance-ovate, inequilateral and falcate, the base rounded or subcordate, the apex obtuse and cuspidulate; entire, revolute, coriaceous, deep green, above glabrous and shining, underneath pubescent on the veins, 2-nerved, strongly reticulate; peduncles solitary in the axils, scarcely half the length of the leaves; heads 4 or 5 cm. in diameter when in full bloom, scarlet or crimson; calyx 3–4 mm. long, campanulate, strongly many-nerved, the teeth short, triangular-ovate; corolla infundibular, more than twice the length of the calyx, strongly about 25-nerved, the teeth 2 mm. long, ovate, obtuse; stamens many times the length of the corolla; fruit not seen.

Vic. Guanai, 1892 (1586).

In some respects this appears more like a *Pithecolobium*, but its venation marks it a *Calliandra*, in the section *Macrophyllae*.

Pithecolobium sophorocarpum Benth. in B. & H. Gen. Pl. 1: 598.

Var. (?) ANGUSTIFOLIUM var. nov.

The leaflets are 1.5 cm. long by about 3 mm. broad at the clasping cordate inequilateral base, which is conspicuously yellow-tufted, the margin is ciliate, the lower surface pale and very prominently reticulate, the rhachis hirsute. It appears to me to be a distinct species, but flowers are lacking.

Vic. Guanai, 1892 (1606).

PITHECOLOBIUM VENOSUM sp. n.

A large tree, the foliage softly pubescent except the upper leaf-surfaces; branchlets unarmed, stoutish, angular, flexuous, the internodes short and unequal; stipules not apparent; petioles strongly articulated to a prominently enlarged base, longer than the internodes of the rhachis, stout, angled; pinnae about 6 pairs, imperfectly opposite, their petioles swollen at the base, the lowest 2- the uppermost 4-jugate; glands 1 mm. below the insertion of the leaflets, conspicuous, orange-colored to brown; leaflets regularly enlarging upward, 2.5–5 cm. long, 1.5–4 cm. broad, on petioles about as broad as long, inequilateral, rhomboidally oval, subrotund at base and apex, shortly and bluntly cuspidate, entire, slightly revolute, coriaceous, dark-green and glabrous above, pale beneath, finely and strongly reticulate, the 5–8 pairs of primaries and veins prominent, especially beneath; peduncles solitary in the axils and clustered at the summit, .75 to 1 dm. long, erect or ascending, angled; flowers densely capitate; calyx 1 cm. long, infundibular, the teeth very short, triangular-ovate, yellowish pubescent; corolla about 1.6 cm. long, divided nearly down to the calyx, the lobes oblong, with rounded apices; stamens about thrice the length of the corolla; stigma inconspicuous; legumes (only the very youngest seen) coiled in a circle.

Between Guanai and Tipuani, Apr.–June, 1892 (1392). Related to *P. ferrugineum* and *P. lusorium*.

Inga Bourgoni (Aubl.) DC. Prodr. 2: 434. (*Mimosa Bourgoni* Aubl. Pl. Guian.) Between Guanai and Tipuani, Apr.–June, 1892 (1439).

Inga marginata Willd. Sp. 4: 1015 (excluding the synonymy). Espirito Santo, 1891 (1179). Also collected by Pearce at Coroico.

Inga heterophylla Willd. Sp. 4: 1020. Between Guanai and Tipuani, Apr.–June, 1892 (1421).

INGA PALLIDA sp. n. (Sect. *Euinga*).

Ferruginous-tomentose, the branchlets rather slender, the internodes 4 to 8 cm. long; stipules lanceolate, caducous; petioles two-thirds the length of the internodes, about equalling the internodes of the rhachis, stout, quadrangular; leaves tri-jugate, the petiolules nearly as broad as long, the leaflets 1–2 dm. long, 3–6 cm. broad, the upper successively larger, lance-oblong, inequilateral, with subcuneate base and abruptly acuminate apex, above very pale with minute ferruginous dots, the midrib prominent and ferruginous, the veins impressed, the primaries about 20 pairs, underneath strongly ferruginous, the veins prominent and finely and strongly reticulate; spikes axillary (mostly 3) strongly peduncled, unequal, the longest mostly exceeding the rhachis of the leaf, dense above, slightly interrupted below, about 1.5 cm. thick; bracts linear, nearly as long as the calyx; calyx tubular-campanulate, 3 mm. long, the teeth 1 mm. long, obtusely triangulate; corolla infundibular, 5 mm. long, the lobes 1 mm. long, triangulate; stamens about twice the length of the corolla, united to about the middle; stigma inconspicuous; fruit not seen.

Espirito Santo, 1891 (1165).

ROSACEAE.

Hirtella Americana Aubl. Pl. Guian. 1: 247. Between Guanai and Tipuani, Apr.–June, 1892 (1468)=Rusby's 1311.

Prunus Brittoniana Rusby, Mem. Torr. Bot. Club, 3: (3) 24. Vic. Sorata, Nov., 1892 (1619)=821, also Mandon's 677 and Spruce's 5992.

PRUNUS PEARCEI sp. n. (Sect. Padus).

Branches slender, blackish, the internodes 3 to 4 cm. long; petioles 1.5 cm. long, 2 mm. broad, channelled, reddish-brown; blades 1–2 dm. long, 4–8 cm. broad, oval, the smaller varying to ovate, the larger to obovate, slightly and obliquely pointed, the base rounded and obscurely produced, entire, strongly revolute, coriaceous, both surfaces pale, glabrous, slightly shining, the midrib prominent and deeply but narrowly channelled above, more prominent underneath, the primaries about 5 to 8 pairs, imperfecty opposite toward the base, obscure above, prominent underneath, coarsely anastomosing by the secondaries; racemes solitary in the axils, shorter than the leaves, weak and slender, rather loosely flowered; pedicels 1 to 1.5 mm. long, very stout, divaricate, articulated and leaving prominent broad scars; calyx puberulent, broadly turbinate, 2 mm. long, shallowly lobed, the lobes broadly semicircular; petals orbicular, 1.5 mm. long; fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1465). Collected also by Pearce at Chailla, alt. 3,000 ft.

PRUNUS GUANAIENSIS sp. n. (Sect. Padus).

Branches reddish, slender, the internodes about 2 cm. long; petioles 1–1.5 cm. long, stout; blades 1–1.5 dm. long, 3–6 cm. broad, ovate, the base rounded, the apex slightly pointed, entire, sharply revolute, coriaceous, deep green, drying brown, glabrous both sides, shining above, the midrib channelled above, prominent underneath, veins obscure, or the 7–10 pair of primaries, alternating with as many short intermediate ones, slightly prominent underneath, obscurely anastomosing near the margin; racemes solitary in the axils, distinctly but variably peduncled, about half the length of the leaves, very slender and loosely flowered; pedicels 5 mm. long, very slender, pendulous; calyx-tube hemispherical, 1 mm. deep, 2 mm. broad, the teeth triangular; petals orbicular, scarcely 1 mm. long; fruit (dry) globose, broader one way, about 1 cm. in diameter, the surface deep reddish-brown, dull, conspicuously reticulate.

Between Guanai and Tipuani, Apr.–June, 1892 (1432). Very distinct from the last in form and color of leaves and in all the inflorescence characters.

Rubus megalococcus Focke, Abhand. Nat. Gesell. Brem. **4**: 157. Vic. Sorata, Nov., 1892 (1618)=Rusby's 470 and 472 and Mandon's 662.

Rubus roseus Poir. Encyc. **6**: 265. Vic. Sorata, 8,000 ft., Nov., 1892 (1617, as to those specimens with strongly angled stem, prickly peduncles and rhachis, and few flowers)=Mandon's 659 and 661. This yields a nearly fleshless bony bitter inedible blackberry, and is in herbaria confused with the next. It appears to me identical with *R. Mandoni* Focke.

Rubus Bogotensis H. B. K. Nov. Gen. **4**: 158. Vic. Sorata, 8,000 ft., Nov., 1892. The same as Triana's no. 4189 from New Grenada. No. 684, previously enumerated as *R. Bogotensis*, is distinct and is the equivalent of Rusby's no. 474 and Mandon's 657.

Osteomeles pernettyoides (Wedd.) Britton, Bull. Torr. Bot. Club **16**: 11. Below Cochabamba, 1891 (1086).

SAXIFRAGEAE.

Hydrangea scandens Poepp. ex DC. Prod. 4: 666. Between Guanai and Tipuani, Apr.–June, 1892 (1437).

ESCALLONIA BRIDGESII sp. n.

Sparingly armed with short stout more or less recurved prickles; branchlets short, very stout, red, very coarsely and bluntly angled; leaves very numerous, scattered and crowded at the ends of the short branchlets, extremely irregular in size, the largest about 1 dm. long, 3 or 4 cm. broad, obovate with narrowed base and rounded apex, very finely serrate, thickish and rigid, glabrous above, puberulent on the principal veins underneath, the primaries 12 to 15 pairs, very irregular and crooked, venation very prominent and coarsely reticulate underneath; panicles terminal and in the upper axils, on peduncles about one-fourth their length, broad and lax, the branches divaricate or slightly recurved, the rhachis and branches strongly angled, puberulent; bracts green, linear-oblong, acute, longer than the pedicels, nearly equalling the flowers; pedicels divaricate, 2–3 mm. long; calyx-tube hemispherical, 2.5 mm. broad, 5-angled or costate; the triangular-ovate, acuminate acute lobes about as long as the tube; petals white, ovate-oval with rounded apex, nearly twice the length of the calyx-lobes; style nearly as long as the calyx-teeth, stout, angled, the stigma peltate, lobed, nearly 1 mm. in diameter; fruit not seen.

By the action of water the leaves are turned to a greenish-indigo color.

Turedon, 1891 (1130). Also collected in Bolivia by Bridges.

ESCALLONIA ADSCENDENS sp. n.

Glabrate; apparently an alpine dwarf, diffusely branched, the branches ascending, blackish, the branchlets red; leaves crowded, 5–7 mm. long, 4–5 mm. broad, obovate, tapering to the sessile or barely petioled base, the apex rounded, occasionally retuse or short-pointed, serrate or crenate-serrate, revolute, thick and rigid, minutely puberulent when young, faintly papillose, the midrib impressed above, very prominent beneath, the venation indistinct; flowers solitary at the ends of the branchlets, the very short red peduncle continuous with the broadly turbinate angled calyx-tube, which is 3 mm. long, nearly 4 mm. broad, and dark colored; calyx-limb yellowish white, 6 mm. broad, lobed more than half-way to the base, the lobes triangular, acuminate and acute, rigid, green; petals 5 or 6 mm. long, obovate, veiny; ovary depressed, the style very stout, angled, 4 mm. long, the stigma peltate, 1 mm. broad; fruit not seen.

Vic. Cochabamba, 1891 (1089). The same as Mandon's no. 603 and also collected by Pearce at Ayacucho, 12,000 to 13,000 ft.

Windmannia fagaroides H.B.K. Nov. Gen. 6: 54. Below Cochabamba, 1891 (1085).

WINDMANNIA SESSILIFOLIA sp. n.

The dark brown branchlets, inflorescence and midrib tomentellate, otherwise glabrous; leaves sessile or some of them barely petioled; 4–6 cm. long, 3–4 cm. broad, the pair at the base of the inflorescence about half as large, ovate, with slightly cordate base and rounded apex, coarsely but regularly crenate-serrate, the teeth strongly incurved, coriaceous and very thick, pale, shining above, very finely and strongly reticulate both sides, brownish underneath, where the midrib is coarsely hairy, the primaries about 12 pairs, ascending at about 45° with the midrib; racemes geminate at the summits, 1.5–2 dm. long, inclusive of the peduncle which is about a fifth of their length; pedicels mostly about 6 together, very slender, 5 or 6 mm. long, the bracts, when present, nearly half their length, thin and weak; calyx 3–3.5 mm. broad, the sepals ovate, acute, thin; styles slender: fruit not seen.

Vic. Sorata, 10,000 ft., 1892 (1577). The same as one collected by Pearce at Huaycani, 9,000 to 11,000 ft.

WINDMANNIA COCHABAMBENSIS sp. n.

Glabrous throughout; branchlets blackish; leaves subsessile, 4–8 cm. long, 3–5 cm. broad, the floral only slightly smaller, ovate with rounded or subcordate base and acute apex, coarsely and acutely serrate, coriaceous but not thick, pale and shining above, deep rusty-brown underneath, inconspicuously and rather coarsely reticulate, the primaries 15–20 pairs, nearly divaricate; racemes solitary in the upper axils and a terminal pair, 6–8 cm. long, including the peduncle, which is about half that length; pedicels mostly 3 together, 3 mm. long, stout, the bracts more than half their length, ovate, thick and rigid; calyx 4–5 mm. broad, the sepals ovate, tapering and acute, thick and rigid; styles stout. Seen only in young fruit.

Espirito Santo, 1891 (1198). Very near No. 1577, but the venation and toothing of the leaves and the inflorescence mark it clearly distinct. The same as Matthews' no. 1203 from Peru.

CRASSULACEAE.

Tillaea connata R. & P. Fl. Per. 1: 70. Turedon, 1891 (1138).

HALORAGEAE.

GUNNERA BOLIVIANA Morong, sp. n.

Stem compressed, sulcate, nearly 2 cm. broad below, glabrous or with a few minute scales; flowers polygamous, in long subverticillate or scattered spikes, mostly staminate or perfect above and pistillate below; spikes numerous, linear, 4–20 cm. long, the rhachis striate and glabrous, or slightly pubescent; calyx-lobes 2, minute, ovate, denticulate at the apex; petals on the staminate and perfect flowers 2, alternate with the lobes of the calyx, obovate, with a short claw, denticulate or minutely fringed at the apex, 1–2 mm. long, greenish white, caducous; stamens 2, filaments filiform, longer than the anthers; anthers oval, 1 mm. long, 2-celled, dehiscing by lateral slits; pistillate flowers 1 mm. long, apetalous, styles 2, much exserted, papillose, wholly stigmatic; leaves obovate in outline, deep green and glabrous on both surfaces, except in having a few scattered teeth and a slight pubescence on the nerves, deeply several-lobed, the lobes ovate, acute, incisely lobed and with many small cartilaginous teeth on the margins; the leaves on the specimens imperfect, but they appear to be 2- or 3-palmately nerved from the base, the nerves branching above and running into the apices of the lobes, the leaf tapering abruptly into a petiole.

Espirito Santo, 1891 (1214) = Mandon's 598 in Herb. Kew.

Myriophyllum Titicacense Remy, Analact. Boliv. Near snow-line, Mt. Tunari, 1891 (1031).

COMBRETACEAE.

COMBRETUM GUANAIENSE sp. n.

Branchlets rather slender, the internodes .8–1 dm. long; petioles about 1 cm. long, blades 1 to nearly 2 dm. long, 4–10 cm. broad, ovate to oval, the base subcordate, the apex abruptly contracted into a slender acute point, coriaceous and very thick, above dark green, glabrous and shining, underneath ferruginous-tomentose and sparingly red-lepidote, midrib and 6–8 pairs of primaries prominent both sides, the latter strongly connected by the secondaries; spikes (always?) solitary in the axils, shortly and stoutly peduncled, 1.5 dm. long, densely red-lepidote; calyx-tube 3–4 mm. long, 1 mm. broad, strongly 4-angled, the limb about 7 mm. long, its cylindrical portion 1 mm. long, the open campanulate portion divided one-third of the way down, the lobes broadly triangular, acute, separated by rounded sinuses; petals yellow, obovate with rounded apex, nearly as long as the calyx-lobes; stamens 8, the longest 2 cm. long; fruit not seen.

Vic. Guanai, Apr.–June, 1892 (1320). The same as Rusby's number 623, collected at the same place in 1886. Near *C. Aubletii* DC., but tomentose, and with a different calyx.

COMBRETUM NUMMULARIUM sp. n.

Branchlets slender, terete, dark brown; petioles 5–8 mm. long, blades .75–1 dm. long, 3–6 cm. broad, oval with rounded base and abrupt short blunt point, deep green and minutely lepidote both sides, the scales dull, gray-green; peduncles and branches of the inflorescence elongated (in fruit), subfiliform; flowers not seen; fruit, as pressed, orbicular or a little broader than long, about 5 cm. across, glabrous.

Between Guanai and Tipuani, Apr.–June, 1892 (1378).

COMBRETUM GLORIOSUM sp. n.

Branchlets stout, light brown, the internodes about 6 cm. long; petioles 1–2 cm. long, blades 1–1.5 dm. long, 6–10 cm. broad, oval-elliptical or the base very slightly produced, entire, not revolute, membranaceous but rigid, above obscurely, underneath conspicuously, golden-lepidote, finely veined, the primaries about 7 pairs, strongly ascending-curved, lightly connected by the secondaries; panicles sessile, of few spikes, the branches very stout, the densely golden-lepidote spikes secund, 1 dm. long, shortly peduncled, densely flowered; calyx-tube nearly 3 mm. long, 1 mm. broad, sharply 4-angled, sharply articulated with the limb, which is 6–7 mm. long, the lower half cylindrical and narrower than the tube, the upper open-campanulate and lobed nearly half its length, the lobes triangular-ovate; petals yellow, oval, two-thirds the length of the calyx-lobes; stamens 8, golden-yellow, the longest 1.5 cm. long, the anthers purple; fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1427). Near *C. Lindbergii* Eichl.

Combretum—sp. Probably undescribed, and near *C parviflorum*, but in the absence of flowers a determination is not possible. Between Guanai and Tipuani, Apr.–June, 1892 (1334) = Rusby's 2635, also without flowers.

SPARATTANTHELIUM GLABRUM sp. n.

A climbing shrub, glabrous except for the minute scales, the branches ramose, flexuous, brown, costate; petioles about 2 cm. long, slender, blades 7–11 cm. long, ovate with rounded base and abrupt obtusish point, entire, minutely lepidote, coriaceous, strongly 3-nerved from the petiole, the venation inconspicuous; flowers not seen; fruiting cyme compound, very broad and open, the branches, pedicels and fruit strictly erect; fruit a little more than 2 cm. long, about 1 cm. broad, ovoid, the apex blunt, tipped with the reddish styles which are about 1 mm. long, strongly but bluntly 6–8-costate, cinereous.

Between Guanai and Tipuani, Apr.–June, 1892 (1371).

MYRTACEAE.

Psidium pomiferum L. Sp. Pl. ed. 2, 672. Between Tipuani and Guanai, Dec., 1892 (1688) = 253.

Myrtus microphylla Humb. et Bonp. Pl. Equin. *pl. 4.* Vic. Mapiri, 12,000 ft., 1892 (1573) = Rusby's 2042.

MYRCIA BANGII sp. n.

Ferruginous-tomentose upon the branchlets, inflorescence and venation; branchlets strict, the internodes 5–7 cm. long; petioles 1 cm. long, stout; blades 1–2 dm. long, 4–8 cm. broad, ovate with acute base and abrupt short blunt point, entire, coriaceous, deep green, glabrous above, prominently reticulate underneath, the primaries about 15 to 20 pairs, nearly divaricate, lightly curved, anastomosing close to the margin; inflorescence sessile, trichotomous, open, the flowers densely clustered at the ends of the branchlets, sessile; bud globose, 3 mm. in diameter; calyx-tube broadly campanulate, about 1 mm. long and broad, the lobes about as long, triangular-ovate; petals 3 mm. long; stamens numerous and dense; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1644). Near *M. Selloana.*

Myrcia Paivae Berg, in Mart. Fl. Bras. **14**: Part 1, 179. Between Tipuani and Guanai, Dec., 1892 (1700).

Myrcia cucullata Berg, Linnaea, **27**: (1854) 97. Between Tipuani and Guanai, Dec., 1892 (1709).

MYRTUS OSTEOMELOIDES.

Apparently alpine and dwarf, diffusely branched, the branchelets crowded, but a few centimeters long, very leafy, the internodes 1–3 mm. long; petioles 1–2 mm. long, very broad; blades 1–1.5 cm. long, 4–8 mm. broad, obovate with narrowed base and rounded retuse apex, very thick, dark green and shining above, yellowish and papillose underneath, entire, strongly revolute, midrib stout and prominent underneath, venation inconspicuous; panicles terminal, short and broad, the branches short and stout; pedicels 3–5 mm. long, stout; bracts manifest, but caducous, narrow; calyx-tube narrowly turbinate, 1.5 mm. long and two-thirds as broad, the limb (yellowish-white), nearly 3 mm. broad, divided midway, the lobes thick and rigid, triangular-ovate, obtuse; petals 3 mm. long, obovate, thickish, drying yellowish; cells about 8-ovuled.

Vic. Sorata, Nov., 1892 (1623). The same as Mandon's 636, and also one by Moritz (no. 1184) probably from Venezuela.

EUGENIA UNINERVIA sp. n. (Sub. Eueugenia.)

Glabrous, except the scurfy petioles, much branched and very leafy; the internodes mostly 1–1.5 cm. long; petioles 2–4 mm. long, rather stout; blades 4–6 cm. long, 1–1.5 cm. broad, oblong, regularly and equally tapering to both ends, acutish, entire, revolute, coriaceous, the midrib above not prominent, of a brighter green than the leaf-surface, underneath prominent, the venation inconspicuous, coarsely reticulate; pedicels geminate, from an excessively short node-like branch, scarcely bracted, 6–8 mm. long, slender, ascending; calyx-tube turbinate, 2 mm. long and broad, dark-colored, the lobes (4) bright green, about the same length, triangular-ovate, acute; petals nearly twice the length of the calyx-lobes; fruit not seen.

Vic. Guanai, July, 1892 (1602). Near *E. glaucescens* Camb.

LECYTHIS ANDINUS sp. n.

Petioles 2–3 cm. long, excessively stout; blades 2–4 dm. long, 7–14 cm. broad, oblong-lanceolate with slightly produced base and very short abrupt blunt point, coriaceous but not thick, glabrous, dark green above, pale underneath, midrib sharply prominent above, underneath very stout and several-ribbed, the primaries about 25 pairs, anastomosing less than 1 cm. from the margin; panicle diffusely branched, the branches stout, much and sharply wrinkled, light brown; pedicels very short, as broad as long; calyx-tube (in flower) 5 or 6 mm. long, turbinate, the limb 1 cm. broad, divided midway, the lobes broadly ovate, rounded; petals (color?) coriaceous, obovate, 2.5–3 cm. long; fruit not seen.

Mapiri, July—Aug., 1892 (1522). Very near Jenman's 4155, from British Guiana.

MELASTOMACEAE.

(Communicated by Dr. A. Cogniaux.)

Arthrostemma campanulare (Naud.) Tr. Melast. 35 (*Heteronoma campanulare* Naud. Ann. Sci. Nat. (III.) **16**: (1851) 153. Espirito Santo, 1891 (1221).

Tibouchina Rusbyi Cogn. Bull. Torr. Bot. Club, **17**: 54. Espirito Santo, 1891 (1246) = Rusby's 2339.

Tibouchina granulosa angustifolia Britton, Bull. Torr. Bot. Club, **17**: 54. Espirito Santo, 1891 (1166) = Rusby's 2245.

Adelobotrys ascendens (Swz.) Tr. Melast. 67. (*Melastoma ascendens* Swz. Fl. Ind. Occ. **2**: 772). Between Tipuani and Guanai, Dec. 1892 (1702).

Miconia calvescens DC. Prod. **3**: 185. Vic. Cochabamba, 1891 (1160) = Rusby's 2264.

Miconia dodecandra (Desr.) Cogn. in Mart. Fl. Bras. **14**: 4 (*Melastoma dodecandra* Desr. Lam. Encyc. **4**: 46). Mapiri, July–Aug., 1892 (1487).

MICONIA ERIONEURA Cogn. sp. nov. (sect. Octomeris); ramis apice alternatim hinc et inde valde compressis; foliis magnis, rigidiusculis, elongato-oblongis, breviter obtuseque acuminatis, basi rotundatis, margine integerrimis et densiuscule breviterque ciliatis, 5-plinerviis fere 5-nerviis supra glabris laevibusque, subtus ad nervos breviuscule denseque villoso-hirtellis caeteris brevissime sparseque pilosulis; floribus 5-meris, subsessilibus; calyce glabro, obscure verruculoso, limbo truncato.

Rami robusti, juniores ad nodos brevissime denseque annulato-pilosi caeteris glabrati. Petiolus robustus, densiuscule breviterque pilosus, 3–6 cm. longus. Folia intense viridia, 2–3 dm. longa, 5–8 cm. lata; nervis robustis, supra latis impressis, subtus valde prominentibus; nervulis numerosis, subrectis, subtus satis prominentibus. Paniculae angustae, submultiflorae, 1½ dm. longae, ramis simplicibus vel paullo ramulosis. Calyx basi rotundatus, 6 mm. longus, limbo satis dilatato, 7 mm. lato. Petala glabra, rigida, subquadrangularia, apice oblique subtruncata, 5–6 mm. longa. Antherae anguste oblongae, 4–5 mm. longae. Stylus robustus, apice truncatus et vix dilatatus, 8–9 mm. longus. Species *M. Schlimii* Triana (Cogn. l. c. 757) proxima.

Between Tipuani and Guanai, Dec., 1892 (1683).

Miconia glandulifera Cogn. Melast. 737. Var. BOLIVIENSIS Cogn. n. var.

Folia integerrima vel vix undulata, fere 5-prinervia. Calyx dense furfurascens.

Vic. Cochabamba, 1891 (1173).

Miconia holosericea bracteata Cogn. Melast. 237. Between Tipuani and Guanai, Dec., 1892 (1647) = Rusby's 2250 and 2297.

Miconia Ibaguensis (Bonp.) Tr. Melast. 110. Mapiri, July–Aug., 1892 (1525) = Rusby's 2262, 2277 and 2289.

Miconia Matthaei Naud. Ann. Sci. Nat. (III.) **16**: 176. Mapiri, July–Aug., 1892 (1492).

Miconia minutiflora (Bonp.) DC. Prod. **3**: 189. (*Melastoma m.* Bonp. Melast. 150. *pl. 22.*) Between Guanai and Tipuani, Apr.–June, 1892 (1402) = Rusby's 2276 and 2294.

Miconia persicariaefolia Cogn. Bull. Torr. Bot. Club, **17**: 59. Between Guanai and Tipuani, Apr.–June, 1892 (1410) = Rusby's 992.

Miconia prasina (Swz.) DC. Prod. **3**: 188. (*Melastoma p.* Swz. Prod. 69.) Between Tipuani and Guanai, Dec., 1892 (1698) = Rusby's 2257 and 2267.

Miconia punctata (Desr.) D. Don. Mem. Wern. Soc. **4**: 316. (*Melastoma p.* Desr. Lam. Encyc. **4**: 50.) Between Tipuani and Guanai, Dec., 1892 (1685).

Miconia theaezans subtriplinervia Cogn. Melast. 421. Mapiri, July–Aug., 1892 (1537).

Miconia tiliaefolia Naud. Ann. Sci. Nat. (III.) **16**: 151. Between Guanai and Tipuani, Apr.–June, 1892 (1453) = Rusby's 2322.

Miconia undata Tr. Melast. 107. Var. Boliviensis Cogn. var. nov. Petiolus 1–2½ cm. longus; folia breviore acuminata, nervis supra paulo impressis.

Mapiri, July–Aug., 1892 (1502).

Clidemia capitellata (Bonp.) D. Don, Mem. Wern. Soc. **4**: 310. (*Melastoma c.* Bonp. Melast. 5. *pl. 3.*) Between Tipuani and Guanai, Dec., 1892 (1706).

Clidemia hirta (L.) D. Don, Mem. Wern. Soc. **4**: 309, excl. syn. (*Melastoma hirta* L. Sp. Pl. 390). Between Tipuani and Guanai, Dec. 1892 (1705); Espirito Santo, 1891 (1193) = Rusby's 2236, 2239 and 2240.

Bellucia imperialis Sald. et Cogn. in Mart. Fl. Bras. **14**: Part 4, 515. Between Tipuani and Guanai, Dec., 1892 (1645) = Rusby's 2330.

Mouriria parviflora Benth. Bot. Sulph. Voy. 97. *pl. 36.* Espirito Santo, 1891 (1206) = Rusby's 2681.

LYTHRARIEAE.

(Communicated by Dr. E. Koehne.)

Adenaria floribunda H. B. K. Nov. Gen. **6**: 188. Vic. Sorata, May, 1892 (1311) = 374, and Rusby's 1419.

Cuphea ianthina Koehne, in Mart. Fl. Bras. **13**: Part 2, 238. Below Cochabamba, 1891 (1066).

Cuphea ianthina forma (?). Espirito Santo, 1891 (1245). [This species I had determined as *C. cordata* R. & P. Syst. Veg. 119, when Dr. Koehne favored me with his determination as above. The species of this section Dr. Koehne regards as very puzzling. H. H. R.]

Cuphea setosa Koehne, Mart. Fl. Bras. **13**: Part 2, 223. Espirito Santo 1891 (1227 and 1238) = Triana's specimen collected at 1000 metres altitude near Bogota, and Lechler's 2322 from Peru.

Cuphea Spruceana Koehne, Mart. Fl. Bras. **13**: Part 2, 226. Var. Bangii Koehne, var. nov. Differt a typo foliis obtusiusculus et calyce parce breviterque hispidulis. Espirito Santo, 1891 (1228).

CUPHEA TRICHOPETALA Koehne et Rusby sp. n.

Herba perennis videtur, caulibus paucis 10–17 cm. altis, subascendente-erectis, pubescentibus et glutinoso-hirtellis. Folia internodia circ. aequantia vel paullo longiora, petiolis circiter 1–2 mm. longis, ut caulo vestitis incidentia, e basi obtusiuscule oblonga (10–20 mm.: 4–9 mm.), acuta, rigidula, hirtello-strigosa et superiore pagina saepe parce hispidula, *floralia minora in quave pari subaequalia.* Inflorescentia e racemis brevibus secundis subtrifloris composita circ. 2.5–8 cm. longa. Pedicelli 1–2 mm. longi interpetiolares, apice prophylla 2 minuta ovata instructi. Calyx (8–10 mm.) brevissime calcaratus, pallide violaceo-coloratus nerva intensius violaceis breviter hirtello-pubescentibus et glutinoso-hirtella, dorso subconvexus pauce subampliatus, post anthesis infra medium oblique incrassatus, intus infra stamina in nervis parce villosiusculus, nervis staminum 2 brevium exceptin villosissimis, supra stamina ventre barbatus; lobos dorsalis cateris paullo major et subproductus; appendices brevissimae crassiusculae setulosae. *Petala* 6 violacea calycis ½ longitudinae aequantia, *persistentia*, 2 dorsalia anguste cuneato-obovata, 4 ventralia subbreviora et triente angustiore, *omnia in nervo medio supra parce, subtus dense villosiuscula.* Stamina 11; 9 ventralia ad tubi ⅔ lineae deorsum subconnexae inserta, 5 episepala lobos fere, 4 ventralia sinus vix aequantia, 2 dorsalia parva inferius inserta ceterorum insertionem paullo superantia. Ovarium oblique ovatum glabrum in stylum aequilongum villosissimum subulatum, semper inclusum abiens. Discus horizontalis, crassus, semiorbicularis. Ovula 5–6. Semina 3 mm. longa et lata, castanea, margine vix pallidiora testa ibidem haud incrassata, laevia.

Vic. Cochabamba, 1891 (1008).

Adn. Species propter petala in calyce fructifero persistentia corrugato-inflexa ad sectionem *Pseudocircaeam* Koehne juxta *Cupheam persistentem* Koehne rei publicae Argentinae incolam pertinens, sed petalis pilosis non solum inter Cupheas sed inter Lythraceas omnes distinctissima.

Physocalymna scaberrimum Pohl, Flora (1827) 153. Mapiri, July–Aug., 1892 (1527) = Rusby's 2444.

ONAGRARIEAE.

Jussiaea octonervia Lam. Encycl. **3**: 332. Mapiri, July–Aug., 1892 (1494) = Rusby's 1798.

Oenothera rosea Ait. Hort. Kew. **2**: 3. Vic. Mapiri, 8,000 ft., Jan., 1893 (1746).

SAMYDACEAE.

Casearia sylvestris Swz. Fl. Ind. Occ. **2**: 752. Var. TOMENTELLA var. nov.

The permanence of its indumentum sufficiently distinguishes it from the type, which is early glabrate. It is probably distinct, but until this composite species is analyzed, this form may as well rest within it.

Vic. Guanai, July, 1892 (1592). Collected also by Pearce at Pampas. Matthews' 1601 from Tarapota, Peru, is similar in other respects than the pubescence.

CASEARIA ATTENUATA sp. n. (Sect. Zuelania.)

Glabrous, except the minutely puberulent pedicels and calyx; branchlets slender, somewhat flexuous, striate, reddish brown, the internodes 1.5–3 cm. long; petioles 5 mm. long, broad; blades 8–13 cm. long, 2–3 cm. broad, lance-oblong, the base tapering into the petiole, the apex contracted into a long attenuate tip, obscurely serrate, coriaceous, conspicuously punctate, dark green, reticulate, the venation slightly prominent beneath, the primaries about 5 pairs, strongly ascending; pedicels slender, about 5 mm. long, articulated at about the middle; calyx crateriform, 3.5–4 mm. broad, pistil 2 mm. long, the ovary broadly pyramidal-ovoid, a little longer than the style, the stigma 0.5 mm. broad, peltate, deeply lobed.

Mapiri, July–Aug., 1892 (1529). The same as Burchell's 8439.

Banara pyramidata Rusby, Mem. Torr. Bot. Club; **3**: Part 3, 33. Between Tipuani and Guanai, Dec., 1892 (1692)=365.

Abatia Boliviana (Mand. et Wedd.) Britt. Bull. Torr. Bot. Club, **17**: 214. Vic. Sorata, 10,000 ft., Nov., 1892 (1613)=Mandon's 1511 and Rusby's 2468.

LOASEAE.

Klaprothia mentzelioides H. B. K. Nov. Gen. **6**: 123. *pl. 537*. Espirito Santo, 1891 (1244).

(For other numbers occurring here, see Part 1.)

TURNERACEAE.

Turnera Weddelliana Urb. et Rolfe, Jahrb. Kgl. Bot. Gart. **2**: 90. Between Guanai and Tipuani, Apr.–June, 1892 (1335)=Rusby's 2653 and 2094.

PASSIFLOREAE.

Passiflora coccinea Aubl.; Mast. Gard. Chron. (1873) 605. Mapiri, July–Aug., 1892 (1557)=Rusby's 492.

PASSIFLORA VENOSA sp. n. (Sect. Astrophea).

Glabrous, erect, non-cirrhose, the branchlets elongated, slender, flexuous, striate, green, the internodes 2 or 3 cm. long; petioles 1–1.5 cm. long, blades 7–12 cm. long, 5–7 cm. broad, ovate, with rounded base and acutely short-pointed apex, coriaceous, bright green, conspicuously reticulate-veined, the 5 pairs of primaries prominent both sides, the others so underneath; pedicels mostly geminate, 1–1.5 cm. long, articulated at the junction of the lowest third, the upper portion dark; calyx-tube less than 5 mm. long, one-half broader, the lobes 1.5–2 cm. long, oblong-oblanceolate, obtuse; petals a little longer (apparently violet or light-purple), linear-oblanceolate, obtuse; crown single, of two series, the divisions of the outer a little more than half the length of the petals, darker, linear-oblanceolate and falcate, the upper margin oblique and obscurely sinuately-lobed, those of the inner scarcely a third as long, filiform or narrowly linear; column 1 cm. long to the base of the style-branches; stamens 5, the filaments and anthers each about 5 mm. long, the former inserted a little above the middle of the column; style-branches 3, nearly as long as the column, the stigma large; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1656). Near *P. Mandoni.*

PASSIFLORA URNAEFOLIA sp. n. (Sect. Disemma?)

Glabrous, climbing, stems slender, green, very strongly angled, the internodes 5 or 6 cm. long; petioles 2–3 cm. long; blades (length of midrib) 5–6 cm. long, 6–8 cm. broad, urn-shaped by the abbreviation of the terminal lobe, which is exceeded 1 cm. or more by the two lateral, the outline below the acute apices of the latter regularly rounded, thinly revolute; membranaceous, strongly reticulate, bright green, 3-ribbed; tendrils simple, slender; pedicels geminate in the axils, 2 or 3 cm. long, slender; bracts none; sepals (light-blue?) 2 cm. long, oblong, obtuse; petals about half as long; crown double, the outer of two series; divisions of the outer series linear, 8 mm. long, those of the inner rudimentary, filiform; inner crown a fimbriate thick annulus; stamens 5, inserted at the base of the obovoid ovary, the filaments 1 cm. long, thick and fleshy, white, the anthers 3 or 4 mm. long; styles 3, very slender, green, about 8 mm. long, the stigmas large; fruit on a stipe half its own length, globose.

Mapiri, July–Aug., 1892 (1517). Near *P. Andersonii* DC.; also near *P. capsularis* Lam.

Tacsonia insignis Mast. Gard. Chron. (1873) 1112. *fig. 239.* Mapiri, July–Aug., 1892 (1556)=Rusby's 2465.

Carica Papaya L. Sp. Pl. 1036. Espirito Santo, 1891 (1170) Mapiri, July–Aug., 1892 (1559).

CUCURBITACEAE.

LAGENARIA LEUCANTHA (Duch.) (*Cucurbita leucantha* Duch. in Lam. Encyc. **2**: 150. 1786 = *Lagenaria vulgaris*, Ser. Mem. Soc. Gen. **3**: (1) 25. *f. 2* (1825)). Between Guanai and Tipuani, Apr.–June, 1892 (1400). The "Maté Gourd."

Momordica Charantia L. Sp. Pl. 1009. Between Guanai and Tipuani, Apr.–June, 1892 (1360). Introduced.

Citrullus vulgaris Schrad. Linnaea, **12**: 412. Between Guanai and Tipuani, Apr.–June, 1892 (1399). Escaped.

Cyclanthera pedata edulis (Naud.) Cogn. Cucurb. 826 (*Cyclanthera e.* Naud. Belg. Hort. (1872) 360. Espirito Santo, 1891 (1260). Escaped; the "Acchocte" = Rusby's 491.

BEGONIACEAE.

Begonia scandens Swz. Prod. Fl. Ind. Occ. 86. Mapiri, July–Aug., 1892 (1509) = Rusby's 678.

Begonia Clarkei Hook. f. Bot. Mag. *pl. 5663* and *5675.* Near snow-line, Mt. Tunari, 1891 (1016) = Rusby's 680.

UMBELLIFERAE.

Hydrocotyle ranunculoides L. f. Supp. 177. Near snow-line, Mt. Tunari, 1891 (1020). Without flower or fruit.

Azorella biloba Wedd. Chlor. And. **2**: 195. Near snow-line, Mt. Tunari, 1891 (1017) = Rusby's 1952.

Azorella multifida Pers. Syn. **1**: 303. Near snow-line, Mt. Tunari, 1891 (1047).

Eryngium nudicaule Lam. Encyc. **4**: 759. Near snow-line, Mt. Tunari, 1891 (1028) = Mandon's 585.

Sanicula Mexicana DC. Prod. **4**: 84. Espirito Santo, 1891 (1293).

Oreomyrrhis andicola (H. B. K.) Endl. Gen. Pl. 787 (1833). (*Myrrhis andicola* H. B. K. Nov. Gen. **5**: 13. *pl. 419.* [1821]) Vic. Sorata, Nov. 1892 (1615) = Mandon's 1769 and 1770.

ARALIACEAE.

Didymopanax Morototoni (Aubl.) Decne et Planch. Rev. Hort. (1854) 109 = (*Panax M.* Aublet. Pl. Gui. **2**: 949. *pl. 360* = *Sciadophyllum paniculatum* Britton, Bull. Torr. Bot. Club, **17**: 37). Between Guanai and Tipunai, Apr.–June, 1892 (1438) = Seeman's 1615, Jenman's 5928 from Demerara, and Rusby's 608.

CAPRIFOLIACEAE.

Viburnum glabratum H. B. K. Nov. Gen. **3**: 428. A little below Cochabamba, 1891 (1087) = Rusby's 2469 and 2584.

RUBIACEAE.

Cinchona ovata R. & P. Fl. Per. **2**: 52. *pl. 195*. Between Guanai and Tipuani Apr.–June, 1892 (1404) = Rusby's "E," etc.

Cinchona Josephiana Wedd. Ann. Sci. Nat. (V.) **12**: (1869) 58. Vic. Sorata. Nov., 1892 (1612) = Rusby's "F. 4," etc., distributed as *C. amygdalifolia* Wedd.

Cascarilla magnifolia (R. & P.) Wedd. Ann. Sci. Nat. (III.) **10**: 10 (*Cinchona m.* R. & P. Flor. Per. **2**: 53. Between Guanai and Tipuani, Dec., 1892 (1661).

Macrocnemum Sprucei sp. n.

A small tree; glabrous except upon the leaf-veins underneath; branchlets short, stoutish, gray, the leaves crowded at the ends; stipules 3 cm. long, 1.5 cm. broad, oval with narrowed base and rounded apex; petioles 2 or 3 cm. long; blades 1–1.5 dm. long, 6 or 7 cm. broad or becoming after the flowering stage nearly twice as large, obovate with cuneate base and slightly produced obtusish apex, veins obscurely pubescent underneath; panicles axillary, 2–3 dm. long inclusive of the peduncles, which comprise nearly half the length, broad, lax, the subulate acute divergent bracts 2–4 mm. long, the pedicels almost absent; calyx-tube 6 or 7 mm. long, infundibular-cylindraceous, the limb 1 mm. long, 3 mm. broad, the teeth triangular, acute, very short; corolla rose-purple, the tube 1 cm. long, cylindrical, the upper third contracted, the limb in the bud hemispherical-ovoid with angled base and rounded summit, the lobes 4 mm. long and broad, rotund-ovate, acute, pilose within; stamens inserted about the middle of the tube, the filaments stout, flattened, bearded, very unequal, the longest reaching to the base of the lobes, the anthers small; style reaching to the base of the corolla-lobes, stout, the stigma small; disc fleshy, annular, prominent; fruit oblong, flattened.

Between Tipuani and Guanai, Dec., 1892 (1635).

The same collected by Spruce. Mr. Bang states that the bark is used for binding thatch and for other purposes requiring great strength and durability, but I think he must refer to some other tree.

Lecanosperma lycioides Rusby, Bull. Torr. Bot. Club, **20**: 431. Vic. Cochabamba, 1891 (1121 and 1122).

Lygistum ignitum (Vell.) Kuntze, Rev. Gen. Pl. 287. (*Guangnebina i.* Vell. Fl. Flum. **1**: *pl. 115*) = *Manettia ignita* Schum. Mart. Fl. Bras. **6**: Part 6, 171. Between Guanai and Tipuani, Apr.–June, 1892 (1372) = Rusby's 1126.

LYGISTUM MICANS (Poepp. & Endl.) (*Manettia m.* Poepp. et Endl. Nov. Gen. et. Sp. 3: 24 = *M. ignita micans* Schum. in Mart. Fl. Bras. **6**: Part 6, 171). Espirito Santo, 1891 (1255).

LYGISTUM TENUE Britton, sp. n.

Stems elongated, very slender, green, sharply angled toward the summit, and, like the inflorescence, minutely scabrous; stipules short and inconspicuous; petioles 3–5 mm. long, blades 4–7 cm. long, 2–3 cm. broad, ovate with rounded base and acuminate obtuse apex, entire, bright green, glabrous above, minutely scabrous on the midrib underneath, thin, venation very slender and inconspicuous, primaries about 7 on each side; racemes solitary in the axils, compound, secund, few and loosely flowered, about 4 cm. long, the bracts 2 mm. long, oblong, acute, green, the bractlets linear; pedicels 2–3 mm. long, slender; calyx-tube from elongated-hemispherical to truncate-ovoid, 2.5 mm. long, the triangular acute teeth half as long, recurved-spreading; only undeveloped corollas seen, apparently narrowly infundibular, about 1 cm. long; fruit brown, globose, about 4 mm. in diameter.

Vic. Sorata, Nov., 1892 (1725). The same as Rusby's no. 2158, collected near Mapiri. Description taken from Mr. Bang's specimens.

Lygistum —— sp. near *L. umbellatum* and apparently undescribed; but material insufficient. Espirito Santo, 1891 (1268).

Lygistum —— specimens too incomplete. Espirito Santo, 1891 1269.

CONDAMINEA ANGUSTIFOLIA sp. n.

Finely puberulent, except the glabrous upper leaf-surfaces, stipules and corolla; branchlets stout, terete; stipules 3–5 cm. long, 7 mm. broad, lanceolate, long-attenuate, entire, rigid, brownish-green, finely nerved, the midrib very prominent on the upper side, like a keel; petioles less than 1 cm. long and very stout; blades 2.5–3.5 dm. long, 6–8 cm. broad, oblong with subcordate base and abruptly short-pointed apex, entire, coriaceous and very thick, above pale green, glabrous and slightly shining and the veins inconspicuous, underneath softly puberulent with the midrib and 18 to 20 pairs of primaries very prominent; cymes very stoutly peduncled, successively trichotomous, the branches widely spreading and elongated; pedicels proper only 5–8 mm. long, very stout, continuous with the calyx-tube which (in flower) is 1 cm. long, infundibular, strongly 4-angled, the limb hemispherical or cup-shaped, 6–8 mm. broad, coriaceous, reddish, the margin sinuately lobed; corolla thick, purple, in bud ovoid with rounded short apiculate apex, the tube campanulate, about 1 cm. long, the lobes ovate, acute, 7 mm. long, 5 mm. broad; filaments inserted a little below the middle of the corolla, nearly 2 mm. broad at the base, the anthers oblong, 8 mm. long, 2 mm. broad, lightly exserted; style about equalling the filaments, very stout; fruit oblong, truncate.

Between Guanai and Tipuani, Apr.–June, 1892 (1429).

Chrysoxylon tubulosum (A. Rich.) Kuntze, Rev. Gen. Pl. 278 (*Macrocnemum tubulosum* A. Rich. in DC. Prod. **4**: 403 = *Pogonopus tubulosus* Schum. in Mart. Fl. Bras. **6**: Part 6, 265). Between Guanai and Tipuani, Apr.–June, 1892 (1344) Dec. 1892 1716) = Rusby's 2090.

Sipanea pratensis Aubl. Pl. Guian. **1**: 147. Mapiri, July–Aug., 1892 (1488) = Rusby's 2461.

ISERTIA RETICULATA Britton, sp. n.

Arborescent; densely and rather harshly short-tomentose throughout; branchlets very stout, obtusely quadrangular; stipules 1.5 cm. long, ovate, acuminate and very acute, entire, obtusely keeled; petioles 2.5–4 cm. long, very stout, semi-cylindrical to nearly cylindrical, the upper surface nearly plane; blades 2–4 dm. long, 1 to nearly 2 dm. broad, obovate, the base acute to cuneate, apex acutely very short-pointed; entire, revolute, thick and rigid, very finely bullate, above dark green, underneath white, the 20 to 25 or 30 pairs of primaries impressed above, very prominent beneath, nearly divaricate, intercommunicating almost at the margin; peduncle and rhachis exceedingly stout, 2 or 3 dm. long, the bracts and bractlets similar to the stipules and smaller; calyx turbinate, about 8 mm. long, the teeth very short; corolla thick and rigid, 4 cm. long, the tube infundibular, the mouth 1.5 cm. broad, the rounded lobes about 7 mm. long, darker than the tube; anthers 7 mm. long, reaching to the middle of the corolla-lobes; style slightly exceeding the stamens.

Between Guanai and Tipuani, Apr.–June, 1892 (1358)=Rusby's 1895.

SABICEA CUNEATA sp. n.

Gray-tomentose throughout except the strigose upper leaf-surfaces; branchlets elongated, stout, striate, purplish, the internodes 4–6 cm. long; stipules 7 or 8 mm. long, 5 mm. broad, ovate, blunt, entire, herbaceous, strongly reflexed; petioles .75–1.5 cm. long, margined; blades .75–1.5 dm. long, 3–4.5 cm. broad, oval-ovate, acuminate and acute at each end, entire, above dark green and strigose, underneath softly gray-tomentose; cymes axillary, trichotomous, on short very stout peduncles, mostly 15–20-flowered, about 2 cm. broad; bracts about 5 mm. long, linear and tapering, herbaceous, recurved, the pedicels 3–5 mm. long; calyx-tube (in flower) 2 mm. long, globose-urceolate, the lobes 5 mm. long, linear-tapering, herbaceous, recurved; corolla purple, pilose, 1 cm. long, the tube infundibular-cylindraceous, the lobes 4 mm. long, ovate, obtuse, recurved-spreading; capsule blackish, depressed-globose, 5 mm. in diameter.

Between Guanai and Tipuani, Apr.–June, 1892 (1380).

The species appears intermediate between one collected by Mathews (no. 1951), one by Linden (New Grenada no. 1492) and one by Pearce (Moro, Jan., 1866).

Hamelia patens Jacq. Stirp. Amer. 74. *pl. 50.* Espirito Santo, 1891 (1222) = Rusby's 2105.

Bertiera Guianensis Aubl. Pl. Guian. 1: 180. *pl. 69.* Between Tipuani and Guanai, Dec., 1892 (1712) = Rusby's 2118.

Amaioua corymbosa H. B. K. Nov. Gen. 3: 419. *pl. 294.* Between Tipuani and Guanai, Dec., 1892 (1655).

GUETTARDA ALBICAULIS sp. n.

Branches elongated, terete, whitish, the flowering branchlets short, stout, rough with numerous leaf-scars; stipules brown and subscarious, 5 mm. long, triangular-ovate, very acute, connate; petioles about 2 mm. long, very stout, pubescent; blades 4–7 cm. long, 2–4 cm. broad, ovate, abruptly short-pointed, obtuse, the margin obscurely sinuate; thick and coriaceous, dark-green, glabrous, with impressed midrib and 4 or 5 pairs of primaries above, softly pubescent, scrobiculate in the axils and with sharply prominent veins underneath; terminal internode of the flowering branchlet purple, striate, pilose, clavate, the peduncles axillary in its triangular-ovate acute bracts, 5–8 mm. long; flowers sessile, about 5–8; calyx 2 or 3 mm. long, 2 mm. long at the summit, lobed nearly to the middle, the teeth white-pilose, ovate, acutish; corolla pilose, white (?), the tube 8 mm. long, very slenderly infundibular, the lobes 3 mm. long, ovate, recurved; stamens equalling the tube; style nearly equalling the corolla-lobes, the flat branches nearly 1 mm. long, oblong with rounded apex; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1636).

Chomelia tenuiflora Benth.; Rusby, Mem. Torr. Bot. Club, **3**: Part 3, 45. Between Tipuani and Guanai, Dec., 1892 (1738) = 342.

The characters of the fruit (mature ?) of this species, unknown until now, are as follows: Nearly 1 cm. long, 2–2.5 mm. broad, oblong, the base slightly narrower, the apex subtruncate, tipped by the conspicuous cup of the calyx-limb, which about equals the strongly recurved teeth, blackish, minutely hispidulous, irregularly and rather lightly costate, slightly curved.

Chiococca brachiata genuina Muell. Arg. Mart. Fl. Bras. **6**: Part 5, 51. Mapiri, July–Aug., 1892 (1507).

Coffea Arabica L. Sp. Pl. 172. Mapiri (Cult.), July–Aug., 1892 (1560).

COUSSAREA RUDGEOIDES sp. n.

Glabrous; branchlets stout, somewhat flexuous, fleshy, the internodes 2–3 cm. long; stipules 3 or 4 mm. long, 4 or 5 mm. broad, the summit rounded; petioles proper scarcely perceptible; leaves 1.25–2.5 dm. long, .5–1 dm. broad, oval, abruptly short-acuminate at both ends, entire, bright green, thin but rigid, the primaries 10–13 pairs, intercommunicating about 5 mm. from the margin; cymose panicles mostly solitary at the summit, successively trichotomous, 5 or 6 cm. long, including the stout peduncles which comprise nearly half their length, 4 or 5 cm. broad, dilated at the branching-points, the bracts and bractlets wanting, the flowers sessile or very short-pedicelled; calyx turbinate-campanulate, 4-angled, truncate, the border obscurely sinuate; expanded corollas not seen, in the bud 6–8 mm. long, lance-oblong, the lobes free at the tip.

Between Tipuani and Guanai, Dec., 1892 (1666.) Very near Spruce's 2486.

Faramea salicifolia Presl. Symb. Bot. 24. *pl. 70.* Between Tipuani and Guanai, Dec., 1892 (1684) = Rusby's 2626.

Faramea anisocalyx Poepp. & Endl. Nov. Gen. et Sp. **3**: 28. Between Tipuani and Guanai, Dec., 1892 (1641) = Spruce's 4873.

Mapourea brachypoda Muell. Arg. in Mart. Flor. Bras. **6**: Part 5, 422. Between Tipuani and Guanai, Dec., 1892 (1710) = Rusby's 1882.

MAPOUREA PALLESCENS sp. n.

Glabrous; branchlets stoutish, the internodes 3–4 cm. long; stipules 7 or 8 mm. long, ovate with rounded apex, entire, brown, caducous; petioles about 1 cm. long; blades .75–1.5 dm. long, 4–8 cm. broad, oval, both base and apex very slightly produced, but obtuse, thickish, very pale, the 10–12 pairs of primaries widely diverging and only slightly falcate-ascending; peduncles 5 or 6 cm. long, erect, stout, green, sulcate; cyme and its branches umbelliform, about 4 cm. long by 6 cm. broad, the rigid bracts extremely short, the flowers sessile; calyx campanulate, barely 1 mm. long, 1.5 mm. broad, the margin truncate, entire or barely sinuate; corolla 8 mm. long, in bud obovoid-pyriform with truncate apex, the lobes 3 mm. long, oblong, the apex rounded, in the bud slightly inflexed; filaments inserted in the pilose throat, very short, the anthers oblong, 1.5 mm. long, a little surpassing the base of the lobes; style much exserted, its branches as long as the anthers, spatulate-oblong; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1675). Very near Schomburgk's Brit. Gui. 1708 B.

Mapourea? Apparently an undescribed species of this genus, but the specimens present only fruit in a very immature state. Between Tipuani and Guanai, Dec., 1892 (1693 and 1714) = Rusby's 1883.

Mapourea sp.? A positive generic determination cannot be given in the absence of fruit. If a *Mapourea*, it is not published. Between Tipuani and Guanai, Dec., 1892 (1670).

Psychotria cuspidata Bredem. ex R. & S. Syst. Veg. **5**: 192. Between Guanai and Tipuani, Apr.–June, 1892 (1713). Apparently = Rusby's 2112.

Psychotria flexuosa Willd. Sp. **1**: 966. Between Tipuani and Guanai, Dec., 1892 (1653) = Matthews, Peru, 1488.

Psychotria tabacifolia Muell. Arg. in Mart. Fl. Bras. **6**: Part 5, 236. Espirito Santo, 1891 (1204) = Rusby's 1880.

Psychotria tomentosa (Willd.) Muell. Arg. in Mart. Fl. Bras. **6**: Part 5, 370. Between Guanai and Tipuani, Apr.–June, 1892 (1469) = Rusby's 853, 854 and 855.

Psychotria.—Between Tipuani and Guanai, Dec., 1892 (1649). A positive determination of this plant must await the publication of Part IV.

PSYCHOTRIA TRIVIALIS sp. n.

Glabrous; branchlets slender, lax; stipules 2 or 3 mm. long, triangular-ovate, acute, deciduous; leaves .5 to 1 dm. long, 2–3 cm. broad, oblong-ovate, the base tapering into a short petiole, the apex abruptly acuminate, acute, entire, thin, pale, the primaries 6 or 8 pairs, strongly ascending; peduncles solitary, terminal, 1–3 cm. long, sharply angled, the panicles 3 or 4 cm. long and broad, trichotomous, the very slender pedicels 2 or 3 mm. long; flowers not seen; fruit at maturity depressed-globose, 4 or 5 mm. broad, the calyx-limb deciduous, bright red, the seed light brown, deeply sulcate.

Espirito Santo, 1891 (1186)=Schlimm's No. 584, from New Granada, 4,000 ft.

PSYCHOTRIA LUXURIANS sp. n.

Glabrous, except the minutely puberulent inflorescence; branchlets elongated, ascending, somewhat quadrangular; stipules connate, 6 or 7 mm. long and broad, triangular, acute, entire; leaves 1.25–2.5 dm. long, .5–1 dm. broad, oval, the base very abruptly acuminate into a short petiole, the apex similarly pointed; entire, bright green, pale underneath, very thin, the primaries about 16 pairs, falcate-ascending; peduncles .8–1 dm. long, purplish, quadrangular, the panicle 1–2 dm. long, 1–1.5 dm. broad, pyramidal, obtuse, loose, the rhachis flexuous, the branches divaricate, the bracts linear-oblanceolate, herbaceous, 1–1.5 cm. long; flowers actually sessile, but mostly appearing pedicelled by terminating the branchlets; bud ovoid, with rounded apex; calyx green, turbinate-campanulate, 1.5 mm. long, toothed midway, the teeth acute, tardily, if at all, deciduous; corolla infundibular, about 4 mm. long, the ovate, obtusish lobes 1.5 mm. long; fruit 3 or 4 mm. long, deeply sulcate.

Between Tipuani and Guanai, Dec., 1892 (1741) = Mathews, Peru, 1167. Very near *P. platyphylla* DC.

Psychotria rigida Kunth, Nov. Gen. 3: 289. Var. BREVIPES var. nov.

Differs from the type in the petioled leaves and very short and stout branchlets, peduncles and branches of the panicle, all of which are blackish.

Between Tipuani and Guanai, Dec., 1892 (1667).

Psychotria—specimen not matched at Kew, but cannot be determined without flowers. Espirito Santo, 1891 (1184).

Psychotria—unfit for determination. Between Tipuani and Guanai, Dec., 1892 (1727).

Palicourea riparia Benth. Hook. Journ. Bot. 3: (1841) 224. Espirito Santo, 1891 (1243).

RUDGEA VALIDA sp. n.

Tomentose, except the short-strigose upper leaf-surfaces; branchlets stout; stipules 1.5 cm. long, lanceolate, tapering to an acute point, inequilateral, connate about one-third of their length; petioles scarcely 1 cm. long, very broad; blades 1.5–2 dm. long, 6–8 cm. broad, with short-acuminate base and apex, thickish, rigid, the primaries 18–20 pairs, slender, regular and parallel, falcate, prominent, especially beneath where they are connected by the irregularly reticulate secondaries; peduncle terminal, stout, quadrangular, about half as long as the rhachis; panicle dense, not equalling the leaves, its bracts lance-linear, thin, the longest about 5 mm. long; flowers sessile, the calyx very short, the teeth about as long as the tube, broadly ovate, acute; corolla-tube cylindraceous, 4 mm. long, the strongly recurved lobes 2 mm. long; fruit not seen.

Mapiri, July to August, 1892 (1564). = Mathews' Peru, 1494, and near Kallbreyer's Antioquia, 1647. Species near *R. viburnoides* Benth.

Endlichera umbellata (Spreng.) Schum. Mart. Fl. Bras. **6**: Part 6, 38.
Between Guanai and Tipuani, Apr.–June, 1892 (1467) = 1000'

Borreria verticillata (L.) Meyer, Prim. Fl. Esseq. 83. *pl. 1.* Between Guanai and Tipuani, Apr.–June, 1892 (1341) = Rusby's 1401

RICHARDIA CRUCIATA sp. n.

Sparingly and coarsely setose-hispid; root stout, vertical, branching; stems 1–3 cm. long, ascending from the stout crown, branching from the base; setae of the stipules few, whitish-cartilaginous, 1.5 mm. long; leaves closely sessile, 1–1.5 cm. long, 4–8 mm. broad, ovate-oval, acute, strongly revolute, thick and rigid, bright green, 3–4-nerved, the nerves impressed above, very prominent underneath; flowers terminal, closely sessile, few; calyx-tube lanceolate, 2 mm. long, the lobes of equal length, lance-linear, very acute, setose-tufted at the apex; corolla-tube infundibular, 3.5 mm. long, the lobes a little shorter, ovate, acute; stamens reaching about to the middle of the corolla-lobes; style capillary, about as long as the corolla-lobes, the stigma large, capitate, 4-lobed; fruit 4-coccous.

I was at first inclined to regard this as a *Diodia*, in spite of the fruit structure, which is typical of *Richardia*; but Mr. N. E. Brown has kindly corrected me and shown that this, as well as *D. tetracocca*, which it resembles, belongs in *Richardia*.

Near snow-line, Mt. Tunari, 1891 (1034).

Galium Cochabambense sp. n.

Stems very slender, whitish, strongly quadrangular, sulcate, retrorsely hispid; leaves sessile, 1.25–2.25 cm. long, 1.5–2.5 mm. broad, linear-oblong, acute, pale, 1-nerved, retrosely hispid on the margin and less so on the midrib; peduncles terminal, mostly 2, 2- or 3-flowered, the pedicels divaricate, stoutish, 3–5 mm. long; corolla 1.5 mm. long, the lobes broad, ovate, rounded; fruit not seen.

Vic. Cochabamba, 1891 (1145).

VALERIANEAE.

Valeriana andina Britton, Bull. Torr. Bot. Club, **17**: 264. Near snow-line, Mt. Tunari, 1891 (1030) = Rusby's 878.

Valeriana Boliviana Britton, Bull. Torr. Bot. Club, **17**: 263. Vic. Sorata, May, 1892 (1300) = Rusby's 871, 875, 1237, etc.

Valeriana, apparently an undescribed species near *V. scandens*, but plant too young. Vic. Sorata, May, 1892 (1319).

COMPOSITAE.

Vernonia laurifolia DC. Prod. **5**: 30, *fide* Dr. L. Radlkofer. Mapiri, July–Aug., 1892 (1534) = 617 and (?) Rusby's 1617.

Vernonia arborescens Swz. Fl. Ind. Occ. **2**: 1320. Espirito Santo, 1891 (1207).

Vernonia, apparently *V. missionis* Gardn. Hook. Lond. Journ. Bot. **6**: 422, in a young state. Between Guanai and Tipuani, Apr.–June, 1892 (1420) = Traill's 453 from upper Brazil.

Vernonia Bangii sp. n.

(*Lepidoploa scorpioideae verae.*) Summit of stem only seen, Robust, apparently erect, simple, corymbosely branched above, the inflorescence in my specimen nearly 3 dm. high and broad; puberulent throughout, except the upper leaf-surface, which is scabrate; stem finely angled; upper leaves on stoutish petioles 2–3 cm. long, the blades 1.5–2 dm. long, by 5–7 cm. broad, narrowly and regularly ovate, with rounded or obscurely produced base, regularly tapering to the acute apex and with the lightly revolute margin distantly serrate, the teeth reduced to minute blunt mucros; texture thickish, somewhat rigid, veins slightly prominent, reticulated, elevated both sides, the primaries 15 to 20 pairs; floral leaves few and large; heads closely sessile, rather loosely arranged along the slender sharply angled ultimate branchlets, dull grayish yellow, about 7 mm. high and broad; involucre hemispherical, 4 mm. high and a little broader, the scales 40–60, in 4 or 5 series, dirty yellowish-white with broad green middle portion, thick and rigid, the appressed or slightly recurved apex obtuse to rounded; bristles of the pappus rather few and stout, nearly 3 mm. long, a little exceeding the infundibular tube of the corolla, the lobes of which are lanceolate, acutish, 1.5 mm. long; akenes (immature) black, less than 1 mm. long, nearly as broad.

Between Mapiri and Tipuani, July–Aug. 1892 (1483).

Species near *V. Pacchensis.*

VERNONIA COSTATA sp. n.

(*Lepidoploa scorpioideae verae.*) Stout, widely branching, the inflorescence loosely paniculate; branches about 8-angled, ferruginous and slightly cinereous, those of the inflorescence ferruginous only; only the upper leaves seen, their petioles 2 cm. long, 5 mm. broad, the blades 2–2.5 dm. long, 7–8 cm. broad, lance-ovate with sub-rotund base, acute apex and almost imperceptibly sinuate-dentate margin, very thick and rigid, above finely strigose, ferruginous on the veins, underneath silvery or slightly yellowish, very softly tomentose; midrib slightly impressed above and, like the 20–25 pairs of primaries, extremely strong and prominent beneath, the latter connected very close to the margin; heads sessile, at length loose, 8 or 9 mm. long; involucre open-campanulate, 6 mm. long, the scales in 4 or 5 series, loosely imbricated, the inner series very much longer, lanceolate, keeled, pungent, purplish-brown, lightly white-hairy; pappus-bristles white, acute, faintly scabrous, 4 mm. long, the outer complanate; corolla light purple, variously shaded with yellow, the slender tube 4.5 mm. long, the narrow lobes 1 mm. long; style-branches yellow.

Mapiri, July–August, 1892 (1472).

VERNONIA JUBIFERA sp. n.

(*Critoniopsis?*) White-tomentose, the stem and branches densely shaggy, the upper leaf-surfaces scabrous; stems apparently tall and widely branching, terete or nearly so, the inflorescence open-paniculate; leaves amplexicaul, with blunt or rounded auricles 1–1.5 cm. long and broad, oval to slightly ovate, or obovate, the lower fourth contracted somewhat abruptly, the apex abruptly short-acuminate, obtuse, the margin irregularly and very lightly crenate-dentate; not coriaceous, the veins lightly impressed above, elevated beneath, crooked and slender except the midrib, which is very stout, reticulate, the primaries 15–18 pairs, lightly ascending and inter-arched near the margin; heads sessile and crowded on the short branchlets, mostly in threes, nearly 1 cm. long; involucre turbinate-campanulate, about 4 mm. long and broad, the scales in 4 or 5 series, loosely imbricated, tawny and variously tinged with purple, especially the inner which are successively much longer, lanceolate, obtusish, straight, concave, thick and rigid; pappus 4 mm. long, rather copious, fine, white; corolla bright purple, the tube infundibular, slender, 3 mm. long, the lobes narrow, 1.5 mm. long; style-branches purple; akene brown, faintly hispid, 2 mm. long, .5 mm. broad at the apex, tapering to .25 mm. at the base.

Between Mapiri and Tipuani, July–Aug., 1892 (1554).

VERNONIA TRIXIOIDES sp. n.

(*Paniculatae.*) Apparently erect and sub-simple, rather slender, paniculately branched at the summit, glabrous except the inflorescence, the stem brown, finely many-angled, the branchlets of the inflorescence green, very strongly few-angled; petioles 1–2 cm. long, strongly flattened, the base somewhat dilated; blades about 1.5 dm. long, 5–6 cm. broad, lance-ovate with rounded base, regularly acuminate and acute apex and serrate margin with distant small strongly appressed spinulose teeth; green, membranaceous, venation not prominent, faintly reticulate, the primaries about 10 pairs, moderately curved; panicle naked except for a few small subulate bracts, several dm. high, 2–3 dm. broad, open, the branches at about 45°, slender; peduncles slender, .5–1.5 cm. long, one-bracted near the involucre, bearing solitary heads nearly 2 cm. long; involucre 1 cm. long and broad, or broader, hemispherical-campanulate, the bracts in 5 or 6 series, appressed, ovate, abruptly short-acuminate and pungent, 1-nerved, slightly concave, green with yellowish margin, puberulent and ciliate; pappus-bristles unequal, 6–9 mm. long, copious, fine, white, acute, minutely scabrous, the outer similar, ¼ to ⅓ as long; corolla bright purple, the tube 7 or 8 mm. long, the limb 4 mm. long; akene dark brown, 2 mm. long, strongly 8-or 10-costate, the ribs densely white-bearded.

Mapiri, July–Aug., 1892 (1484).

VERNONIA ROBUSTA sp. n.

(*Lepidoploa scorpioideae foliatae axillares.*) Stem stout and coarse, much and widely branched, the branchlets thickish but weak, elongated, strongly ascending and sub-drooping at the ends, flexuous, canescent; petioles flat, very short and nearly as broad, the blades (lower not seen) 7–10 cm. long, 3–5 cm. broad, irregularly and inequilaterally oval to ovate, with rounded base, abruptly acute apex and revolute, very obscurely sinuate-dentate margin, brownish green, above scabrous, underneath harshly tomentellate, thick, rigid, of very coarse texture, strongly rugose; the midrib, 8–10 pairs of primaries, and few secondaries very prominent, coarsely reticulate; floral leaves similar, ¼ to ⅓ as large; heads 2–3 cm. apart, solitary in the axils, very large, about 2 cm.

long; involucre sub-globose, or broadly campanulate with contracted mouth, 1 cm. long, 12–14 mm. broad, squarrose, the scales in 6 or 7 series, canescent, green with purple tips, margins and veins, ovate, acuminate and acute, rigid; pappus 8 mm. long, tawny, coarse, blunt, serrate, the outer sub-paleaceous, nearly 1 mm. long; corolla purple, the slender tube 7 mm. long, tomentose, the limb 4 mm. long; anthers dull white, large, much exserted; akene (immature) 4 mm. long, light brown, sparsely hispid, the 10 very strong ribs black-tipped.

Between Guanai and Tipuani, April to June, 1892 (1424).

Near Glaziou's 18,328 and Pearce's specimen of *V. macrophylla.*

Piptocarpha Lechleri (Sch. Bip.) Baker, in Mart. Fl. Bras. **6**: Part 2, 127 in obs. (*Carphobolus L.*, Sch. Bip. Pollichia [1863] 428). Mapiri, July–Aug., 1892 (1506) = Lechler's 2479.

STEVIA GRANDIDENTATA Sch. Bip. Bull. Soc. Bot. Fr. **12**: (1865) 81. Name only.

Hispidulous-pubescent throughout, the upper leaf-surface strigose; tall, erect, simple or corymbosely branched at the summit; upper leaves only seen, opposite, their petioles 1–2 cm. long, margined, dilated and sub-connate at the base; blades 5–8 cm. long, 2.5–4 cm. broad, angularly ovate, the base rounded, in the smaller very abruptly contracted into the margined petiole, in the lower probably becoming cordate, the apex obtusish to obtuse, the margin bluntly and rather coarsely dentate, pale, the veins reticulate and rather sharp underneath; floral leaves similar, becoming gradually smaller, the floral branchlets subtended by lanceolate bracts; heads very numerous, densely crowded at the ends of the branches, deep purple, 11–12 mm. long; involucre 6 mm. long, deep purple, the base green, akene (immature) 4 mm. long, very slender, sharply 5-angled, glabrous; pappus of 5 very small ovate acute scales, less than .5 mm. long; corolla 7 mm. long, narrowly funnel-form, the lower portion of tube 2 mm. long, dark, pilose, the upper much broader, glabrescent, the limb 1 mm. long.

Vic. Cochabamba, 1891 (1149).

Exactly the same as Mandon's no. 245.

STEVIA OBOVATA sp. n.

Stem very short, branching from the base, the branches several, 1.5–2 dm. long in my specimens, ascending, slender, sinuous, branched from the upper axils, very leafy at the base, with elongated internodes above, terete, dark purple, pubescent above; leaves sessile, 2–3.5 cm. long, 8–12 mm. broad, obovate to oblanceolate with blunt apex and slightly sinuate-dentate margin, thickish, dark green, sparsely hairy on the veins beneath and ciliate, the veins very prominent on both sides, irregularly reticulate; corymbs dense, 1.5–3 cm. broad; heads 1 cm. long, the involucre 5 mm. long, deep purple, of 4 oblanceolate acutish pubescent scales; akene (in flowering stage) 3 mm. long, whitish, sharply angled; pappus of unequal aristate paleæ, the shorter .5 mm., the longer 1.5 mm. long; corolla-tube infundibular, 4 mm. long, 1 mm. broad at the apex, dark-purple, sparsely hairy, the lobes oval-elliptical, nearly 2 mm. long, light purple with lighter margins.

Vic. Cochabamba, 1891 (1027).

The same as Spruce's 5042, etc. although the corollas of the latter are smaller.

Eupatorium conyzoides Vahl, Symb. 3: 96. Espirito Santo, 1891 (1208). Between Guanai and Tipuani, Apr.–June, 1892 (1444) = Rusby's 1621 and 1624.

Eupatorium glomeratum DC. Prod. 5: 154. Mapiri, July–Aug. 1892 (1514).

Eupatarium sordescens DC. Prod. 5: 167. Var. Bolivianum var. nov. Differs from the type in being ferruginous and in the longer black akenes with more tapering base.

Between Guanai and Tipuani, Apr.–June, 1892 (1464).

Eupatorium Bangii sp. n.

(*Praxelis.*) Branched from near the base, the branches apparently sub-ascending, 3–5 dm. long, the stems green, angled, pubescent and slightly harsh, the upper internodes dilated at the summit; leaves 4–8 cm. long, 1.5–3 cm. broad, angularly ovate with acute apex, sub-cuneate base narrowed into a short margined petiole and distant coarse short teeth; above strigose-hispidulous, underneath pale and sparsely pilose, 3-nerved and sparsely veiny; peduncles elongated, strongly angled, stout, enlarged at summit, cymose, naked, or with a pair of foliar leaves; heads solitary, at maturity nearly 1.5 cm. long and broad; involucre 1 cm. long, regularly campanulate, the scales in 5 or 6 series, imbricated and closely appressed, the outer successively shorter, obovate to spatulate, with rounded bright purple tips, conspicuously 3–7-nerved; involucre slightly convex, foveolate, hollow; akenes curved, 4 mm. long, stout, black, with 5 very strong and sharp white hispid angles; pappus single, sub-equal, 5 mm. long, coarse, sharply serrate, obtuse, dull white; corolla purple, the tube infundibular, 4.5 mm. long, the lobes .5 mm. long; anther-appendages manifest, and like the style-branches, little exserted.

Vic. Cochabamba, 1891 (1133).

Species near *E. liatridea* and *E. Guanaiense.* Also collected in Bolivia by Bridges.

EUPATORIUM CONNIVENS sp. n.

Shrubby, much branched, the branches strongly ascending, dark brown, striate, the branchlets erect, slender, green, few-angled, scabrellate-pubescent; leaves subsessile, 3–6 cm. long, 1–2.5 cm. broad, ovate to lance-ovate, with regularly tapering obtusish apex, base abruptly contracted into a very short petiole-like portion, and distantly and coarsely serrate margin, above scabrous, underneath prominently reticulate, and sparsely and harshly hairy on the veins, somewhat 3-ribbed; heads closely aggregated upon the erect branchlets, either sessile or upon short peduncles dilated at the summit, 1.5 cm. long; involucre 1 cm. long and 3–4 mm. broad, cylindraceous, the scales in many series, the outer successively shorter, closely appressed, obovate-spatulate with regularly rounded purple apex, nerved, the innermost linear-oblanceolate and obtuse; involucre very small, conical, about 15-flowered; akene 4.5 mm. long, black, with sharp white angles; pappus 6.5 mm. long, scanty, unequal, tawny, minutely serrate; corolla-tube 6 mm. long, the lobes a little over 1 mm. long.

Vic. Cochabamba, 1891 (1114).

Near *E. paucidentatum* Sch. Bip., but much more robust and with heads much longer. The same as Mandon's 248. Also collected by Bridges in Bolivia.

EUPATORIUM VENOSISSIMUM sp. n.

Tall and coarse, widely and laxly branching; stem sinuous, purple, finely angled, the branches similar, lighter, slender, the branchlets pale-green, minutely hispidulous; petioles .5–1.5 cm. long, margined, at the base, abruptly dilated and connate; blades 5–12 cm. long, 2–5 cm. broad, ovate to lance-ovate, with subrotund to slightly produced base, regularly tapering acute apex and coarsely and sharply serrate margin, thin, pale, minutely scabrate and very sparsely hairy both sides, 3-ribbed and prominently veiny both sides, especially so beneath, the veins whitish; heads corymbed, the corymbs loosely branched, but the heads closely crowded on the ultimate branchlets, mostly short-peduncled, the peduncles pubescent; heads 3.5–4 mm. long, the involucre nearly equalling the pappus, the scales about 8, loosely imbricated, ovate-oblong, obtuse, pubescent, 3–5-nerved; receptacle 5-flowered; akene (very immature) short, pubescent; lower third of corolla abruptly much contracted, strongly pubescent, the upper portion cylindraceous, yellowish, with very short erect lobes.

Vic. Cochabamba, 1891 (1113).

Near *E. laeve.*

Willoughbya cordifolia (L.) Kuntze, Rev. Gen. Pl. 372. Between Guanai and Tipuani, Apr.–June, 1892 (1497).

Willoughbya hirsutissima (DC.) Kuntze, Rev. Gen. Pl. 372. Between Guanai and Tipuani, Apr.–June, 1892 (1331).

Willoughbya psilostachya (DC.) Kuntze, Rev. Gen. Pl. 372, in syn. Between Tipuani and Guanai, Dec. 1892 (1730) = Rusby's 1701, 1702 and 1703.

Willoughbya scandens (L.) Kuntze, Rev. Gen. Pl. 372. Espirito Santo, 1891 (1267.) A form near var. *barbinervia*.

WILLOUGHBYA DIOSCOREOIDES sp. n.

Branches stout, purplish brown, finely and sharply many-angled, glabrous; petioles (only two seen) 4 cm. long, dark purple, verrucose, the blades 2 dm. long, 1.5 dm. broad, ovate with beautifully rounded base, abrupt apical acumination 1–2 cm. long, and entire slightly revolute margin, coriaceous, glabrous both sides, very pale above and brownish beneath, 5-ribbed from near the base, the lower pair of ribs less stout, soon marginal, a trace of a third pair at the margin of the base, the veins obscure above, rather prominently reticulate beneath; panicle of indefinite size, in my specimen 6 dm. long including the long peduncle, very loose and open, its lower branches 1 dm. apart, the latter at the base laterally keeled and abruptly upwardly and downwardly dilated, the lower dilation adnate to the petiole of the floral leaf, the upper to the parent branch; floral leaves small, on broad connate ferruginous-tomentose petioles; branchlets of the inflorescence ferruginous, subtended by subulate bracts; heads sessile and solitary in loose interrupted spikes about 3 cm. long, subtended by subulate bractlets nearly half their length, 2.5 mm. long, 1 mm. broad, pear-shaped in the bud, campanulate when expanded, the pappus and corolla scarcely equalling the involucre; scales oblong, obtuse, chartaceous, light brown, 3-costate; akene blackish, with minute whitish costae, stout, oblong-obovoid, nearly half the length of the corolla; pappus copious, white, coarse; corolla-tube proper about one-half the length of the upper portion.

Vic. Cochabamba, 1891 (1256).

Species very near *W. Bangii* Rusby, but differing particularly in the form of involucre and its scale-characters and the relative length of the flowers.

WILLOUGHBYA FERRUGINEA sp. n.

Climbing, stems sharply many-sulcate, and like the petioles and principal veins on the underside, densely hirsute with ferruginous hairs; branchlets articulated by an enlarged terete base; petioles 1–1.5 cm. long, broad, their bases much dilated, connate; blades 7–10 cm. long, 3–5 cm. broad very near the base, somewhat inequilateral, ovate with regularly tapering acutish apex, sub-cordate base and entire margin, bright green, above glabrous, with obscure veins, underneath ferruginous with prominent veins, the primary only 3 pairs, with many faint intermediate ones; peduncles of the axillary panicles approximately as long as the floriferous portion, which is 7–12 cm. long, 5–7 cm. broad, pyramidal, moderately dense, lanceolate-bracted; heads 3–5, 8 mm. long, sessile and crowded at the ends of slender branchlets slightly longer than themselves, subtended by broadly ovate serrate branchlets about two fifths as long as the involucre; involucre 6 mm. long, the scales oblong-oblanceolate, the apex rounded and ciliate, finely 5-nerved, with scarious margins, nearly glabrous; akenes black with very fine whitish angles, 3.5 mm. long, little tapering at the base; pappus 3.5 mm. long, copious, tawny, the serration scarcely perceptible; corolla-tube blackish, 1.25 mm. long, from an abruptly dilated base, very narrow, the limb 2 mm. long, broadly campanulate, the lobes 1 mm. long, broadly ovate.

Between Guanai and Tipuani, Apr.–June, 1892 (1419). The same as Jameson's 5095. Very near *W. Pohliana*, but that has a glabrous stem.

WILLOUGHBYA LONGIACUMINATA sp. n.

Branches stoutish, finely many sulcate, and, like the branchlets, petioles and veins on lower surface ferruginous-tomentellate; petioles 1–2 cm. long, broadly margined, at the base slightly dilated and connate; blades 7–12 cm. long, 2.5–4 cm. broad near the base, ovate with rounded base, regularly long-acuminate and very acute apex, and entire margin, minutely ferruginous both sides, thickish, bearing three pairs of rib-like primaries from the lower fourth, the upper primaries mostly obscure, angularly reticulate with the former and with one another, the veins slightly impressed above and prominent underneath; panicles solitary in the axils, the lower shorter, the upper much longer than their leaves, pyramidal, somewhat loose, lanceolate-bracted, the peduncles one-half as long as the floriferous portion, the heads at length crowded, sub-sessile, 4 mm. long and one-half as broad, subtended by a bract 1 mm. long and broad; involucral scales obovate, cartilaginous, whitish with green middle portion, finely many-nerved, the terminal portion thin, fimbrillate, tending to become recurved or spreading, the shorter pair about equalling the flowers; akene .5 mm. long, more than one-half as broad, very hairy; pappus 2.5 mm. long, coarse, tawny, equalling the corolla.

Mapiri, July–Aug., 1892 (1504).

Near *W. laevis.* Nearly the same as a specimen collected by Holton (no. 344), but in that the pappus much exceeds the involucre.

GRINDELIA BOLIVIANA sp. n.

Glabrous, very pale or glaucous, erect or ascending, 4 dm. high, or more, freely branching from the base upward, the branches erect, and like the stems irregularly and roughly angled; leaves 5–8 cm. long, 1.5–2 cm. broad, lance-oblong from a broad clasping and slightly decurrent base, with acute and mostly pungent apex and coarsely, strongly pungently serrate margin, midrib prominent, the veins obscure, very finely and very strongly reticulate; heads terminal, solitary, nearly 2 cm. long; involucre a little more than 1 cm. long, nearly 2 cm. broad, hemispherical-cupulate, the margin little if at all contracted; scales very loosely imbricated, the outer linear, wholly herbaceous, thick, drooping or loosely spreading, the inner lanceolate, middle and upper portions green, the latter loosely spreading; rays about twice the length of the involucre, one-third longer than the disk, deep yellow, oblanceolate, strongly 8–10-nerved, slightly notched; akenes (of the disk) 2 mm. long, 1 mm. broad, strongly compressed, the margins dilated; awns mostly 5, 6 mm. long, acicular, pungent; corolla 5.5 mm. long; appendages of the style triangular.

Vic. Cochabamba, 1891 (1055).

Near *G. pulchella* Dunal.

Laestadia Lechleri Wedd. Chlor. And. 1: 184. Vic. Mapiri, 12,000 ft., Sept., 1892 (1576) = Rusby's 2667.

Erigeron hieracioides Wedd. Chlor. And. 1: 194. Espirito Santo, 1891 (1219) = Rusby's 2716 and 2717.

Baccharis trimera DC. Prod. 5: 425. Vic. Sorata, 1892 (1313) = 692, and Rusby's 1564.

Baccharis trinervia (Lam.) Pers. Syn. 2: 423. Espirito Santo, 1891 (1202). An extreme form, with ovate acuminate leaves.

BACCHARIS DEBILIS sp. n.

Herbaceous, glabrous, the stems erect, very slender, 5 dm. high, or more, with 3–5 strong angles and twice as many secondary ones, the branches similar, strongly ascending; petioles 3–7 mm. long; blades 5–15 cm. long, .7–2.5 cm. broad, lance-ovate, with acute base gradually contracted into the petiole, long regularly acuminate and acute apex, and lightly sinuate, shortly ciliate margin, thin but rigid, dark green, 3-nerved, the midrib lightly impressed above, prominent beneath, veins moderately prominent beneath, reticulate; cymes few and small, loose with few heads, linear-bracted, the peduncles 3–10 mm. long; heads small, the involucres broadly hemispherical-campanulate, 2 mm. long, 3 mm, broad, the scales in 2–4 series, few, loosely imbricate, lanceolate, acute, white, with lacerate margin and green midrib; receptacle convex, strongly foveolate. *Pistillate flowers:* akene hispid, .75 mm. long; pappus 2 mm. long, slender, rather sparse; corolla 2 mm. long; style-branches .3 mm. long, erect, linear, acute. *Sterile flowers:* akene wanting; pappus similar to last, but more serrate, 2 mm. long; corolla 2 mm. long, broadly campanulate, deeply lobed; style not exserted (but the flowers are not yet fully developed).

Between Guanai and Tipuani, April–June, 1892 (1457).

Species near *B. salicifolia*, but the heads are broader and the leaves more acuminate.

Baccharis Mapirensis sp. n.

Fruticose or suffruticose, sub-glabrous, much branched, the branches somewhat flexuous, greenish, sharply and irregularly 4–5-angled, the branchlets short, divergent; petioles 1–5 mm. long, margined; leaves 3–7 cm. long, 1–2.5 cm. broad, lanceolate, with sub-rotund base, acuminate acute apex and entire margin, slightly thickish, very minutely and sparingly pulverulent beneath, the midrib lightly impressed above and prominent beneath, the veins rather obscure, primaries 6–10 pairs, intercommunicating some distance from the margin; floral leaves successively smaller; inflorescence loosely and irregularly paniculate-cymose, the branches very strongly angled, the bracts lanceolate-subulate, thickish; heads on slender peduncles mostly equalling their own length, 5 mm. long, 7 or 8 mm. broad in full flower, tawny; involucre campanulate-hemispherical, 3 mm. long, 4 mm. broad, the scales in 2 or 3 series, imbricate, closely appressed, lance-ovate, obtuse or obtusish, middle portion green, margins broad, white, ciliate; receptacle convex, foveolate, the margins of the pits fimbrillate; hermaphrodite sterile flowers only seen; akene none, pappus very scanty; corolla-tube 1 mm. long, limb 2 mm. long, its lobes 1 mm. long, narrow; essential organs much exserted, erect; style-branches projecting nearly 1 mm. beyond the anthers, 1 mm. long, connivent, subulate.

Between Mapiri and Tipuani, July–Aug., 1892 (1481).

Baccharis oblanceolata sp. n.

Fruticose or arborescent, glabrous, except the puberulent inflorescence; branches stout, leafy, grayish or reddish-brown, angled above, little branched; leaves scarcely petioled, 6–10 cm. long, 2–3 cm. broad, oblanceolate, with acute base, abruptly short-acuminate and acute apex and entire margin, slightly inequilateral, thickish, above dark green, below pale and minutely black-dotted, the midrib rather prominent on both sides, veins obscure both sides, the primary about 8–10 irregular pairs; panicles 1–1.5 dm. long, 1.5–2 dm. broad, loose, the branches nearly divaricate, the lower branches subtended by foliage leaves, the branchlets by small and delicate subulate bracts; heads strongly divergent, on peduncles 2–6 mm. long; heads 4–5 mm. long, 5–6 mm. broad, tawny; involucre campanulate-hemispherical to broader, two-thirds the length of the head, the scales few, in two series, broadly ovate, obtuse, the middle green, the margins white and fimbriate; receptacle conico-hemispherical, brown, strongly foveolate; sterile flowers only seen; akene (in flower) very small, pappus sparse, 1-serialled, white, the apex slightly recurved, not thickened; corolla tube brown, 1 mm. long, the limb campanulate, 1.5 mm. long, yellowish, the lance-ovate lobes nearly 1 mm. long; anthers truncate or slightly emarginate at the base, with small triangular apical appendages; style-branches erect, broadly triangular, the apex of style recurved-exserted.

Mapiri, July–Aug, 1892 (1490). Very near *B. brachaelnoides*, but differs in the maculate leaves, of different form and nervation.

FACELIS CAPILLARIS sp. n.

A tomentose annual; stems 4–6 cm. high, very slender, reddish; leaves opposite, sessile, .5–1.5 cm. long, about 1 mm. wide when flattened out, linear or a little broader upward, acute, strongly revolute, the margins and midrib of a deeper green; heads axillary and terminal, only 2 or 3 mm. broad, the involucre lance-ovoid, the scales few, unequal, the longest about 5 mm. long, ovate, acutish or obtuse, the very hyaline margins as broad as the green middle portion; flowers apparently all fertile, about 5; akenes comparatively large, 1 mm. long, oval, light brown, their hairs developing a dense mass of mucilage when wetted; pappus fine, very slightly plumose, 4 mm. long; corolla 2 mm. long, very slenderly cylindrical, white, with brown contracted apex.

Vic. Cochabamba, 1891 (1144). A satisfactory dissection is difficult owing to the mass of mucilage which is developed.

GNAPHALIUM VERSATILE sp. n.

Root vertical, stout, woody; stems numerous, tufted, erect or ascending, slender, simple, 2–4 dm. high; indumentum fine, close, white, uniform throughout; leaves numerous, erect, mostly secund, sessile, 5–10 mm. long, 1–2 mm. broad, subulate, thickish; inflorescence capitate, globular or broader, 2–3 cm. broad, dense; heads 5 mm. long, somewhat broader, the pappus about equalling the campanulate involucre; scales uniformly whitish to light-brown, except the lower third which bears a bright green central stripe, scarious, oblanceolate to obovate, obtuse or acutish, minutely and faintly many-nerved.

Near snow-line, Mt. Tunari, 1891 (1035). Also collected by Pearce at Pelechuco.

Clibadium Surinamense L. Mant. **2**: 294. Espirito Santo, 1891 (1203) = Matthew's 1736 from Peru. This I believe to be one of several distinct species included under this name; but for the present I follow the Fl. Bras., and place it here.

Polymnia edulis Wedd. Ann. Sci. Nat. (IV.) **7**: (1857) 114. Espirito Santo, 1891 (1229).

Acanthospermum hispidum (Less.) DC. Prod. **5**: 522. Between Guanai and Tipuani, Apr.–June, 1892 (1445).

Acanthospermum humile (Less.) DC. Prod. **5**: 522. Turedon, 1891 (1137).

Zexmenia, sp.? It appears probable that a new genus will have to be established for this species which, besides being rayless, has an involucre quite different from that of any known species of *Zexmenia*. For this reason I prefer not to assign it a specific name under this genus. At the same time, the unsettled state of the literature of this section of the Compositae forbids my proposing a new generic name.

Between Guanai and Tipuani, April–June, 1892 (1340).

Verbesina australis (Hook.) Baker in Mart. Fl. Bras. **6**: Part 3, 215. A little below Cochabamba, 1891 (1003). Also collected by Pearce at Tarija, Bolivia.

VERBESINA CINEREA sp. n.

Cinereous and scabrous throughout; stems erect, stout, flexuous, 5 dm. high or more; leaves alternate, on very short stout petioles, or the upper sessile, 5–15 cm. long, 2–5 cm. broad, lanceolate to ovate, base mostly rounded, apex acutely pointed, coarsely and sharply serrate, strigose, coarsely veined, the midrib prominent both sides; heads stoutly peduncled, sub-globose, 1.5–2 cm. long; involucre sub-hemispherical, 1 cm. long, the scales in about 3 series, the outer shorter, oblong, obtuse or acute, thick and rigid, appressed, dark gray with very narrow light margins; receptacle convex; chaff enclosing the akene, hirsute and black above; akene black, 7 mm. long, 4 mm. broad exclusive of the narrow wing which is above broader and ciliate or lacerate; pappus of 2 rigid bristles 5 mm. in length, hispid; corolla-tube proper 2 mm. long, densely villous, the upper half abruptly contracted, the limb 5 mm. long, cylindrical; style-branches of the disk flowers lightly villous toward the summit.

Below Cochabamba, 1891 (1092).

Salmea mikanioides Britton, Bull. Torr. Bot. Club, **19**: 150. Mapiri, July–Aug., 1892 (1486). The same as Rusby's no. 1739.

Cosmos diversifolius Otto in Knowles & Westc. Fl. Cab. **2**: 8. *pl. 47.* Near snow-line, Mt. Tunari, 1891 (1021). Vic. Sorata, May, 1892 (1302).

Bidens rubifolius H. B. K. Nov. Gen. **4**: 237. *pl. 381.* Between Guanai and Tipuani, Apr.–June, 1892 (1406). The flowers are smaller and more deeply colored than in the type.

Galinsoga calva Rusby, Mem. Torr. Bot. Club, **3**: Part 3, 61. Vic. Cochabamba (1148).

Calea robusta Britton, Bull. Torr. Bot. Club, **19**: 151. Between Guanai and Tipuani, Apr.–June, 1892 (1423) = 429.

Porophyllum oblanceolatum sp. n.

Glabrous, the base fruticose; flexuous, the elongated branches sub-erect, slender, green or purplish, irregularly costate; leaves sparse, 2–4 cm. long, 3–5 mm. broad, oblanceolate, tapering into an elongated petiole-like base, the apex blunt, entire; fleshy, pale green or some with purple midrib and narrow purple margin; floral leaves linear; heads solitary at the ends of elongated slender naked peduncles, which are abruptly dilated at the apex, 1.5 cm. long; involucre campanulate, 1.2 cm. long; the scales 5, free, green-purple with scarious imbricated margins, oblanceolate to obovate, blunt; akenes 5.5 mm. long, slenderly oblanceolate, black, angled, sparsely hispidulous; pappus unequal, 7 mm. long, distinct, white, slightly serrate; straight portion of corolla-tube 5 mm. long, the base abruptly dilated, the gradually dilated upper portion abruptly recurved, the lobes about 1 mm. long, ovate, acutely pointed, strongly spreading; essential organs exserted, conspicuous, deep purple.

Below Cochabamba, 1901 (1013). Species near *P. longifolium.*

Schkuhria abrotanoides Roth, Cat. **1**: 116. Vic. Sorata, March, 1892 (1298) = 755.

Tagetes Mandoni Sch. Bip. Bull. Soc. Bot. France, **12**: 79. Name only.

Stoutish, erect, 5 dm. high or more, very leafy, glabrous; leaves 5–10 cm. long, on very short petioles or with one or two reduced linear leaflets at the insertion, obovate; leaflets mostly 6½ pairs, the terminal largest, 3–7 cm. long, by 1–2 cm. broad, the lower successively smaller, oblong, acute at both ends, incisely serrate, decurrent upon the rhachis, dark green above, yellowish-green and blackish glandular, with stout and prominent midrib beneath; inflorescence mostly compact, the heads 1.5 cm. long, 4–5 mm. broad, short-peduncled; involucre oblong-obovoid, the glands few, brownish, elongated, the teeth broadly ovate to semicircular and very slightly spreading; ray-corollas bright yellow, conspicuous, the tubular 6–7 mm. long, narrowly funnelform, blue-black; akenes 6 mm. long, very slender, sharply angled, minutely papillose; pappus 3 mm. long.

Near snow-line, Mt. Tunari, 1891 (1111). Same as Rusby's 1641.

Liabum hastifolium Poepp. & Endl. Nov. Gen. et Sp. **3**: 43. Mapiri, July–Aug., 1892 (1475) = Rusby's 1742.

Liabum Rusbyi Britton, Bull. Torr. Bot. Club, **19**: 263. Espirito Santo, 1891 (1195). Near Mapiri, 10,000 ft. Sept., 1892 (1581). The latter has smaller leaves than the type, less pointed and more oblong or oblanceolate.

Liabum ovatum (A. Gray) Britton, Bull. Torr. Bot. Club, **19**: 263. (*L. uniflorum* Ball, Journ. Linn. Soc. **22**: [1885] 46). Near snow-line, Mt. Tunari, 1891 (1045) = Rusby's 1633.

Senecio Sprucei Britton, Bull. Torr. Bot. Club, **19**: 265. Mapiri, July–Aug., 1892 (1513) = Rusby's 1695.

Senecio Yungasensis Britton, Bull. Torr. Bot. Club, **19**: 264. Mapiri, July–Aug., 1892 (1538) = Rusby's 1719.

Senecio culcitroides Wedd. Chlor. And. **1**: 103. Espirito Santo, 1891 (1240) = Rusby's 1692.

SENECIO SINAPOIDES sp. n.

Stem tall, coarse, widely branching, angled, light green, the younger parts thinly floccose; lower leaves 1–2 dm. long or more, 5–8 cm. broad, ovate, tapering into a narrowly winged petiole, coarsely dentate with sharp teeth and rounded sinuses, or toward the base lobed to pinnatifid, a pair of linear stipuloid pinnae at the insertion, very thin, pale; the upper lanceolate, less toothed or entire, floccose underneath; inflorescence rather sparse, loosely paniculate; heads 1 cm. long and broad, on peduncles nearly as long; involucre 7 mm. long, short-campanulate from a broad truncate connate base, the scales linear-lanceolate, almost regularly tapering from the base to the acute blackish tip, the midrib darker; at the base of the involucre and upon the peduncles several bracts resembling those of the involucre but smaller; receptacle 2.5 mm. broad, plane, rugose or shallowly foveolate; akenes light brown, stellate-scurfy, compressed, finely many-nerved, nearly 3 mm. long, oblong-lanceolate; pappus copious, white, fine, minutely scabrous; rays spreading, strongly 5-nerved; disk-corollas 6 mm. long, slender, gradually and slightly broadened upward; base of anthers obtuse, entire; style-branches truncate or sub-rounded.

Turedon, 1891 (1135) near *S. Sepium*.

SENECIO RHIZOMATUS sp. n.

From a horizontal terete rhizome; hispidulous; stem erect, 1–2 dm. high, purple; basal leaves on broad petioles nearly of their own length, the blade 3–6 cm. long, 1–2.5 cm. broad, ovate, cordate or rounded at the base, blunt, irregularly and coarsely sinuate-dentate, probably becoming lobed, thickish, at first erect; the cauline similar but lance-linear, clasping, tapering from the base to an acutish tip, more or less purplish; heads several at the summit, cernuous, about 2 cm. long and 3 cm. broad; involucre distinctly 2-serialled, nearly 2 cm. long, the scales rather lax, purplish with lighter margins, ferruginous-hairy, ovate, acutish, nearly equalling the pappus; rays not apparent; disk-corollas 1 cm. long, the tube proper green, slender, slightly dilated upward, nearly as long as the limb, into which it is abruptly expanded and which is gradually dilated to the summit; anther-bases minutely produced; style-branches abruptly terminating in a discoid dilation; mature akenes not seen.

Near snow-line, Mt. Tunari, 1891 (1050). Apparently the same is (1046) from the same locality. In herb. Kew as *S. croceus* Wedd., apparently a Ms. name and antedated by *S. croceus* (Tratt.) DC.

SENECIO PSIDIIFOLIUS sp. n.

Apparently scandent, glabrous except the puberulent peduncles; branches brownish, finely costate; petioles 1–2 cm. long, stout; blades 5–10 cm. long, 4–6 cm. broad, oval, the base sub-rotund and slightly inequilateral, the apex blunt but minutely cuspidate; entire, finely revolute, thick and rigid, pale green, veins finely reticulate, somewhat prominent beneath, the primaries 8–10 pairs, very crooked and irregular; panicles long, lax, interrupted, the heads 2 cm. broad, in rather dense glomerate or broadly ovoid clusters at the ends of the branchlets; heads on very short subulate or linear-bracted peduncles, 7 mm. long; involucres 4 mm. long, short-campanulate, their basal bracts wanting or rudimentary; scales in a single series, oblong, rigid, obtuse, yellow with brownish middle portion; receptacle plane, sparsely but deeply foveolate; rays few, conspicuous, bright yellow; tubular corollas 5 mm. long, gradually dilated upward, the lobes strongly spreading or recurved; anther-bases strongly mucronate; style-branches truncate and somewhat enlarged at the tip; akenes short, obovoid, mature ones not seen.

Mapiri, July–Aug., 1892 (1532). Near *S. prunifolius* and *S. Sprucei.*

GYNOXIS MANDONI Sch. Bip. Bull. Soc. Bot. France **12**: 86. Name only.

Scandent, the branches weak and slender, finely tomentellate, gray, or on the new growth yellow, angled; petioles 1.5–3 cm. long, stout; blades 6–10 cm. long, 2–4 cm. broad, lanceolate to ovate, base rounded, apex regularly tapering to an acute tip, margin entire or obsoletely toothed, thickish; above bright green, glabrous or sparingly and minutely strigose, underneath tomentellate or glabrate, grayish or yellowish green, the veins slender but prominent, the primaries 12–15 irregular pairs; inflorescence lax, corymbose or broadly paniculate, gray-tomentose, linear-bracted; heads pedunculate, about 1.2 cm. long, campanulate; involucre 8 mm. long, linear-bracted; scales oval-oblong, obtuse; receptacle very small, plane, foveolate; rays narrow, strongly nerved; disk-corollas 7 mm. long, gradually dilated upward; pappus-bristles slightly thickened at the tips.

Espirito Santo, 1891 (1196). The same as Mandon's 84, though less tomentose. Not the same as Linden's 903 and 954, which I take to be *G. pendula.*

GYNOXIS ALTERNIFOLIA Sch. Bip. Linnaea, **34**: (1865-66) 531. Name only.

Scandent, the branches stout, crooked, tomentellate, light gray, toward the summit ferruginous; petioles alternate, 2–4 cm. long, stout, fleshy; blades 1–2 dm. long, 3–6 cm. broad, ovate-oblong, base slightly cordate, apex mucronate, margin coarsely and shallowly sinuate, perhaps several mucronate teeth toward the apex; thick and fleshy, above glabrous and very finely reticulate, the midrib slightly impressed, underneath ferruginous or gray tomentose, the veins prominent; inflorescence corymbose, ample, dense, linear-bracted, strongly ferruginous; heads peduncled, 1 cm. long, narrowly campanulate; involucre 6 mm. long, a few linear-subulate bracts at the base similar to those upon the peduncle; scales few, in 2 series, the outer narrower, linear-oblong; receptacle very small, slightly convex, foveolate; rays conspicuous, reflexed, bright yellow, oblong-oval, strongly 5-nerved; disk-corollas 7 mm. long, gradually dilated upward, the lobes nearly 2 mm. long, spreading; anthers early separate, not produced at base; style-branches dilated and hairy at apex; akenes naked, angled, obovoid; pappus white, in a single circle, slightly coherent at the base.

Vic. Mapiri, 8000 ft. Sept., 1892 (1574). Same as Mandon's 131.

GYNOXIS GLABRIUSCULA sp. n.

Branches blackish or dark brown, at first white-tomentose, but early glabrate, dilated at the nodes; petioles 1.5–3 cm. long, stoutish; blades 4–8 cm. long, 2–4 cm. broad, ovate, the base mostly rounded, tapering regularly to an obtusish or acute point, the margin distantly and minutely toothed; thickish, glabrous both sides, reticulate with inconspicuous veins; inflorescence open, corymbose, white-tomentose, sparingly leafy-bracted; heads short-peduncled, 1.5 cm. long and broad, campanulate; scales 8 mm. long, broadly oval, blunt, purple upward, thick, appressed; receptacle slightly convex, foveolate; rays elongated, oblong, sharply 3-toothed; disk-corollas 1 cm. long, gradually dilated upward, slightly exceeding the pappus, which is in one circle, scabrous, acute; akene 2 mm. long, obovoid, compressed, angled (mature ones not seen); essential organs not mature.

Near snow-line, Mt. Tunari, 1891 (1116). The same as a specimen collected in Bolivia by Bridges.

Werneria villosa A. Gray, Proc. Am. Ac. 5: (1861) 139. Espirito Santo, 1891 (1220). Same collected in Peru by the Wilkes Expl. Exp., but Mandon's 86 and 87 and Lechler's 2111 are apparently distinct.

MUTISIA BIPONTINA Mandon, Bull. Soc. Bot. France, 12: 79. Name only.

A cirrhiferous climber; branches stoutish, coarsely angled, narrowly and thinly winged by the decurrent leaves, yellow-tomentose; leaves sessile, decurrent, terminating in a branched tendril; leaflets 4–7 pairs, imperfectly opposite, their internodes 1.5–2 cm. long; sessile, 4–7 cm. long, 1–3 cm. broad, inequilaterally ovate, the base oblique, rounded or sub-cordate, the apex mucronate, entire, flaccid, above very dark and minutely tomentellate, underneath ferruginous-tomentose, the venation obscure; peduncles very stout, coarsely angled and, like the involucre, ferruginous-tomentose; involucre broadly and irregularly campanulate, the scales spreading or reflexed, about 4 cm. long, linear, tapering regularly from the base to the acute apex; rays deep crimson, glabrous, about 7 or 8 cm. long; disk-corollas 4 cm. long, exceeding the coarse straw-colored pappus about 5 mm.; style-branches long-exserted, slender, slightly clavate.

Espirito Santo, 1891 (1253) = Mandon's no. 6 and Rusby's 1549.

Barnadesia venosa sp. n.

Branches stout, the younger parts puberulent; leaves 8–16 cm. long, 2–4 cm. broad, inequilaterally oblanceolate, tapering into a petiole 5–8 mm. long, with acutely pointed apex, entire, finely reticulate, above dark-green and glabrous, with the veins obscure, underneath very pale or slightly yellowish, the veins prominent, the midrib and 5–8 pairs of strongly ascending and incurved primaries sparingly hairy; branchlets bearing 5–10 loosely corymbed heads, on slender peduncles 1–2 cm. long; involucre campanulate-turbinate; outer scales broadly ovate, thick, with recurved apices, the inner successively longer (becoming 3 cm. long and linear, erect, thick and rigid), sericeous, narrowly scarious-margined and minutely spine-tipped; receptacle slightly concave, with a peripheral circle of large fimbriate-margined foveolae; ray-flowers 8, fertile, the akenes 4 mm. long, densely pilose, dorso-ventrally sigmoid-curved, with very obliquely truncate base, 5-ribbed; the pappus subequal, 1.5 cm. long, 1-serialled, purple, white-plumose, connate at the white base, acute; the corolla bright purple, long-pilose, its tube 2 cm. long, narrowly cylindrical, 5-angled, the filiform lip 1.5 cm. long, entire, the other 2.5 cm. long, 5 mm. broad, oblanceolate, 4-toothed, the teeth 2 mm. long, ovate, acute; the androecium completely tubular, very long-pilose within, equalling the corolla, the anthers 8 mm. long, narrowly linear, not caudate, the appendages 2 mm. long, broader than the anther, obtuse, white with purple midrib, the style reaching to the base of the anther-appendages, cylindrical, of uniform thickness or very slightly thickened upward, glabrous, the branches 1.5 mm. long, 1 mm. broad, flattened, oval, with rounded apex twice the breadth of the style; disk-flower one, neutral, its akene-vestige 2 mm. long and broad, cylindrical, straight with truncate base, densely pilose; pappus bristles equal, 1.25 cm. long, 1-serialled, connate at the base, which is produced downward into a beautifully crenated border, the lower half yellowish white, the upper purple, minutely puberulent, aristiform, rigid, acute, about 25 in number, becoming recurved, the corolla purple, densely pilose, cylindrical, nearly uniform, 2 cm. long, 3 mm. broad, the lobes 2 mm. long, ovate, acute, the base truncate and produced downward into a slight entire acute annulus; style a mere vestige.

Espirito Santo, 1891 (1265). Also collected by Pearce at Muña, 7000–8000 ft.

Plazia daphnoides Wedd. Chlor. And. 1: 12. *pl. 2.* Vic. Cochabamba, 1891 (1147).

Seris (Onoseris) sagittatus sp. n.

Plant 5–10 dm. high or more, the stem and lower leaf-surfaces densely and closely white-floccose, the peduncles glabrate; petioles 1–2 dm. long, strongly winged, the wings slightly amplexicaul; blades from 6 cm. long by 3 cm. broad to 15 cm. long and broad, triangular-hastate, apex from very acute to obtuse or mucronate, the margin coarsely and irregularly dentate, the sinuses broad, shallow, rounded, the teeth mucronate and salient, upper surface green and glabrous, the veins sparse, whitish, slender, slightly prominent, underneath very prominent, very thin; peduncles sparingly branched, 3–10 dm. long, sharply angled, subulate-bracted, the branches elongated, slender, erect; heads 3–4 cm. long and (as pressed) equally broad, the involucre campanulate, equalling the pappus, the scales imbricated and appressed in many series, the outer successively and regularly shorter, linear, acutish, bright green with 2 darker green stripes, and with white and floccose margins and purplish tips; corollas rose-purple, exceeding the moderately tawny pappus by 1 cm., the pappus at most 1.5 cm. long; akene about 9 mm. long, very strongly and coarsely angled, greenish gray with a rather coarse pubescence.

In dry gravelly or clayey soil, Turedon, vic. Cochabamba, 1891, (1139). Near Pearce's 630, but that has strictly 1-headed peduncles, less floccose and less sagittate leaves.

Perezia pinnatifida (H. & B.) Hook. et Arn. Com. **1**: 34. Espirito Santo, 1891 (1217).

Perezia pungens (H. & B.) Less. Linnaea **5**: 20 (1830). Var. (?) CERNUA var. nov. Differs from the type in its less broad, cernuous heads, the purple involucral scales broader, with more rounded and more mucronate apex, the midrib less spinescent.

This puzzling form presents some characters strikingly different from those of the type, but I cannot establish specific distinctions. It varies from 1 dm. in height, with solitary heads and basal leaves 8 cm. in length, to 7 dm. in height or more with basal leaves more than 3 dm. in length and 5 to 8 racemosely arranged heads. The leaves are oblanceolate, more or less coarsely sinuately and rather deeply and pungently toothed. The heads are cernuous, 2 cm. long, as broad or broader, with broad, mostly deep purple involucral scales, and a deeply tawny pappus.

Near snow-line, Mt. Tunari, 1891 (1049). The larger form of it from Espirito Santo, 1891 (1218).

PEREZIA FOLIOSA sp. n.

Roots numerous, elongated, fleshy but slender, with few branches; stems several, 3–5 dm. long, weak, ascending, above erect-branched, green or purplish, hispidulous, coarsely angled above; basal leaves numerous, 2 dm. or more in length, oblong to oblanceolate, narrowed into a winged petiole, acute or acutish, the margin thickly beset with unequal small pungent divaricate teeth, bright green, thin, wrinkled, scabrous, especially beneath, the midrib only conspicuous; cauline leaves numerous, ovate, strongly amplexicaul by a broad base, acute, otherwise similar to the basal; heads cymose on few elongated erect branches, 2 cm. long, (exclusive of the corolla) 1.5 cm. broad; scales nearly equalling the pappus, about 10 in number, besides 2 or 3 more leaflike ones at the base, imbricated, rather unequal, appressed, lanceolate, strongly and pungently pointed, green, with a slight keel and scarious margins, except at the summit, where they are spiny-toothed; akene black, obovoid, compressed, the faces lightly keeled, sparsely appressed-sericeous, 4 mm. long by 1.5 mm. broad; pappus copious, coarse, tawny, somewhat unequal, 1.3 cm. long, very minutely roughened; corollas apparently light purple, exceeding the pappus by 6 or 7 mm.; essential organs conspicuous, blue-black.

Turedon, 1891 (1131).

Trixis divaricata (H. B. K.) Spreng. Syst. 3: 501. Mapiri, July–Aug., 1892 (1493) = Rusby's 1699.

TRIXIS AGGREGATA sp. n.

Apparently herbaceous with tufted stems, 5 dm. high or more, the branches erect, stout, originating near the base, simple, green, finely costate, roughish, pubescent, leafy; leaves erect, sessile, 5–7 cm. long, 1–1.5 cm. broad, acute at both ends, with irregular minute sharply salient teeth, bright green, strigose-hairy, very sparsely above, the midrib stout, whitish, the primaries irregularly 10–12 paired, crooked, articulating toward the margin; corymbs nearly 1 dm. broad, the divisions about 4 cm. broad, on peduncles 2 or 3 cm. long and bearing about 7 heads closely aggregated on short peduncles; heads 2 cm. long; involucres about 1 cm. long, campanulate, the principal scales about 8, in a single series, a few shorter ones outside, the longer oblanceolate, acutely pointed, bluntly keeled, puberulent; akenes linear-oblanceolate, 5 mm. long, densely hispid; pappus copious, slightly tawny, about 12 mm. long, minutely toothed; corollas slightly exceeding the pappus.

Vic. Cochabamba, 1891 (1150).

JUNGIA DIVARICATA sp. n.

Fruticose, size unknown, the branches spreading widely, the branchlets divaricate, rigid, deep purple, puberulent; petioles 1–2 cm. long, stoutish, rigid, terete, purple and puberulent, conspicuously articulated with the stem, the insertion strongly nodose; blades 1.5–4 cm. long and nearly as broad, round-ovate, slightly cordate, with 2 or 3 pairs of triangular acute lobes extending nearly half way to the midrib and irregularly and sharply serrate-dentate, the sinuses of similar form; thick, rigid, strongly reticulate-veiny, above dark green and scabrous, underneath gray-green, pubescent, finely black-glandular; heads articulated to the summit of the branchlets, 1 cm. long and broad; involucre double, the outer reflexed, of several oblong foliaceous scales 3 mm. long by 1 mm. broad, the inner 7 mm. long, campanulate, the scales slightly imbricated, puberulent, appressed, rigid, in a single series, linear-oblong, boat-shaped, acutely pointed; pappus fine, white, one-third longer than the involucre and equally exceeded by the white corollas; akene lance-linear, light brown, densely hispid, 2.5 mm. long; pappus in a single circle, slightly exceeding the tube of the corolla, hispid.

Near snow-line, Mt. Tunari, 1891 (1115). Species near *J. rosea*

CAMPANULACEAE.

Siphocampylus volubilis (H. B. K.) Don, Gen. Syst. Gard. 3: 703. Vic. Guanai, Dec., 1892 (1593) = 256 and Rusby's 643 and 650; also collected by Pearce at Butero.

Siphocampylus aureus sp. n.

Glabrous; stems herbaceous, slender, weak, ascending; petioles .5–1 cm. long, broad, margined, purplish at the base; blades 6–12 cm. long, .5–1.5 cm. broad, lanceolate, with cuneate base and long-acuminate, acute apex, coarsely and irregularly short-serrate, very thin, pale, venation indistinct, the few primaries nearly erect; peduncles 4–6 cm. long, very slender, purple; calyx-tube campanulate, 5 mm. long (in flower), narrowly 10-costate, the lobes about 8 mm. long, linear, tapering from the base to an acute apex; corolla yellow, 5 cm. long or more, infundibular, slightly curved, gradually and regularly ventricose to double the diameter at the base, the upper portion fissured for about 1 cm.; lobes about 7 mm. long, lance-ovate, acute, 2 of them connate for more than half their length; anther-tube 5 mm. long, two anthers slightly tufted, the others nude; mature capsule not seen; when nearly mature tipped with the stout purple style.

Espirito Santo, 1891 (1234). Also collected by Bridges in Bolivia.

SIPHOCAMPYLUS RADIATUS sp. n.

Stem tall, stout, coarsely and irregularly angled, above slightly winged by the decurrent petioles and strongly nodose by the leaf-scars, slightly canescent; floral leaves only seen, sessile and lightly decurrent, 2–3 dm. long, 5–7 cm. wide, irregularly lanceolate, the apex long-tapering, the base less so, irregularly and sharply serrate with rather small cartilaginous, tipped teeth, thinly membranaceous, bright green, smooth both sides, strongly reticulate-veined, the veins impressed above, the midrib very strong and, like the 20–25 irregular pairs of principal veins, whitish and somewhat crooked; unfolding leaves whitish-tomentellate; pedicels solitary in the axils, about equalling their leaves, more or less ascending, stoutish from a much and abruptly contracted base, nearly terete, slightly dilated and compressed at the summit, sparsely puberulent; bud cernuous, becoming erect in anthesis and fruit; calyx-tube in flower nearly hemispherical, 12 mm. broad, in fruit one-half larger, with umbilicate base and contracted margin, strongly 10-ribbed; teeth herbaceous, erect, 2 cm. long, or more, lance-linear from a short broad base, strongly 1-nerved; corolla dull white or yellowish, tomentose within and without, sub-coriaceous, the tube, after drying, about 1 cm. broad, 1.5 cm. long, the limb 2.5 cm. long; seeds blackish, somewhat compressed, trapezoidal, .5 mm. long, white-dotted under a high power.

Vic Cochabamba, 1891 (1106).

Species near *S. giganteus* Britton.

SIPHOCAMPYLUS OBLONGIFOLIUS sp. n.

Glabrous, apparently climbing by tortuous petioles; branches elongated, simple, cylindrical, sharply wrinkled, light brown; petioles 5 mm. long, broad, margined; blade 6–12 cm. long, 2–4 cm. broad, oblong or slightly lance-oblong, with obtuse to sub-rotund base, acutish to acute brown-mucronate apex and a slightly sinuous margin, its teeth reduced to brown mucros similar to that of the apex; dark green, thick, the veins obscure above, underneath the 8–10 pairs of primaries prominent, like the midrib coarse, irregular, whitish; pedicels several in the axils, unequal in developing, those of the preceding season persisting with their calyx-ribs, at length 1.5 cm. long, dilated and angled at the apex and like the calyx papillose; calyx-tube turbinate, in flower 4 mm. broad and high, in fruit twice as large, the teeth 7 or 8 mm. long, subulate, soon spreading or reflexed; corolla deep purple, the tube cylindrical, 2.5 cm. long, 4 mm. broad, the limb 1.5 cm. long. Fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1461).

Very nearly the same as a specimen collected by Matthews (?), no. 185, Lima, Peru.

Lobelia nana H. B. K. Nov. Gen. 3: 317. *pl. 272.* Below Cochabamba, 1891 (1052) = Rusby's 1075. Vic. Sorata, Nov. 1892. (1622).

VACCINIACEAE.

Psammisia leucostoma Benth.; Meissn. in Mart. Fl. Bras. 7: 127. Mapiri, July–Aug., 1892 (1516).= Spruce's 2465.

Chupalon pubescens (H. B. K.) Kuntze. (See no. 290.) Between Guanai and Tipuani, Apr.–June, 1892 (1383). Leaves somewhat narrower than in no. 290.

ERICACEAE.

Befaria glauca H. et. B. Pl. Equin. 2: 118. *pl. 177.* Espirito Santo, 1891 (1167) = Rusby's 2010 and 2123.

Clethra Brasiliensis Cham. (See 393 and 474.) Between Guanai and Tipuani, Apr.–June, 1892 (1403).

MYRSINEAE.

Myrsine Gardneriana A. DC. Ann. Sci. Nat. (II.) 16: 86. Between Guanai and Tipuani, Apr.–June, 1892 (1422) = Rusby's 866 and 869.

Myrsine Guianensis (Aubl.) R. & S. Syst. Veg. 4: 509. (*Rapanea Guianensis* Aubl. Pl. Gui. 1: 121 [1775]). Between Guanai and Tipuani, Apr.–June, 1892 (1463) = Schomburghk's 695, Spruce's 3918 and Matthews' 1564.

MYRSINE VIRIDIS sp. n.

Glabrous; branchlets purple, slender, terete; petioles .5–1 cm. long, strongly channelled; blades 4–8 cm. long, 1.5–3 cm. wide, oblanceolate to obovate, mostly a little inequilateral, acutish at base and apex, entire, revolute, coriaceous, deep-green, pale beneath, the midrib lightly impressed above, very prominent underneath, the numerous primaries and veins very slender, crooked and inconspicuous; fascicles axillary and supra-axillary, about 8–10-flowered, the flowers very short-pedicelled, the pedicels sharply angled; only withered flowers seen; calyx whitish, 3 mm. broad, lobed two-thirds of the way to the base; corolla purple, coriaceous, lobed nearly to the base, the lobes 2 mm. long, oblong-ovate; style extremely short and stout, stigma large, peltate, lobed and apparently lightly fimbriate; fruit purple, 4 mm. broad.

Mapiri, July–Aug., 1892 (1476) = Fendler's 758 from Venezuela.

PECKIA PSYCHOTRIAEFOLIA sp. n.

Branchlets stout, terete and (like the peduncles, rhachis, pedicels, petioles and lower leaf-surfaces) beset with small purple scurfy glands; petioles about 1 cm. long, stout, subcarinate like the midrib; blades 1.5–2.5 dm. long, 6–9 cm. broad, obovate with cuneate base, the apex very abruptly contracted to a short broad blunt point, entire, membranaceous but rigid, dark-green, glabrous above, the 10–12 pairs of primaries slender, very prominent, abruptly arching upward to connect about 5 mm. from the margin; racemes simple, mostly solitary, erect-spreading, 1–1.5 dm. long, loosely flowered (or becoming loose) the rhachis angled, the subulate purple deciduous bracts nearly as long as the pedicels, which are 1 or 2 mm. long, very stout, horizontal or slightly deflexed; calyx- and corolla-lobes about 1.5 mm. long, oval, broadly imbricated, the corolla greenish and of firmer thicker texture than the persistent white calyx; stamens inserted below the middle of the corolla-lobes, the elliptical anthers nearly as broad as long; fruit (black?) depressed-globose, about 7 mm. broad, minutely tipped with the persistent style.

Between Tipuani and Guanai, Dec., 1892 (1651 in flower) = Rusby's 1218 (in fruit). Species near *P. nitida.*

EBENACEAE.

DIOSPYROS TETRAMERA sp. n.

Glabrous, the branchlets blackish, flexuous, the internodes about 2 cm. long; petioles 3 mm. long, nearly as broad, margined; blades 5–12 cm. long, 2–4 cm. broad, lance-oblong with acutish to sub-rotund base, slightly acuminate but very obtuse apex, and crumpled revolute margin, coriaceous, rigid, pale green, midrib impressed above, prominent and sharp beneath, the veins elevated both sides, reticulate, the primary very numerous; the 4-merous flowers solitary in the axils or several on an apparently axillary branchlet, subsessile, the calyx subtended by about 4 broadly ovate whitish cartilaginous bracts; calyx campanulate, 3 mm. broad, a little longer, very shallowly lobed, cartilaginous: corolla coriaceous, dark purple, in bud lanceolate and acute, in anthesis the campanulate tube 5 mm. longer than the calyx, the mouth 4 mm. broad, the strongly recurved lobes one-half as long the tube, nearly semi-circular; anthers 8, linear, slender, 2 mm. long, scarcely distinguishable from the blackish filaments which are a little more than one-half as long; pistil 7 mm. long, the ovary rudimentary; style stout. Pistillate flowers not seen.

Between Tipuani and Guanai, Dec., 1892 (1681).

APOCYNACEAE.

Thevetia. Species almost certainly undescribed, but must await the collecting of flowers. A little above Cochabamba, 1891 (1088).

Plumiera bracteata A. DC. Prod. 8: 394. Between Tipuani and Guanai, Dec., 1892 (1679).

Forsteronia Sellowii Muell. Arg. (See no. 850.) Between Tipuani and Guanai, Dec., 1892 (1689).

ODONTADENIA BOLIVIANA sp. n.

Glabrous, except the finely tomentellate inflorescence, including calyx and corolla; branchlets stoutish, terete, purple; petioles 1.5–2 cm. long, broad, margined; blades 1.5–2 dm. long, 6–10 cm. broad, oval with a short and broad point, coriaceous, the midrib strongly channelled above, prominent underneath, the 10 or 12 pairs of primaries strongly falcate, especially at the ends, where they connect with those above about 5 mm. from the margin; cymes axillary and terminal, the peduncles about 4 cm. long, stout, sulcate, obsoletely bracted below, several–many-flowered, the pedicels about 1 cm. long, stoutish; calyx about 6 mm. long and broad, coriaceous, divided nearly to the base, the lobes imbricated, rounded, minutely crenate-dentate; corolla yellow (?) about 5 cm. long to the base of the lobes, the tube proper 1–1.5 cm. long, strongly contracted at the summit, the throat 4 cm. long, infundibular, the broad lobes widely spreading, the limb 5 or 6 cm. broad.

Between Tipuani and Guanai, Dec., 1892 (1687).

MANDEVILLA BANGII sp. n.

Glabrous; branches stout for the genus, light reddish-brown, terete, the older portions verrucose, the internodes 5 or 6 cm. long; petioles 1.5–2 cm. long, rather slender; blades .5–1 dm. long, 2.5–5 cm. broad, ovate with cordate base and abruptly acuminate, then tapering, acute apex, membranaceous, pale underneath, the primaries 6–8 pairs, veins inconspicuously reticulate; raceme simple, several–many-flowered; calyx 2 cm. long, parted almost to the base, the lobes linear, tapering regularly from the base to the acute apex; corolla rose-purple, 4 or 5 cm. long, the tubes 2 cm. long, infundibular with narrower cylindrical lower part, the lobes spreading, oval-ovate with rounded apices, 2 cm. broad; anthers 8 mm. long, sessile, inserted at the summit of the contracted basal portion of the tube, adnate below the middle to the stigma, short-acuminate, the apex inflexed, the base short-sagittate, obtuse, or long-sagittate with the lobes adnate; style slender, the stigma 5 mm. long, 3 mm. broad, strongly

5-winged, the wings produced at the base, acutely beaked; disk short, white, fimbriate-divided; glands 5, short, slightly 2-lobed; ovary 3 or 4 mm. long, compressed, ovoid, green. Pedicels in fruit 2–2.5 cm. long, very stout; follicles 2.5–3 dm. long, continuous, terete, reddish, slightly falcate; seeds 1 cm. long, 3 mm. broad when flattened out, lance-oblong, strongly compressed and boat-shaped, keeled upon the concave surface, the keel extending from the apex two-thirds of the way to the base, the coma 2–2.5 cm. long, ample, tawny, shining.

Near snow-line, Mt. Tunari, 1891 (1120).

ASCLEPIADEAE.

Gothofreda Dombeyana (Decne.) Kuntze, Rev. Gen. Pl. 420 (?).
Between Guanai and Tipuani, April–June, 1892 (1395).

Although this plant appears to agree in every respect with the above, it is entirely lacking in the appendages to the pollinia which are characteristic of *Gothofreda*, and it may have to be removed from this genus.

Blepharodon mucronatum (Schlecht.) Decne. in DC. Prod. **8**: 603.
Espirito Santo, 1891 (1275).

Ditassa ——? Probably new, but not to be determined without flowers. Between Tipuani and Guanai, Dec., 1892 (1711).

SCHISTOGYNE ATTENUATA sp. n.

Grayish-puberulent or the upper leaf-surfaces sub-glabrous; stems twining, slender, the internodes 1–1.5 dm. long; petioles 1.5–2 cm. long, rather stout; blades 5–8 cm. long, 3–4 cm. broad, ovate, with strongly cordate base, the sinus closed by the overlapping rounded lobes, and with long attenuate apex, thin, veins inconspicuous, or the 5 or 6 primaries slightly conspicuous beneath; peduncles 2.5–3 cm. long, stout, about 5-flowered, the pedicels setaceous-bracted, in flower about 1, in fruit 2 cm. long, more or less recurved; bud 5 mm. long, broadly ovoid, scarcely acuminate at maturity; calyx-tube none, the lobes 5–7 cm. long, lance-linear, tapering to an acute point; corolla-tube saucer-shaped, about as long as the calyx-lobes, about 4 mm. broad, the lobes 8 mm. long, ovate, tapering from base to apex, strongly reflexed; crown adherent to the corolla-tube, of five squamae which are fleshy-thickened, upright, oblong with an indistinct lobe on each side near the apex, and a blunt appendage on the inner face, two-thirds the length of the calyx-lobes; anther-appendages white, membranaceous, oval, extending to the base of the branches of the stigmatic appendage, two-thirds as long as the remainder of the column; callosities linear; stigmatic appendage bright red-purple, five-cleft, the branches nearly 4 mm. long; fruit (in young state) unarmed, puberulent, lanceolate, tapering.

Espirito Santo, 1891 (1254). Perhaps the same as Mandon's no. 858.

VINCETOXICUM UMBELLATUM sp. n. (Sect. Cynoctonum).

Glabrous, except the minutely puberulent inflorescence; branchlets stoutish, faintly striate, the internodes 2–3 cm. long; petioles 7–10 mm. long, slender; blades 3–5 cm. long, 1.5–2 cm. broad, somewhat inequilateral, obtuse, flaccid, the midrib and 3 or 4 primaries conspicuous, the other veins indistinct, coarsely reticulate; peduncles axillary, solitary, scarcely 1 cm. long; umbels about 2.5 cm. in diameter, rather loose, the pedicels nearly as long as the peduncles, acutely angled; calyx 3 mm. long, divided nearly to the base, the lobes lanceolate, tapering to an acute point; glands oblong, scarcely exceeding the tube; corolla-tube about half the length of the calyx, hemispherical or broader, the lobes 4–5 mm. long, ovate, long-acuminate; crown cup-shaped, 2 mm. long and nearly as broad at the summit, free from the corolla, membranaceous, 5-lobed half-way to the base, each lobe again 2-lobed, each of its halves traversed by a rib with projecting and slightly incurved points; stamen-column shorter than the crown; beak of the stigma entire, twice or thrice the length of the stamen-column, much curved or twisted; fruit not seen.

Vic. Sorata, Nov., 1892 (1620). The same as Mandon's no. (356?) and also collected by Pearce in Bolivia.

The solitary pistil is apparently the result of abortion, as a withered second pistil was found in one flower.

Fischeria Martiana Decne. in DC. Prod, **8**: 601 (*Gonolobus M.* Hook. f. Bot. Mag. *pl. 4472*). Between Tipuani and Guanai, Dec., 1892. (1654) = Rusby's 936.

LOGANIACEAE.

BUDDLEIA CANESCENS sp. n.

Densely short yellow-tomentose throughout, except the minutely papillose upper leaf surfaces; branchlets elongated, terete, slender, strongly ascending; petioles 1.5–2 cm. long, stout; blades .5–1.5 dm. long, 2–4 cm. broad, lance-ovate, acute, thickish, entire, the venation inconspicuous, the short, crooked primaries communicating near the margin; peduncles .5–1.5 cm. long, stout, the flowers sessile in dense compound capitate cymes, the bracts oblong, mostly about equalling the 4-merous flowers; calyx 5 mm. long, campanulate, glabrous within, the lobes short and broad, blunt; corolla deep orange (?), the tube about 6 mm. long, campanulate, the lobes half as long, sub-orbicular; anthers sessile in the sinuses, the stout clavate style slightly exceeding them; ovary globose-pyriform, blackish, slightly tomentose at the summit; fruit not seen.

Near snow-line, Mt. Tunari, 1891 (1117).

Desfontainea parvifolia D. Don, Edin. Phil. Journ. (July–Sept., 1831) 275. Vic. Mapiri, 10,000–12,000 ft., Sept., 1892 (1580) = Rusby's 1950.

GENTIANEAE.

Voyria aphylla (Jacq.) Pers. Syn. 1: 284 (*Gentiana a.* Jacq. Amer. *pl. 60. f. 3*). Mapiri, July–Aug., 1892 (1562) = Rusby's 857.

Lisianthus sp. Espirito Santo, 1891 (1242). This will be treated of by Dr. Gilg in a later publication.

Lisianthus calygonus R. & P. Fl. Per. 2: 14. Between Tipuani and Guanai, Dec., 1892 (1697) = 339.

Gentiana primulaefolia Griseb. Gent. 221. Vic. Cochabamba, 1891 (1153).

GENTIANA COCHABAMBENSIS sp. n.

Stems 2–5 dm. long, decumbent or ascending, branched from the base, the internodes 2–4 cm. long, the inflorescence capitate, congested; lower leaves about 5 cm. long, 1.25 cm. broad, oblong-spatulate, the upper oblong and acute; cymes 3 or 4 cm. broad, scarcely as long, densely many-flowered, the flowers short-pedicelled, 5-merous; calyx 7 mm. long, lobed about half way, the tube turbinate, lightly 10-angled, the lobes triangular-ovate, acute, with herbaceous tips, the sinuses of same form, slightly broader, obtusish; corolla (whitish with blue margins?) naked, 1.5 cm. long, 1 cm. broad, lobed three-fourths of the way, the tube turbinate, the lobes oblong with rounded apex, 5-nerved; stamens and pistil reaching to the middle of the lobes, the anthers bluish, small, the stigmas sessile, very short and broad; fruit not seen.

Espirito Santo, 1891 (1232).

GENTIANA BANGII sp. n.

Stems slender and weak, erect or ascending, 2 or 3 dm. high, purple at the base, sparingly branched, the branches erect or ascending, the peduncles elongated, slender; basal leaves none, the cauline 1.5–2.5 cm. long, .5–1 cm. broad, ovate, acute, strongly 3-nerved; flowers 5-merous; calyx 2 cm. long, lobed two-thirds of the way to the base, the tube campanulate, 10-angled, the lobes linear, tapering to a very acute point, 3-nerved, the nerves strongly papillose, the sinuses of similar form and size; corolla blue, naked and entire, 4 cm. long, lobed to the middle, the lobes obovate, rounded; stamens and pistil reaching to the middle of the corolla-lobes, the anthers yellow, 4 mm. long, oval, the stigmas nearly circular, 2.5 mm. in diameter.

Turedon, 1891 (1132). Some specimens of another species (perhaps *G. incurva* Hook.) were mixed with this number in distributing and may be recognized by their long (7 cm.) internodes, oblong leaves and triangular calyx-lobes.

GENTIANA MANDONI sp. n.

Erect, slender, 1–3 dm. high, the stems purple at the base, the branches erect and very slender, the internodes about 3 cm. long; basal leaves none, the cauline 1.5–3 cm. long, 3–8 mm. broad, linear-oblong to ovate, acute, sub-3-nerved; pedicels slender, exceedingly variable in length, the longest 2 cm., papillose; flowers 5-merous; calyx papillose, 1–1.25 cm. long, cleft three-fourths of the way to the base, the tube narrowly campanulate, lightly angled, the 3-nerved lobes linear, tapering gradually to a very acute purple point, the sinuses acute; corolla apparently rose-purple, 1.5 to nearly 2 cm. long, about 7 mm. broad at the summit, infundibular-campanulate, the lobes only 5–6 mm. long, obovate, very acute, naked, entire, with darker margins; stamens reaching to the base of the corolla-lobes, in some of the flowers reduced to vestiges 4–5 mm. in length, at the base of the corolla; anthers 2 mm. long; pistil nearly as long as the corolla, the stipe of the ovary as long as the stamens, the style very short, the stigmas strongly flattened, 1.5 mm. long, oval with rounded apex; fruit not seen.

Vic. Cochabamba, 1891 (1143). The same as Mandon's no. 365. Near *G. Pearcei* Phillippi, from Oranco, Chili, but that has rounded petals.

GENTIANA SPECTABILIS sp. n.

Root stout, erect; stems several (and basal leaves numerous) from a many-headed crown, erect or ascending, purple at the base, 2–2.5 dm. high, the internodes 3–6 cm. long; inflorescence virgate-cymose; basal leaves about 1 dm. long, 1 cm. broad, or less, linear-oblanceolate, sub-petioled by the long tapering base, 3-nerved, the apex rounded or blunt; cauline leaves sessile, 2 or 3 cm. long, similar, or lanceolate; flowers loosely cymose, the pedicels 2–5 cm. long, slightly enlarged upward, sharply angled or narrowly winged; flowers 5-merous; calyx 2 cm. long, the tube one-third of its length, turbinate-campanulate, 8-angled, the lobes lanceolate, tapering from the base to an acute apex; the sinuses obtuse; corolla deep blue, 2–4 cm. long, campanulate, lobed three-fourths of the way to the base, the tube campanulate, the lobes obovate, rounded, entire, naked; stamens two-thirds the length of the pistil, the filaments flattened, the anthers oblong, attached near their summits and accumbent, naked; pistil two-thirds as long as the corolla, the ovary linear-oblong; style very short and broad, the stigmas semi-circular, recurved; fruit not seen.

Vic. Cochabamba, 1891 (1015).

GENTIANA SEMINUDA sp. n.

Primary root short, stout, diffusely branched; stems tufted, ascending, 1–4 cm. long, almost filiform, 1-flowered or rarely branched; basal leaves spatulate, thickish, .5–1 cm. long, 1.5–2.5 mm. broad; cauline leaves usually but one or two pairs, oblong, obtuse, 1-nerved, 3–5 mm. long; flowers 5-merous; calyx 1 cm. long, lobed to a little below the middle, the tube narrowly campanulate, with 10 purple stripes, those continuous into the lobes broad, the alternate ones very narrow, the lobes linear-lanceolate, tapering gradually to an acutish point, the sinuses about twice as broad, obtusish to blunt; corolla bright blue, 1.5 cm. long, 1 cm. broad, lobed to a little below the middle, naked, entire, the tube campanulate, the lobes obovate, acutish; stamens reaching nearly to the middle of the corolla-lobes, the anthers yellow; pistil equalling the stamens, the stigmas very short and broad; fruit not seen.

Espirito Santo, 1891 (1231). The calyx differs slightly from that of Mandon's no. 363, but it may be the same species. It is very near *G. limoselloides* and also *G. primulaefolia* Griseb., but the sepals are too attenuate for either.

GENTIANA VIRGATA sp. n.

Root stout; stems several, stoutish but weak, ascending, 3–5 dm. long, the internodes 4–6 cm. long; branches short, strictly erect, like the pedicels (2 or 3 cm. long), the inflorescence strictly virgate; basal leaves numerous, grass-like, fleshy, 6–10 cm. long, 5–8 mm. broad, obtusish, the cauline similar, 3 or 4 cm. long; flowers 5-merous; calyx 1 cm. long, lobed two-thirds of the way, the obscurely angled tube turbinate, the lobes triangular-lanceolate, tapering regularly from the base to the acute apex, narrower than the acute sinuses; corolla (yellowish with purple margins ?) 2 cm. long, lobed nearly three-fourths of the way to the base, naked, the tube turbinate, the lobes obovate with subrotund apex; stamens a little more than half as long as the corolla, the anthers blackish, 3 mm. long, oblong; pistil a little exceeding the stamens; fruit not seen.

Espirito Santo, 1891 (1230). Also collected in Bolivia by Bridges.

Tetragonanthus gracilis (Griseb.) Kuntze, Rev. Gen. Pl. 431. (*Halenia gracilis* Griseb. Gen. et. Sp. Gent. 327.) Near snow-line, Mt. Tunari, 1892 (1019).

POLEMONIACEAE.

Gilia laciniata R. & P. Fl. Per. 2: 17. *pl. 123. fig. b.* Near snow-line, Mt. Tunari, 1891 (1029).

HYDROPHYLLACEAE.

Phacelia Peruviana (R. & P.) Spreng. (See 169). Near snow-line, Mt. Tunari, 1891 (1040).

BORAGINEAE.

Cordia Gerasacanthus L. Syst. ed. 10, 936. Between Guanai and Tipuani, Apr.–June, 1892 (1347). Espirito Santo, 1891 (1178) = Rusby's 1902.

Cordia hispidissima DC. Prod. 9: 475. Between Guanai and Tipuani, Apr.–June, 1892 (1436) = Rusby's 1901.

Cordia Salzmanni DC. Prod. 9: 494. Between Guanai and Tipuani, Apr.–June, 1892 (1394). Dec. (1443) = Rusby's 2053 and 2054.

Cordia Rusbyi Britton sp. n.

A stout much-branched scabrous shrub; petioles 3–5 mm. long, stout; blades 2.5–5 cm. long, 1–2.5 cm. broad, angularly ovate with slightly produced base and obtusish apex, irregularly serrate with mostly blunt teeth, thickish and rigid, densely and harshly tomentose both sides, yellowish-gray underneath, the veins deeply impressed above, prominent underneath, the primaries about 5 pairs, strongly ascending, somewhat crooked; peduncles terminal, but some appearing lateral or supra-axillary, 2–3 cm. long, stoutish, the flowers closely capitate, sessile, the heads 1–1.5 cm. broad; calyx rigid (in flower) 5 mm. long, broadly campanulate, lobed nearly half way to the base, the lobes triangular-ovate, acutish; corolla campanulate with somewhat spreading border, about double the length of the calyx, white; stamens a little shorter than the corolla, the anthers broadly oval; style shorter than the stamens, deeply 2-cleft; fruit about 6 mm. long, broadly ovoid, obtuse, not costate, dark brown with whitish summit, two-thirds included in the calyx.

Near snow-line, Mt. Tunari, 1891 (1110). The same collected by myself at Sorata (no. 2456), concerning which Dr. Britton says, "Related to *Varronia crenulata* R. & P., and in part the same as Mandon's no. 527, under *Lantana*."

CORDIA PAUCIFLORA sp. n.

Branchlets, inflorescence and veins underneath pubescent; branchlets elongated, slender, somewhat angled, the internodes very unequal, about 3–5 cm. long; petioles about 1 cm. long, broad, solitary on stout branchlets 2 or 3 mm. long, which bear the peduncles, the latter thus appearing as though axillary and adnate to the base of the petiole; blades .75–1.5 dm. long, 5–7 cm. broad, ovate, the base abruptly contracted and narrowed into the petiole, the apex abruptly short-acuminate and acute, coarsely and obsoletely serrate, the minute teeth salient and acute; membranaceous, thin, deep green, above slightly shining, the venation not prominent, the primaries about 8 or 10 pairs; peduncles 1 or 2 cm. long, bearing a few loose branches, the few flowers sessile near the tips; calyx open-campanulate, 4 mm. long, cleft nearly to the middle, the teeth ovate, acute, with acute sinuses; corolla 5 mm. long, the tube cylindraceous and slightly contracted in its middle part, the limb open-campanulate; stamens about equalling the corolla, the anthers nearly circular in outline; style about half the length of the stamens, entire; fruit not seen.

Espirito Santo, 1891 (1291).

CORDIA BUDDLEOIDES sp. n.

Branches elongated, stoutish, brown, harshly tomentose; petioles broad, varying from scarcely any to nearly 1 cm. in length; blades 7–10 cm. long, 3–5 cm. broad, ovate with very abruptly contracted base and acute apex, obsoletely serrate-dentate, membranaceous but rigid, above scabrous with deeply impressed veins, underneath strigose, with prominent midrib and about 6 pairs of irregular strongly upwardly curved primaries, the veins coarsely reticulate; pseudo-panicles ample, leafy, the spherical heads distantly racemose upon the branches, less than 1 cm. in diameter, very densely flowered; calyx-tube campanulate, 1.5 mm. long, the lobes 3 mm. long, tapering regularly from the base to the acute apex, strongly reflexed; corolla about as long as the calyx, the margin slightly crenulate; stamens included, the anthers subglobular, the cells at the base slightly divergent; ovary pyriform-obovoid, lightly 4-lobed, 1.5 mm. long, the style nearly 2 mm. long, 4-cleft about a third of the way down; fruit not seen.

Mapiri, July–Aug., 1892 (1530). Near *C. patens* H. B. K.

Heliotropium Curassavicum L. Sp. Pl. 130. Near snow-line, Mt. Tunari, 1891 (1039).

CONVOLVULACEAE.

Ipomoea Batatas Poir. in Lam. Encyc. **6**: 14. Espirito Santo, 1891 (1290).

Ipomoea macrocalyx (R. & P.) Choisy in DC. Prod. **9**: 362 (*Convolvulus m.* R. & P., Fl. Per. **2**: 10). Espirito Santo, 1891 (1279).

Ipomoea pentaphylla (L.) Jacq. Coll. **2**: 297 (*Convolvulus p.* L. Sp. Pl. ed. 2, 223). Between Guanai and Tipuani, Apr.–June, 1892, (1346).

Ipomoea setifera Poir. in Lam. Encyc. **6**: 17? Espirito Santo, 1891 (1278). Differs from the type in being glabrous and minus the awns to the calyx-teeth; but in *I. setifera* the degree of development of the latter is variable.

Ipomoea umbellata L. Syst. ed. 10, 924. Mapiri, July–Aug., 1892 (1482). Determination not free from doubt, as the flowers are wanting.

IPOMOEA MAGNIFOLIA sp. n.

Stems terete, glabrate, the younger portions and inflorescence pubescent; petioles 1–2 dm. long; blades 1 to nearly 2 dm. long, 1–1.5 dm. broad, regularly ovate, the base cordate with rounded lobes and a sinus of 90 degrees or more, the apex very abruptly contracted into a short attenuate point, very thin, above minutely, underneath manifestly strigose, the primaries about 5 pairs, forking at about two-thirds of their length; inflorescence very loosely paniculate, the branches of the panicle elongated, thickish, but weak; pedicels stout, 2 cm. long; calyx 1.5 cm. long, cleft three-fourths of the way to the base, the lobes erect, ovate, acuminate and acute, finely and obscurely nerved, the outer longer; corolla open-campanulate, about 8 cm. long, 5 cm. broad, red-purple with whitish tube and throat; stamens two-thirds the length of the corolla, unequal, the anthers 5 mm. long, 1.5 mm. broad, lance-ovate, sagittate; style equalling the stamens, the stigma sub-globose, lightly 3-lobed; ovary 3-celled; fruit not seen.

Espirito Santo, 1891 (1277). Apparently near *I. pandurata.*

Jacquemontia Blanchetii Moric. Nouv. Pl. Am. *pl. 27.* Between Guanai and Tipuani, Apr.–June, 1891 (1393). Same collected by Dr. Morong in Paraguay.

JACQUEMONTIA ACUMINATA sp. n.

Ferruginous-tomentose throughout, the branches terete, stoutish, the internodes 5–8 cm. long; petioles 3–5 cm. long, blades 8–12 cm. long, 4–6 cm. broad, regularly ovate, the sinus shallow and broad, the apex abruptly attenuate and very acute, the margin obscurely sinuate; thick, densely tomentose or velutinous both sides, venation indistinct, the primaries about 10 pairs; peduncles stout, at length exceeding the leaves; cyme dichotomous, many-flowered, rather dense, linear-bracted, the pedicels about 5 mm. long; calyx campanulate, about 8 mm. long, the lobes rigid, brownish-green with scarious margins, ovate, sharply acuminate, the outer longer; corolla campanulate, 1.5 cm. long, two-thirds as broad at the mouth, red-purple, 5-lobed, the short lobes acute; stamens half the length of the corolla, the filaments at the base dilated and puberulent, the anthers oval; style a little exceeding the stamens, the stigmas turgid or fleshy, broadly ovoid and blunt, nearly 2 mm. long, deeply channeled on the under side, or perhaps reduplicate; fruit not seen.

Espirito Santo, 1891 (1263).

JACQUEMONTIA PEDUNCULATA sp. n.

Scurfy-pubescent throughout, and the younger portions sparsely pilose; root vertical, stout, terete; stems several from a large crown, elongated, slender, ascending or decumbent; petioles .5 to 1 cm. long; blades 1–2 cm. long, .75–1.5 cm. broad, ovate, obtuse, the margin obscurely sinuate, thickish; peduncles solitary at the nodes, appearing as though axillary, one-flowered or at length loosely several-branched, 5 or 6 cm long, subulate-bracted; sepals erect, 5 mm. long in flower, the inner slightly longer, ovate, acuminate and acute; corolla deep blue, nearly 2 cm. long, campanulate with widely spreading border; stamens 5 mm. long, the filaments slightly dilated and pubescent at the base, the anthers large, oval; style a little longer than the stamens, the stigmas ovoid, turgid; capsule 5 mm. long, globose, brown.

Vic. Cochabamba, 1891 (1067). The same as Glaziou's no. 9971.

Convolvulus Bonariensis Cav. Ic. 5: 54. *pl. 480. f. 2.* Vic. Cochabamba, 1891 (1158).

Evolvulus linifolius L. Sp. Pl. ed. 2, 392. Below Cochabamba, 1891 (1006).

Cuscuta grandiflora H. B. K. Nov. Gen. 3: 123. *pl. 213.* Vic. Sorata, May, 1892 (1304) = Rusby's 2006.

CUSCUTA FRAGRANS sp. n.

Glabrous; inflorescence dense, the flowers sessile; calyx 7 mm. broad when expanded, 5-parted two-thirds of the way to the base, the lobes somewhat unequal, rhomboidally-ovate, blunt; disk deep orange or scarlet, annular, thickish, sinuately lobed, prominent; corolla-tube 4 mm. long, urceolate, the lobes ovate, obtuse, 3 mm. long, strongly reflexed; anthers reaching to the middle of the corolla-lobes; scales broad, fimbriate, reaching nearly to the base of the anthers; ovary large; styles stout; stigmas large, white, capitate.

Vic. Sorata, May, 1892 (1303). The flowers are very fragrant. It is very near *C. odorata* R. & P., but does not agree with either the figure or the description.

SOLANACEAE.

Solanum argenteum Decne. in Poir. Encyc. Supp. 3: 755? Between Tipuani and Guanai, Dec., 1894 (1699).

Solanum asarifolium Kunth et Bouché, Ind. Sem. Hort. Ber. (1845) 10. Espirito Santo, 1891 (1235).

Solanum Gayanum (Remy) Phil. Cat. Pl. Vasc. Chil. 228. Vic. Cochabamba, 1891 (1151).

Solanum mammosum L. Sp. Pl. 187. Between Tipuani and Guanai, Dec., 1892 (1735).

Solanum nigrum L. (See 539 and 727). Between Guanai and Tipuani, Apr.–June, 1892 (1462).

Solanum nutans R. & P. Fl. Per. 2: *pl. 166*. Between Tipuani and Guanai, Dec., 1892 (1740) = Linden's 218.

Solanum polytrichum Moric. Nouv. Amer. 32. *pl. 22*. Between Guanai and Tipuani, Apr.–June, 1892 (1374) = Salzmann, "Bahia, in collibus," not Sellow's 363.

Solanum Schlechtendalianum Walp. Rep. 3: 61. Mapiri, July–Aug., 1892 (1566). In the many representatives of this species in the Kew Herbarium, the flowers are uniformly smaller and the indumentum less aureous than in Mr. Bang's specimen, but I can hardly regard the latter as distinct. It is the same as Spruce's no. 791 and near Schomburghk's 859, which has a truncate calyx and different anthers.

Solanum styracioides Rusby. (See No. 522.) Between Tipuani and Guanai, Dec., 1892 (1662).

Solanum tuberosum L. Sp. Pl. 185. Vic. Cochabamba, 1891 (1100 and 1101) = Pentland's Titicaca specimen.

Solanum validum Rusby (see no. 972). Vic. Cochabamba, 1891 (1096).

Solanum Wrightii Benth. Pl. Hartw. 243. Vic. Guanai, July, 1892 (1608).

SOLANUM AUREIFOLIUM sp. n.

Glabrous, except the puberulent flowers, shrubby, much and widely branched, the branches light brown, striate, the internodes 2–2.5 cm. long; petioles 1–2 cm. long, broad but weak; blades .75–1.5 dm. long, 3–5 cm. broad, lance-oblong to oblong-ovate, the base blunt, the apex abruptly contracted into a tapering and acute point, thin, drying yellowish-green, the primaries 5–7 pairs, slender, irregular and crooked, the venation very fine and obscure; peduncles 2–3 cm. long, angled, the cyme racemiform, very loose, twisted, the pedicels 1.5 cm. long, faintly striate, at the apex dilated and angular; calyx cup-shaped to saucer-shaped, lobed about half-way to the base, the lobes triangular, acuminate and acute, with broad rounded sinuses; corolla pubescent, 1 cm. long, divided nearly to the base, the lobes oblong-ovate, obtuse, white, translucent and conspicuously reticulate-veined; anthers 7 mm. long, lanceolate, slightly whitish-thickened at the summit, where the small pores look directly upward and are continuous with lateral sutures; style stout, slightly exceeding the anthers, the stigma very small; fruit a little more than 1 cm. broad, red when immature, deep red-purple at maturity.

"Near snow-line, Mt. Tunari" (?), 1891 (1119).

SOLANUM CLAVATUM sp. n.

Glabrous; a much-branched shrub, the branchlets crowded, irregular, short and stout, very leafy, the internodes .5–1 cm. long; leaves 6–15 cm. long, 1–4 cm. broad, lance-oblong, the base tapering into a winged petiole about 1 cm. long, the apex obtusish; the margin entire but irregular, thick and rigid, pale beneath, where the midrib is very stout and prominent, the primaries 10 or 12 pairs, the reticulation indistinct; peduncles 2–5 cm. long, slightly thickened upward; cymes 5 or 6 cm. broad, mostly 10–20-flowered, the pedicels about 2 cm. long, clavate and quadrangular at the summit; calyx-tube proper cupulate, 3 mm. long, 5 mm. broad, the teeth mostly a little longer, narrowly triangular-acuminate, the sinuses broad and rounded; corolla white, finely spotted inside, thickish, 1.5 cm. broad; anthers 5 mm. long, nearly 2 mm. broad, lance ovate, obtuse, straight, the pores directed about equally upward, inward and laterally; style exceeding the anthers by one-half their length; fruit dull, about 1 cm. in diameter.

Near snow-line, Mt. Tunari, 1891 (1118. It appears that some specimens of the next may have been accidentally mixed with this number in distributing). The same species collected on Mt. Chimborazo. The specimens in Herb. Kew bear the number 33, but the name of the collector does not appear.

SOLANUM HIBISCIFOLIUM sp. n.

Yellowish-gray throughout, with dense stellate-scurfy tomentum; branches stout, terete; petioles 4–8 cm. long, stout; blades .75–1 dm. long, .5–1 dm. broad, oval-ovate, the base more or less cordate, the apex barely pointed, acutish, the margin entire but irregularly waving; thickish but flaccid, venation inconspicuous above, the midrib and 5 or 6 pairs of primaries prominent and stout underneath, their secondaries meeting about midway at a broad angle; peduncles stout, 6–8 cm. long, the cymes 6–10 cm. broad, rather densely flowered; pedicels stoutish, 1.5–2 cm. long, erect; calyx about 1 cm. long, the lobes thickish, erect, broadly ovate, acute, with acute sinuses; corolla white, one-fourth or one-third longer than the calyx, thickish; anthers 4 mm. long, oblong, blunt, the cells a little produced at the base, the pores looking directly inward; style 1 mm. longer than the anthers; fruit 1 cm. broad, slightly elongated, sparsely short-stellate.

Vic. Cochabamba, 1891 (1141). Near *S. verbascifolium.*

SOLANUM LINDENII sp. n.

Glabrous, or the twigs puberulent; shrubby, the branchlets erect, stoutish, flexuous, coarsely and bluntly angular, the internodes 2.5–5 cm. long; petioles 1–1.5 cm. long, broad; blades .75–2 dm. long, 4–7 cm. broad, oval, obtuse at both ends, entire, revolute, coriaceous, the venation obscure except the midrib and 7–10 pairs of primaries, the secondaries connecting with the primaries and with the midrib; peduncles 1.5–2 cm. long, the cymes few-flowered, loose, the pedicels 1–1.5 cm. long, slender; calyx-tube hemispherical, 4 or 5 mm. broad, the lobes less than half as long, very broad, acute, with acute sinuses; corolla white, rigid, 7 or 8 mm. long, the lobes oval-ovate, very acute; anthers 5 mm. long, straight, oblong, blunt at both ends, the pores looking inward rather more than upward, prolonged downward into sutures; mature fruit not seen.

Mapiri, July–Aug., 1892 (1526). The same as Linden's 1624 from New Granada and almost Fendler's 978 from Venezuela.

SOLANUM PHYSALIFOLIUM sp. n.

Glandular-pubescent, herbaceous, widely branching, the branches coarsely and sharply angled, the internodes irregular and very unequal; petioles .5–1.5 cm. long, slender and weak; blades 2–4 cm. long, 1–2.5 cm. broad, rhomboidally ovate, acute, coarsely and rather indistinctly sinuate-lobed, thin, flaccid, the venation inconspicuous, the reddish primaries about 5 irregular pairs; peduncles about 1 cm. long, mostly 3–5-flowered, the pedicels 1–1.5 cm. long, weak; flowers white, only 5 mm. long; anthers 2 mm. long, oval, the pores looking upward and inward;

fruiting calyx spreading, 1 cm. broad, the lobes oval, obtuse; fruit green, shining, 1 cm. in diameter, the epicarp very thin.

Vic. Cochabamba, 1891 (1159). Near *S. phyllanthum* Cav.

SOLANUM SYMMETRICUM sp. n.

Glabrous; branchlets erect, rather slender, very flexuous, blackish, the internodes 2–2.5 cm. long; petioles 1 cm. long; blades about 1 dm. long and 5 cm. broad, oval, the base shortly acuminate, apex obtuse; entire, thin but rigid, the midrib and about 7 pairs of primaries prominent beneath, the reticulation fine, indistinct; peduncles mostly solitary at the nodes, 1 cm. long, slender, divergent, the rhachis spiral or cochleate, so as to make the many-flowered cyme sub-spherical; cyme 2.5–3 cm. in diameter, the pedicels slender, about 7 mm. long; calyx open-campanulate, 2.5–3 mm. long and broad, divided nearly midway, the lobes triangular and acutish, the sinuses nearly of the same form; corolla white (with violet center?), rotate, strongly reflexed, 5 or 6 mm. long, deeply lobed, the lobes tapering-ovate; anthers 3 mm. long, straight, oblong and somewhat narrowed toward the base, the pores facing inward, upward and laterally; style a little exceeding the stamens, stout, clavate, the stigma large; fruit not seen.

Mapiri, July–Aug., 1892 (1478).

SOLANUM VELUTISSIMUM sp. n.

Shrubby, unarmed, the branchlets short, stout, divergent, terete, blackish, the leaves crowded at their summits, the younger parts, like the inflorescence, petioles and lower leaf-surfaces, densely white stellate-scurfy; petioles .5–1 cm. long, margined; blades 4–10 cm. long, 2–5 cm. broad, oval, acute, thick, above of a bright (slightly yellowish) green and densely velutinous; peduncles 3–4 cm. long, stout, erect, the cyme 6–8 cm. broad; calyx broadly campanulate to saucer-shaped, about 7 mm. broad; divided nearly midway, the lobes triangular-ovate, acute, 3 mm. broad, sinuses acute; corolla (light-blue?) stellate-scurfy without, divided nearly to the base, the lobes nearly 1 cm. long, ovate; anthers 3 mm. long, oblong, lightly curved, the pores looking inward and a little upward; style stout, tapering, stellate-scurfy; immature fruit lightly stellate-scurfy.

Vic. Sorata, 8,000 ft., Nov. 1892 (1627). Near Mandon's 424, but the calyx-teeth are different.

Solanum sp. almost certainly undescribed, but must await flowers. Near *S. Swartziana*, but the calyx and fruit are different. Vic. Sorata, 1892 (1630). Nearly the same as Rusby's 777.

CYPHOMANDRA UNILOBA sp. n.

Glabrous, except the under leaf-surfaces; branches elongated, weak and apparently reclining; petioles 2.5–5 cm. long, slender; blades 1–2 dm. long, .5–1 dm. broad, ovate, the base inequilateral and somewhat cordate, the apex normally acute, or in some cases shortly pointed, the margin obscurely and coarsely sinuate-lobed, many of the leaves with one large sinus hollowed out near the base upon the larger side, thin, sparsely and very minutely strigose on the lower surface; peduncles 3–5 cm. long, the cyme dichotomous, its branches elongated and racemiform; pedicels 1–1.5 cm. long, angled, dilated at the summit; calyx open-campanulate, 5 mm. long and a little broader, the margin sinuately lobed, rigid; corolla 8–10 mm. or occasionally 15 mm. long, deeply cleft, thickish, the lobes ovate, acuminate; anthers 6 mm. long, ovate, the dorsum lightly outwardly arched, the turgid brown connective entirely concealing the thecae at the back, the pores very small, looking inward, laterally, and a little upward, continuous with fully developed sutures; style very stout, angled, about as long as the anthers, the stigma large, its margin lightly sinuately lobed; fruit not seen.

Mapiri, July–Aug., 1892 (1535).

Bassovia solanacea Benth. & Hook. f. Gen. Pl. 2: 891. Espirito Santo, 1891 (1210). The strigose form.

BASSOVIA INAEQUILATERA sp. n.

Herbaceous; the branches, inflorescence and veins underneath cinereous, the leaf-surfaces sparsely strigose; branches slender, flexuous, angled, the internodes 2.5–4 cm. long; petioles 1 cm. long, broad; blades 1–2 dm. long, 0.5–1 dm. broad, oval-obovate, very inequilateral, the base acuminate, the apex abruptly very short-pointed and acute; entire, very thin, dark-green, underneath paler, the primaries 12–15 pairs, strongly falcate-ascending, reticulation very coarse and inconspicuous; cymes sessile, loosely few-flowered, the pedicels unequal, the longest 1 cm. long, slightly dilated upward; calyx 2 mm. broad, slightly longer, 10-toothed, the teeth very small; corolla-lobes 4.5 mm. long; style 4 mm. long; fruit not seen.

Between Tipuani and Guanai, Dec. 1892 (1708).

The following specimens, seen in Herb. Kew. under *Solanum*, require careful comparison with this plant: Spruce's nos. 4182 and 4849 from Tarapota (but not the finely lepidote specimen from the same place); R. Tate's 262, labeled *Solanum foetidum*, and Gaudot's New Grenada specimen, labeled *S. radiatum*. It is the same as Rusby's 765 from Bolivia.

Capsicum baccatum L. Mant. 116. Turedon, 1891 (1126) (Cult.).

Capsicum frutescens L. Sp. Pl. 189. Espirito Santo, 1891 (1185). Mapiri, July–Aug., 1892 (1474) (Cult.).

POECILOCHROMA ALBESCENS Britton, sp. n.

A low strongly branching shrub, the branches ascending, scurfy, above pubescent; petioles 2 or 3 mm. long, whitish, blades extremely variable in size, in some specimens only .5–1 cm. in length, in others 2 or 3 cm. long, .75–1.5 cm. broad, oval-ovate, slightly inequilateral, obtuse, revolute, thickish, rigid, above glabrous, pale, the veins impressed, underneath very pale or whitish, papillose, the veins prominent; cymes lateral, loosely few-(mostly 3- or 4-) flowered, slenderly peduncled, the pedicles filiform, 1 or 2 cm. long; flowers white, their size proportionately greater in the larger-leaved form, 1.5–2.5 cm. long; calyx 3 mm. long and broad, cleft half-way to the base, the tube broadly campanulate, the lobes triangular-ovate, obtuse; corolla broadly campanulate, the lobes about 7 mm. long and broad, triangular-ovate; filaments inserted into the base, 2 mm. long, the anthers distinct, 4 mm. long, lance-ovate, truncate; style filiform, considerably exceeding the stamens, the stigma inconspicuous.

Vic. Mapiri, 8,000 ft., Sept. 1892 (1575), the form with smaller leaves and flowers. The larger form is Rusby's 2564, from which the above measurements of the dissection are taken.

Salpichroa glandulosa (Hook.) Miers, in Hook. Lond. Jour. Bot. 4: (1845) 325. (*Atropa g.* Hook. Bot. Misc. 2: 230.—Hook. Ic. *pl. 106*). Near snow-line, Mt. Tunari, 1891 (1048).

LYCIUM PAUCIFOLIUM sp. n.

A much branched, spiny shrub, the branchlets much elongated, slender, flexuous, horizontal or lightly ascending, whitish, glabrous, the spines divaricate, .5–1.5 cm. long, slender, terete, very pungent; leaves .5–1 cm. long, 2 or 3 mm. broad, oblong-obovate, obtuse, with a tapering petiole-like base half as long as the laminate portion, entire, thickish, very minutely scabrous, pale, the veins indistinct; pedicels unequal, the longest nearly 1 cm. long, slender, thickened upward; bud obovoid, obtuse, 4 mm. long; calyx campanulate, striate, 4 mm. long, lobed a fourth or a third of the way to the base, the lobes triangular, acute, the sinuses of the same form; corolla-tube infundibular, twice the length of the calyx, the lobes about 3 mm. long, obovate, obtuse, strongly reflexed; stamens a little exceeding the corolla-lobes; fruit elongated-globose, 5 or 6 mm. long.

Vic. Cochabamba, 1891 (1098). Very nearly, if not, identical with a specimen collected by Jameson in the Argentine.

Markea verrucosa sp. n.

Branchlets very stout, densely verrucose with intermediate stellate pubescence; leaves sub-ternately arranged; petioles 5 mm. long, very stout, leaving a nearly circular whitish concave scar 5–7 mm. broad; blades 1.5–2.5 dm. long, .7–1 dm. broad, oval, the base acute, the apex abruptly contracted into a short broad acute point, coriaceous, above so densely and shortly velutinous as to appear glabrous, the veins impressed, underneath densely yellowish short-stellate; peduncle and rhachis together 6 dm. long, or more, verrucose, distantly branched; flowers not seen; fruiting calyx-tube turbinate, 1.5 cm. long, 1 cm. broad, the limb divided nearly to the base, the lobes 4 cm. long, lanceolate, acuminate and acute, coriaceous; apparently purple, reticulate-veined, glabrous; fruit 2 cm. or more in diameter, the pericarp wanting, the very numerous seeds nearly 3 mm. long, ovate, obtusely angled, the base obliquely truncate.

Espirito Santo, 1891 (1294).

Unique in the genus in its very peculiar indumentum.

Cestrum coriaceum Miers in Hook. Lond. Journ. Bot. **5**: (1846) 160. Guanai, Dec., 1892 (1634. A few specimens of the fruit perhaps distributed separately as 1414.) Apparently an extreme form of this variable species.

Cestrum strigillatum R. & P. Fl. Per. **2**: 29. *pl. 156.* Espirito Santo, 1891 (1189).

Cestrum floribundum Britton, sp. n.

Glabrous, except for the very slight and sparse puberulence of the inflorescence; branches elongated, coarsely angled at the summit, the internodes about 3 cm. long; petioles 1 cm. long, weak; blades .5–1.5 dm. long, 3–7 cm. broad, regularly ovate with rounded base and acute apex, thin but somewhat rigid, the primaries 7–9 pairs, strongly falcate-ascending, the reticulation very coarse and faint; panicle ample, rather lax, leafy, the branches horizontal; pedicels very slender, 2 or 3 mm. long; calyx open-campanulate, 3 mm. long, lobed to a variable depth, mostly one-fourth to one-third of the way, the lobes broadly ovate, whitish-ciliate-margined; corolla-tube nearly 2 cm. long, 1.5 mm. broad, at the summit abruptly dilated to 2.5 mm., the lobes 6 mm. long, oblong, acute, strongly reflexed, whitish with broad green middle portion; stamens and style about equalling the corolla-tube; fruit not seen.

Espirito Santo, 1891 (1200) and between Guanai and Tipuani, Apr.–June, 1892 (1470). The same Rusby's 818.

Sessea vestita (Hook.) Miers in Hook. Lond. Journ. Bot. **5**: (1846) 155. (*Cestrum v.* Hook. Ic. *pl. 381*). Espirito Santo, 1891 (1164).

Nicotiana glauca Grah. Bot. Mag. *pl. 2837*. Espirito Santo, 1891 (1182).

Nicotiana tomentosa R. & P. Fl. Per. **2**: 16. *pl. 129. fig. a.* Vic. Sorata, Nov. 1892 (1625)=Rusby's 2533.

Browallia viscosa H.B.K. Nov. Gen. **2**: 373. Mapiri, July–Aug., 1892 (1533.)

Brunfelsia latifolia (Pohl) Benth. in DC. Prod. **10**: 199. (*Franciscea l.* Pohl, Pl. Bras. Ic. **3**: *pl. 2.*) Between Guanai and Tipuani, Apr.–June, 1891 (1398)=Rusby's 621.

SCROPHULARINEAE.

Fagelia deflexa (R. & P.) Kuntze, Rev. Gen. Pl. 459 (*Calceolaria d.* R. & P. Fl. Per. **1**: 18. *pl. 30.* Near snow-line, Mt. Tunari, 1891 (1038)=Mandon's 455 at Herb. Kew, except for a fragment of some other species.

Fagelia chelidonioides (H.B.K.) Kuntze, (see 720). Near snow-line, Mt. Tunari, 1891 (1018).

FAGELIA TRILOBATA (Hemsl.) (*Calceolaria t.* Hemsl. Biol. Cent. Am **2**: 439). Espirito Santo, 1891 (1226).

Mimulus glabratus H.B.K., Nov. Gen. **2**: 370. A little below Cochabamba, 1891 (1014).

Stemodia pusilla Benth. Bot. Sulph. 144. Between Guanai and Tipuani, Apr.–June, 1892 (1388).

Stemodia pauciflora Ait. Hort. Kew. ed. 2, **4**: 52. Between Guanai and Tipuani, Apr.–June, 1892 (1387)= Mandon's 467.

COLUMELLIACEAE.

COLLUMELLIA SERRATA sp. n.

Glabrous; branchlets numerous, 1.5–2 dm. long, slender, tough, erect or ascending, light gray-brown, sharply but irregularly angled, enlarged at the nodes, which are about 1 cm. apart; petioles about 5 mm. long, broad, margined, sharply carinate, the keel extending along the midrib; blades 3–6 cm. long, 1–2 cm. broad, oblanceolate, very inequilateral, the base cuneate, the apex rounded; coarsely serrate, the teeth erect with enlarged purple tips, thick, the veins strongly impressed above, finely reticulate;

cymes terminal, few-flowered, the purple-angled pedicels about 1 cm. long; calyx-tube 3 mm. long, turbinate, purple, angled, the reflexed foliaceous lobes nearly as long as the tube, oval to obvate with rounded apex, 3-nerved, the nerves purple; corolla (yellow) about 2 cm. broad, lobed more than two-thirds of the way to the base, the lobes sub-orbicular, with entire crisped margin; filaments inserted at the base of the tube, very stout, 4 mm. long; the anther large, curved into a globose mass 3 mm. in diameter; disk greenish, of two very broad thick fleshy glands interposed between the stamens, adnate to the bases of the ovary and corolla; ovary fleshy, compressed, 4 mm. broad, the top deeply grooved along the long axis; style brown, about as long as the filaments, very stout, much enlarged at the summit, the stigma nearly 3 mm. broad, peltate, thick, fleshy, white, irregularly lobed.

Espirito Santo, 1891 (1172).

GESNERACEAE.

Gloxinia reflexa sp. n.

Younger portions long-pilose and glandular; stems erect or ascending, coarsely angled, weak, simple, the internodes 4 or 5 cm. long; petioles 2.5–5 cm. long, broad; blades 6–10 cm. long, 4–8 cm. broad, ovate, very inequilateral and the slightly cordate base very oblique, the apex short, acuminate and acute; coarsely crenate-serrate, very thin, bright green, sparsely and minutely hispid-strigose on both sides; peduncles axillary, about 1 cm. long, 5–15-flowered, the pedicels about as long; calyx-tube 7 or 8 mm. long, 2 mm. broad, cylindraceous-infundibular, the reflexed, herbaceous lobes about of equal length, oblanceolate with rounded apex; corolla (purple-white?) pubescent, 2.5 cm. long and broad (as pressed), open-campanulate with rounded ventricose base, and lightly lobed sub-equal sparsely fimbriate margin; stamens shorter than the corolla, the filaments capillary.

Vic. Mapiri, Jan., 1893 (1745). It has no near relative, and its reference to this genus is somewhat doubtful.

Achimenes albescens sp. n.

Finely short-strigose; rhizome oblique; stems ascending, weak, the nodes few and distant; leaves .75–1.5 dm. long, 2–4 cm. broad, inequilateral, oblong, the base tapering gradually into a short petiole, the apex acuminate and acute; entire, very short strigose both sides, above whitish and papillose, underneath purplish; peduncles axillary and terminal, 1-flowered, 3–6 cm. long, very slender; calyx 1 cm. long, lobed two-thirds of the way, the tube broadly turbinate, lobes narrowly lance-linear, the two upper a little shorter and broader, sinuses broad and rounded; corolla purplish-white, pubescent, 1.5 cm. long and half as broad, the base strongly declined, sub-saccate on the upper side, the body swollen on the lower side, the mouth sub-equal, the lobes 3 mm. long, erect, spreading; ovary short and broad, style stout, pubescent; stigma ovoid, the apex concave; disk annular, short, sinuate.

Espirito Santo, 1891 (1211).

ACHIMENES RUSBYI Britton, sp. n.

Strigose-tomentose and the younger parts long-pilose; a portion of the nearly horizontal rhizome densely imbricated with fleshy scales each 1 cm. long and two-thirds as broad, reddish brown with whitish margins; stem erect, simple, 3–6 dm. or more high, reddish, the internodes .7–1 dm. long, the leaves ternate or opposite below; petioles 1–2 cm. long, slender; blades 5–8 cm. long, 2.5–4 cm. broad, ovate, the base obtuse, the apex tapering and acute, coarsely serrate, the teeth acute, purplish underneath, the venation obscure; flowers apparently only one to several, terminal, and occasionally in the upper axils; pedicels 2 or 3 cm. long, ascending; calyx nearly 2 cm. long, the campanulate tube one-third of its length, the lobes linear or almost setaceous, the sinuses broad and rounded; corolla deep maroon-purple, 4 or 5 cm. long, nearly straight, the base very oblique; narrow basal portion of tube 1 cm. long, 5 mm. broad (as pressed), gradually dilated into the ventricose body, which is 1.25 cm. broad; mouth 2 cm. broad, lightly oblique, the lobes reflexed, beautifully margined and spotted with deep indigo-purple; stamens barely exserted.

Between Tipuani and Guanai, Dec., 1892 (1721) = Rusby's 1102.

ACHIMENES FLACCIDA sp. n.

Rhizome slender; hirsute; stems erect or ascending, slender and weak, sparingly branched or simple, green or purplish below, long-pilose, the internodes about 1 dm. long; petioles only 2–3 mm. long, very broad; blades 6–9 cm. long, 3–4 cm. broad, ovate, short-acuminate and acute, minutely serrate and strongly ciliate, thin and flaccid, pale, strigose underneath and very sparsely so above; peduncles 1-flowered, solitary in the upper axils, and terminal, 2–4 cm. long; calyx 1 cm. long, lobed to or a little below the middle, the tube turbinate, purple (like the peduncle), densely strigose, the lobes green, subequal, lance-ovate, long-acuminate and acute; corolla deep rose-purple, tomentose, 3 cm. long when fully developed, 1.5 cm. broad, as pressed, the base oblique, the narrow basal portion scarcely any, body ventricose, mouth subequal and contracted, lobes small, erect-spreading; stamens and style about as long as the corolla; disk annular, deeply sinuately lobed; style stout, pubescent, stigma ovoid.

Espirito Santo, 1891 (1213).

SEEMANNIA CUNEATA sp. n.

Closely short-strigose and purple throughout; rhizome oblique, short, stoutish, sparsely hairy, bearing short whitish fleshy imbricated scales; stems .5–1 m. or more high, erect, stoutish, simple, the internodes of very irregular length, the upper much elongated; leaves ternate, ovate, 5–8 cm. long, 2–3 cm. broad, the tapering cuneate base passing into a petiole 1–2 cm. long, the apex acute; entire, thickish and sub-rigid, thickly and closely strigose; peduncles stout, erect, about 2 cm. long; calyx-tube turbinate, 4 mm. long, the lobes sub-equal, 6 mm. long, narrowly lance-linear, tapering from the base to an acute point, erect, rigid; corolla scarlet, tomentose, nearly 1.5 cm. long, half as broad, the base oblique, declined and gibbous on the upper side, the body cylindraceous, the mouth slightly contracted, the lobes very short, erect-spreading; stamens nearly equalling the corolla, strongly gibbous at the base; style stoutish, flattened, puberulent, the stigma 2-lamellate, the lobes broadly ovate, obtuse; ovary sub-truncate; disk annular, sinuately lobed; fruit oval-ovoid, 8–10 mm. long.

Espirito Santo, 1891 (1212). The same as Rusby's 1100 but not 1101. It differs from *S. ternifolia* Regel in the cuneate petioled leaves, longer and more rigid peduncles and smaller and narrower flowers. A different species, with leaves rounded at the base and scarcely petioled, was mixed with this in distribution.

Koellikeria argyrostigma (Hook.) Regel. (See no. 275.) Between Tipuani and Guanai, Dec., 1892 (1720).

DIASTEMA LATIFLORA sp. n.

Herbaceous, green or purple, very sparsely short-pilose, flowering when 2 or 3 cm. high, at length 3 dm. high or more, simple or sparingly branched, erect; leaves varying proportionately with the size of the plant, at length 1.5 dm. long and .75 to 1 dm. broad, the broad margined petioles one-third of the length; ovate, the base very abruptly contracted, the apex obtusish, coarsely, irregularly and deeply crenate-serrate, the teeth obtuse, longer than broad, very thin, the venation coarse and broad; pedicels loosely cymose-paniculate, 2 cm. or more long, slender, erect; calyx 7 or 8 cm. long, lobed two-thirds of the way, the tube in fundibular-campanulate, the lobes obovate with rounded apex and acute sinuses, strongly herbaceous, in flower spreading or reflexed, in fruit again erect; corolla (rose-purple?) sparsely hairy, 1.5 cm. long, 1 cm. across the oblique mouth, conspicuously curved, campanulate, lobed nearly to the middle; filaments capillary, purple, nearly equalling the corolla; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1728). The same as a specimen collected in Ecuador by Dr. Sinclair, and one of those collected in Bolivia by Pearce. Different from Mathews' and Spruce's. Species near *D. urticaefolia*.

ISOLOMA SPRUCEI Britton, sp. n.

Strigose; stem rooting at the base, erect or ascending, 3–6 cm. high, branched only at the inflorescence, quadrangular, densely strigose-tomentose, the internodes 5 or 6 cm. long; petioles 2 or 3 cm. long; blades 1–1.5 dm. long, 4–6 cm. broad, oblong, slightly inequilateral, closely serrate, the teeth mostly acute, above bright green and short-strigose, underneath bright purple and sparsely pubescent, the veins densely strigose; peduncles in the upper axils, 2 or 3 cm. long, stoutish, umbellately 5–8-branched, the branches at length nearly as long as the peduncles, 1-flowered, the bracts in the form of small leaves; calyx densely tomentose, 7 or 8 mm. broad, the tube very short, saucer-shaped, the lobes short, broadly ovate to semi-circular, slightly pointed, soon reflexed; corolla tomentose, deep purple, 1.25–1.5 cm. long, the base very oblique, the tube campanulate, ventricose, curved, 7 mm. broad, the somewhat oblique mouth but little broader; fruit 5 mm. broad.

Vic. Mapiri, Aug., 1892 (1541). The same as Rusby's no. 2151. Description taken from Mr. Bang's specimens.

ISOLOMA PARVIFLORA sp. n.

Densely long-pilose throughout; rhizome elongated, purple, not tuberiferous in my specimens; stem apparently ascending, slender, simple, sulcate, the internodes about 4 cm. long; petioles 1–1.5 cm. long; blades 4–8 cm. long, 2.5–5 cm. broad, ovate with rounded base and short-acuminate, acute apex, closely and sharply serrate, densely strigose; flowers few, in the upper axils and terminal, the pedicels slender, 1 or 2 cm. long; calyx-tube 4 mm. broad, hemispherical or shorter, the lobes 4 or 5 mm. long, 2 mm. broad, oblong, obtuse, herbaceous; corolla red-purple, 7 mm. long, 6 mm. broad, the narrow basal portion very short, the oblique mouth much narrower than the body, the reflexed lobes very short and broad; stamens barely exserted; disk of (always?) 8 globose brown glands, 6 of them united into three pairs, the others solitary to right and left of the lower pair; fruit not seen.

Mapiri, July–Aug., 1892 (1563a. Perhaps partly distributed as 1565.). This is very similar to, if not the same as, no. 544 previously enumerated, with doubt, as a *Besleria*. It is very near Spruce's 4962 from Chimborazo.

Alloplectus Patrisii DC. Prod. 7: 545. Espirito Santo, 1891 (1259) = Spruce's 2604, and a specimen in Herb. Kew. marked "ex Herb. Sagot 425."

Columnea Boliviana Rusby (See no. 515). Mapiri, July–Aug., 1891 (1551).

COLUMNEA OBLONGIFOLIA sp. n. (Sect. Pentadenia).

Branches purple, thick but weak, hirsute above, the internodes 2 or 3 cm. long; petioles .5–1 cm. long, very broad; blades .5–1.5 dm. long, 2.5–5 cm. broad, the pair moderately unequal, oblong, inequilateral, the base obtuse, the apex acute; coarsely and shortly serrate, densely short-strigose, purple underneath; pedicels 7–10 cm. long, slender, ascending, recurved; calyx densely strigose, 1.5 cm. long, cleft nearly to the base, the lobes linear-lanceolate, tapering from base to apex; corolla red-purple, tomentose, finely many-nerved, 5 cm. long or more, 1.5 cm. broad (as pressed), the tube short, lightly curved, expanding gradually into the ventricose body, the mouth slightly contracted and lobes erect-spreading, about 1 cm. long; stamens slightly exserted, the anthers globoidal, broader than long; style about as long as the corolla, dilated at the summit, the stigma truncate with circular summit; fruit not seen.

Vic. Mapiri, Jan., 1893 (1744). Near *C. strigosa.*

BESLERIA ROTUNDIFOLIA sp. n.

Glabrous; stems thick but weak, strongly sulcate, the internodes 4–5 cm. long; petioles 3–5 cm. long, broad; blades 1.25 to nearly 2 dm. long, nearly as broad, sub-orbicular, the base broadly cuneate, distantly beset with very small sharp salient teeth; flowers loosely paniculate-cymose in the upper axils and at the summit, the cymes mostly long-peduncled, 3 or 4 cm. long, not bracted, the pedicels .5–1 cm. long, enlarged upward, strongly quadrangular and sulcate; calyx 6 mm. long, 8 mm. broad, the tube very short, saucer-shaped, the lobes unequal and inequilateral, ovate, obtuse, more or less keeled, coriaceous or cartilaginous; corolla red-purple, 1 cm. long, 6 mm. broad, the base oblique and ventricose, the body nearly straight, the mouth slightly contracted, the small oval lobes spreading; stamens short; disk short, cupulate, sinuately lobed, deficient on one side; ovary broadly conical; fruit globose, 5 mm. in diameter.

Espirito Santo, 1891 (1250). Very similar to *B. ovalifolia* Rusby, but certainly distinct.

NAPEANTHUS ANDINUS sp. n.

Sparsely strigose-hirsute; stem rhizomatous, short, stout, the leaves crowded at the summit; leaves .3–1.5 dm. long, 1–3 cm. broad, inequilateral, obovate with long tapering petiole-like base and acute apex, obsoletely serrate, deep green, thin; peduncles filiform, recurved-spreading, 2–5 cm. long, bearing two or three branches, the bracts oblong-lanceolate, 5 mm. long, the pedicels filiform, 1–2 cm. long; calyx 5 mm. long, lobed two-thirds of the way, the tube broadly campanulate, sharply many-nerved, the lobes triangular-ovate, acuminate and very acute; corolla white (?) the tube 5 mm. long, broadly campanulate, slightly ventricose, the broadly spreading or reflexed lobes nearly as long; fruit globose, brown, nearly as long as the calyx, tipped for some time by the capillary recurved style.

Between Tipuani and Guanai, Dec., 1892 (1729).

NAPEANTHUS RIGIDUS sp. n.

Stem of similar habit to the last, but stouter; leaves .5–1 dm. long, 1.5–3 cm. broad, oblanceolate, with cuncate sessile base and acute apex, coarsely short-serrate, the teeth mostly sharp, thick and rigid, glabrous and glaucous above, sparsely strigose underneath, the midrib and primaries very stout and prominent underneath; peduncles 1–1.5 cm. long, stout, erect, several-flowered, the bracts very thin, the longest 1 cm. long, tapering, lance-linear; pedicels rigid, erect, 1–2 cm. long; calyx 8 mm. long, lobed nearly to the base, sharply many-nerved, the lobes lanceolate, tapering from the base to a pungent apex, rigid; corolla little exceeding the calyx; capsule not more than half the length of the calyx, bright green.

Between Tipuani and Guanai, Dec., 1892 (1729a).

BIGNONIACEAE.

Lundia Spruceana Bureau in Baill. Adansonia, **8**: (1867–68) 279. Between Tipuani and Guanai, Dec., 1892 (1672). Leaves slightly thicker and more reticulate than in Spruce's 4489.

LUNDIA PHASEOLIFOLIA sp. n.

Glabrous; branchlets red, striate, the internodes 5–7 cm. long; petioles 3–6 cm. long, slender, striate; leaflets 3, the petiolules .5–2 cm. long, the terminal more than twice the length of the lateral, blades 6–10 cm. long, 4–5 cm. broad, the base cordate, the lateral slightly inequilateral, the apex long-acuminate and acute, membranaceous and thin; bright green, the primaries about 5 pairs, prominent beneath, venation slightly and coarsely reticulate; panicles axillary and terminal, short and broad, the peduncles mostly shorter than the petioles, the slender pedicels about 5 mm. long; calyx of a little deeper yellow than the corolla, 6 mm. long, 5 mm. broad, campanulate, the margin truncate and obscurely sinuate; disk annulate, inconspicuous; corolla puberulent without, 4 or 5 cm. long, 2 cm. broad, not strongly 2-lipped, the mouth scarcely oblique; stamens reaching a little beyond the middle of the corolla, the anthers red-brown, pilose, the thecae divaricate; style about equalling the stamens, the stigma lozenge-shaped, broader above; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1650). Also collected by Pearce in "woods near Salta" (sub *Bignonia* in Herb. Kew). Near *L. corymbifera.*

Bignonia brachypoda DC. Prod. 9: 145. Mapiri, July–Aug., 1891 (1500).

BIGNONIA IMPRESSA sp. n.

Glabrous; branchlets stout, terete; petioles 4–7 cm. long, stout, lightly angled; leaflets 3, the terminal petiolule about 2 cm., the lateral 1 cm. long, semi-cylindrical, hollowed with sharp edges upon the upper side, the blades 1–1.5 dm. long, about 5 cm. broad, the terminal longer, lance-ovate, the base rounded, the apex bluntly acuminate; strongly revolute, coriaceous and rigid, but not thick, dark-green and shining above, pale underneath, veins strongly impressed above, very prominent beneath, the principal primaries 5–7 pairs, the veins strongly and coarsely reticulate; panicle terminal, sessile, the pedicels 1–3 cm. long; disk cup-shaped; calyx thick, 1.5 cm. long, nearly 1 cm. broad at the apex, which is not oblique, campanulate, cleft nearly to the middle, the lobes unequal, entire; corolla 8 cm. long, 5 or 6 cm. broad at the oblique mouth, the tube broadly infundibular, slightly curved and ventricose; stamens reaching a little beyond the middle of the corolla, the style a little longer; style-branches 5 mm. long, oblong, broad, flattened; fruit oblong, 1.5 dm. long, 3 cm. broad, slightly compressed, lightly keeled; seed (exclusive of wing) about 2 cm. broad in each direction.

Between Guanai and Tipuani, Apr.–June, 1892 (1321). Apparently the same as Rusby's 1129, from which the descriptions of the fruit and seed are taken.

BIGNONIA PEARCEI sp. n.

(Sect. *Arrabidaea.*) Ferruginous-hirsute or tomentose throughout; branchlets short and very stout, terete, light brown; petioles 2–3 cm. long; leaflets 3, the petiolules .5–1 cm. long, the terminal one-half longer than the lateral, stout, the blades 1–1.5 dm. long, .5–1 dm. broad, ovate to rotund-ovate, the base very oblique and subcordate, membranaceous but rigid, above very sparingly hairy, underneath abundantly so with the veins and 5 pairs of primaries very prominent, frequently some of the lower primaries forked below the middle; panicles in the upper axils and terminal, short and broad, stoutly peduncled, many-flowered, the pedicels 3–5 mm. long, rather slender; disk cup-shaped, 2 mm. long; calyx campanulate, truncate, with entire border, 5 mm. long; bud obovoid with rounded or obscurely pointed apex; corolla 2.5 cm. long, the oblique mouth 1.5 cm. broad, infundibular-campanulate, puberulent without, bright purple; stamens about as long as the corolla-tube, the anthers linear, the thecae divaricate; fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1391). Also collected by Pearce at Palta. Near *B. Sieberi* DC.

BIGNONIA TECOMAEFLORA sp. n.

Glabrous; branches reddish-brown, striate, the internodes 5–10 cm. long; petioles 1–2 cm. long, angular, the leaflets a single pair, the petiolules half as long as the petioles; blades 5–7 cm. long, 3–4 cm. broad, ovate, the base rounded, the apex short-acuminate and acute, venation inconspicuous, the primaries 5 or 6 pairs, the surface finely pitted; rhachis in the form of a tendril, which is trifid at the summit; panicle ample, broad, lax, the branches sharply angled; pedicels 5–7 mm. long; calyx open-campanulate, 5 mm. long, 5-lobed, the lobes exceedingly short, mucronate; corolla coriaceous, deep red, 6 or 7 cm. long, infundibular, lightly curved and very slightly ventricose, the lobes recurved, oblong with rounded apex, which is pubescent within, the lower one exterior and slightly longer, nearly 2 cm. long; stamens lightly exserted by the recurving of the corolla-lobes, the anthers 4 mm. long, the thecae separated at the rounded base, lanceolate in outline; style slightly exceeding the stamens, the stigma ovate, 3 mm. long; capsule 2.5 dm. long, strongly flattened, smooth, lightly curved, acuminate and acute; seeds (inclusive of the wing) nearly 4 cm. long, 1 cm. broad, light brown with scarious entire margin.

Mapiri, July–Aug., 1892 (1510) and vic. Sorata, Sept., 1892 (1596).

Cuspidaria. The species apparently does not exist at Kew, but the specimens are without flowers. Mapiri, July–Aug., 1892 (1485).

Pithecoctenium Lundii DC. Prod. 9: 196. Between Tipuani and Guanai, Dec., 1892 (1668).

Amphilophium paniculatum (L.) H.B.K. Nov. Gen. 3: 149. (*Bignonia p.* L.; Jacq. Am. 183. *pl. 116.*) Between Tipuani and Guanai, Dec., 1892 (1739)=Morong's 446.

Tecoma mollis H.B.K. Nov. Gen. 3: 144. Vic. Sorata, March, 1892 (1315)=Rusby's 1128.

Crescentia —— sp. Espirito Santo, 1891 (1161).

ACANTHACEAE.

Mendoncia Lindavii Rusby. (See no. 532). Between Tipuani and Guanai, Dec., 1891 (1707).

Ruellia Willdenoviana Nees in DC. Prod. 11: 207. Espirito Santo, 1891 (1199).

Ruellia amoena Nees in DC. Prod. 11: 203. As syn. Espirito Santo, 1891 (1223). Between Guanai and Tipuani, Apr.–June, 1892 (1390).

Ruellia ——— ? Espirito Santo, 1891 (1295). Dr. Lindau denotes this as an undescribed species of the Sect. Thysruellia, and will doubtless supply a description.

RUELLIA BANGII sp. n.

Closely strigose; root vertical, stout; stem erect, widely branching, sharply quadrangular and above narrowly winged, very dark green; petioles 1–2 cm. long; blades .75–1.5 dm. long, 2–4 cm. broad, ovate, varying greatly in comparative breadths, the base tapering acutely into the petiole, the apex acuminate and acute, dark green, thin, closely and rather sparsely (sub-equally on the two sides), short-strigose; calyx 1 cm. long, divided nearly to the base, the lobes unequal, narrowly lanceolate, tapering to an acute pungent apex, ciliate; corolla 4–6 cm. long, the tube slender, curved, the lobes very broad; stamens much shorter than the tube.

Between Guanai and Tipuani, Apr.–June, 1892 (1355).

It is very unfortunate that my material of this interesting species is so scanty and poor that a good dissection cannot be made. A better description will doubtless be given by Dr. Lindau.

RUELLIA GRACILIS sp. n. (Sect. Thysruellia.)

Minutely strigose; stems 2 or 3 dm. high, erect, slender, nearly simple, sharply quadrangular, the internodes 3 or 4 cm. long; leaves sessile, 3–5 cm. long, 3–7 mm. broad, linear-oblong, tapering at both ends, obtusish, entire, bright-green, erect; flowering branchlets 4 or 5 cm. long, very slender, erect, one-flowered or bearing several flowers sessile near the summit; calyx 7 or 8 mm. long, the tube very short, campanulate, the lobes more or less unequal, linear-setaceous, tapering to a very acute point, rigid, bright green, the sinuses several times broader, obtusish; corolla scarlet, 2 cm. long, the narrow basal portion 5 mm. long, dilated abruptly into the body, which is four times as broad, strongly ventricose on the lower side, the lobes short and broad, erect-spreading; stamens inserted near the base of the corolla, reaching to the base of the lobes, the anthers 1.5 mm. long, broad; fruit lance-oblong, acute, green, a little more than 1 cm. long.

Between Guanai and Tipuani, Apr.–June, 1892 (1449).

SANCHESIA PERUVIANA (DC.) (*Ancylogyne P.* DC. Prod. 11: 222.) Mapiri, July–Aug., 1892 (1473).

LOPHOSTACHYS CONFERTA sp. n.

Minutely and harshly strigose throughout; stems slender and weak, decumbent and rooting at the base, obscurely angled, the internodes about 5 cm. long; leaves 6–12 cm. long, 2–4 cm. broad, oval-ovate, the base abruptly contracted into a margined pseudo-petiole 1–2 cm. in length, the apex about equally acuminate, acute or obtusish; entire, dark green; spikes very dense, 3–7 cm. long, about 2 cm. broad, sessile; bracts 1 cm. long, 4 mm. broad, highly inequilateral, ovate, falcate, abruptly contracted into a pungent acumination, green, with 4 or 5 very strong dark-green nerves, strongly reticulate and ciliate; the 2 larger calyx-lobes broadly obovate, shortly and pungently pointed, scarious with stout green nerves and veins, strongly ciliate, unequal, the larger 1.25 cm. long, nearly 1 cm. broad, cleft to the base; the two smaller setaceous, 6 mm. long; corollas of my flowers withered and unfit for dissection; style, exclusive of ovary, more than 1 cm. long, the stigma small; capsule (immature) on a narrow basal angled portion (stipe ?) nearly as long as the body, which is ovoid, acute, light-brown, glabrous, flattened, the flat surfaces broadly and bluntly keeled.

Vic. Guanai, July, 1892 (1604). The same as Rusby's 1114 from Mapiri.

Aphelandra tetragona (Vell.) Nees in DC. Prod. 11: 295. Between Guanai and Tipuani, Apr.-June, 1892 (1368).

BELOPERONE COCHABAMBENSIS sp. n.

Stem and leaves minutely and harshly strigose, the inflorescence long-pilose; stems elongated, decumbent and rooting at the base, obscurely quadrangular, sulcate, green, branching, the internodes 4 or 5 cm. long; petioles 1 or 2 cm. long, broad; blades .75–1 dm. long, 2–4 cm. broad, ovate, the base acute, the apex regularly acuminate and acute, irregularly sinuate, pale green; spikes solitary and sessile at the summits of the stem and slender branches, dense, the mass of bracts about 3 cm. long and half as broad; bracts leaf-like, 1.5–2 cm. long, 6 mm. broad, obovate, shortly, abruptly and pungently acuminate; calyx 1.25 cm. long, the tube scarcely any, the lobes linear-setaceous, and very pungent, more or less unequal, green and long-pilose; corolla deep red-purple, puberulent, 4 cm. long, the tube infundibular, the lobes 1.5 cm. long; stamens nearly as long as the corolla.

Espirito Santo, 1891 (1215).

BELOPERONE NUDA sp. n.

Coarsely and sparsely strigose, the younger growth pubescent; stems herbaceous, tall, widely branching, obtusely quadrangular and deeply sulcate, the internodes 4 or 5 cm. long; leaves sessile or sub-petioled by a short margined base, 1–2 dm. long, 4–7 cm. broad, oval-ovate, acuminate and acute at both ends, entire, thin, bright green, the 12–15 pairs of primaries regular, strongly falcate-ascending, the tip of one approximating or touching that next above very close to the margin, faintly connected by the secondaries; panicles axillary and terminal, the peduncles 1 dm. long, erect, angled, the floriferous portion about as long, broad, the subulate-setaceous bracts 2 or 3 mm. long, the pedicels .5–1 cm. long, erect; calyx 1 cm. long, lobed almost to the base, the lobes oblong, acutish, herbaceous but erect; corolla 5 cm. long, infundibular-cylindraceous, the longer lip 2.5 cm. long, its lobes 5 mm. long, rounded at the apex, the middle nearly twice as broad as the lateral, concave-arched, the shorter lip 2 cm. long, entire; stamens reaching to the middle of the lips, the anther-cells strongly overlapping, the caudae short, broad, white and translucent; style 7 mm. shorter than the stamens, the stigma small, obtuse; mature fruit not seen.

Mapiri, July–Aug., 1892 (1511). Species near *B. fragilis*.

Beloperone Bangii sp. n.

Stems erect, stout, terete, minutely strigose, green, swollen and dark purple at the joints, the internodes 3 or 4 cm. long; petioles 1 cm. long, broad, consisting of the abruptly contracted leaf-base; blades .6–1.25 dm. long, 3 or 4 cm. broad, ovate, acuminate and obtusish, entire, very short-strigose both sides, rather pale, drying brownish; spikes axillary and densely aggregated at the summit, dense, 6 or 7 cm. long, about 3 cm. broad, sessile or stoutly peduncled; bracts 2 or 3 cm. long, narrowly linear, tapering regularly to a most acute point, hispid and sparsely hirsute, grayish green; calyx 1.5 cm. long, divided nearly to the base, the lobes narrowly lanceolate or oblanceolate, tapering into an attenuate pungent point nearly as long as the body, keeled, rigid; corolla 5 or 6 cm. long; the tube very slender, the lobes 1 cm. long; stamens reaching to the middle of the corolla-lobes, the anther-cells approximate, appendages at apex and base well developed.

Espirito Santo, 1891 (1224). Apparently the same as Rusby's 1749 from the Beni River region. It appears also to be the same as Traill's 660 from San Antonio on the Madeira.

Justicia Boliviana sp. n. (Sect. Dianthera).

Glabrous, except the sparsely and coarsely strigose leaf-surfaces, especially the upper; stems weak, decumbent and rooting below, obscurely angled, very dark, the internodes 4–6 cm. long; lower petioles 2 or 3 cm. long, very slender; blades 5–10 cm. long, 2–5 cm. broad, oblong to oval-ovate, short-acuminate and acute at both ends, entire, dark green; spikes about 1 dm. long, very slender, erect, the peduncles longer than the petioles, rather loosely flowered; bracts setaceous, green, half as long as the calyx; calyx 1 cm. long, divided nearly to the base, the 4 lobes subequal or becoming very unequal in fruit, lance-linear, attenuate and pungent, green; corolla 1.5 to nearly 2 cm. long, the tube straight, slightly contracted near the middle, the lower lip 8 mm. long, its middle lobe distinctly larger, concave, the upper lip a little shorter, entire, concave; stamens a little shorter than the upper lip, the thecae approximate and subequal; style equalling the upper lip, the stigma small, but distinctly oblique; capsule oblanceolate, 1 cm. long, light brown; seed nearly 2 mm. long, ovoid, flattened, brown, light-muricate.

Espirito Santo, 1891 (1225). Apparently the same collected by Triana in New Granada, and a very similar one by Holton in Bolivia.

Pachystachys Riedeliana N. ab. E. in Endl. & Mart. Fl. Bras. Fasc. 7: 93. Mapiri, July–Aug., 1892 (1555).

JACOBINIA TENUISTACHYS sp. n.

Slightly strigose, the inflorescence pubescent, the upper leaf-surfaces glabrous; stems widely branching, the branches slender, lightly angled; leaves sessile, 1.25–2 (or probably more) dm. long, 4–6 cm. broad, ovate, the base slightly inequilateral, the apex acuminate and acute; entire, membranaceous, bright green, the primaries about 10 pairs, very slender, strongly falcate-ascending and connecting close to the margin; panicles in the upper axils and terminal, the slender erect peduncles 6 or 8 cm. long, the branches distant, widely spreading, very slender, the bracts and bractlets very small, varying from setaceous to subulate, the flowers distant and sessile; calyx 4 or 5 mm. long, deeply cleft, green, rigid, the lobes lanceolate, acuminate and acute; corolla scarlet, nearly straight, 2.5 cm. long; the lips nearly equal, 1 cm. long, nearly entire; stamens as long as the corolla, attached at about its middle, the filaments dilated at the base, the thecae parallel, nearly equal, attached at about the middle and separated by a short and broad connective; fruit not seen.

Between Guanai and Tipuani, Apr.–June, 1892 (1441). Nearly, if not the same as Lechler's 3153.

DIAPEDIUM MULTICAULE sp. n.

Sub-glabrous; primary root short and stout; stems numerous, erect or ascending from a broad crown, 3–6 dm. high, very slender, sharply quadrangular, green, the internodes 4–5 cm. long;

leaves sessile or on margined petioles 1 cm. long, 3–4 cm. long, 1–2 cm. broad, ovate, acute at both ends, entire, dark green; bracts numerous, 7–8 mm. long, 4 mm. broad, obovate, acute at base, the apex very shortly and very acutely pointed; light green, rigid; bractlets 7 mm. long, lanceolate, tapering to an acute point, scarious, greenish, ciliate; calyx 4 mm. long, scarious, white, the tube 1 mm. long, campanulate, the lobes lanceolate, tapering to a very acute point, ciliate, nerved; corolla pubescent, light purple, 1.5 cm. long, the lips nearly two-thirds of its length; stamens nearly equalling the lobes, the filaments broad, pubescent, the upper sterile theca the larger, broad, white; ovary ovoid-oblong, brown, 2 mm. long.

Vic. Cochabamba, 1891 (1001). The same as Mandon's no. 296.

VERBENACEAE.

LIPPIA CAESPITOSA sp. n.

Root vertical, slender, much elongated; stems and principal branches stout, very crooked, prostrate and rooting, terete, woody; leaves .5–1 cm. long, 2 or 3 mm. broad, oblanceolate, acute or acutish, very closely strigose or sericeous; peduncles a little shorter than the leaves, weak; heads 5 mm. broad; bracts green, ovate, acuminate and acute, 3 mm. long and nearly as broad; calyx 2.5 mm. long, 2-keeled, the margin truncate, but the keels slightly prolonged, hispid; corolla 4 mm. long, the tube as long as the calyx, cylindraceous-infundibular, nearly straight, very slightly ventricose, the larger lobe orbicular; pistil 1 mm. long, the cylindrico-conical style as long as the broadly ovoid ovary, the stigma small.

Vic. Cochabamba, 1891 (1009. Perhaps some accidentally distributed as 1008.).

LIPPIA LIPPIOIDES (Cham.) (*Riedelia lippioides* Cham. Linnaea, 7: 224 = *Lippia Chamissonis* D. Dieterich, Syn. Pl. 3: 598). Between Tipuani and Guanai, Dec., 1892 (1726).

Priva lappulacea (L.) Pers. Ench. 2: 139 (*Verbena l.* L. Sp. Pl. 19 = *Priva echinata* Juss. Ann. Mus. Par. 7: 69). Between Guanai and Tipuani, Apr.–June, 1892 (1375).

Verbena polystachya H.B.K. Nov. Gen. 2: 274. A little below Cochabamba, 1891 (1058).

Petrea bracteata Steud. in Flora (1843), 764. Mapiri, July–Aug., 1892 (1480).

Callicarpa acuminata H.B.K. Nov. Gen. 2: 252. Between Tipuani and Guanai, Dec., 1892 (1669).

AEgiphila tomentosa Cham. Linnaea, 7: 110. Between Tipuani and Guanai, Dec., 1892 (1332) = Rusby's 2516.

AEGIPHILA DENSIFLORA sp. n.

Harshly yellowish-scurfy and strigose; stems elongated, slender and weak, erect or somewhat ascending, obtusely quadrangular, the internodes about 3 cm. long; petioles divaricate, about 5 mm. long; blades 7–10 cm. long, 2–4 cm. broad, oblong, varying to obovate, the base rounded, the apex abruptly acuminate and tapering to a very acute point, short-strigose on both sides, the 10 pairs of primaries very prominent beneath, communicating near the margin and connected by the very crooked secondaries, the reticulation coarse and prominent; panicles stoutly peduncled, close or interrupted, the flowers crowded upon the branches into dense hemispherical secondary panicles, the bracts and bractlets setose, elongated, weak, acute; pedicels slender, mostly 5–7 mm. long; calyx 5 mm. long, the tube 3 mm. long, turbinate, the lips cleft half way, the lobes ovate, obtuse; corolla-bud strongly pyriform, the apex rounded; tube cylindraceous, 6 mm. long, 2 mm. broad, the lobes 3.5 mm. long, broadly ovate with rounded apex; stamens slightly longer than the corolla, but not exserted, attached just below the lobes; ovary black, scarcely 2 mm. long; style shorter than the stamens; fruit not seen.

Between Tipuani and Guanai, Dec., 1892 (1732). Very near *AE. cuspidata* Rusby.

LABIATAE.

Mesosphaerum uncinatum (Benth.) Kuntze, Rev. Gen. Pl. 527 (*Hyptis u.* Benth. Lab. Gen. et Sp. 80). Espirito Santo, 1891 (1236).

MESOSPHAERUM ARBOREUM (?) BRACTEOSUM n. var.

Differs from the type principally in its large oblong or oblanceolate floral leaves, of a brilliant purple on the upper surface, and its calyx of the same color. There is at Kew a specimen by Weir (no. 161) of the same, referred to *M. arboreum*, but it may perhaps better be regarded as a distinct species.

Mapiri, July–Aug., 1892 (1519).

Mesosphaerum lantanaefolium (Poit.) Kuntze, Rev. Gen. Pl. 525 (*Hyptis l.* Poit. Ann. Mus. Par. 7: 468. *pl. 29*). Between Guanai and Tipuani, Apr.–June, 1892 (1425).

Mesosphaerum odoratum (Benth.) Kuntze (See no. 270a). Mapiri, July–Aug., 1891 (1495).

BYSTROPOGON (?) AXILLARE sp. n.

Shrubby and intricately much-branched, the branchlets almost filiform, sharply angled, reddish; leaves .5–1 cm. long, 2–3 mm. broad, lance-oblong, the base tapering into a petiole 1 or 2 mm. long, the apex acutish, entire, revolute, 1-nerved, lightly canescent, green, strongly papillose; peduncles 3 mm. long, 1–3–5-flowered, the pedicels nearly as long, recurved; calyx 2 mm. long, turbinate, green, strongly 15-nerved, nearly equally 5-toothed, the teeth broadly ovate, acute; corolla 3 mm. long, the tube as long as the calyx, straight, broadly cylindraceous, the lobes short, rounded, strongly reflexed; stamens inserted just below the lobes, slightly exserted; style equalling the stamens, lightly cleft.

Turedon, 1891 (1125). Species near *B. andinum* Britton.

Gardioquia grandiflora H.B.K. Nov. Gen. **2**: 314. Turedon, 1891 (1127).

Alguelagum tenuiflorum (Benth.) Kuntze (see no. 167). Near snow-line, Mt. Tunari, 1891 (1044).

Alguelagum salviaefolium (H.B.K.) Kuntze, Rev. Gen. Pl. 512. (*Sideritis s.* H.B.K. Nov. Gen. **2**: 307.) Near snow-line, Mt. Tunari, 1891 (1108).

ALGUELAGUM AURIFERUM sp. n.

A large stout shrub, finely canescent upon the stems, inflorescence and lower leaf-surfaces; branches thick but weak, obtusely angled, the internodes 5–7 cm. long; petioles 1–2 cm. long, broad, the blades 1.5–2 dm. long, .5–1 dm. broad, ovate, the base blunt, the apex acuminate and acute; finely dentate, the alternate teeth minute, finely bullate and harsh above, underneath canescent and thickly sprinkled with brightly shining golden particles; panicles axiliary and terminal, long-peduncled, very dense; calyx in flower 4 mm. long, 2 mm. broad, campanulate, lobed nearly to the middle, the lobes not very unequal, triangular-ovate, acute, canescent within and without; corolla 5 or 6 mm. long; style slightly exserted, the branches recurved; ovary 1 mm. long and broader at the apex, deeply lobed; fruiting calyx 1.5 cm. long and broad (as pressed); nuculae oval-ovoid, 2 mm. long, 1 mm. broad, deep purple-brown, smooth.

"Near snow-line, Mt. Tunari" (?) 1891 (1107).

SALVIA COCHABAMBENSIS sp. n.

Finely canescent throughout; shrubby, the branches elongated, erect, slender, purple at the base, sharply angled, the internodes 2.5–5 cm. long; petioles 3–5 mm. long, slender; blades 4–6 cm. long, .5–1 cm. broad, lance-oblong, tapering to a very acute point at both ends, crenate-dentate, thick, erect, the veins strongly impressed above, yellowish and very prominent underneath, the erect primaries about 7 pairs, connected by the secondaries; pedicels stoutish, 3–5 mm. or in fruit about 1 cm. long, distantly racemed, 3–5 together; calyx (in flower) 1.25 cm. long, about 5 mm. broad, campanulate; corolla (deep purple-red?) tomentose, 3–4 cm. long, the upper lip 1.5 cm., the lower 1.25 cm. long, the points 2 cm. apart; style exceeding the stamens, densely pilose, the longer branch about 5 mm. long.

Vic. Cochabamba, 1891 (1059).

Stachys Bogotensis H.B.K. Nov. Gen. **2**: 309. A little below Cochabamba, 1892 (1054).

PLANTAGINEAE.

Plantago sericea R. & P. Fl. Per. **1**: 51. *pl. 79, B.* Vic. Cochabama, 1891 (1152).

NYCTAGINEAE.

Boerhaavia scandens L. Sp. Pl. 3. A little below Cochabama, 1891. With white flowers (1069) and with purple flowers (1070).

Boerhaavia erecta L. Sp. Pl. 3. Between Guanai and Tipuani, Apr.–June, 1892 (1431) = Rusby's 904.

Bougainvillea longispinosa sp. n.

Intricately branching, the branchlets stout, purple, terete, glabrous, very leafy; spines elongated, 1–2 cm., very slender and pungent, divergent; petioles about 5 cm. long; blades 1.5–3 cm. long, .75–1.5 cm. broad, the smaller obovate to oblong, the larger rhomboidally ovate, the base cuneate, apex acute or obtusish; entire, more or less 3-nerved by the exaggeration of the lower pair of primaries, thick, papillose, drying yellowish green; bracts (in fruit) 2 cm. long, or more, 1.5 cm. broad, oval-ovate, the base rounded, the apex blunt (color?); flowers 3, not seen; fruit (mature?) sub-sessile, 1 cm. long, 4 mm. broad, obovoid, triquetrous and sharply angled, green, bearing the marcescent corolla.

Turedon, 1891 (1123). The same collected by Pearce at Catamarca, in Nov., 1863.

Pisonia hirtella H.B.K. Nov. Gen. **2**: 217. A little below Cochabamba, 1891 (1063).

AMARANTACEAE.

Chamissoa altissima (Swz.) Kunth in H.B.K. Nov. Gen. **2**: 197. *pl. 125.* Between Guanai and Tipuani, Apr.–June, 1892 (1415) = Rusby's 1505.

Telanthera Moquinii Webb. ex. DC. Prod. 13: Part 2, 379. Between Guanai and Tipuani, Apr.–June, 1892 (1359) = Rusby's 1521.

TELANTHERA BANGII sp. n.

Villous; stems slender and weak, yellowish-green, the internodes 1–1.5 dm. long; petioles about 5–7 mm. long; blades 5–8 cm. long, 2–4 cm. broad, oval-ovate, very short-pointed, acute, entire, the venation inconspicuous; heads 1 cm. long, 8 or 9 mm. broad, ovoid, acutish, somewhat compound; bracts 2.5 mm. long, broadly ovate, concave, scarious, rigid, 1-nerved, very acute; calyx 4 mm. long, purple at the base, the lobes equal, oval-oblong with blunt apex, 1-nerved; androecium 2 mm. long, the appendages of the tube between the stamens oblong, long-fimbriate, a little longer than the filaments; pistil 1 mm. long, the ovary broadly ovoid; style conical; stigma rather large, peltate.

Near snow-line, Mt Tunari (?)1891 (1024).

Philoxerus sp.? Although very different from any other species of the genus, it appears to belong here. My specimens do not afford dissection material, and a positive determination cannot be made.

Mt. Tunari, 1891 (1084).

Gomphrena villosa Mart. Nov. Act. Nat. Cur. 13: (1826) 303. A little below Cochabamba, 1891 (1007). Vic. Sorata, May, 1891 (1301) = Mandon's 1016 and Rusby's 1518. I do not regard this as being the same as *G. perennis* L.

Hebanthe decipiens Hook. f. in B. & H. Gen. Pl. 3: 41 (*Iresine grandiflora* Hook.). Mapiri, July–Aug. 1892 (1521).

CHENOPODIACEAE.

Chenopodium foetidum Schrad. (See no. 799). A little below Cochabamba, 1891 (1004).

Basella rubra L. Sp. Pl. 272. Cochabamba (1062). Turedon (1103). (Cult.)

PHYTOLACCACEAE.

VILLAMILLA ROSEA-OENIA (Lem.) = *Ladenbergia r.* Lem. Illust. Hort. 16: (1869) *pl. 591.* Espirito Santo, 1891 (1292).

Microtea Maypurensis (Kunth,) G. Don; Loud. Hort. Brit. ed. 2, 98. Vic. Guanai, 1892 (1589) = Rusby's 1379.

POLYGONACEAE.

Polygonum lacerum H.B.K. (See no. 130). A little below Cochabamba, 1891 (1051).

Polygonum persicarioides H.B.K. Nov. Gen. 2: 179. Near snow-line, Mt. Tunari, 1891 (1025).

SARCOGONUM TAMNIFOLIUM (H.B.K.). (*Polygonum t.* H.B.K. Nov. Gen. 2: 180 = *Muhlenbeckia t.* Meissn. Gen. 2: 227.) Below Cochabamba, 1891 (1064). Espirito Santo, 1891 (1252).

TRIPLARIS HISPIDA Britton sp. n.

Branchlets purplish, slender, flexuous, fistulous, striate, sparsely long strigose-hispid with red hairs, papillose where these have fallen away; petioles 5–7 mm. long, very stout, erect, and, like the midrib underneath, clothed similarly to the branchlets; leaves 3 dm. or more long, 1 dm. broad, oblong with oblique base and abruptly short-acuminate apex, entire, rigid, glabrous except for the midrib, which is prominent on both sides, sparsely strigose underneath; spikes loosely panicled, with very stout rhachis, about 1 dm. long; bract of the staminate flower (only flowers seen) 3 mm. long, campanulate, at length completely fissured down the lower side, half-way along the upper, long-pilose; perianth pilose, the tube infundibular, 3 mm. long, 1.5 mm. broad at the summit, the lobes nearly 2 mm. long, oval-ovate with rounded apex; filaments long-exserted; fruiting calyx 3 cm. long, the tube 1.25 cm. long, lightly constricted above the fruit, densely ferruginous-hirsute, the lobes dark red, sparsely ferruginous-hirsute, linear-oblanceolate with rounded apex, the inner lobes 7 mm. long; fruit dark red, very sharply triquetrous, the styles stout, triquetrous, recurved-spreading.

Espirito Santo, 1891 (1169, fruit) = Rusby's 1424, from which the description of the flower is taken.

TRIPLARIS GUANAIENSIS sp. n.

A large tree, the branchlets fistulous, flexuous, light brown, their upper portions minutely verrucose, the inflorescence very densely and long ferruginous-pilose; petioles (only the uppermost leaves seen) 2 cm. long, very stout, channelled above like the midrib; blades 2.5–4 dm. long, .75–1.5 dm. broad, oblanceolate or obovate, the base acute and slightly inequilateral, the apex abruptly short-pointed; entire, thin and membranaceous but rigid, pale and above slightly glaucous, glabrous except upon the midrib of the younger leaves underneath, where there are a few fine hairs, the primaries 20–25 pairs, connected by very slender crooked secondaries; staminate spikes densely panicled, 2–2.5 dm. long, about 6 mm. broad dense, cylindrical, uniform; bracts 3 or 4 mm. long and broad, ovate; calyx lightly pilose, 3 mm. long, lobed two-thirds of the way to the base, the tube campanulate, purple, the sub-equal lobes lighter, with dark middle portion, widely spreading, oval-obovate, acutish; stamens one-half longer than the calyx, the anthers elliptical-oval, less than 1 mm. long; pistillate spikes .5–1.5 dm. long, the flowers not seen; fruiting calyx densely hirsute, purple, 3.5 cm. long, contracted above the fruit, the outer lobes 2 cm. long, 5 mm. broad, oblong-oblanceolate with rounded apex, the inner 8 mm. long.

Vic. Guanai, July, 1892 (1600 in fruit, 1601 in flower). This is possibly the same as my 1243 from the lower plains, but I think not. That has regularly and broadly ovate cordate leaves which are not glabrous.

PIPERACEAE.

Piper umbellatum L. Sp. Pl. 30. Vic. Guanai, July, 1892 (1607) =Rusby's 2173.

Piper longistylosum C.DC. Bull. Torr. Bot. Club, **21**: (1894) 161. Espirito Santo, 1891 (1233).

Peperomia pseudo-rufescens C.DC. Bull. Torr. Bot. Club, **21**: (1894) 160. Vic. Cochabamba, 1891 (1148a).

Peperomia Mandonii excelsis C.DC. Bull. Torr. Bot. Club, **21**: (1894) 160. Vic. Sorata, 1891 (1299).

Peperomia psilophylla C.DC. Bull. Torr. Bot. Club, **21**: (1894) 160. Mapiri, 1892 (1516a).

Peperomia umbilicata macrophylla C.DC. Prod. **16**: Part 1, 394. Espirito Santo, 1891 (1251a).

Peperomia hispidula (Sw.) A. Dietr. Sp. **1**: 165. Between Tipuani and Guanai, Dec., 1892 (1719).

Peperomia magnoliaefolia (Jacq.) C.DC. Prod. **16**: Part 1, 427. Between Guanai and Tipuani, Apr.–June, 1892 (1328).

MYRISTICACEAE.

Myristica sebifera (Aubl.) Swz. Fl. Ind. Occ. 1129. Between Tipuani and Guanai, Dec., 1892 (1678) =Rusby's 1216.

MONIMIACEAE.

Siparuna Sprucei A.DC. Journ. Bot. **3**: (1865) 219. Between Tipuani and Guanai, Dec., 1892 (1640) =Spruce's 2777.

Siparuna nigra Rusby (See no. 844). Mapiri, July–Aug., 1892 (1523.)

Siparuna limoniodora (R. & P.) A.DC. Prod. 16: Part 2, 646 (*Citrosma l.* R. & P. = *Citrosma dentata* Poepp. et. Endl., but there is an uncertain *C. dentata* of R. & P. which has precedence. Espirito Santo, 1891 (1183).

LAURINEAE.

(Communicated by Dr. Karl Mez.)

Aniba bracteata (Nees) Mez. Laur. 66 (?) (*Aydendron bracteatum* Nees, Syst. 256 = *A. argenteum* Griseb. Fl. Brit. W. I. 285). Espirito Santo, 1891 (1180). Leaves only. One of the trees yielding "False Coto."

Persea gratissima Gaertn. Fruct. 3: 222. Espirito Santo, 1891 (1162).

Persea Boliviensis Mez et Rusby spec. nov.; foliis longe petiolatis, adultis supra glabris haud vel vix foveolatis, subtus tenuiter tomentellis, bene ellipticis, utrinque subrotundatis; inflorescentia pauciflora, dense adpresseque subferrugineo-tomentella, thyrsoidea, foliis permulto breviore; limbi segmentis valde inaequalibus; androeceo seriebus 2 exterioribus fertilibus, 2 interioribus sterilibus; filamentis ser. I., II., antheras duplo superantibus, pilosis; antheris fertilibus 4-locellatis; ovario glaberrimo, stylo manifeste longiore.

Arbor vel frutex, ramulis dense ferrugineo-tomentellis, subteretibus, gemmis ferrugineo-tomentosis, cortice paullo adstringente, esipido. *Folia* petiolis usque ad 40 mm. longis, supra leviter inciso-canaliculatis, ferrugineo-tomentellis stipitata, sparsa, coriacea, basi saepius minute asymmetrica, ± 0.2 m. longa, 80 mm. lata, penninervia, reti laxo subtus conspicue prominente, costis crasse prosilientibus e nervo medio sub angulo 45–60° prodeuntibus, margine paullo incurvulo. *Inflorescentia* dense ferrugineo-tomentella, brevissima pedunculata, pauciflora, anguste subthyrsoideo-paniculata, petioles paullo superans; pedicellis minutis, 1–2 mm. longis; bracteolis deciduis. *Flores* ± 7 mm. longi, flavescenti-subsericei; limbi segmentis exterioribus quam interiora subtriplo brevioribus. *Filamenta* ser. III., basi glandulis binis parvis, sessilibus praedita. *Antherae* ser. I., II., 4-locellatae, introrsae, elliptico-ovatae, apice acutae; ser. III. specie biloculares revera indehiscentes steriles. *Staminodia* sagittata, filamento paullo longiore, dense piloso stipitata. *Bacca* (immatura solum suppetens) globosa, vix 7 mm. diam. metiens, perianthii lobis patentibus insidens.

Habitat in Bolivia ad Tipuani–Guanai, Dec., 1891 (1657, 1733).

Peraffinis *Perseae Peruvianae* Nees, solemniter tamen suis notis distincta.

Endlicheria dysodantha (R. & P.) Mez, Laur. 119. Between Tipuani and Guanai, Dec., 1892 (1676).

Endlicheria Szyszytowiczii Mez, Laur. 121. Between Tipuani and Guanai, Dec., 1891 (1691).

Ocotea Guyanensis Aubl. Pl. Gui. 2: 781. *pl. 310*. Between Guanai and Tipuani, Apr.–June, 1891 (1336 and 1715).

Ocotea Minarum Mart; Nees, Syst. 303. Vic. Sorata, Sept., 1892 (1571).

OCOTEA ALBIDA Mez et Rusby spec. nov.; foliis rigidiuscule coriaceis, adultis supra glabris subtus omnino albidis perobscureque adpresse tomentellis, ellipticis, utrinque obtusiusculis vel apice obscure lateque acuminulatis demumque rotundatis, penninervibus, supra immerse subtus prominulo-costatis ceterum laevibus; inflorescentia abbreviata, subample paniculata, dense adpresseque tomentella omnino alba vel cinerea, folia subaequante vel iis breviore; filamentis ser. exterioris antheras ovatas, rotundatas sequantibus, dense pilosis; staminodiis stipiti formibus, dense pilosis; ovario in flore ♂ suppetente glabro, reducto.

Arbor vel frutex ramulis tenuissime peradpresseque ferrugineo-tomentellis, junioribus leviter angulatis adultis teretibus; gemmis subsericeo-tomentosis; cortice aromatico, subpiperato. *Folia* petiolis usque ad 15 mm. longis, profunde canaliculatis, glabris stipitata, sparsa ± 1.1 dm. longa, 35 mm. lata, supra bene viridia pernitida; costis e nervo medio sub angulo 45–60° prodeuntibus, margine minute incurvulo. *Inflorescentia* pedicellis vix 2 mm. longis, bracteolis deciduis. *Flores* dioici, ♀ ignoti, vix ultra 2.5 mm. longi, dense albo-tomentelli; perianthii tubo brevi, obconico, apice nullo modo constricto, basi in pedicellum sensim transeunte.

Limbi segmenta brevia, squamiformia, subrotundata, aequalia. *Filamenta* ser. III. basi glandulis binis conspicuis, subcordatis, solemniter stipitatis aucta. *Antherarum* locelli normaliter dispositi. *Fructus* baccatus, fere 20 mm. longus, crasse ellipsoideus, basi cupulae crassae, simplicimarginatae, haud rugosae insidens; cotyledonibus sapore adstringenti- aromatico, quam maxime mucoso.

Mapiri, July–Aug., 1892 (1550). Between Tipuani and Guanai, Dec. (1646).

Obs. Proxima *Ocoteae argenteae* Mez, sed foliorum forma, inflorescentiae dense albo-tomentellae habitu, staminibus valde pilosis, staminodiis conspicuis, glandulis longe stipitatis bene distincta.

OCOTEA BANGII Mez et Rusby spec. nov.; foliis chartaceis, glaberrimis, utrinque subnitidis, late ellipticis, basi acutiusculis apice breviter sed manifeste acuminatis, penninervibus, glaberrimis, utrinque sed praesertim subtus prominulo-reticulatis; inflorescentia non nisi fructifera cognita ut videtur pauciflora, abbreviata. *Arbor* vel frutex ramulis glaberrimis, teretibus, gemmis flavido-pilosis, cortice brunneo, esipido. *Folia* petiolis usque ad 15 mm. longis stipitati, ± 0.13 m. longa, 60 mm. lata, sicca olivaceo-viridia, costis e nervo medio sub angulo 50-70° prodeuntibus, margine subpleno. *Flores* ignoti, absque dubio dioici. *Bacca* atra, crasse ellipsoidea, ± 13 mm. longa, 9 mm. diam. metiens, apice optime rotundata nec mucronulata, cupulai pateriformi, simplicimi, laevi, apice sinuatim in pedicellum valde auctum incrassatumque transeunti insidens.

Between Tipuani and Guanai, Dec., 1892 (1674).

Obs. Verisimiliter *Ocoteae laxiflorae* Mez, proxima, cui abhorret cupulae forma.

Nectandra laevis Mez, Laur. 45. Between Tipuani and Guanai, Dec., 1891 (1680).

Nectandra reticulata (R. & P.) Mez, Laur. 404. Between Guanai and Tipuani, Apr.–June, 1892 (1536).

Nectandra Pichurim (H.B.K.) Mez, Laur. 449. Between Guanai and Tipuani, Apr.–June, 1892 (1396).

NECTANDRA CITRIFOLIA Mez et Rusby spec. nov.; foliis adultis glaberimis, supra glauco-viridibus subtus ferrugineo-rubentibus, ellipticis, praesertim apice breviter lateque acuminatim acutis, utrinque minutissime immerse reticulatis; inflorescentia pauciflora brevissime tomentella; floribus hermaphroditis, strigoso-tomentellis, vix 5 mm. diam. metientibus; filamentis staminum ser. exteriorum nullis; ovario glaberrimo, ampulliformi, stylo subnullo.

Arbor vel frutex ramulis junioribus minute strigoso-tomentellis, adultis cortice laevi, cinereo, paullo aromatico obtectis. *Folia* petiolis usque ad 10 mm. longis, permanifeste canaliculatis stipitata, sparsa, chartacea, ± 90 mm. longa, 40 mm. lata, penninervia, venulis tenuissimis immersis neglectis adultis saltem laevia, costis e nervo medio sub angulo 45–55° prodeuntibus, margine minute recurvulo. *Inflorescentia* pauci-(infra 10-) flora, saepissime subracemosa, adpresse minuteque tomentella, foliis multo brevior; pedicellis 2–5 mm. longis, bracteolis deciduis. *Flores* perianthii tubo brevissimo late obconico. *Limbi segmenta* elliptica, acutiuscula vel subrotundata. *Filamenta* ser. III., glabra, basi glandulis binis maximis, compressis aucta. *Antherae* ser. I., II. reniformes apice rotundatae minutissime papillosae locellis omnibus introrsum dehiscentibus. *Staminodia* minuta, stipitiformia. *Ovarium* stigmate obtuso-pulvinato. *Fructus* ignotus.

Between Tipuani and Guanai, Dec. (1673).

Obs. Ex affinitate *Nectandrae Riedelii, psammophilae* et praesertim *Brittonii,* floribus tamen permanifeste strigoso-tomentellis, ne reliqua proferam, optime distincta.

PROTEACEAE.

Rhopala Gardneri Meissn. in Mart. Fl. Bras. 5: Part 8, 3. *pl. 31.* Mapiri, July–Aug., 1892 (1528).

PANOPSIS SPRUCEI Meissn. Ms. in Herb. Kew.

Branches light gray, the young growth, like the petioles and inflorescence red-ferruginous-tomentose; leaves sub-verticillate, the petioles stout, broad, 1 cm. long, the blades .75–1.5 dm. long, 2–5 cm. broad, oblong, inequilateral, the base acute, the apex apiculate; entire, thick, bright green above, reddish underneath, prominently reticulate; peduncles terminal, erect, stoutish, bearing solitary or verticillate racemes about 1 dm. long; flowers irregularly distributed, the pedicels 3–5 mm. long, divergent, not bracted; bud clavate-pyriform, obtuse, 3 mm. long; perianth divided to the base, the 3 divisions 4 mm. long, linear-oblanceolate, the apex rounded, strongly recurved and spirally twisted, the stamens nearly as long as the perianth, inserted near its base, the filament nearly as broad as the perianth-division, the anther less than 1 mm. long; pistil red-tomentose, the ovary 1 mm. long, the stout style nearly 5 mm. long, the stigma capitate.

Between Tipuani and Guanai, Dec., 1892 (1686). The same as Spruce's no. 1817 and very near *P. rubescens* Pohl.

Loranthus flexile Rusby (See no. 468). Between Tipuani and Guanai, Dec., 1892 (1659).

Loranthus eugenioides H.B.K. (See no. 6). Vic. Cochabamba, 1891 (1155).

STRUTHANTHUS NUDIPES sp. n.

Glabrous, the leaves papillose on both sides; branchlets slender, terete, grayish-brown; petioles about 5 mm. long, broad; blades 2.5–4 cm. long, 1–2 cm. broad, ovate with rounded base and acute apex, entire, thick and coriaceous, dark-green, the venation indistinct; spikes 4–6 cm. long inclusive of the strongly angled weak peduncles, which constitute from a half to three-fourths of their length, loosely flowered, the flowers ternate, the trio and the flowers sessile, the rigid bracts 1 mm. long, broadly ovate, very acute, bractlets none; bud 4 mm. long, narrowly clavate-pyriform, obtuse; calyx 1 mm. long, the tube hemispherical, the limb reduced to a whitish sub-entire ring; petals six, distinct, 5 mm. long, linear-oblanceolate, obtuse, plane, naked, recurved and again incurved toward the summit, thick, yellowish; stamens inserted at about one-third above the base, three of them two-thirds the length of the petals, the filaments half as long as the anther, thick, the others nearly as long as the petals, with subulate filaments, the anthers versatile; style stout, about as long as the shorter stamens, the stigma capitate, very small.

Between Tipuani and Guanai, Dec., 1892 (1637). The species is intermediate between *S. polyanthus* and *S. marginatus.* It is the same as Miers' no. 4307, in Herb. Kew. as *S. syringaefolius*, and Burchell's no. 2011 from the Organ Mts. It is not the same as Gardner's no. 53.

STRUTHANTHUS MAPIRENSIS sp. n.

Glabrous; petioles 5 mm. long, broad; blades 5–8 cm. long, 1.5–2.5 cm. broad, oblanceolate, acute or obtusish, mostly a little inequilateral, fleshy, pale, the midrib impressed above, prominent underneath, venation inconspicuous; racemes axillary and clustered at the summit, peduncled, .5–1 dm. long, loosely flowered, the peduncle of the trio stout, divergent, 3–5 mm. long, the flowers sessile in the bracts; bracts distinct, large, foliaceous; bud 1.5cm. long, slenderly clavate, acutish; calyx-tube 3 mm. long, cylindraceous, striate, dark brown, the limb narrow, whitish, spreading, sinuate; petals 6, yellow, 1.4 cm. long, linear, spreading; stamens inserted at the junction of the lower third; filaments nearly as broad as the petals; anthers short, ovoid; style stout, angled.

Mapiri, July–Aug., 1892 (1569). The same as Lechler's no. 2626.

Phoradendron Mandoni Eichl. in Mart. Fl. Bras. 4: Part 2, 124
Between Tipuani and Guanai, Dec., 1892 (1717).

PHORADENDRON SUBTRINERVE sp. n.

Stems stout, yellowish, the younger portions minutely scabrous, flattened and broadened toward the summits of the internodes, which are 3–5 cm. long; petioles 5–7 mm. long; blades 2–4 cm. long, 1.5–3 cm. broad, rotund-obovate, the base very abruptly contracted, then tapering into the petiole, the apex rounded, the margin crumpled, thick, faintly 3-5-nerved by the prominent primaries; spikes 2 or 3 cm. long, including the stout peduncles, which comprise nearly half the length, erect-spreading; rhachis only slightly thickened, the flowers lightly immersed; flowers (the pistillate only seen) 1.5 mm. in diameter, 3- or 4-parted; perianth-lobes very short and thick, obtusish, slightly recurved; ovary very small, the stigma comparatively large, closely sessile; fruit white, 5–7 mm. broad.

Mapiri, July–Aug., 1892 (1549). This is the same as Fendler's No. 1116, in Herb. Kew. under *P. ellipticum*, and is intermediate between that species and *P. emarginatum*. It is nearly related to a specimen collected by Pearce at Carapai.

EUPHORBIACEAE.

Euphorbia geniculata Orteg. (See no. 232). Vic. Guanai, 1892 (1584).

Euphorbia dentata Michx. Fl. Bor. Am. **2**: 211 (?). Vic. Mapiri, 8,000 ft., Jan., 1893 (1743).

Euphorbia lasiocarpa Klotsch, Nov. Act. Nat. Cur. **19**: Supp. 1: (1843) 414. Between Guanai and Tipuani, Apr.–June, 1892 (1458) = Mandon's 1063.

Phyllanthus orbiculatus L. C. Rich. Act. Soc. d'Hist. Nat. Par. (1792) 113. Vic. Guanai, July, 1892 (1590) = Rusby's 903.

Phyllanthus lathyroides H.B.K. (See no. 335). Mapiri, July–Aug., 1892 (1518).

PHYLLANTHUS INEQUALIS sp. n.

Glabrous; shrubby, the branchlets light gray, slender; leaves exceedingly unequal, the petioles .5–1.5 cm. long, filiform, the blades 1–6 cm. long, .5–3 cm. broad, ovate or some oval, the base rounded, apex blunt; entire, very thin, pale-green above, glaucous underneath, the venation slender; apparently dioecious, only the staminate flowers seen, these clustered upon short leafless tubercle-like branchlets, the capillary pedicels .5–1 cm. long; perianth 3-bracted, the bracts highly unequal, ovate, obtuse, concave, sub-hyaline, closely appressed; perianth 4–5 mm. broad, whitish, 6-parted, the outer divisions smaller and firmer, oval; disk crateriform with sinuate border, thickish, rigid; ovary none; filaments monadelphous, the anthers forming a circle, 6 or more (rarely 5), small, yellow; rudimentary stigma enclosed by the anthers, circular, peltate.

Between Tipuani and Guanai, Dec., 1892 (1704). Species apparently near *P. nutans* Swartz, and with a structure much like that of *P. Martii*.

Jatropha Curcas L. (See no. 626). Mapiri, July–Aug., 1892 (1558).

Jatropha urens L. Sp. Pl. ed. 2, 1006. Between Guanai and Tipuani, Apr.–June, 1892 (1376).

Jatropha clavuligera Muell. Arg. Linnaea, **34**: (1865–66) 209. A little below Cochabamba, 1891 (1083)=Mandon's 1073.

Croton sp. = Pohl's 1613, 1614 in part, and 1624. In Flora Bras., none of these numbers is cited, nor can I find a description to fit the plant, which is near *C. pungens.* But it appears probable that it is somewhere described. Between Guanai and Tipuani, Apr.–June, 1892 (1343).

CROTON RUSBYI Britton, sp. n.

A large shrub or small tree; branchlets stout, marked with the prominent triangular leaf-scars; petioles crowded at the summits of the branchlets, .5–1 dm. long, slender, glabrous; blades 1–2 dm. long, .5–1 dm. broad, regularly ovate with rounded base and short-acuminate obtusish apex, entire, membranaceous, deep green, glabrous, the midrib and 6–8 pairs of primaries slender and prominent both sides; panicles in the upper axils, appearing as though clustered at the summit, 2 or 3 dm. long, narrow, on short stout sulcate peduncles, gray-scurfy; bracts subulate, 1 mm. long; pedicels 1–2 mm. long, slender: bud depressed-globose, nearly 2 mm. broad; calyx lobes 2 mm. long, ovate, acute, tomentose both sides; petals about equalling the calyx-lobes, tomentose; stamens (of st. fls.) shorter than the petals, about 15, the filaments filiform, red, pubescent, the anthers globose; ovary (of pist. fls.), 3-lobed upon the summit, gray-scurfy, the red styles 2-cleft two-thirds of the way, the branches strongly recurved.

Between Tipuani and Guanai, Dec., 1892 (1664). The same as Rusby's no. 1224 from Mapiri.

Acalypha mollis H.B.K. Nov. Gen. 2: 94. Vic. Sorata, May, 1892 (1316) = Rusby's 1257, at least in part.

ACALYPHA FLABELLIFERA sp. n.

Coarsely hispid-strigose and slightly ferruginous throughout; branches stout, purplish, the internodes 3–4 cm. long; petioles 3–6 cm. long, very stout, ascending; blades 1–2 dm. long, .75–1 dm. broad, ovate, cordate with mostly closed sinus, acuminate, finely crenate-dentate, sub-five-nerved from the summit of the petiole, the midrib bearing about 5 additional pairs of strongly ascending primaries; staminate spikes axillary, 1–1.5 dm. long, 4 mm. broad, dense, the bracts ovate, acuminate and acute, 2 mm. long; flowers 1.5 mm. broad, densely pilose; pistillate flowers at the base of the staminate spikes, enclosed in bracts which are curved to form two campanulate truncate spathes, a little more than 1 cm. long and broad, herbaceous, numerously and strongly flabellate-nerved.

Near snow-line, Mt. Tunari (?) 1891 (1109). The same collected in Bolivia by Pearce. Species near *A. cuspidata.*

Acalypha sp. probably undescribed, but the buds are in so young a state that a description cannot be drawn up. Vic. Guanai, July, 1891 (1591).

Acalypha —— species near *A. multispicata* Wats. Vic. Cochabamba, 1891 (1081).

Acalypha —— may be the same as no. 676. Mapiri, July–Aug., 1892 (1548).

Manihot Aipi Pohl, Pl. Bras. **1**: 29. *pl. 23*. Between Guanai and Tipuani, Apr.–June, 1891 (1364) = Rusby's 886. Vic. Cochabamba, 1891 (1241).

Alchornea triplinervia Muell. Arg. (See no. 210). Between Guanai and Tipuani, Apr.–June, 1891 (1466).

Mabea fistulifera Mart. Reise Bras. 479. Between Guanai and Tipuani, Apr.–June, 1892 (1333).

Dalechampsia scandens L. Syst. ed. 13, 720. Between Guanai and Tipuani, Apr.–June, 1892 (1434) = Rusby's 1347.

URTICACEAE.

Celtis Iguaneus (Jacq.) Sargent, Silva, **7**: 64, ex Rusby Ms. = *Rhamnus I.*, Jacq. Am. 74 (1763) = *Rhamnus aculeatus* Swz. Prod. Veg. Ind. Occ. 53. Mapiri, July–Aug., 1892 (1539).

Chlorophora tinctoria (L.) Gaud. Freyc. Voy. Bot. 508, in note (*Morus t.* L. Sp. Pl. 986). Between Tipuani and Guanai, Dec., 1892 (1652 and 1737) = Rusby's 1284.

Ficus Radula Willd. Sp. Pl. **4**: 1144. Between Tipuani and Guanai Dec., 1892 (1665).

HELICOSTYLIS TOMENTOSA (Poepp.) (*Olmedia t.* Poepp. Nov. Gen. **2**: 32. *pl. 145* (1838) = *Helicostylis Poeppigianus* Trécul, Ann. Sci. Nat. III. **8**: 136 [1847]). Between Tipuani and Guanai, Dec., 1892 (1696).

Urera baccifera (L.) Gaud. Freyc. Voy. Bot. 497. Espirito Santo, 1891 (1209). Vic. Guanai, July, 1892 (1609).

Urera laciniata Wedd. Ann. Sci. Nat. III. **18**: 203. Vic. Cochabamba, 1891 (1247).

Phenax Sonnerattii Wedd. in DC. Prod. **16**: Part 1, 235. Vic. Sorata, May, 1892 (1308).

PHENAX GLOBULIFERA sp. n.

Branchlets and young growth minutely canescent, otherwise glabrous; branchlets elongated, very slender, terete, light brown, slightly flexuous, the internodes 1.5–2.5 cm. long; stipules 3-5 mm. long, lanceolate, attenuate, brown, scarious and deciduous; petioles .5–1 cm. long, very slender, partially concealed by the inflorescence; blades 6–8 cm. long, .75 to 1.5 cm. broad, lanceolate with sub-rotund base and attenuate apex, coarsely and sharply short-serrate, dark green, strongly 3-nerved, the remaining venation inconspicuous; heads of a rich brown, 7 or 8 mm. in diameter, very dense, closely enveloping the node and the base of petiole; bracts 1.5 mm. long, .5 mm. broad, oblong, obtuse; akene (flowers not seen) less than .5 mm. long, whitish, the stigma more than 3 mm long.

Espirito Santo, 1891 (1191).

Parietaria debilis Forst. Fl. Ins. Aust. Prod. 387. Vic. Cochabama, 1891 (1099).

BURMANNIACEAE.

Burmannia tenella Benth. in Hook. Kew Journ. Bot. 7: (1855) 10. Mapiri, July–Aug., 1892 (1563).

ORCHIDEAE.

(Determined by Mr. R. A. Rolfe.)

Humboldtia ruscifolia (L.) Kuntze, Rev. Gen. Pl. 669. Mapiri, July–Aug., 1892 (1567).

PLEUROTHALLIS COMPLICATA Rolfe sp. n.

Stems slender, terete, 6–8½ in. long. Leaves sessile, ovate-lanceolate, subobtuse, 5–7 in. long, 1–2½ in. broad. Racemes several from the axil of each leaf, the base covered with a persistent sheath, ¾ in. long, slender, longer than the leaves, many-flowered. Bracts tubular-infundibular, obtuse, 1 lin. long. Pedicels 1 lin. long. Dorsal sepal lanceolate-oblong, subacute, 1¾ lin. long; lateral ones connate to apex, subacute, base very concave, 1 lin. broad. Petals linear, acute, 1½ lin. long. Lip orbicular, complicate, the apical half being abruptly deflexed under the basal one, with the rounded sides erect, apex subobtuse. Column short and stout.

Mapiri, n. 1568.

Closely allied to the Venezuelan *P. semipellucida* Rchb. f., and having a similar dwarf lip, which is curled up in the sac of the united lateral sepals, yet the two are quite distinct in various details of the flower.

HEXADESMIA BOLIVIENSIS Rolfe sp. n.

Stems branched, internodes slender, 3–7 in. long, apex 2-leaved. Leaves linear, obtuse, 4–6 in. long, 2–3½ lin. broad. Flowers in fascicles of 1–4; pedicels slender, 5–7 lin. Bracts lanceolate, acuminate, 1½ lin. long. Sepals lanceolate, acute, 3 lin. long, the lateral ones a little broader and subfalcate. Petals linear-lanceolate, acute, 3 lin. long. Lip obovate-spatulate, 3-lobed, 3 lin. long, 1¼ lin. broad; lateral lobes rounded; front lobe roundish-oblong, emarginate; disc with five slender linear undulate keels. Column slender, arcuate, 2½ lin. long. Chin oblong, obtuse, ½ lin. long.

Between Guanai and Tipuani, n. 1329.

Allied to *H. stenopetala* Rchb. f., but rather stouter, the leaves broader, and the flowers twice as large. The pollen has all been removed, but the plant has precisely the habit of this genus; which, however, closely resembles *Scaphyglottis* in habit.

Epidendrum paniculatum R. & P. Syst. Veg. 243. Mapiri, July–Aug., 1892 (1552).

Epidendrum Schomburgkii Lindl. Bot. Reg. (1838) Miscel. 15. Espirito Santo, 1891 (1284 and 1284a).

ONCIDIUM PUSILLUM (L.) (*Epidendrum p.* L. Sp. Pl. ed. **2**: 1352 = *Oncidium iridifolium* H.B.K. Nov. Gen. **1**: 344). Between Guanai and Tipuani, April–June, 1892 (1330).

Selenipedium caricinum (Lindl. & Paxt.) Reichb. f. Bonplandia **2**: (1854) 116 = *Cypripedium c.* Lindl. and Paxt. Fl. Gard. **1**: 39 (1850–51). Espirito Santo, 1891 (1285).

Habenaria maculosa Lindl. Gen. et. Sp. Orch. 309. Espirito Santo, 1891 (1239).

RUSBYELLA Rolfe n. gen.

Sepals suberect, the lateral ones connate for two-thirds their length. Petals suberect. Lip erect, with a long narrow unguis, which is bordered with a narrow membranaceous border below the middle, and above this three tooth-like appendages, two of them lateral; terminal limb broadly cordate. Column footless, clavate, truncate, nearly wingless; anther oblong, stipes of pollen slender.

A new genus allied to *Cohnia* Rchb. f., and *Sigmatostalix* Rchb. f., but differing in various details of the flower. The structure of the lip is very curious.

RUSBYELLA CAESPITOSA Rolfe sp. n.

Pseudobulbs densely tufted, ovoid-oblong, subcompressed, 12–15 lin. long, apex monophyllous, base diphyllous. Scapes lateral, 6–7 in. long, occasionally with one or two lateral branches, loosely racemose. Bracts triangular-lanceolate, acute, scarcely 1 lin. long. Pedicels 2½ lin. long. Sepals linear-lanceolate, acute, 2½ lin. long. Petals spathulate-lanceolate, acute, 2½ lin. long. Lip 2½ lin. long, limb shorter than the unguis. Column 1½ lin. long.

Specimens without number.

SCITAMINEAE.

Costus spicatus (Jacq.) Sw. (See no. 912) Espirito Santo, 1891 (1248).

Etherium racemosum (R. & P.) Kuntze, Rev. Gen. Pl. 689 (*Amomum r.* R. & P. Pl. Per. = *Renealmia* Rosc. ex Griseb. Flor. Brit. W. I. 601). Espirito Santo, 1891 (1237). Between Tipuani and Guanai, Dec., 1891 (1658).

Calathea Mansonis Koern. Bull. Soc. Nat. Mosc. 35: (1862) Part 1, 119. Between Tipuani and Guanai, Dec. 1892 (1660). Kindly determined by Mr. Spencer Moore.

Calathea Pearcei sp. n. (Sect. Eucalathea).

Glabrous; rhizome horizontal, short, stout; culm sheathed at the base by about 3 obtuse thin scarious finely many-nerved leaf-sheaths; culm 3–6 dm. high; leaf-sheaths 4 or 5 cm. long, extended on each side into a blunt appendage 3 mm. long, at the base of the petiole, which is 5 mm. long, very stout and tomentose upon the upper side; blades .75–1.5 dm. long, 3 or 4 cm. broad, oval-ovate, acute, pseudo-pinnately-veined; peduncle 6–10 cm. long, sharply striate; heads 1.5–3 cm. broad, the bracts 1 cm. long, broadly ovate, obtuse, finely many-nerved; flowers a little more than 1 cm. long, the corolla double the length of the calyx, the petals, especially the larger, crenate.

Between Tipuani and Guanai, Dec., 1892 (1723a). Collected by Pearce at Yungas, 3000–4000 ft., Jan., 1866. The same as Rusby's no. 2233.

Canna glauca L. Sp. Pl. 1. Espirito Santo, 1891 (1281.)

BROMELIACEAE.

(Communicated by Mr J. G. Baker.)

Pitcairnea Lehmanni Baker, Handb. Brom. 164. Between Guanai and Tipuani, Apr.–June, 1892 (1352).

PITCAIRNIA (PUYOPSIS) BANGII Baker, sp. n.

Basal leaves ensiform, very rigid, 2½–3 ft. long, 1½ in. broad at the base, narrowed gradually to the point, glabrous on both surfaces, armed on the margin with curved ascending brown horny slender spines ⅛ in. long. Inflorescence panicled; racemes lax, subsecund, reaching a length of 8–9 in.; their rachises white-floccose; branch-bracts oblong, cuspidate, serrated, 2–3 in. long; flower-bracts ovate-cuspidate, scarious, glabrous, 1–1¼ in. long; pedicels ½–¾ in. long, white-floccose like the rachis. Sepals lanceolate, glabrous, above 1 inch long. Petals protruded ½ inch beyond the calyx, curled up spirally as the flowers fade.

Near *P. Rusbyi* and *P. Weddeliana* Baker, Handb. Bromel. 122, both plants of the Bolivian Andes. Vic. Sorata, Nov. 1892 (1631).

PUYA MOLLIS Baker, sp. n. (ex Mez Mon. Brom. 488).

Basal leaves ensiform, very rigid, 2½–3 ft. long, 2 in. broad at the base, tapering gradually to a long point, quite glabrous on both surfaces, armed on the margins with curved ascending horny prickles, those at the base of the leaf ¼ in. long, the upper growing gradually smaller. Inflorescence panicled; spikes moderately dense, 4–6 in. long; rachis and bracts clothed with soft white woolly pubescence; flower-bracts oblong-mucronate, entire, the upper 1 in., the lower above 1½ in. long; pedicels densely pubescent, ⅓–½ in. long; calyx densely persistently pubescent, 1 in. long; sepals oblong, obtuse, much imbricated. Petals oblong, unguiculate, obtuse, twice as long as the calyx, apparently greenish-white. Stamens distinctly shorter than the petals.

Near *Puya vestita* Andre; Baker, Handb. Bromel. 125. Vic. Sorata, Nov., 1892 (1629).

Guzmannia monostachya (L.) Rusby, ex Mez Mon. Brom. 905. = *Tillandsia m.* L. *fide* Baker, Handb. Brom. 152 = *Guzmannia tricolor* R. & P. Fl. Per. **2**: 38. *pl. 26*. Vic. Mapiri, 10,000 ft., Sept., 1892 (1582).

Tillandsia recurvata L. Sp. Pl. 287. Vic. Cochabamba, 1891 (1154a) = Mandon's 1177. (Dr. Mez regards this as *T. Cordobensis* Hieron.)

Tillandsia stricta Soland. et Sims. Bot. Mag. *pl. 1529* (1813), *not* Lindley, 1830. Vic. Sorata, Nov., 1892 (1628). (Dr. Mez regards this as *T. pulchella rosea* Mez.)

TILLANDSIA (ALLARDTIA) BANGII Baker, sp. n.

Basal leaves lanceolate, entire, chartaceous, ½ ft. long, 2 in.

broad at the middle, narrowed gradually to the acute point, hardly at all lepidote on either surface, concolorous; panicle lax, deltoid; spikes dense, distichous, sessile or shortly peduncled, about ½ ft. long, 1 ¼ in. broad; lower branch-bracts with a long green lanceolate point; upper short, scarious, red; flower-bracts oblong-navicular, much imbricated, naked, stamineous, 1–1 ¼ in. long, ¾ in. broad, with a deltoid acute tip; calyx glabrous, as long as the flower-bracts; limb of the petal oblong, very small; stamens shorter than the petals.

Nearly allied to the Columbian *T. Kalbreyeri* Baker, Handb. Bromel. 28.

Espirito Santo, 1891 (1283). (Dr. Mez regards this as *T. paniculata* Ch. & Sch.)

HAEMODORACEAE.

Xiphidium floribundum Swz. Prod. Veg. Ind. Occ. 1: 17. Espirito Santo, 1891 (1280).

IRIDEAE.

Cypella Peruviana Baker, Bot. Mag. sub. *pl. 6213*. Vic. Cochabamba, 1891 (1157). Vic. Sorata, May, 1892 (1318) = Specimens by Pentland, not Mandon's 1223.

CYPELLA MANDONI sp. n.

Glabrous; bulb tunicated, ovoid-lanceolate, purple, conspicuously nerved; stems 1 m. or more high, very slender, purple at the base; leaves lightly sheathing, grass-like, about 1 cm. wide, strongly channelled, acute, exceeding the stem; peduncles axillary, stout, erect, 1–1.5 dm. long; spathes 2, ovate-lanceolate, acute, about 4 cm. long, 1 cm. wide, green, very finely many-nerved; bracts scarious, as broad as the spathes and slightly exceeding them; flowers 4 or 5, completely exserted, blue, nearly 3 cm. long, the triquetrous ovary 5 mm. long; capsule (immature) green, tipped with a short conical broad brown point.

Vic. Cochabamba, 1891 (1077). The same as Mandon's no. 1223, but not the same as Pentland's. In Herb. Kew. Mandon's specimen is doubtfully referred to *C. Peruviana*, but the width of leaves, size of spathe and color of flowers show that it is distinct.

Nemastylis nana Wats. Proc. Am. Acad. **18**: 160. Near snowline, Mt. Tunari, 1891 (1042) = Type in Herb. Kew., also (?) Mandon's 1224.

ORTHROSANTHUS NIGRORHYNCHUS sp. n.

Glabrous; rhizome stout, purple; basal leaves distichous, equitant, 3–4 dm. long, erect, rigid, linear, very narrow, acute; stems about 1 m. high, erect, slender, simple or branched; cauline leaves shorter than the stem, similar to the basal, long-sheathing; spathes racemose, the peduncles solitary in the axils of the upper leaves, shortly exserted; spathes 2, ovate, acute, 1.5 cm. long, enclosing one or more scarious bracts and a single sub-sessile white flower, which is 2.5 cm. long, the ovary 1 cm. long, black, oblanceolate, truncate; capsule lanceolate, truncate, the summit blackish.

Vic. Cochabamba, 1891 (1074).

Sisyrinchium junceum E. Meyer in Presl, Rel. Haenk. **1**: 118. Vic. Cochabamba, 1891 (1075) = Mandon's 1222.

SISYRINCHIUM CRYPTOCARPUM sp. n.

Glabrous; stems densely tufted, the basal leaves, some longer, some shorter, than the stems, linear-terete, very slender, very acute; stems very slender, .75–1.5 or even 2 dm. high, terete; spathe green, setaceous, longer than the inflorescence, mostly 3-flowered, the flowers enclosed in scarious bracts with setaceous green awns, or the inner awnless; flowers not seen; capsule scarcely exserted, folded in the scarious bracts, black, obovoid, 4 or 5 mm. long.

Vic. Cochabamba, 1891 (1073). In the absence of flowers this is doubtfully referred to this genus, near *S. filifolius*. It is not impossible that it is an *Orthrosanthus*, which the inflorescence-habit more closely resembles. If so, it is quite distinct from any other species.

AMARYLLIDEAE.

Hippeastrum Mandoni Baker, Handb. Amaryll. 49. Vic. Sorata, Nov., 1892 (1624) = Rusby's 2454.

Bomarea distichyophylla (Herb.) Baker, Journ. Bot. 1882, 202. Between Tipuani and Guanai, Dec., 1892 (1722) = Rusby's 571 and 574.

VELLOZIA (XEROPHYTA) BOLIVIENSIS Baker, sp. n.

Stems short, slender, woody, covered downward with the persistent imbricated lanceolate bases of the old leaves; produced leaves many, crowded, narrow, linear, ascending, 6–9 in. long, tapering from a lanceolate base to a subulate tip, conduplicate, firm in texture, bristly and serrulate on the edges; peduncle shorter than the leaves, slender, 1-flowered, more or less bristly, especially upward; ovary subglobose, densely clothed with ascending bristles; segments lanceolate-conduplicate, an inch long, bristly outside; stamens 6, shorter than the perianth-segments; anthers linear, nearly ½ in. long.

No other species of this genus is recorded from the Bolivian Andes, but there are a large number in the interior of Brazil and the rest are African.

Turedon, 1891 (1134).

DIOSCOREACEAE.

Dioscorea convolvulacea Ch. & Sch. Linnaea, **6**: (1831) 49? Espirito Santo, 1891 (1296) = Fendler's 2171 and nearly his 1541.

Dioscorea —— in too young a state. Between Guanai and Tipuani, Apr.–June, 1892 (1379).

Dioscorea—species in all probability undescribed, but my material is insufficient for a description. Espirito Santo, 1891 (1264).

LILIACEAE.

ANTHERICUM SPRENGELI (*Phalangium ciliatum* Kunth, in H. & B. **1**: 276 (1815) = *Anthericum ciliatum* Spreng. Syst. **2**: 84 (1825), not L. f. Supp. (1781). A little below Cochabamba, 1891 (1061).

Nothoscordum flavescens Poepp. in Kunth, Enum, **4**: (1843) 459 (*Allium f.* Poepp. Hort. Berol. 837). Below Cochabamba, 1891 (1060).

COMMELINACEAE.

Tradescantia elongata G. F. W. Meyer, Esseq. 146. Espirito Santo, 1891 (1282).

Campelia zanonia (L.) H.B.K. Nov. Gen. **1**: 264. Between Guanai and Tipuani, Apr.–June, 1892 (1412) = Rusby's 1228 and 1229.

JUNCACEAE.

Juncus brunneus Buchen. (See no. 73). Below Cochabamba, 1891 (1076).

PALMAE.

Iriartea ventricosa Mart. Hist. Nat. Palm. **2**: 37. *pl. 35, 36?* Between Tipuani and Guanai, Dec., 1892 (1734).

AROIDEAE.

Spathantheum Orbignyanum Schott, Bonplandia (1859) 165. Vic. Sorata, Nov., 1892 (1626). Determined by Mr. N. E. Brown.

CYPERACEAE.

(Determined by Prof. N. L. Britton.)

Cyperus vegetus Willd. Vic. Cochabamba, 1891 (1072).

Eleocharis sp. Too young for determination (1503).

Rynchospora paniculata Liebm. Vic. Cochabamba, 1891 (1071).

Rynchospora glauca Vahl. Between Guanai and Tipuani, Apr.–June, 1892 (1426).

GRAMINEAE.

(All of the numbers pertaining to this order will be published together in a later part of the enumeration).

MARSILEACEAE.

Azolla Caroliniana Willd. Near snow-line, Mt. Tunari, 1891 (1032 and 1033 mostly).

SELAGINELLACEAE.

Selaginella polycephala Baker. Espirito Santo, 1891 (1287).

Selaginella haematodes Spreng. Espirito Santo, 1891 (1286).

Selaginella microphylla Spreng. Vic. Cochabamba, 1891 (1097).

FILICES.

(Determined by Mrs. E. G. Britton.)

Hymenophyllum polyanthos Swz. Between Guanai and Tipuani, Apr.–June, 1892 (1384). Mixed with this is a species of *Lepidozia* and of *Bazzania*.

Adiantum obliquum Willd. Between Guanai and Tipuani, Apr.–June, 1892. (1440).

Pellaea marginata Baker. Vic. Cochabamba, 1891 (1094).

Pteris gigantea Willd. Vic. Tipuani, Dec., 1892 (1632).

Blechnum occidentale L. Vic. Guanai, July, 1892 (1594.)

Asplenium serratum. Between Guanai and Tipuani, Apr.–June, 1892 (1350).

Asplenium rhizophorum cicutarium Sw. (Specimen without number, locality or date) = Rusby's 389.

Polypodium serrulatum Mett. Between Guanai and Tipuani, Apr.–June, 1892 (1381).

Polypodium Plumula H.B.K. in a young state. Between Guanai and Tipuani, Apr.–June, 1892 (1448).

Polypodium angustifolium Swz. Espirito Santo, 1891 (1288).

Notholaena hypoleuca Kunze. Vic. Cochabamba, 1891 (1093a).

Platymiscium andinum Baker. Between Guanai and Tipuani, Apr.–June, 1892 (1414).

Aneimia phyllitidis Swz. Between Guanai and Tipuani, Apr.–June, 1892 (1351).

Aneimia trichorhiza Gardner? Vic. Cochabamba, 1891 (1093).

Lygodium venustum Swz Between Guanai and Tipuani, Apr.–June, 1892 (1349) = Rusby's 143.

MUSCI.

Polytrichum conforme Mitt. Mapiri, July–Aug., 1892 (1546).

Leucobryum giganteum C. Müll. Mapiri, July–Aug., 1892 (1505).

HEPATICAE.

(Determined by Prof. L. M. Underwood.)

Asterella sp.? Immature and not to be determined with certainty. Mapiri, July–Aug., 1892 (1545).

Aitonia valida. Vic. Mapiri, Jan., 1893 (1748).

LICHENES.

(Determined by Dr. J. W. Eckfeldt.)

Cladonia pyxidata (L.) Fr. Vic. Mapiri, Jan., 1893 (1762).

Cladonia gracilis verticillata Fr. Vic. Mapiri, Jan., 1893 (1763).

Cladonia botryella Nyl. Vic. Mapiri, Jan., 1893. (1761). *pp*.

Cladonia fimbriata (L.) Fr. (1761). *pp*.

Peltigera rufescens (Neck.) Hoffm. Vic. Mapiri, Jan., 1893 (1754, *pp*.; downy above).

Peltigera canina membranacea (Ach.) Nyl. Vic. Mapiri, Jan., 1893 (1754 *pp*.; smooth throughout and more or less fibrillose beneath).

Parmelia citrata Ach. Vic. Mapiri, Jan., 1893 (1750). *pp*.

P. praetervira Muell, Arg. Vic. Mapiri, Jan., 1893 (1750). *pp*

Theloschistes chrysophthalmus (L.) Norm. Vic. Sorata, May, 1892 (1316a).

Theloschistes chrysophthalmus flavicans Wall. Vic. Mapiri, Jan., 1893 (1755).

Usnea barbata florida Fr. Vic. Mapiri, Jan., 1893 (1749).

Sticta pallida Hook. Vic. Mapiri, Jan., 1893 (1756).

Sticta quercizans Peruviana? Vic. Mapiri, Jan., 1893 (1751 *pp.*).

Sticta (*Ricasolia*) *corrosa* Sch. Vic. Mapiri, Jan., 1893 (1760).

Leptogium pulchellum (Ach.) Nyl. Vic. Mapiri, Jan., 1893 (1753).

LEPTOGIUM PHYLLOCARPUM (Pers.) Eckfeldt (*L. bullatum phyllocarpum* Pers.) Vic. Mapiri, Jan., 1893 (1752).

Cora pavonia Fr. Vic. Mapiri, Jan., 1893 (1759).

Physcia leucomella (L.) Michx. Vic. Mapiri, Jan., 1893 (1751).

Physcia hypoleuca (Mühl) Tuck. Vic. Mapiri, Jan., 1893 (1757).

The same covered with *Biatora* (*Abrothallus*) *oxyspora* (Nyl.) Tul. Vic. Mapiri, Jan., 1893 (1758).

FUNGI.

(Determined by Prof. W. G. Farlow.)

Hexagonia tenuis Hook. Between Guanai and Tipuani, Apr.–June, 1892 (1327).

Polyporus Floridanus Berk. Between Guanai and Tipuani, Apr.–June, 1892 (1325).

Polyporus sanguineus Fr. Between Guanai and Tipuani, Apr.–June, 1892 (1323).

Lenzites striata Fr. Between Guanai and Tipuani, Apr.–June, 1892 (1322, *pp.*).

Polystictus flavidus Berk. Between Guanai and Tipuani, Apr.–June, 1892 (1322, *pp.*).

Polystictus occidentalis (Klotsch) Fr. Between Guanai and Tipuani, Apr.–June, 1892 (1324). The form which has been called *P. byrsimus* Mont.

Hypolyssus Montagnei Berk. Mapiri, July–Aug., 1892 (1479).

Dimerosporum sp. Mapiri, July–Aug., 1892 (1547).

Agaricini, not in a condition to be determined, are nos. 1326, 1447 1498, 1747, 1765 and 1769.

No. 1570 is an indeterminable mixture of fresh-water algae.

Nos. 994, 1540, 1542, 1764, 1766, 1767 and 1768 are galls.

MEMOIRS

OF THE

TORREY BOTANICAL CLUB.

VOL. VI. NO 2.

A REVISION

—OF THE—

NORTH AMERICAN ISOTHECIACEAE

—AND—

BRACHYTHECIA.

BY ABEL JOEL GROUT.

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By Abel Joel Grout.

The work on the Isotheciaceae and Brachytheciaceae was undertaken with the purpose of correlating and bringing up to date the later work on the American plants of this group which has been done largely by foreigners and has been published in various scientific publications, some of which are difficult of access. Barnes and Heald's new Keys to the Genera and Species, it is true, contain all these collected descriptions, but it has been felt by every student of American bryology that much of the recent work, especially that of Nils Conrad Kindberg, was, to say the least, of uncertain value. The sentiments expressed by Dr. Barnes concerning this matter in the preface to the second edition of his Keys, are heartily approved by every American bryologist. A very large proportion of the new species in this group has been founded on insufficient and incomplete material and the descriptions of perfect specimens even have often been entirely inadequate for the determination of the species.

My thanks are especially due to Professor John Macoun, Dr. William Mitten and M. Jules Cardot for notes and specimens. By Professor Macoun's kindness I have been able to examine type collections of most of Kindberg's new species. Professor Macoun assures me that the specimens of *Brachythecium harpidioides*, *B. lamprochryseum*, *B. gemmascens*, *B. rutabuliforme*, *B. pseudo-collinum*, *B. nanopes*, *B. platycladum* and *B. mirabundum* "are absolutely identical with those named by Kindberg."

The work was undertaken at the suggestion of Mrs. Elizabeth G. Britton, to whose kind criticism and assistance is due much of whatever value this revision may possess. These studies were begun about the time that Limpricht's treatise on the Isotheciaceae (Rabenhorst Kryptogamen Flora) was issued and it was planned to parallel his work on the European plants of this and related groups by a somewhat similar treatment of the American forms.

Except the recent issue of the first part of Braithwaite's work on the pleurocarpous mosses, all the extended treatments of the Musci Pleurocarpi have followed Schimper's classification in principle.

A somewhat fragmentary publication like this has followed the more extended treatises in this particular by reason of the comparatively narrow limits of the work.

This study was begun with no bias either for or against Schimper's classification, but, as the work progressed, it became more and more evident that the Isotheciaceae do not form a natural group, but a highly artificial one, being based principally on the following characters: Erect capsule, inner peristome attached to a narrow basal membrane, and absence of cilia.

It is very easy to see that the cilia, being merely thickenings of cell walls, would be much more likely to disappear wholly or partially as a variation than that the variation should modify the general structure of the plant and leaf. In some plants the number of cilia varies from one perfect cilium and another imperfect to three perfect cilia. In *Brachythecium Fendleri*, which is described as having cilia solitary and short or none, other capsules from type specimens possess two well developed cilia. In species where cilia have never been known to develop, the lack of cilia is of greater import, but even when associated with an erect capsule cannot be considered as a character suitable to distinguish families, although these characters may well distinguish species or even genera, their importance depending solely on their constancy.

Any one who will take the trouble to compare carefully the European species of *Homalothecium* with several species of *Camptothecium* cannot help seeing that the two genera are much more closely related than *Homalothecium* and *Entodon*, or any genera of the Isotheciaceae.

The species of *Pylaisiella* also are so closely related to *Hypnum* (*Raphidostegium*) *cylindricarpum* Muell. that Jaeger (St. Gall. Nat. Gesell. 1876–77: 304) calls the latter a *Pylaisia*. *Hypnum cylindricarpum*, notwithstanding, is not a unique species in this respect, but is very closely related to several other species, notably *H. microcarpum* Muell. *Entodon* is also more closely allied to *Plagiothecium* than to any of the other Isotheciaceae.

All the species of *Isothecium* itself excepting, perhaps, *I. myurum* are so closely related to *Brachythecium* and other genera of the Brachytheciaceae that there is no reason whatever for putting them in another family. These conclusions were arrived at independently, but a comparison with Lindberg's Musci Scandinavici will show that this is essentially his idea of the relations of the species, although he combines the genera to an extent not likely to be approved by succeeding workers.

These facts have led to the conclusion that, in the Hypnaceae at least, Lindberg's general classification must be conceded to be much more natural than that of Schimper. In order to present the result of two years' labor in a form available for immediate use, the generally accepted classification has necessarily been followed in part, but care has been taken to arrange the species in genera in a way that will not require any change in order to conform to the general principles of Lindberg's classification.

A great deal of attention has been given to ascertaining the habitat and distribution of the species, as data of this kind have proved of the greatest value in deducing those general principles of biology which represent the highest achievements of science and to which the systematist, the physiologist, and the morphologist alike contribute.

In this connection it is worthy of remark that very few collectors give sufficient data on their labels. It is to be hoped that the collectors of the future will record the exact habitat of each collection and time at which the collection was made as well as locality and year. Had these data been given with each specimen studied in the preparation of this revision, the work would have been much simplified and its value greatly enhanced. The aim of the work has been to render intelligible the species already described rather than to complicate the matter by making a new species of every doubtful specimen at hand. Doubtless a more complete knowledge of our moss-flora will show that many forms described as varieties will prove to be good species.

The keys are entirely new and have been made with special reference to their use by amateurs. Gametophyte characters have been used in preference to sporophyte characters wherever possible, in order to facilitate the identification of sterile specimens.

Special care has been taken to correlate the descriptions so that any character of two closely related species can be easily compared. Measurements, both comparative and absolute, have been given in order to facilitate such comparisons.

The absence of many published varieties will be noticed and probably criticized. The extreme multiplication of varieties, so much in vogue with the Germans, seems to the author to be confusing and valueless. Only well marked varieties, with characters easily recognizable, have been included. Often these would seem to be good species except for the many intermediate forms. In other cases more material will probably give characters sufficient to raise the varieties to specific rank.

ISOTHECIACEAE Spruce, Ann. and Mag. Nat. Hist. (II.) 3: 285. 1849.

Gametophyte generally large, never minute. Primary stems creeping, radiculose. Paraphyllia lacking (except in *Climacium*). Leaves smooth, often plicate or concave; median leaf-cells linear, alar cells quadrate (except in *Holmgrenia*). *Sporophyte* long exserted. Seta smooth, twisted. Calyptra cucullate. Operculum conic to conic-rostrate. Columella persistent. Capsule erect, straight, not conspicuously contracted under the mouth when dry. Peristome double, well developed; teeth lanceolate, articulate. Segments of endostome linear to lanceolate, attached to a narrow basal membrane, free, or adherent to the teeth in two species of *Pylaisiella*; cilia rudimentary or wanting. Spores roughened.

Distinguished from the Brachytheciaceae by the straight erect capsule not contracted under the mouth when dry, absence of cilia and short basal membrane.

Homalothecium and certain species of *Brachythecium* (notably *B. acuminatum*) have the capsule characters of this family, but their other characters show their relationship to be with the Brachytheciaceae.

Key to the Genera.

Leaves costate, costa single, extending to the middle of the leaf or beyond. 4. CLIMACIUM.

Leaves ecostate or the costa short and double.

- Alar cells not quadrate. 3. HOLMGRENIA.
- Alar cells quadrate.
  - Leaves complanate (except *E. repens* and *E. seductrix*); annulus large, persistent (except *E. Drummondii*). 1. ENTODON.
  - Leaves more or less falcate-secund especially at the tips of branches; annulus narrow. 2. PYLAISIELLA.

1. ENTODON C. Muell. Linnaea, **18**: 704. 1844. Also Bot. Zeit. **2**: 740. 1844.

[CYLINDROTHECIUM Br. & Sch. Bryol. Eur. fasc. 46, 47. *pl. 464, 465.* 1851.]

Gametophyte growing in wide intricate mats. Stems densely leafy, creeping, subpinnately branching (stems erect and pinnate in *E. orthocarpus*); stem and branches more or less complanate-foliate, not radiculose above, without paraphyllia. Leaves pluriseriate, imbricate, entire or slightly serrate at apex, smooth, concave, ecostate or with a very short double costa; leaf-cells linear, enlarged and quadrate at the basal angles. Male branches gemmiform, borne on the stem. *Sporophyte* with the seta long, smooth, twisted to the right. Calyptra cucullate. Capsule cylindric, erect and symmetric or sometimes slightly curved. Operculum conic to conic-rostrate. Columella persistent. Annulus large and conspicuous (aborted and indistinct in *E. Drummondii*), remaining attached after dehiscence and falling away in fragments with age. Peristome double, inserted below the mouth of the capsule; teeth subulate to linear-lanceolate, strongly articulate; segments narrowly linear, carinate, attached to a very narrow basal membrane (usually free in *E. repens;* attached to teeth as a hyaline margin in *E. brevisetum*). Spores brown to brownish green, minutely roughened.

The leaves of many species of this genus are much more variable than the peristome, consequently the distinctions are based upon peristome characters wherever possible.

Leaves obtuse; quadrate alar cells in 2 or 3 layers. — 7. *E. orthocarpus.*
Leaves acute or acuminate; quadrate alar cells in one layer.
  Leaves gradually narrowly acuminate; segments of endostome adhering to the teeth. — 8. *E. brevisetus.*
  Leaves acute to apiculate; segments free.
    Teeth conspicuously hyaline margined. — 6. *E. repens.*
    Teeth not conspicuously hyaline margined.
      Annulus apparently none; seta yellow. — 5. *E. Drummondii.*
      Annulus narrow, of small cells; seta red. — 2. *E. seductrix.*
      Annulus large, of large cells.
        Teeth uniformly papillose-roughened. — 3. *E. compressus.*
        Teeth conspicuously striolate above; leaves serrate. — 4. *E. Sullivantii.*
        Teeth not conspicuously striolate; leaves nearly entire. — 1. *E. cladorrhizans.*

1. ENTODON CLADORRHIZANS (Hedw.) C. Muell. Linnaea, **18**: 707. 1844. Also Bot. Zeit. 1844.

Neckera cladorrhizans Hedw. Sp. Musc. 207. *pl. 47.* 1801.
Cylindrothecium cladorrhizans Schimp. Syn. Ed. 1, 514. 1860.
Entodon Transylvanicus Demet. Hedwigia, **23**: 81. 1884.
Entodon minutipes Kindb. Can. Rec. Sci. **1894**: 21. 1894.

Gametophyte in wide soft glossy yellowish-green intricate mats; stems about 5 cm. long, subpinnately branching; stems and short branches complanate-foliate, lying in the same plane; older branches often radiculose at end; branch leaves oblong-ovate, 1.5 by 0.6–0.8 mm., acute, entire or slightly denticulate at apex, very concave; costa short and double; median cells linear fusiform, 10–15 : 1; quadrate alar cells numerous; stem leaves larger and broader at base: monoicous; male branches frequent; antheridia few, large, cylindric; perigonial leaves sub-orbicular to oval, short acuminate, entire, ecostate: perichaetium 2.5 mm. long, loosely sheathing; the inner leaves oblong-acuminate, denticulate at extreme apex; upper cells linear; basal enlarged, hyaline, rhomboidal to rectangular. *Sporophyte* 1.5 to 2.5 cm. high; seta light reddish brown; capsule cylindric-ovoid, brown, 3.5 mm. long, 5–6:1; annulus large, of two rows of cells; peristome about .35–.4 mm. long; teeth linear-lanceolate, reddish brown, closely and regularly articulate and slightly granulose-roughened below, lighter, more distantly articulate and smooth or finely striolate above, with conspicuous median line, often perforate between articulations; segments linear, as long as the teeth; spores minutely roughened, 16μ, maturing in autumn.

Type locality, Lancaster, Pa. (Muhlenberg).

On roots of trees, old logs, soil, etc. Not uncommon in North America east of the Mississippi; Minnesota (Holzinger); Iowa (A. S. Hitchcock and Miss McGee).

ILLUSTRATIONS.—Sull. Icon. Musc. *pl. 91;* Hedw. l. c.; A. Gray, Man. Ed. 2, *pl. 5*; Lesq. & James, Mosses of N. A. *pl. 5*; Husnot, Musc. Gall. *pl. 89*; Rab. Krypt. Fl. 4^3 : *f. 356.*

EXSICCATI.—Drumm. Musc. Am. (S. States) 96, (*Neckera cladorrhizans*); Sull. Musc. Allegh. 77; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 260, (Ed. 2) 386. Macoun, Can. Musc. 263.

Limpricht, in Rab. Krypt. Fl. 4: part 3: 30, separates *E. Schleicheri* of Europe from *E. cladorrhizans* and also cites *E. cladorrhizans* as European. That the two species are distinct can hardly be doubted, if the teeth of the peristome be compared. *E. acicularis* C. Muell. and Kindb. in Macoun, Cat. Can. Pl. part 6, 176 (Macoun's 816 in part and 170), is only a peculiar form of *E. cladorrhizans.* It may possibly prove to be a good variety.

It is characterized by having a peculiar brownish green color, the tips of branches lighter; very short turgid branches which are largest in the middle and at the largest part bear leaves as large as the stem leaves; capsule and seta much shorter and teeth more perforate than is typical. *E. Transylvanicus* Demeter and *E. minutipes* Kindb. are said by Limpricht, l. c. to be identical, and only slightly divergent forms of *E. cladorrhizans.* I have been unable to see specimens of either.

2. ENTODON SEDUCTRIX (Hedw.) C. Muell. Linnaea, **19**: 214. 1847.

Neckera seductrix Hedw. Sp. Musc. 208. *pl. 47. f. 8–13.* 1801.

Pterigynandrum Carolinianum Brid. Musc. Recent. Suppl. 1: 132. 1803.

Cylindrothecium seductrix Sull. in A. Gray, Man. Ed. 2, 664. 1856.

Gametophyte in wide glossy yellowish-green mats; stems about 5 cm. long, more or less complanate-foliate; branches nearly terete, 5–10 mm. long, often giving off short secondary branches; branch leaves imbricate-appressed, oblong-elliptical to ovate, about 1.2 by 0.7 mm., short-apiculate, entire or slightly denticulate above; costa short and double, median cells linear; quadrate alar cells numerous; stem leaves ovate, larger, with rather broader cells; monoicous; male branches abundant, short-stipitate; antheridia comparatively few, large, oblong; perigonial leaves obovate, apiculate, entire, bordered with a row of narrow cells, ecostate; paraphyses large: perichaetium about 2.5 mm. long, loosely sheathing; the inner leaves oblong-acuminate, serrulate at apex, somewhat plicate with a thin costa extending to the middle. *Sporophyte* 1.3–1.6 cm. high; capsule reddish brown, cylindric, 3–3.5 mm. long, 5–6 : 1; operculum conic-rostrate; annulus of two to three rows of small cells, obscured by base of teeth; teeth of peristome subulate, short, 0.3 mm. long, very deeply inserted, about $\frac{1}{5}$ below the mouth of capsule, dark reddish brown below, much lighter above, bordered by a lighter margin, with a very distinct median line throughout the entire length; articulations close and irregular below but distant above, only 7 to 10 appearing above the mouth of capsule; segments linear, about the length of the teeth; spores about 15μ, finely roughened, time of maturing variable, probably depending on season, autumn to early winter.

Type locality, Lancaster, Penn. (Muhlenberg).

On decaying wood, earth, moist rocks, bark of trees, etc.

A very variable species and appropriately named; found only in the eastern United States and Canada. Common in the Appalachian region from Canada to the Gulf; less frequent northward and not reported far west of the Mississippi. I have seen no specimens from northern New England or eastern Canada.

Dallas, Texas (J. Boll); Missouri, Kansas, Wisconsin, Minnesota, Ontario.

ILLUSTRATIONS.—Hedw. l. c.; Sull. Icon. Musc. *pl. 92*.

EXSICCATI.—Drumm. Musc. Am. (S. States) 97, (*Neckera seductrix*); Sull. Musc. Allegh. 78; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 261, (Ed. 2) 387; Macoun, Can. Musc. 663; Ren. & Card. Musc. Am. Sept. Exsic. 90.

2a. E. SEDUCTRIX LANCEOLATUS Grout, Bull. Torr. Club, **23**: 226. 1896.

Stem leaves ovate-lanceolate, acute; branch leaves broadly lanceolate, tapering gradually to the serrate acute apex; median cells 12 : 1; capsule 3–5 mm. long, about 8 : 1.

On rotten wood, Hanging Rock, Wabash Co., Ill., April 3, 1890. (J. Schneck.)

2b. E. SEDUCTRIX MINOR (Aust.) Grout, l. c.

Entire plant much reduced, dirty green; leaves, seta and capsule shorter than in type. Capsules 1.5–2 mm. long, its length about 3 times its diameter.

Ohio (Sullivant); sand hill near Augusta, Ga. (J. D. Smith), Feb. 2, 1877. A portion of no. 388 of Sull. and Lesq. Musc. Bor. Am., in Columbia Herb., issued as *Cylindrothecium compressum* Br. and Sch. is this variety.

2c. E. SEDUCTRIX DEMETRII (Ren. & Card.) Grout, l. c.

Cylindrothecium Demetrii Ren. & Card. Rev. Bryol. **20**: 14. 1893.

Stems irregularly divided and branched, strongly complanate-foliate, slender, having almost exactly the facies of *E. compressus*;

leaves ovate, gradually acute, very entire. Peristomal teeth often irregularly perforate.

On stones at top of well, Emma, Saline Co., Mo. (Rev. C. H. Demetrio).

This species is easily distinguished from *E. cladorrhizans* by its short deeply inserted sparsely articulate peristomal teeth, peculiar annulus, and by its dark and less flattened stem and branches. It is exceedingly variable and the three varieties named above are the most aberrant forms. Judging from the figures, Hedwig's type differs a good deal from the plant figured by Sullivant; it has ovate leaves and rather short capsules while Sullivant figures an elliptical-oblong leaf and a much larger capsule. The plants corresponding to Hedwig's figure grow in places that are dry at times, and its leaves are regularly and closely imbricated on the stout, terete branches. The regularity of imbrication gives a very striking appearance like the shingles of a roof. The plants corresponding to Sullivant's figure grow on rotten wood and in more moist situations; the branches are more slender, the leaves less abruptly apiculate and less closely and regularly imbricate. Sullivant's figure, l. c., of the mouth of the capsule is incorrect; he figures the mouth of the capsule as it appears when first mounted in water, but when cleared up with glycerine it will be seen that 2 or 3 of the upper rows of cells are small annulus cells. Var. *lanceolatus* is characterized principally by its lanceolate leaves and var. *minor* by its short capsules, var. *Demetrii* by its strongly flattened stems and branches.

3. Entodon compressus (Hedw.) C. Muell. Linnaea, **18**: *707*. 1844.

Leskea compressa Hedw. Sp. Musc. 232. *pl. 56. f. 1–7.* 1801.

Cylindrothecium compressum Br. & Sch. Bryol. Eur. fasc. 46–47. 1851.

Gametophyte in thin dirty green mats; stem and branches complanate-foliate and lying in the same plane, as in *E. cladorrhizans*, but both much more slender; stems often much divided, 2–5 cm. long, subpinnately branching; branches short; leaves becoming appressed in drying, causing the plants to lose their flattened appearance in a measure; branch leaves oblong-ovate, 1.1 mm. long by half as wide, obtuse, with apiculation very short or none, entire or slightly denticulate at apex, very concave; costa short and double; median leaf cells linear, 11: 1; basal cells quadrate; stem leaves larger, proportionately broader, entire: monoicous; male branches small; antheridia few, subcylindric; inner perigonial leaves ovate, acute, ecostate, bordered by a row of narrow cells: perichaetium 1.5–2 mm. long, sheathing; inner leaves oblong-lanceolate, very gradually acuminate, entire, slightly bicostate; leaf cells linear above, rhomboidal below. *Sporophyte* 12–15 mm. high; seta light reddish-brown; capsule brown, elongated-ovoid, contracted below mouth, 2.5 mm. long, 4: 1; operculum conic-rostrate, with a slender inclined beak; annulus compound, persistent, of 3 rows of cells; peristome about 0.3–0.4 mm. long; teeth narrowly linear-lanceolate, closely and regularly articulate, densely and minutely papillose; segments linear, shorter than the teeth, usually broken off, minutely papillose; spores very minutely roughened, 11–13μ, maturing in autumn.

Type locality, Lancaster, Penn. (Muhlenberg).

On earth and rotten logs in the shade, roots of trees near water courses.

Rhode Island, New Jersey, Ohio, Illinois, Kansas, Nebraska, Missouri. Not common.

ILLUSTRATIONS.—Hedw. l. c.; Sull. Icon. Musc. *pl. 93*.

EXSICCATI.—Sull. and Lesq. Musc. Bor. Am. (Ed. 1) 264, (Ed. 2) 388 in part, mixed with *E. seductrix minor*.

Easily distinguished by its short ovoid capsules and long minutely papillose peristome.

4. ENTODON SULLIVANTII C. Muell. Can. Rec. Sci. **1894**: 21. 1894.

Neckera Sullivantii C. Muell. Syn. Musc. **2**: 65. 1851.

Cylindrothecium Sullivantii Sull. in A. Gray, Man. Ed. 2: 664. 1856. Also Icon. Musc. 149. *pl. 95*.

Gametophyte in rather thin, glossy-green mats; stems 3–5 cm. long, pinnately branching; stem and branches slender, complanate-foliate, lying in the same plane; branches 5–15 mm. long; branch leaves ovate-lanceolate, 1.1 by 0.4 mm., acute, serrate at apex, very concave, margins incurved; costa short and double; median cells linear-rhomboidal, 8:1; quadrate alar cells numerous, extending nearly or quite to costa at base; stem leaves much larger, 1.6 mm. long, broadly ovate-lanceolate, entire except at extreme apex: male branches elongated-ovoid; perigonial leaves oval-oblong, concave, with a short broad acumination: perichaetium 1.5–2 mm. long; inner leaves erect, loosely sheathing, oval-oblong, acuminate, entire or serrulate at apex, ecostate, leaf-cells of upper half linear-rhomboidal, gradually much broader and looser below. *Sporophyte* 1.8–2.5 cm. high; seta orange; capsule brown, cylindric, 3.5–4 mm. long, 5–7: 1; operculum conic-rostrate; annulus very large, compound, of 3–4 rows of cells; peristome nearly 0.4 mm. long; teeth linear-lanceolate, orange, closely and regularly articulate; upper part of teeth with articulations more distant, marked with a double line, irregularly striolate with striolae vertical to oblique; obscurely striolate below with horizontal striolae; segments a little shorter than teeth, linear from a lanceolate base; spores minutely roughened, about 13μ.

Type locality in woods along the French Broad River, N. Carolina (Sullivant).

On damp rocks in woods.

North Carolina (Gray and Sullivant); Tennessee (Lesquereux); South Carolina. Very rare.

Reported from Japan. *Vide* Jaeger, Adumbratio.

ILLUSTRATIONS.—Sull. l. c.

EXSICCATI.-Sull. Musc. Allegh. 64, (*Leskea compressa*); Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 263, (Ed. 2) 389.

Easily distinguished from *E. compressus*, which it resembles, by its more slender stem and branches, serrate leaves, longer capsule, and striolate teeth.

5. ENTODON DRUMMONDII (Br. & Sch.) Jaeger & Sauerb. Ber. St. Gall. Nat. Gesell. 1876–77: 282.

Cylindrothecium Drummondii Br. & Sch. Bryol. Eur. fasc 46–47. 1851.

Neckera cladorrhizans Hook. & Wils. Drumm. Musc. Am. (S. States) 96. 1841.

Gametophyte in rather thin yellowish green mats; stems 4–8 cm. long, complanate-foliate, subpinnately branched; branches lying in one plane, short; branch leaves loosely imbricate, oblong-lanceolate to ovate-lanceolate, 1.8 by 0.5–0.7 mm., acute, serrate at apex, smooth, concave, ecostate; upper cells linear, 15:1; basal enlarged, rhomboidal, quadrate at the angles; stem leaves shorter and broader with more enlarged and hyaline basal cells: monoicous; male branches borne on stem or branches; antheridia oblong; paraphyses numerous and large; perigonial leaves oval to short-oblong, concave, the inner with a short, broad acumination: perichaetium about 2.5 mm. long; outer leaves sheathing at base with tips more or less spreading; inner nearly erect, oblong, long acuminate with a few long spreading teeth at apex; leaf-cells linear above, gradually enlarged to rhomboidal or quadrate at base. *Sporophyte* 10–25 mm. high; seta yellow; capsule brown, cylindric, 2–2.5 mm. long, 4:1; operculum long-conic, apiculate; mouth of capsule bordered by two or three rows of horizontally compressed cells, above these a row of enlarged cells without a cavity, closely simulating non-vesicular annulus cells; peristome about 2.5 mm. long; teeth linear-lanceolate, smooth and hyaline above, striolate and often thicker, brown and perforate below; segments linear, nearly or quite as long as teeth; spores minutely roughened, 13–15 μ, apparently maturing in spring, but data insufficient.

Type locality, Louisiana (Drummond).

On trees, rocks and logs, in woods. Southern United States east of the Mississippi, north to Tennessee and North Carolina; northern Mexico (Pringle).

Illustrations.—Sull. Icon. Musc., *pl. 94*.

Exsiccati.—Drumm. Musc. Am. (S. States) 96 type; Sull. & Lesq. (Ed. 1) 264, (Ed. 2) 390. Aust. Musc. Appal. Suppl. 538; Ren. & Card. Musc. Am. Sept. Exsic. 91. Macoun's Can. Musc. 436 is not this species.

Distinguished at sight from *E. cladorrhizans* and *E. compressus* by its very wide flattened branches and yellow seta.

6. Entodon repens (Brid.) Grout, Bull. Torr. Club, **23**: *227*. 1896.

Pterigynandrum repens Brid. Musc. Recent. Suppl. **1**: 131. 1806.

Platygyrium repens Br. & Sch. Bryol. Eur. fasc. 46–47. *pl. 458*. 1851.

Pterogonium repens Schwaegr. Suppl. 1^1: 100. *pl. 27.* 1811.
Neckera repens Schwaegr. Suppl. 3^1: Sect. 2. *pl. 246.* 1828.
Cylindrothecium repens De Not. Epil. 214. 1869.

Gametophyte in rather thin intricate mats, varying from dark green to a lighter yellowish green; stems 2–6 cm. long, prostrate; branches short, cylindric, ascending, often slightly curved; ends of sterile branches often bearing numerous small gemmae in the axils of the leaves; leaves oblong-ovate to oblong-lanceolate, closely imbricate when dry, 0.7–1.2 mm. long by 0.3–0.4 mm. wide, acute to acuminate; margins recurved and entire; costa lacking or short and double in robust plants; apical cells rhomboidal, median linear, 8 : 1; quadrate alar cells numerous and extending up the margin of leaf; stem leaves larger and proportionally broader: dioicous; male branches not abundant; antheridia oblong, large, stipitate; perigonial leaves bordered by a row of narrow cells, short-oblong, concave, slightly narrowed at base: perichaetium 1.5 mm. long, sheathing below, spreading above; inner leaves oblong, long acuminate, denticulate at apex, usually with a short thin double costa, upper cells linear, alar enlarged and rectangular. *Sporophyte* 2–3 cm. high; seta brown; capsule erect, about 3 mm. long, 4 : 1, brown; operculum conic-rostrate; annulus large, of three rows of cells; peristome 3–4 mm. long; teeth linear-lanceolate, hyaline-margined, orange, with raised lines at base; segments linear, usually free at base, nearly as long as teeth; spores minutely roughened, 14μ, maturing in early autumn.

Type locality, Switzerland.

On bark of trees, decaying logs and stumps. Europe, and North America east of the Rocky Mountains. Common.

Illustrations.—Schwaegr. l. c.; Br. & Sch. l. c.; Lesq. & James, Mosses of N. A. *pl. 5.*; Husnot, Musc. Gall *pl. 89.*; Limpr. Rab. Krypt. Fl. 4^3: *f. 353.*

Exsiccati.—Drumm. Musc. Am. (S. States) 98 and Musc. Am. 159 (*Neckera sericea*). Sull. Musc. Allegh. 45; (*Neckera sericea*); Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 259, (Ed. 2) 385; Austin, Musc. Appal. 281; Ren. & Card. Musc. Am. Sept. Exsic. 235.

6a. ENTODON REPENS ORTHOCLADOS (Kindb.) Grout, Bull. Torr. Club, **23**: 227. 1896.

Platygyrium repens orthoclados Kindb. in Macoun, Cat. Can. Pl. **6**: 172. 1892.

Platygyrium repens sciuroides Limpr. Rab. Krypt. Fl. 4^3: 7. 1896.

Platygyrium repens ramulis elongatis Bryol. Eur. *pl. 458. f. 3.*

Glossy, yellowish green. Branches much larger and longer; leaves larger, 1.2×0.4 mm., loosely imbricate, shortly bicostate.

Type from Skeads' Farm near Ottawa (Macoun).

EXSICCATI.—Sauter in Breut. Musc. Frond. Exsic. 296; Macoun, Can. Musc. 259 in part.

This variety seems to me to be only a robust form of a variable species. It was not considered by Schimper as worthy of varietal rank, although he figures the form. I have seen Dr. Sauter's type and also Kindberg's and they are without doubt the same. Kindberg's criticisms in Macoun's Catalogue on the descriptions and plates of this species are entirely without point. The Columbia College specimens of Macoun's no. 259 contained no fragment of *Platygyrium*, but consisted of *Pylaisia polyantha*.

Every character that has been supposed to separate this species from the genus *Entodon*, is possessed by some other member of the genus as here constituted, hence, in spite of its unlike appearance it seems best to place it here.

7. ENTODON ORTHOCARPUS (La Pyl.) Lindb. Musc. Scand. 39. 1879.

Hypnum Schreberi orthocarpum Brid. Bryol. Univ. **2**: 422. 1827.

Hypnum orthocarpum La Pylaie; Brid. Bryol. Univ. **2**: 422. 1827.

Cylindrothecium Montagnei Br. & Sch. Bryol. Eur. fasc. 46–47, *pl. 465.* 1851.

Cylindrothecium concinnum Schimp. Syn. 515. 1860.

Gametophyte in wide loosely intricate yellowish green tufts; stems 2–10 cm. or more long, suberect, pinnately branching; stems and branches terete to somewhat complanate-foliate, rigid; branches about 1 cm. long, tapering; branch leaves oval-oblong, 1.2×0.6 mm. obtuse, entire, very concave, with involute margins, ecostate or short bicostate; upper cells fusiform, much shorter and broader at apex, median about 10:1, basal strongly porose; quadrate alar cells numerous, small, extending up the margin of leaf, densely chlorophyllose, 2–3 layered in the central alar area; stem leaves larger and broader cells narrower and longer: dioicous; perigonial leaves oval, obtusely acuminate, ecostate; antheridia large, inflated: perichaetium about 2 mm. long, loosely sheathing; the inner leaves large, oblong, gradually narrowed above, obtusely acute, entire; median leaf-cells linear, lower rhomboidal. *Sporophyte* 2–2.5 cm. high; seta dark red-brown; calyptra dimidiate, long, descending to below the base of capsule; capsule brown, erect, cylindric, 3 mm. long, 5:1; operculum conic-rostrate, beak often oblique; annulus of 2–3 rows of small cells; peristome about 0.3–0.5 mm. long; teeth linear-lanceolate, red-brown, and closely articulate below, orange and distinctly articulate above, with a very distinct median line along which the tooth is often perforate or split; segments linear, as long as the teeth or longer; "basal membrane none;" spores minutely roughened, about 15μ, maturing in autumn.

Type locality, France (La Pylaie).

Very rare and sterile. Colorado (Brandegee). Middle Arm, Newfoundland (Rev. A. C. Waghorne).

ILLUSTRATIONS.—Br. & Sch. l. c.; Husnot, Musc. Gall. *pl. 89.*

This species is quite common in Europe, but mostly sterile. It has been collected only twice in America. The American specimens in the Columbia herbarium are all sterile and I suspect that all of Brandegee's and Waghorne's collection lacked fruit. The fruit is described from a European specimen.

8. ENTODON BREVISETUS (Hook. & Wils.) Jaeger & Sauerb. Ber. St. Gall. Nat. Gesell. **1876–77**: 291.

Neckera breviseta Hook. & Wils. Lond. Jour. Bot. **4**: 419. *pl. 24 f. a.* 1842.

Cylindrothecium brevisetum Br. & Sch. Bryol. Eur. fasc. 46–47. 1851.

Gametophyte in wide densely intricate mats, dark green below, tips of short branches lighter; stems varying greatly in length, averaging about 5 cm., creeping, subpinnately branching; branches short, suberect, abruptly tapering at end, lower often radiculose at tip; leaves closely imbricate when dry; branch leaves lanceolate, 1.9×0.6 mm., gradually narrowly acuminate, entire or slightly serrulate at apex, concave; costa double, extending nearly ¼ length of leaf; median cells oblong-hexagonal with length 6 times diameter; alar and basal cells quadrate, chlorophyllose; stem leaves larger, ovate-lanceolate: monoicous; male branches frequent; antheridia numerous, oblong-ovoid, stipitate; perigonial leaves bordered by a row of elongated cells, inner oblong-obovate, short acuminate: perichaetium 3.5 mm. long; the outer leaves sheathing at the base with squarrose tips; the inner erect, oblong-lanceolate, long acuminate, entire; costa double, ending below the middle; leaf-cells linear above, rhomboidal below. *Sporophyte* 10–20 mm. high; seta light reddish brown; capsule brown, 2.5–3 mm. long, 5 : 1, cylindric-ovoid, contracted below the mouth when dry; operculum long-conic, obtuse; annulus compound, of 3 rows of cells; peristome 0.3 mm. long; teeth linear-lanceolate, reddish brown, closely and regularly articulate, nodulose at articulations above, bordered the entire length by the adherent segments; spores tuberculate, 21 μ, maturing in autumn.

Type locality, Missouri, near St. Louis (Drummond).

On trees, limestone rocks, etc., New Jersey, Virginia, Pennsylvania, Ohio, Missouri; Canaan Forks, New Brunswick (J. Moser). Not common.

ILLUSTRATIONS.—Hook. & Wils. l. c.; Sull. Icon. Musc. *pl. 96.*

EXSICCATI.—Drumm. Musc. Am. (S. States) 95, (Type); Sull. Musc. Allegh. 79; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 265, (Ed. 2) 391.

This species is readily distinguished from all others by its narrowly acuminate leaves and the adherent segments of the inner peristome. The locality given in the Manual of Lesq. & James must be a mistake, as I have been able to obtain no specimens from the western United States. The male and female organs seem to have a tendency to appear in alternate seasons on the same plant.

DOUBTFUL OR EXCLUDED SPECIES.

ENTODON MACOUNII C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 177. 1892.

Authentic specimens from type locality in Herb. Macoun are not referable to *Entodon* at all, but are one of the complanate-foliate Hypneae. Capsules are needed to classify them. There are no quadrate alar cells and the cells at the angles are so little enlarged as to be scarcely noticeable.

ENTODON SUBFLACEUS C. Muell. & Kindb. Can. Rec. Sci. **1894**: 21. 1894.

Professor Macoun says in a recent letter, "You will notice that *Hypnum subflaccum* is really what is also described as "*Entodon Macounii.*" This was Kindberg's second name. His first was *C. Drummondi.* His third was *H. subflaccum.*"

ENTODON (?) EXPALLENS C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6 : 177. 1892.

This species belongs to the same group as *E. Macounii.*

CYLINDROTHECIUM FLORIDANUM Duby, Regensb. Flora, **58**: 284, is probably not related to *Entodon*, as the horizontal capsules described are not in accordance with the characters of the genus. We have not been able to obtain a specimen of it, as the type cannot be found in the Duby nor the Boissier herbaria at Geneva.

2. PYLAISIELLA Kindb. Can. Rec. Sci. **1894**: 21. 1894.

[PYLAISIA Br. & Sch. Bryol. Eur. fasc. 46–47. 1851. Not Desv. 1814.]

Gametophyte in rather thin glossy green mats. Stems creeping, subpinnately branching. Branches short, erect or ascending, more or less recurved at the tips by reason of the strongly secund apical leaves; not radiculose. Leaves erect-spreading, somewhat falcate-secund, especially when dry, acuminate, concave, ecostate or costa short and double; leaf cells linear, quadrate at the basal angles. Monoicous; paraphyllia none. Male branches gemmiform, borne on stem or branches. Female branches usually borne on the stem. *Sporophyte* with seta smooth, twisted to left above, to right below. Calyptra cucullate. Capsule erect, seldom slightly incurved; operculum conic or short rostrate. Columella persistent, annulus narrow. Peristome double, inserted below mouth of capsule; segments attached to a wide basal membrane, free or adhering to teeth; cilia rudimentary or none. Spores minutely roughened.

Widely distributed in the north temperate zone.

The generic name *Pylaisia* was first used by Desvaux in 1814 to designate a new genus named in honor of De La Pylaie. The specimen upon which his genus was founded is stated to be nothing more than a depauperate form of *Hypnum denticulatum* L.

In 1851 Bruch and Schimper took up the name for a new genus founded on *Hypnum polyanthos* Schreb., thus publishing a homonym. DeNotaris in 1869 extended the genus *Pylaisia* by including *Orthothecium* of the Bryol. Eur., and in this extended form it was degraded by Lindberg in 1879 to a sub-genus of *Stereodon* of Mitten. The name *Pylaisiella* proposed by Kindberg for two species of the genus, viz.: *P. velutina* and *P. subdenticulata*, is very appropriate, as it will commemorate the name of De La Pylaie.

Segments of the endostome entirely free from the teeth.	
Operculum conic; quadrate alar cells few.	1. *P. polyantha.*
Operculum short-rostrate; quadrate alar cells numerous.	2. *P. subdenticulata.*
Segments partially or wholly adherent to the teeth.	
Partially adherent; spores 18–24 μ.	3. *P. intricata.*
Wholly adherent; spores 25–30 μ.	4. *P. velutina.*

1. Pylaisiella polyantha (Schreb.) Grout, Bull. Torr. Club, **23**: 229. 1896.

Hypnum polyanthos Schreb. Spicil. Flor. Lips. 97. 1771.

Pylaisia polyantha Br. & Sch. Bryol. Eur. fasc. 46–47. *pl. 455.* 1851.

Stereodon polyanthos Mitt. Journ. Linn. Soc. **8**: 40. 1865.

Pylaisia heteromalla Br. & Sch. Lond. Journ. Bot. **2**: 669. 1843.

Hypnum polyanthum pallidifolium C. Muell. Syn. **2**: 337. 1851.

Pylaisia Ontariense C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 174. 1892.

Gametophyte in glossy yellowish green intricate mats; stems 2 to 10 cm. long, rarely longer, creeping, pinnately branching; branches 0.5 to 1 cm. long, erect or ascending; branch leaves somewhat falcate-secund, loosely imbricate when dry, broadly ovate-lanceolate, 1–1.3 × 0.4–0.5 mm., more or less long-acuminate, entire, slightly concave, ecostate, or costa very faint, short and double; leaf-cells linear-rhomboidal; median cells 8 : 1; quadrate alar cells few; stem leaves broader, more abruptly acuminate: antheridia oblong; perigonial leaves broadly ovate-lanceolate, entire, acute to acuminate: perichaetium 2 mm. long; the leaves loosely sheathing, squarrose at apex; inner oblong-lanceolate, more or less long-acuminate, more or less serrate at apex, ecostate; cells linear above, rhomboidal and hyaline below. *Sporophyte* 1–2 cm. high; seta red-brown; capsule lighter red-brown, oblong-cylindric, 2.5 mm. long, 3.5–4 : 1, often stomatose at base; operculum conic to conic-apiculate; annulus very narrow and easily detached, of one row of cells; teeth of peristome linear-lanceolate, closely and regularly articulate, sub-moniliform and slightly granular above; segments as long as teeth, linear-lanceolate, strongly carinate, more or less split when old, granular-roughened; spores brownish yellow, minutely roughened, 14μ, maturing in autumn and winter.

Type locality European.

On stems and roots of trees. Not common.

Canada and northwestern United States (Macoun); Kakabeka Falls, Ont. (Mrs. Britton); Saskatchewan and Rocky Mountains (Bourgeau); Santa Fé (Fendler); White Mountains (James); Montana (R. S. Williams); Pike's Peak, Colo. (S. L. Clarke); Minnesota (F. F. Wood); Mt. Desert (Rand, Flora Mt. Desert, 212). Apparently widely distributed in Canada and along the northern border of the United States in mountainous regions, but rather infrequent and local.

ILLUSTRATIONS.—Dill. Hist. Musc. *pl. 42. f. 62* (*Hypnum sericeum ramosius et tenuis*); Hedw. St. Cr. **4**: *pl. 2.* (*Leskea polyantha*) Br. & Sch. l. c.; Husnot. Musc. Gall. *pl. 89;* Rab. Krypt. Fl. **4**^{3}: *f. 354.*

EXSICCATI.—Drumm. Musc. Am. 222; Aust. Musc. Appal. Suppl. 1. 537; Macoun, Can. Musc. 260 (in part).

The typical American form of this species is quite variable in leaf characters even on the same plant, but it differs constantly from European specimens in that the leaves are shorter, more abruptly acuminate and more broadly ovate-lanceolate. The length of the leaf of the European form averages 1.5 mm., that of the American 1 mm., though I have found one plant whose leaves measured 1.4 mm. The length of the acumination of the perichaetial leaves is also very variable. It may be that our forms of this and the next species are but two varieties of the European *P. polyantha*. The American *polyantha* answers very closely to the description of *P. polyantha brevifolia* Lindb. & Arnell, Musc. Asiae-bor. 152. 1890. I have seen the type specimens of *P. heteromalla* from Schimper's herbarium and not only are they *P. polyantha*, but Schimper himself indicated clearly on his labels that he did not consider it a good species; Drummond's no. 222 on which this species was founded, is evidently somewhat mixed as the Columbia Herbarium specimen is *P. intricata*.

1a. Pylaisiella polyantha Jamesii (Sull.) E. G. Britton, Bull. Torr. Club, **23**: 230. 1896.

Pylaisia Jamesii Sull. & Lesq. Musc. Bor. Am. Ed. 2. 383. 1865.

Pylaisia subdenticulata obscura Lesq. & James, Mosses North America, 309. 1884.

Gametophyte smaller than in the typical form; leaves shorter, broadly ovate-lanceolate, shortly bicostate; length of leaf-cells 4–6 times their diameter; quadrate alar cells numerous; perichaetial leaves shorter, abruptly acuminate. *Sporophyte* with shorter subulate-lanceolate peristomal teeth, which are also shorter than the segments.

On the ground and roots of trees. Chelsea, Mass. (James).

This variety has the appearance of *P. subdenticulata* because of its reduced size, otherwise it has the characters of American *polyantha*, such as conic operculum and rudimentary cilia.

1b. Pylaisiella polyantha pseudo-platygyria (Kindb.) Grout, Bull. Torr. Club, **23**: 230. 1896.

Pylaisia pseudo-platygyrium Kindb. in Macoun, Cat. Can. Pl. 6: 173. 1892.

Pylaisia filari-acuminata Kindb. l. c. 174.

Leaves narrowly long-acuminate; upper branch leaves distantly serrate-dentate along sides of acumination; inner perichaetial leaves often long-acuminate, serrate-dentate along the acumination; cilia 1 or 2, better developed than in the type.

Type locality, shores of Lake Nipigon, Ontario. Also found on the west side of the Columbia river at Revelstoke, B. C.

On decayed trunks and on "logs subject to inundation."

Exsiccati.—Macoun, Can. Musc. 626. (*Pylaisia filari-acuminata.*)

2. Pylaisiella subdenticulata (Schimp.) Kindb. Can. Rec. Sci. **1894**: 22. 1894.

Pylaisia subdenticulata Schimp. Bryol. Eur. fasc. 46–47. 1851.

Pylaisia denticulata Sull. in A. Gray Man. Ed. **2**: 52. 1856.

Gametophyte darker green than the last, scattering or in thin mats, often closely intermixed with other species; stems 1–3 cm. long, irregularly divided, subpinnately branching; branches very short, usually less than 5 mm. long; branch leaves erect-spreading, ovate-lanceolate, 0.7–1×0.2–0.35 mm., gradually long-acuminate, more or less denticulate especially above, concave, ecostate or costa thin, short and double; median cells 6–8 : 1; quadrate alar cells numerous: perigonial leaves ovate-lanceolate, acuminate, concave; antheridia oblong: perichaetium 1.5–2 mm. long, loosely sheathing; inner leaves ovate-lanceolate, gradually or abruptly narrowed to a long point, more or less denticulate above, ecostate; leaf-cells linear-fusiform above, broader and rhomboidal below. *Sporophyte* 8–17 mm. high; seta brown; capsule brown, cylindric, 1.5–2 mm. long, 4–5 : 1; operculum conic, short-rostrate; annulus very narrow, consisting of a row of isodiametric polygonal cells and a row of vesicular cells that often come off with the operculum; teeth of peristome linear-lanceolate, orange, closely and regularly articulate, submoniliform and granulose above; segments linear-lanceolate, a little longer than the teeth, more or less split above; cilia lacking; spores yellow-brown, minutely roughened, 10–12μ, maturing in summer or early autumn.

Type locality American (Sullivant).

On trees. New York and New Jersey (Austin); Maryland (Holzinger); Ohio (H. J. Biddlecome); Athens, Ill. (Hall); New Mexico (E. O. Wooton).

Illustrations.—Sull. Icon. Musc. *pl. 87*.

Exsiccati.—Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 382.

Very close to *P. polyantha*, but distinguished by the reduced size, rostrate operculum, absence of cilia and numerous quadrate alar cells.

3. Pylaisiella intricata (Hedw.) Grout, Bull. Torr. Club, **23**: 231. 1896.

Pterigynandrum intricatum Hedw. Sp. Musc. 85. *pl. 18.* 1801.

Pylaisia intricata Schimp. Bryol. Eur. fasc. 46–47. 1851.

Hypnum intricatum C. Muell. Syn. **2**: 338. 1851.

Stereodon intricatus Lindb. Musc. Asiae-bor. **2**: 151. 1890.

Pylaisia Selwynii Kindb. Ott. Nat. **2**: 156. 1889.

Gametophyte in wide glossy-green intricate mats; stems 5–8 cm. long, creeping, pinnately branching; branches about 5 mm. long, erect or ascending, strongly recurved at tips, especially when dry; branch leaves secund, especially at the ends of the branches, ovate-lanceolate, 0.8–1.1×0.3–0.4 mm., more or less long-acuminate, entire or subdenticulate at apex, concave, ecostate or costa short, thin and double; median cells linear-fusiform, 7–12:1; quadrate alar cells numerous, bordering the lower ⅓ of leaf; stem leaves ovate to broadly ovate-lanceolate, more abruptly acuminate, costa short and double; leaf-cells broader, linear-rhomboidal: male branches abundant; antheridia elongated-ovoid; perigonial leaves broadly ovate-lanceolate, acuminate: perichaetium 2–2.5 mm. long, loosely sheathing; inner leaves oblong-lanceolate, acuminate, denticulate above, costa diffuse, reaching middle; leaf-cells linear above, looser, rhomboidal and strongly porose below. *Sporophyte* 12–17 mm. high; seta dark red-brown; capsule red-brown, ovoid to ovoid cylindric, symmetric, slightly narrowed at mouth, 2 mm. long, 3–4:1; operculum conic, erect or oblique; annulus of about 2 rows of cells; teeth of peristome subulate-lanceolate, closely and regularly articulate, light yellow-brown; segments longer than the teeth, adherent for ⅔ their length, split below, united above; spores yellow-brown, minutely roughened, thick walled, 18–24 μ, maturing in autumn.

Type locality, Lancaster, Penn. (Muhlenberg).

On trees, old logs, etc.

Common in the northeastern United States and eastern Canada; Kansas, Missouri, Mississippi, Georgia (Ravenel), Florida (Chapman).

ILLUSTRATIONS.—Hedw. l. c.; Sull. Icon. Musc. *pl. 88;* Gray's Man. Ed. 2, *pl. 5*; Lesq. & James, Mosses of North America, *pl. 5*.

EXSICCATI.—Sull. Musc. Allegh. 34; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 256, (Ed. 2) 380; Macoun, Can. Musc. 262; Ren. & Card. Musc. Am. Sept. Exsic. 89.

This species is easily distinguished by its curved branches, numerous quadrate alar cells and partially adherent segments. It varies a great deal in length of leaves and in length of leaf-cells, length and color of capsule and size of spores. Authentic specimens of *Pylaisia Selwynii* Kindb. show that it is merely a form of this species growing in exposed dry places. The plants are darker and the leaves more strongly recurved than usual.

4. PYLAISIELLA VELUTINA (Schimp.) Kindb. Can. Rec. Sci. **1894**: 21. 1894.

Pylaisia velutina Schimp. Bryol. Eur. fasc. 46–47. 1851.

Gametophyte in wide glossy yellow-green mats; stems 5 cm. or more long, creeping; branches 5–10 mm. long, ascending, curved at tip; branch leaves loose, secund, especially when dry, ovate-lanceolate, 0.8–1.2 by 0.3 mm., more or less long-acuminate, entire or denticulate along the somewhat involute margin, concave, ecostate, or costa short, faint and double; median cells linear-fusiform, 8–10 : 1; quadrate alar cells few; stem leaves much broader: antheridia stipitate, elongated-ovoid; inner perigonial leaves oblong-ovate to broadly ovate-lanceolate, acuminate: perichaetium 2 mm. long; leaves loosely erect, the inner oblong-lanceolate, long-acuminate, somewhat denticulate at apex; leaf-cells linear above, linear-rhomboidal and porose below. *Sporophyte* 1.2–1.7 cm. high; seta brown; capsule brown, ovoid-cylindric, 2 mm. long, 4:1; operculum conic, strongly apiculate to short-rostrate; annulus narrow, of 2 rows of small cells; teeth of peristome yellow-brown, linear-lanceolate, very closely articulate, bordered the entire length by the adhering segments; spores thick-walled, finely papillose, dark yellow brown, 24–30μ, maturing in late summer or early autumn.

Type locality American, (Sullivant).

On bark of trees, old logs, etc.; New Brunswick, and Mt. Desert, Maine, south to North Carolina, west to Ohio and Indiana.

ILLUSTRATIONS.—Sull. Icon. Musc. *pl. 89.*

EXSICCATI.—Sull. Musc. Allegh. 60; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 257, (Ed. 2) 381; Aust. Musc. Appal. 294; Macoun, Can. Musc. 470.

Distinguished from *P. intricata* by the entirely adherent segments; narrower leaves with fewer quadrate alar cells, and larger spores.

PYLAISIA REVOLUTIFOLIA Kindb. in Herb. Macoun, from Leamington, Ont., August 4, 1892, and Pelee Point, Ont., is *Entodon repens.*

3. HOLMGRENIA Lindb. Öfv. Vet.-Ak. Förh. **19**: 605. 1863.

[ORTHOTHECIUM Br. & Sch. Bryol. Eur. fasc. 48. 1851. Not Schott. & Endl. Melet. Bot. 31. 1832.]

Gametophyte in wide glossy bright colored mats (except *H. intricata*). Primary stems irregularly divided, sparsely branching. Paraphyllia lacking. Leaves erect, ascending, not decurrent, usually entire or sometimes slightly serrulate, acuminate, concave; costa short and double or lacking; median leaf-cells linear; basal cells shorter and broader; alar little differentiated. *Sporophyte* rare. long-pedicelled; seta smooth. Calyptra small, fugacious. Capsule nearly or quite erect and symmetric; operculum conic; annulus large. Peristome double; the teeth narrowly lanceolate; segments lanceolate, as long as teeth, from a broad basal membrane; cilia short or lacking.

Gametophyte large (5–10 cm. high); leaves strongly plicate.	1. *H. chrysea.*
Gametophyte small (2–4 cm. high); leaves not plicate.	
Leaves ovate.	2. *H. stricta.*
Leaves narrowly lanceolate.	3. *H. intricata.*

1. HOLMGRENIA CHRYSEA (Schwaegr.) Lindb. Öfv. Vet.-Ak. Förh. **19**: 605. 1863.

Hypnum chryseum Schwaegr. Schulte's Reise auf. d. Glockner, **2**: 364. 1804.

Orthothecium chryseum Br. & Sch. Bryol. Eur. fasc. 48. *pl. 461.* 1851.

Isothecium chryseum Spruce, Annal. & Mag. Nat. Hist. 1849.

Leskea chrysea Hartm. Skand. Flor. Ed. 6. 1854.

Stereodon chryseus Mitt. Journ. Linn. Soc. **8**: 39. 1864.

Gametophyte in thick glossy golden tufts ; stems 5–10 cm. long, erect, simple or 2–3 parted, radiculose at base ; leaves pluriseriate, imbricate, ovate-lanceolate to triangular ovate, 1.3–2 x 0.4–0.8 mm., apiculate to short acuminate, curved, strongly plicate, nearly ecostate ; margins entire, recurved ; median cells linear, 12–14 : 1 ; basal cells somewhat shorter and broader, thick-walled and golden brown: dioicous ; male branches gemmiform ; antheridia short stipulate ; paraphyses few, filiform ; perigonial leaves ovate, concave, acute to acuminate, serrate at apex : perichaetium 1.5–2 mm. long ; leaves few, triangular-ovate, golden brown with several layers at base ; the inner long-acuminate, sharply toothed, not plicate. *Sporophyte* 2–3 cm. high ; seta golden brown, smooth ; capsule ovoid-cylindric, slightly unsymmetric, contracted under the mouth when dry ; operculum conic ; annulus of two rows of cells, easily deciduous ; peristome double ; the teeth linear-lanceolate, closely articulate, hyaline and granulose-roughened above ; segments from a very wide basal membrane as long as teeth, somewhat perforate along the keel ; cilia two, shorter ; spores 12–16μ, roughened.

Type locality European.

On moist rocks and stony slopes, in alpine or boreal regions. Rare and rarely fruiting. Rocky Mountains (Drummond, Macoun) ; Saskatchewan (E. Bourgeau); Columbia Falls, Montana (R. S. Williams); Colorado (Brandegee).

ILLUSTRATIONS.—Br. & Sch. l. c. ; Husnot, Musc. Gall. 316. *pl. 90.*

2. HOLMGRENIA STRICTA Lorentz, Moos Stud. 122. *pl. 5.* 1864.

Stereodon rubellus Mitt. Journ. Linn. Soc. **8** : 40. 1865.

Orthothecium rubellum Kindb. Laubm. Schwed. u. Norw. 46. 1883.

Orthothecium intricatum var. *rubellum* Husnot, Musc. Gall. 173. 1893.

Gametophyte caespitose, orange colored, glossy ; stems erect, 1.5–2 cm. long ; branches few ; lower branch leaves elongated ovate ; upper ovate-lanceolate, 1 x 0.3–0.4 mm., not plicate or sulcate, ending in a flexuous subhyaline acumination ; margins revolute, serrulate above ; costa short and double ; median leaf-cells oblong-linear, 6–8: 1; basal cells shorter, brownish yellow; alar cells not conspicuously quadrate; stem leaves larger, 1–1.4 mm. long: dioicous; perichaetial leaves ovate-lanceolate. *Sporophyte* lacking.

Type locality European.

Davis Strait (Taylor).

In several sets of Drummond's mosses no. 73, from the Rocky Mountains (distributed as *Catoscopium nigritum*), there is no trace of this species. Dr. Mitten kindly sent a portion of the Davis Strait plant and says that the Taylor who collected these specimens was a ship's surgeon and not the Dr. T. Taylor whose herbarium is at Harvard.

"A small moss with all the habit, appearance and color of *Orthothecium intricatum* Br. & Sch., but differing in its almost exactly ovate leaves, with a short sometimes discolored apiculus, the margins revolute, and the areolation composed of cells which are twice as wide." (*Mitten.*)

3. Holmgrenia intricata (Hartm.) Lindb. Öfv. Vet. Ak. Förh. **19**: 605. 1863.

Leskea intricata Hartm. Skand. Fl. Ed. 5: 336. 1849.

Orthothecium intricatum Br. & Sch. Bryol. Eur. *pl. 462.* 1851.

Leskea polyantha β sericeola Brid. Bryol. Univ. **2**: 313. 1827.

Gametophyte in wide densely intricate mats, dark green to brownish green; stems filiform, 2–4 cm. long, creeping, somewhat stoloniferous, irregularly divided; branches short and erect or elongated and prostrate; leaves equally spreading or slightly secund, appressed-imbricate when dry, narrowly lanceolate, 0.8–1.5 x 0.2–0.4 mm. long, subulate to filiform acuminate, entire, somewhat concave, ecostate, median cells linear, 8–10:1; basal cells shorter and broader, often colored red-brown, alar cells not differentiated: dioicous; inner perichaetial leaves lanceolate, long-filiform, acuminate. *Sporophyte* 15–20 mm. high; seta twisted to the right below, to the left above; capsule erect and symmetric, red-brown, 2–2.5:1; operculum conic; annulus of two rows of cells; peristomial teeth closely and regularly articulate; segments linear, perforate along the keel, longer than the teeth, arising from a narrow basal membrane; spores 8–10μ; seldom fruiting.

Type locality European.

On rocks around Kicking Horse Lake, Rocky Mts., sterile, (Macoun.)

Macoun's specimens are more slender and have smaller, more filiform-pointed leaves than is usual with the European plant. The description of the sporophyte is taken largely from Limpricht's description in Rabenhorst's Kryptogamen Flora.

HOLMGRENIA RUFESCENS (Dicks.) Lindb.

Notes from Dr. Mitten indicate that *Holmgrenia rufescens* (Dicks.) Lindb. has not yet been found in North America. In a letter dated April 21, 1896, he says: "I have looked through all my specimens of *Orthothecium rufescens* and find no trace of any North American examples. All Taylor sent me are in with *O. chryseum*, as are the 221 of Drummond in both my sets. I suppose I must have mistaken one of Taylor's to be the first named."

4. CLIMACIUM Web. & Mohr, Iter Suec. 96. 1804. Also Bot. Taschenb. 252. 1807.

Gametophyte erect, dendroid, with underground creeping stems; rarely decumbent or floating. Primary stems densely radiculose; secondary simple below, fasciculately branching above. Stem and branches covered with branching filaments which are chlorophyll-bearing above. Leaves pluriseriate, decurrent; those of secondary stem squamiform, large, closely imbricated and clasping. Branch leaves smaller, crowded, imbricate. Dioicous; antheridial branches rare, scattering. *Sporophyte* with seta long, smooth, twisted to the right; calyptra dimidiate, long, embracing base of capsule. Capsule erect, cylindric. Operculum conic-rostrate, beak often oblique. Columella persistent. Annulus none. Peristome double; teeth linear-lanceolate, closely articulate, minutely papillose. Segments of endostome as long as teeth, carinate, cleft between the articulations, split to the apex when old, attached to a narrow basal membrane, minutely papillose. Spores minutely papillose.

Capsules 3–4: 1; median leaf-cells 10: 1.	1. *C. dendroides.*
Capsules 5–6: 1; median leaf-cells 2–7: 1.	2. *C. Americanum.*

1. CLIMACIUM DENDROIDES (L.) Web. & Mohr, Iter. Suec. 96. 1804. Also Bot. Taschenb. 252. *pl. 10. f. 2.* 1807.

Hypnum dendroides L. Sp. Pl. 118. 1753.

Leskea dendroides Hedw. Sp. Musc. 228. 1801.

Neckera dendroides Brid. Musc. Rec. 2^2: 14. 1797.

Gametophyte bright glossy green, 7–9 cm. high; branches spreading, flexuous; branch leaves loosely imbricate, 2 x 0.7 mm., the upper oblong-lanceolate; lower ovate-lanceolate, denticulate at base, sharply serrate above, obtuse, bisulcate, costate nearly to apex; basal angles sometimes slightly enlarged; median cells linear-rhomboidal to linear-hexagonal, 7–10: 1; alar and apical cells much shorter and broader; stem leaves larger, 2–3 mm. long, ovate, entire, apiculate: perigonial leaves entire, concave; outer suborbicular, ecostate; inner short-oblong, narrowed at base, apiculate, often slightly costate; antheridia oblong; paraphyses numerous, longer than the antheridia: perichaetium about 5 mm. long; inner leaves oblong to oblong-ovate, slightly serrate at the apex, long-acuminate, thinly costate, costa often short or wanting; leaf-cells linear above, rhomboidal and brownish yellow below. *Sporophyte* 2.5–3.5 cm. high; seta reddish-brown; capsule lighter in color, cylindric, about 4 mm. long, 3–4: 1; operculum often remaining attached to columella; peristome reddish-brown; spores 13–22μ. Fruit rare, maturing in autumn.

Type locality European, probably Swedish.

Wet ground, borders of streams, swamps and lakes, especially in the mountains; more common than is indicated by Lesq. & James in the Manual. Ranging through the northern and western part of the continent from New Brunswick to St. Paul Island, Behring sea; south to New Jersey, Colorado and California. Not recorded from Pennsylvania or the North Central States.

ILLUSTRATIONS.—Dillenius, Hist. Musc. *pl. 40. f. 48;* Web. & Mohr., l. c.; Schwaegr. Suppl. 1^2: *pl. 81;* Br. & Sch. Bryol. Eur. *pl. 437;* Hook. & Taylor, Musc. Brit. Ed. 2. *pl. 25;* Husnot, Musc. Gall. *pl. 90.*

EXSICCATI.—Drumm. Musc. Am. 230; Austin, Musc. Appal. 286; Ren. & Card. Musc. Am. Sept. Exsic. 237.

1a. CLIMACIUM DENDROIDES OREGONENSE Ren. & Card. Bot. Gaz. 15: 59. 1890.

"Differs from the type in the leaves narrowed at base, less serrate at apex, sometimes subentire."

Oregon, Willamette R. (L. F. Henderson). A specimen from Sauvie's Island, Oregon (C. G. Pringle no. 510), is probably referable to this variety, as the leaves are almost entire, although broader instead of narrower than in the typical form.

2. CLIMACIUM AMERICANUM Brid. Sp. Musc. Suppl. part 2: 45. 1812.

Neckera dendroides Americana C. Muell. Syn. **2**: 122. 1851.

Gametophyte glossy green, 5–7 cm. high; branches usually straight and tapering; branch leaves closely imbricate, 2 x 1 mm.; upper oblong-lanceolate, broadly auriculate; lower ovate to ovate-lanceolate, denticulate below, sharply serrate above, more acute than in the last, bisulcate, costate nearly to apex; leaf-cells more nearly uniform than in the last; median cells oblong-hexagonal, 5–7:1; stem leaves larger, 2–3 mm. long, entire, apiculate: perigonial leaves as in the last, except less frequently costate, bordered by a row of elongated cells, sometimes slightly denticulate at extreme apex; antheridia oblong, narrowed at base; paraphyses numerous, longer than antheridia; perichaetium about 5 mm. long; the inner leaves oblong-ovate, 4–5 mm. long, slightly denticulate at extreme apex, long-acuminate, thinly costate to above the middle; the lower sometimes ecostate; cells linear above, broader and yellowish brown below. *Sporophyte* 2–3 cm. high; seta brown; capsule cylindric, brown, about 6 mm. long, 5–6:1; peristome reddish-brown, teeth sometimes slightly perforated; spores 14–18μ, maturing in autumn; seldom fruiting.

Type locality, Lancaster, Pa. (Muhlenberg).

Swamps, wet soil and rocks, rotten logs, etc.

This species is exclusively American. It is found in the northern and eastern States, ranging from Canada to North Carolina and probably south to the Gulf; west to Minnesota, Iowa, Illinois and Missouri. "Rocky Mountains eastward," Röll in Hedwigia, **36**: 46. 1897.

ILLUSTRATIONS.—Sull. Mosses of U. S. *pl. 5.* & Icon. Musc. *pl. 97;* Lesq. and James, Mosses of North America. *pl. 5.*

EXSICCATI.—Drumm. Musc. Am. 231; Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 402; Austin, Musc. Appal. 287; Macoun, Can. Musc. 265.

This species closely resembles the last, but is darker in color and the branches are more strict, with leaves more closely imbricate. Under the microscope it is readily distinguished by its very broadly auriculate branch leaves.

2a. CLIMACIUM AMERICANUM KINDBERGII Ren. & Card. Bot. Gaz. 15: 1890.

C. Americanum fluitans Aust. Musc. Appal. 49. no. 289. 1870. Name only.

Stems decumbent, irregularly ramulose, often floating; dendroid secondary stems rarely present; stem leaves scattering, ovate; branch leaves ovate-lanceolate, not auriculate, but clasping by enlarged rounded basal angles, seldom sulcate; areolation nearly uniform; median cells oblong-hexagonal, 2–3 : 1. Seta usually much longer and more flexuous than in the species, 2–4 cm. long; teeth of peristome usually more or less perforate.

In swamps, having the range of the species and extending to the Gulf.

Typical form from Lafayette Woods, La. (Langlois).

Hastings, Ontario and Gill River, Canada (Macoun); Dells of the Wisconsin (E. G. Britton); Cambridge, Mass. (F. Boott); Wellesley, Mass. (Miss Cummings); Conn. (Eaton); New York (E. G. Britton); Del. (A. H. Commons); New Jersey (Austin); River Swamps, Fla. (Chapman).

EXSICCATI.—Austin Musc. Appal. 289; Ren. & Card. Musc. Am. Sept. Exsic. 238.

The specimens of Sull. & Lesq. Musc. Bor. Am. Ed. 2, 42. in the Columbia College Herbarium are this variety as are also Drummond's Musc. Am. (S. States) 120.

A well-marked and interesting variety which would stand as a distinct species were it not for the gradations. Frequently the typical form found on the borders of a swamp will gradually change to the variety at the water's edge. The dendroid form, which is frequent in southern swamps, closely resembles *C. dendroides* in appearance and has often been confused with it. It is easily distinguished by its areolation and elongated capsules. Its typical habit is hypnoid and is well represented by Austin's exsiccati. When growing out into the water it sometimes has the habit of a *Fontinalis* with distant leaves.

CLIMACIUM RUTHENICUM Lindb. is not a *Climacium.* Its affinities are uncertain, but is it not one of the Isotheciaceae. It has been referred to *Pleuroziopsis* by Kindberg in his check list of European and American mosses (Can. Rec. Sci. **1894**: 19, 1894.) He associates it with *Hypnum splendens* Hedw. and *H. triquetrum* L. This does not seem to be its natural alliance.

HOMALOTHECIUM Br. & Sch. Bryol. Eur. fasc. 46–47. 1851.

This genus is so closely allied to *Camptothecium* that it is clearly a violation of natural relationships to put it in another family. The nearly erect and symmetric capsule and the incomplete peristome are the only characters associating *Homalothecium* with the Isotheciaceae.

ISOTHECIUM Brid. Bryol. Univ. **2**: 355, *pl. 10.* 1827.

Schimper, Synopsis, Ed. 2: 662, separates *Isothecium myosuroides* (L.) Brid. from the genus of which *I. myurum* (Pollich) Brid. remains the type. *I. myosuroides* clearly belongs to the Brachytheciaceae and all our American species are closely allied to it. Thus we have no American species of *Isothecium.*

BRACHYTHECIACEAE.

My studies in this family have been confined principally to the following genus.

BRACHYTHECIUM Br. & Sch. Bryol. Eur. Fasc. 52–54. 1853.

Gametophyte generally large, never minute, prostrate or creeping, irregularly or subpinnately branching. Branch leaves pluriseriate, acute to long-acuminate, usually concave, longitudinally plicate or sulcate; vein extending to the middle or beyond; median leaf-cells linear to linear-rhomboidal, length 5–15 times diameter (3–5:1 in *B. reflexum*); basal cells broader and shorter, alar quadrate. Stem leaves larger and broader; paraphyllia none. Male branches gemmiform. *Sporophyte* with seta smooth to very rough, twisted to the right. Calyptra cucullate, smooth; capsule short, 2–4:1, inclined, arcuate (erect and symmetric in *B. Utahense*, *B. acuminatum*, *B. splendens* and *B. biventrosum*); more or less contracted under the mouth when dry; operculum convex-conic to very short-rostrate; columella persistent; peristome double; the teeth united at the base, linear-lanceolate, slender pointed, closely and regularly articulate, with a very distinct median line, darker colored and marked with very fine transverse lines below, above lighter and granulose-roughened. Segments lanceolate, attached to a wide basal membrane, more or less split along the keel, granulose-roughened above, usually brownish yellow; cilia two or three, well developed, nodose or appendiculate (except in the four species mentioned above). Spores some shade of brown, nearly smooth to very finely roughened.

The roughening of the spores and the transverse lines on the peristomal teeth are so fine that a magnification of 300–400 diameters is required to bring out these points well.

The genus can be divided into six fairly distinct groups.

I. *Salebrosum* group including *B. salebrosum*, *B. flexicaule*, *B. campestre*, *B. Roteanum*, *B. acutum*, *B. oxycladon*, *B. albicans*, *B. pseudo-collinum* and *B. turgidum*.

II. *Rutabulum* group including *B. rutabulum*, *B. asperrimum*, *B. lamprochryseum* and *B. rivulare*.

III. *Acuminatum* group including *B. acuminatum*, *B. splendens*, *B. biventrosum* and *B. cyrtophyllum*.

IV. *Plumosum* group including *B. plumosum*, *B. populeum* and *B. digastrum*.

V. *Reflexum* group including *B. reflexum*, *B. glaciale*, *B. Starkei* and *B. Novae-Angliae*.

VI. *Velutinum* group including *B. velutinum*, *B. Leibergii*, *B. Idahense*, *B. sub-erythrorrhizon*, *B. collinum*, *B. Utahense*, *B. erythrorrhizon* and *B. Bolanderi*.

I. Costa extending into apex.

Seta very rough throughout.

Plants very slender; leaf-cells 3–5:1 — 21. *B. reflexum*.

Plants more robust; leaf-cells 8–10:1. — 22. *B. glaciale*.

Seta nearly smooth at base; leaf-cells 5–8:1. — 19. *B. populeum*.

II. Costa extending ½–⅔ length of leaf.

1. Branch leaves entire.*

Branch leaves long-filiform acuminate.

Slender, dioicous. — 7. *B. albicans*.

Very stout, monoicous. — 9. *B. turgidum*.

Branch leaves narrowly acute to acuminate. — 18. *B. plumosum*.

*The branch leaves of *B. acutum* are often entire.

2. Branch leaves serrate.

A. Seta smooth.

a. Capsule erect and symmetric.*

Synoicous. 30. *B. Utahense.*

Dioicous.

Cilia single. 15. *B. splendens.*

Cilia rudimentary or wanting.

Plants slender; leaves gradually slender pointed. 16. *B. biventrosum.*

Plants more robust; leaves acuminate. 14. *B. acuminatum.*

b. Capsules unsymmetric, more or less inclined.

† Capsules 3–4 : 1, suberect.

Monoicous; enlarged basal cells very numerous and conspicuous. 4. *B. Roteanum.*

Dioicous; only a few basal cells enlarged. 6. *B. oxycladon.*

†† Capsules 2–3:1, strongly inclined or horizontal.†

*Stem leaves gradually narrowed from base to slender apex.

Plants robust; leaves at least 1.8 mm. long.

Stem leaves lanceolate, 0.6 mm. broad. 2. *B. flexicaule.*

Stem leaves triangular-ovate, 1 mm. broad. 5. *B. acutum.*

Plants slender; branch leaves not more than 1.5 mm. long. 8. *B. pseudo-collinum.*

** Stem leaves acuminate.

Dioicous. 31. *B. erythrorrhizon.*

Monoicous.

Branch leaves at least 1.8 mm. long. 1. *B. salebrosum.*

Branch leaves not more than 1.2 mm. long.

Stem leaves broadly ovate. 20. *B. digastrum.*

Stem leaves narrowly ovate to ovate-lanceolate.

Branch leaves oblong-lanceolate, 1–1.2 mm. long. 28. *B. suberythrorrhizon.*

Branch leaves ovate-lanceolate, less than 1 mm. long.

——— gradually acuminate. 26. *B. Idahense.*

——— abruptly acuminate. 29. *B. collinum.*

B. Seta slightly roughened with small distant papillae.

Stems short, irregularly branching; monoicous. 29. *B. collinum.*

Stems long and slender, pinnately branching; dioicous. 31. *B. erythrorrhizon Thedenii.*

C. Seta rough above, nearly smooth below.

Leaves plicate, long acuminate. 3. *B. campestre.*

Leaves not plicate, shorter acuminate. 18. *B. plumosum.*

D. Seta rough throughout, with large crowded papillae.

Cells of branch leaves 5 : 1, unipapillate. 24. *B. Novae-Angliae.*

Cells of branch leaves at least 8 : 1, smooth.

Secondary stems dendroid; leaves ovate and very short-acuminate. 13. *B. rivulare.*

**B.* *cyrtophyllum* belongs here.

† Capsules of *B. flexicaule* are sometimes 3–4:1.

Not dendroid; leaves slender pointed.*
    Stem leaves lanceolate. 25. *B. velutinum.*
    Stem leaves ovate to triangular-ovate.
        Monoicous.
            Cilia not appendiculate; plants robust, yellow green.
                10. *B. rutabulum.*
            Cilia appendiculate; less robust, green.
                Stem leaves narrowly ovate. 26. *B. Leibergii.*
                Stem leaves broadly ovate. 23. *B. Starkei.*
        Dioicous.
            Leaves 0.6–0.8 mm. long. 32. *B. Bolanderi.*
            Leaves at least 1.2 mm. long.
                Branch leaves decurrent, strongly serrate.
                    11. *B. asperrimum.*
                Branch leaves not decurrent, merely denticulate.
                    12. *B. lamprochryseum.*

1. BRACHYTHECIUM SALEBROSUM (Hoffm.) Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 549.* 1853.

Hypnum salebrosum Hoffm. Deutschl. Fl. **2**: 74. 1795.

Hypnum plumosum salebrosum C. Muell. Syn. **2**: 359. 1851.

Brachythecium laevisetum Kindb. Bull. Torr. Club, **17**: 279. 1890.

Gametophyte in wide glossy yellow-green mats; stems 5 cm. or more long, creeping and radiculose, irregularly to subpinnately branching; branches terete-foliate or seldom complanate-foliate; branch leaves lanceolate, 1.8–2.3 × 0.5–0.65 mm., long-acuminate, serrate above, very concave, bisulcate; costa extending beyond the middle; median cells linear-vermicular, 10 : 1; basal cells much shorter and broader; alar quadrate, thin walled; stem leaves ovate-lanceolate, nearly entire, 2–2.5 by 0.8–1.1 mm.: monoicous; male branches gemmiform, borne on the stem; perigonial leaves ovate-lanceolate, acuminate; antheridia oblong-clavate, sessile: perichaetium 2 mm. long; the leaves sheathing at base with spreading points; the inner rather abruptly narrowed into a long filiform acumination, entire or distantly serrate above, costa nearly obsolete.

Sporophyte 1–2 cm. high; seta red-brown, smooth; capsule red-brown, 2.5–3 mm. long, 2.5–3 : 1, oblong-ovoid, usually

* *B. lamprochryseum* sometimes assumes a dendroid habit.

strongly arcuate and horizontal; operculum conic-apiculate; annulus very narrow and inconspicuous, often remaining attached to the operculum; teeth of peristome red-brown below; segments nearly as long as the teeth; cilia 2, well developed, nodose or subappendiculate; spores nearly smooth, 15μ, maturing in autumn or early winter.

Type locality European.

On earth, stones, roots and trunks of trees, and rotting wood in woods and moist shady places. Eastern Canada and northern and eastern United States; rarely found west of Minnesota and Nebraska; south to North Carolina; Montana (Dr. F. W. Anderson, R. S. Williams); Idaho (Leiberg); Green Lake and Fraser River (Macoun). Not rare.

ILLUSTRATIONS.—Br. & Sch. l. c.; Lesq. & James, Mosses of North America. *pl. 5;* Husnot, Musc. Gall. *pl. 93*; Rab. Krypt. Fl. 4^3, *f. 364*.

EXSICCATI.—Sull. and Lesq. Musc. Bor. Am. (Ed. 1) 328, (Ed. 2) 487; Austin, Musc. Appal. 312 and 313; Macoun, Can. Musc. 283, 438 (*Hypnum acutum*).

Distinguished from *B. oxycladon*, which it closely resembles, by being monoicous; by the shorter and more curved capsules and the more distant and open leaves, having a looser basal areolation; branch leaves also more slender pointed. The capsules are very variable in length, sometimes almost exactly resembling those of *B. oxycladon*. An extremely variable species as at present understood.

Authentic specimens of *B. laevisetum* Kindb. from the type locality have been examined and no characters could be found to differentiate it from *B. salebrosum*.

A great variation in the appearance of the dried specimens appear to be due to the conditions of drying. Herbarium specimens with the leaves widely spreading and somewhat complanate, upon being wet and dried again took on the appearance that is characteristic of the species, the branches becoming terete-foliate and the leaves much more closely appressed.

1a. BRACHYTHECIUM SALEBROSUM FLACCIDUM Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 550.* 1853.

Gametophyte in wide loose dark green mats; stem and branches slender; branch leaves distant, spreading, more or less complanate, strongly serrate, apex often twisted; stem leaves very broadly triangular-ovate approaching in outline those of *B. Starkei*, about 2 × 1.2 mm., very slenderly acuminate, slightly serrulate. *Sporophyte* with cilia often 3. Capsule much like that of *B. oxycladon*.

New Brunswick (Fowler); Weehawken, N. J., and Oneida, N. Y. (Austin). *B. salebrosum flaccidum* is the extreme broad-leaved form of the species and may be distinct, but at present our knowledge is insufficient to define it.

2. Brachythecium flexicaule R. & C. n. sp.

Gametophyte in wide loosely intricate mats, yellow-green, often brown underneath; stems creeping, densely radiculose, closely applied to the substratum, 5–12 cm. long, pinnately branching; branches 5–10 mm. long, terete-foliate, ascending, attenuate; branch leaves narrowly lanceolate, 2–2.5 × 0.5–0.65 mm., gradually narrowed to a very long slender apex, serrate, concave or bisulcate; margins somewhat reflexed; costa extending ½–⅔ length of leaf; median cells linear-vermicular, 12–14:1; basal cells broader and shorter; extreme alar cells subquadrate: monoicous. *Sporophyte* usually not to be distinguished from that of *B. salebrosum;* capsule sometimes approaching that of *B. oxycladon*, 3–4:1.

Type locality, John's Beach, Newfoundland (Waghorne); on earth, Revelstoke, B. C. (Macoun, sent out as *B. glareosum*); on schistose rocks, Manchester, Vt. (A. J. G.); New Jersey (Austin); on decaying wood, Bradford, Pa. (Burnett); Adirondacks (Mrs. Annie M. Smith).

Type seen.

This species seems to me to be almost identical with *B. salebrosum densum* Br. & Sch. Bryol. Eur. *pl. 550*, but M. Cardot thinks otherwise. It is easily distinguished from all its near allies by the extremely narrow stem leaves, gradually narrowed from just above the base to the apex.

3. Brachythecium campestre Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 11.* 1853.

Hypnum rutabulum campestre C. Muell. Syn. 2: 368. 1851.

Brachythecium subalbicans De Not. Cronaca, 2: 20. 1867. Epil. 118. 1868.

Gametophyte in wide loose glossy yellow-green mats; stems 5 cm. or more long, decumbent or ascending, often stoloniferous at the ends, subpinnately branching; branches 5–10 mm. long; branch leaves equally spreading to somewhat falcate-secund, lanceolate to ovate-lanceolate, 1.4–2 × 0.4–0.6 mm. long-acuminate, strongly serrate above, concave, costate to the middle or beyond; median cells linear-vermicular 10–12:1; basal cells shorter and broader; alar quadrate; stem leaves ovate-lanceolate, less strongly serrate, long subfiliform acuminate, 2 × 0.6–1.1 mm., strongly plicate: monoicous; male branches borne on the stem, gemmiform; antheridia oblong-cylindric; paraphyses very long and numerous; perigonial leaves ovate, acuminate: perichaetium 2–2.5 mm. long; leaves sheathing at base, with squarrose points; inner leaves oblong-lanceolate, rather abruptly narrowed into a long filiform serrate acumination, costate. *Sporophyte* 1–2 cm. high; seta red when young, red-brown when old, more or less roughened with rather low distinct papillae, nearly smooth below; capsule red-brown, 2.5–3 mm., 3:1, unsymmetric and inclined; operculum long-conic, apiculate; annulus narrow, usually adhering to the operculum; cilia 1 or 2, long, nodose and papillose-roughened; spores roughened, 15μ, maturing in autumn.

Type locality European.

On damp earth and stones, in woods and in damp grassy places. Apparently has the range of *B. salebrosum.* As yet no specimens have been reported from farther south than New Jersey. Quesnell, B. C. (Macoun).

Illustrations.—Br. & Sch. l. c.; Husnot, Musc. Gall. *pl. 92.*

Exsiccati.—Aust. Musc. Appal. 314–315.

Scarcely to be distinguished from *B. salebrosum* except by the slightly scabrous seta, rather longer capsule and longer acuminate leaves. There are all grades of roughness of seta and it is doubtful if this species is more than a variety of *B. salebrosum. B. oxycladon, B. flexicaule, B. salebrosum, B. acutum* and *B. campestre* grade into each other and are difficult to separate satisfactorily.

4. Brachythecium Roteanum DeNot. Cronaca, **2**: 19. 1867; Epil. 117. 1869.

Brachythecium salebrosum var. *cylindricum* Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 550.* 1853.

Brachythecium salebrosum Texanum Aust. Bull. Torr. Club, **6**: 44. 1875.

Gametophyte in glossy yellow-green mats; stems creeping, subpinnately branching; branches subjulaceous, 5–12 mm. long, terete-foliate; branch leaves more closely imbricated and appressed than in *B. salebrosum*, ovate-lanceolate, long acuminate, 1.5–2 × 0.45–0.55 mm., serrate above, concave, often bisulcate with reflexed margins; costa extending ½ to ⅔ length of leaf; median cells linear-fusiform, 10–12 : 1; several rows of basal cells much enlarged, quadrate to oblong-hexagonal; lower stem leaves ovate, abruptly narrowed to a long slender acumination, nearly entire, 2–2.4 × 0.9 mm.; areolation much looser; upper stem leaves approaching branch leaves in size and shape: monoicous; male branches gemmiform; inner perigonial leaves ovate, very long-acuminate, entire, ecostate; paraphyses stout, nearly twice the length of the cylindric short-stipitate antheridia: perichaetium 2.25 mm. long; leaves sheathing at base with spreading points; inner oblong-ovate, long acuminate, nearly ecostate and entire. *Sporophyte* 2.5 cm. high; seta red-brown, smooth; capsule red-brown, cylindric, nearly erect, slightly arcuate, about 3 mm. long, 4 : 1; operculum conic-rostrate; annulus (?), cilia 2 or 3, well developed, nodulose; spores granulose roughened, 13μ.

Type locality European.

Dallas, Texas (J. Boll); La., Drumm. Musc. Am. (S. States), 123 "*Hypnum laetum* var ?"

Distinguished from *B. oxycladon* by being monoicous and by the conspicuously enlarged basal cells of the leaves; from *B. salebrosum* by the longer suberect capsule and leaves scarcely or not at all plicate; from both by its much shorter-acuminate perichaetial leaves. The American form here described is clearly distinct from either *B. salebrosum* or *B. oxycladon*, and is referred to *B. Roteanum* on the authority of C. Mueller, who identified a specimen of Boll's collection now in the Columbia Herbarium as *B. salebrosum cylindricum* Br. & Sch. I have not had authentic European material for comparison but the plant described answers very closely indeed to Limpricht's description of *B. Roteanum* (Rab. Krypt. Fl. **4**^{3}: 72.) The specimen Austin described was from the same locality and collector as the specimen identified by Mueller.

5. Brachythecium acutum (Mitt.) Sull. Icon. Musc. Suppl. 99. *pl. 75.* 1874.

Hypnum acutum Mitt. Journ. Linn. Soc. **8**: 33. *pl. 6.*

Brachythecium mammilligerum Kindb. Macoun, Cat. Can. Pl. 6: 192. 1792.

Gametophyte in wide thin glossy-green to yellowish-green mats; stems prostrate, creeping or sometimes floating, 5–10 cm. long, irregularly divided, radiculose at base, branching irregularly pinnatifid; branches few, 5–10 mm. long, frequently somewhat complanate-foliate, not radiculose; branch leaves distant, open, lanceolate to ovate-lanceolate, gradually narrowed from just above the base, ending in a very slender point, 1.6–2 × 0.5–0.7 mm., distantly serrate or entire, very slightly concave, little or not at all plicate; costa extending two-thirds the length of the leaf; median cells linear-vermicular, 10: 1; basal and alar cells shorter and broader, oblong-rhomboidal to quadrate; stem leaves slender pointed, triangular-ovate, nearly entire, 2–2.5 by 1 mm.: monoicous, sometimes polygamous; perigonial leaves ovate-acuminate, bordered by a row of elongated cells: perichaetium 2.5 mm. long; the inner leaves ovate-lanceolate, sheathing at base, open above, abruptly long-filiform acuminate, ecostate. *Sporophyte* 2.5–3.5 cm. high; seta smooth, red-brown, often lighter colored above; capsule red-brown, oblong-ovoid to short cylindric, 3 mm. long, 3 : 1, arcuate and inclined, occasionally nearly symmetric; operculum long conic, apiculate; annulus simple, of 1 or 2 rows of cells; teeth of peristome subulate-lanceolate, orange; segments nearly as long as teeth; cilia 2 or 3, well developed, strongly nodose or appendiculate; spores minutely roughened, 13–15μ, maturing in autumn.

Type seen, from Pack River, British Columbia (Lyall) in Mitten herbarium. On the ground and rotting logs and in moist and swampy places. Northern United States and Canada, across the continent; south to N. J., Ohio and Colorado. Macoun, Can. Cryptogams 110 (*B. salebrosum mammilligerum*).

Illustrations.—Mitt. l. c.; Sull. l. c.

Exsiccati.—Austin, Musc. Appal. 316.

A careful comparison of a large number of specimens indicates that this species is distinct from the European *B. Mildeanum* Sch. The aspect of the plant is different in that it has loosely foliate and rather flaccid branches, while *B. Mildeanum* has more robust, densely foliate, turgid branches. The leaves are long, slender-pointed, more like *B. glareosum* than *B. Mildeanum.* Sullivant's figure resembles *B. Mildeanum* more closely than *B. acutum.* Mitten's figure represents the leaf much more accurately. Austin's Musc. Appal. 316, is, however, more like *B. Mildeanum* and Sullivant's figure and may prove to be distinct. There seems to be a complete series of intergradations between this species and *B. salebrosum.* The gradually tapering stem leaves which are seldom plicate and the more slender-pointed and less serrate branch leaves are the characters most easily recognized.

6. BRACHYTHECIUM OXYCLADON (Brid.). Jaeg. & Sauer. St. Gall. Nat. Gesell. 1877–1878 : 323.

Hypnum oxycladon Brid. Musc. Recent. Suppl. **2**: 123. 1812.

Hypnum laetum Brid. Bryol. Univ. **2**: 479. 1827.

Hypnum luteolum C. Muell. Syn. **2**: 357. 1851.

Brachythecium laetum Br. & Sch. Bryol. Eur. fasc. 52–54. *pl.* 554. 1853.

Brachythecium spurio-acuminatum C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 191. 1892.

Gametophyte in wide glossy yellow-green intricate mats ; stems prostrate, irregularly divided, pinnately branching ; branches unequal, 0.5–2.5 cm. long, attenuate at ends ; upper branch leaves erect-open, ovate-lanceolate, slightly decurrent, 1.5–2 × 0.45–0.8 mm., acute to slenderly acuminate, apex often slightly twisted, serrulate nearly all around, concave, plicate, upper margins often slightly recurved ; costa extending beyond the middle ; median cells narrowly linear, 10: 1 ; areolation gradually becoming shorter and broader toward the base ; alar cells quadrate ; stem leaves larger, 2–2.5 × 0.9–1.2 mm., often nearly entire, more deeply plicate : dioicous or rarely monoicous ; male branches gemmiform, borne on the stem ; antheridia oblong to obovoid ; paraphyses numerous, stout, longer than antheridia ; inner perigonial leaves ovate to oblong-ovate, acuminate, ecostate, loosely areolate : perichaetium 2–2.5 mm. long ; leaves sheathing at base ; the inner with spreading points, oblong-lanceolate, abruptly narrowed to a long filiform acumination, nearly entire or somewhat serrulate above, costa thin or wanting. *Sporophyte* 1.5–2.5 cm. high; seta red-brown, smooth; capsule red-brown, oblong-cylindric, suberect, slightly arcuate, somewhat contracted below the mouth when dry, the neck gradually narrowed to the seta, 2.5–3.5 mm. long, about 4 : 1; operculum long conic to conic-rostrate; annulus none; teeth of peristome light red-brown, rather abruptly narrowed to a slender hyaline point; segments from a broad basal membrane, nearly as long as the teeth; cilia two, strongly nodose or appendiculate; spores finely papillose-roughened, about 15μ, maturing in autumn or early winter.

Type locality, Penn. (Ludwig).

On earth rocks, and roots of trees in woods. Northeastern United States and eastern Canada; west to Minnesota, Kansas and Nebraska; Colorado (Brandegee); south to North Carolina and Tennessee; Missouri (Bush). Apparently common.

Exsiccati.—As *H. laetum* Drumm. Musc. Am. (S. States), 122; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 329, (Ed. 2) 488, 489, 490; Austin Musc. Appal. 309; Macoun, Can. Musc. 281, 566 (*B. spurio-acuminatum*); Ren. & Card. Musc. Am. Sept. Exsic. 104, (*B. biventrosum*).

Illustrations.—Br. & Sch. l. c.; Sull. Icon. Musc. *pl. 115*; Husnot, Musc. Gall. *pl. 93*; Rab. Krypt. Fl. 4^3 : *f. 374*.

Type specimens of both *B. oxycladon* and *B. laetum* have been examined. The branch leaves of the former are less serrate than those of the latter but the acumination and serration of the leaves varies so much even on the same plant, that these characters alone cannot be used even to separate varieties. The species is exceedingly variable and difficult to separate from its allies, especially *B. salebrosum*; the difficulty is increased by the fact that the species is very imperfectly dioicous.

Examination has been made of authentic specimens of *B. laetum* var. *fallax* R. & C. (Bot. Centralbl. **44**: 422. 1890), *B. laetum* var. *pseudo-acuminatum* R. & C. l. c.; *B. laetum Roelli* R. & C. l. c., from type locality and from Herb. Cardot. The variety *fallax* seems to be nothing more than a local form with narrower leaves and a more dirty green color; var. *pseudo-acuminatum* is a dwarfed and more caespitose plant, but differs in no essential particular from the ordinary form of *B. oxycladon* except, perhaps, in the more slender pointed branch leaves. Var. *Roellii* is not at all like *B. laetum*, having short julaceous branches and ovate to ovate-lanceolate leaves of about ½ the size of the leaves of *B. laetum*. All of these varieties were sterile and the species in the *salebrosum* group of *Brachythecium* are too closely related to make valid varieties from sterile specimens.

Renauld & Cardot's 104 differs in no essential respect from the ordinary *B. oxycladon* but as compared with the type of *B. biventrosum* it is larger and stouter; leaves broader and less slender pointed, basal areolation that of *B. oxycladon*. I am unable to agree with the opinion expressed by M. Cardot in Hedwigia **35**: 308. 310. 1896. M. Cardot tells me that he has not seen type specimens of *B. biventrosum* C. Muell. The specimens communicated by Lesquereux could not have been this species or he would not have confused it with *B. laetum*. *B. biventrosum* is very closely related to *B. acuminatum* as is indicated by the erect capsule, imperfect peristome and general appearance. Specimens of *B. digastrum* of the type collection are very distinct from *B. oxycladon* and are most closely allied to the *plumosum* group as is indicated by the leaf characters and general appearance.

6a. BRACHYTHECIUM OXYCLADON DENTATUM (L. & J.).

Hypnum laetum dentatum L. & J. Mosses of North America 335. 1884.

Brachythecium Sullivantii Br. & Sch. Bryol. Eur. fasc. 52–54: 21. 1853.

Gametophyte often submerged and dirty brownish green below; stems and branches slender, stem leaves broader and shorter, acute to acuminate, serrulate; branch leaves shorter pointed and more strongly serrate, more loosely areolate at base. Seta 3–3.5 cm. long, very slightly roughened at base; operculum short-rostrate; apparently growing in wet places and rocks on earth.

In woods near, and on the banks of the Hackensack River, Closter, N. J. (Austin); on ground in ravines, Louisiana (Langlois); banks of a creek, Saline Co., Missouri (Rev. C. H. Demetrio); swamp, Monkton, Vt. (C. G. Pringle).

EXSICCATI.—Sull. Musc. Allegh. 43, in part only.

7. BRACHYTHECIUM ALBICANS (Neck.) Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 553.* 1853.

Hypnum sericeum gracile albicans Dill. Hist. Musc. 328. *pl. 42 f. 63.* 1741.

Hypnum albicans Neck. Meth. Musc. no. 36. 1771; also Hedw. Descr. et Adumb. **4**: 13. *pl. 5.* 1793.

Hypnum flavescens Roth. Fl. Germ. **3**: 303. 1800.

Brachythecium pseudo-albicans Kindb. Bull. Torr. Bot. Club, **17**: 278. 1890.

Gametophyte in rather loose glossy light-green mats; stems decumbent or ascending, much divided, irregularly branching, slightly radiculose; branches erect or ascending, terete-foliate, slender, 5–15 mm. long; branch leaves decurrent, appressed-imbricate when dry, ovate-lanceolate, smaller and narrower toward the end of the branches, $1.6–2.2 \times 0.5$ to 0.7 mm., long and slenderly acuminate, entire or rarely slightly denticulate, concave or bisulcate; margins more or less reflexed; costa extending beyond the middle; median cells linear-fusiform, 5–8:1; basal broader and shorter; quadrate alar cells numerous; stem leaves broader, 0.6–1 mm. wide, more abruptly narrowed to the slender acumination: dioicous; perichaetium 2.5 mm. long; the leaves with loosely sheathing bases and spreading points; inner leaves exceedingly long filiform acuminate from an oblong base, nearly entire, costa extending nearly through the body of the leaf. *Sporophyte* 12–20 mm. high, sometimes 2 from 1 perichaetium; seta smooth, red-brown; capsule red-brown, ovoid, 2 mm. long, 2:1, unsymmetric, inclined or horizontal, little or not at all contracted under the mouth when dry; operculum convex-conic; annulus of 2 rows of cells, persistent; teeth of peristome linear-lanceolate, yellow brown; segments somewhat shorter than the teeth; cilia 2 or 3, appendiculate; spores finely roughened, $14–18\mu$; rarely fruiting.

Type locality European.

On rocks and in dry sandy or grassy places. Rocky Mountains and westward in northern United States and Canada; Agattu, Id. Behring Sea, U. S. S. Albatross; Greenland (Fl. Gr.).

ILLUSTRATIONS.—Dill. l. c.; Br. & Sch. l. c.; Hedw. l. c.; Husnot, Musc. Gall. *pl. 93.*

Exsiccati.—Macoun, Can. Musc. 285.

Distinguished from *B. salebrosum*, *B. acutum* and other closely allied species by being dioicous and by its very slender pointed and entire leaves. *B. glareosum* which has not yet been found in America is also dioicous but is much more robust and its slender pointed leaves are strongly serrate. *B. pseudo-albicans* Kindb. from the type collection, is a form with leaves rather shorter acuminate, occasionally bearing a very few inconspicuous teeth and with a rather larger number of quadrate alar cells. The leaves, however, are not more denticulate than is sometimes the case with European specimens.

7a. Brachythecium albicans occidentale R. & C. Bot. Centralbl. **44**: 422. 1890.

More slender, more loosely foliate; leaves subsecund, shorter acuminate, denticulate. Montana (Röll.)

8. Brachythecium pseudo-collinum Kindb. Macoun, Cat. Can. Pl. 6. 196. 1892.

Gametophyte in loosely intricate, dark green mats; stems creeping, subpinnately branching, radiculose; branches about 5 mm. long, terete-foliate, branch leaves erect-spreading, $1–1.2 \times 0.3–0.4$ mm., very slightly decurrent, lanceolate, concave, serrate; margins reflexed at base; costa extending to middle; apex acute, slender, twisted; median cells linear, 8–10 : 1; basal shorter and broader, alar quadrate; stem leaves ovate-lanceolate, more loosely areolate, less strongly serrate, slightly bisulcate, $1.4–1.6 \times 0.6$ mm: monoicous; perichaetium about 2 mm. long, sheathing; inner leaves ovate-lanceolate, costate, rather abruptly narrowed to a long filiform acumination, nearly entire, very loosely areolate, leaf-cells $130 \times 23\mu$. *Sporophyte*, 15 mm. high; seta smooth, red-brown; capsule brown, ovoid-cylindric, 2 mm. long, 2–2.5 : 1, slightly unsymmetric, suberect; operculum long conic, annulus lacking; segments as long as the teeth; cilia well developed, 1 or 2, strongly nodose or subappendiculate; spores 16μ, strongly papillose.

Type locality under a well platform, Canaan Forks, N. B. (J. Moser); type seen. Also collected at Closter, N. J. (Austin).

Sporophyte strongly resembling *B. collinum* but the gametophyte is entirely different in its microscopic characters.

9. BRACHYTHECIUM TURGIDUM (Hartm.) C. Hartm. Kindb. Enum. 294. 1888.

Hypnum turgidum Hartm. Skand. Fl. Ed. 5: 328. 1849.

Hypnum plumosum turgidum Lindb. Musc. Scand. 36. 1879.

Gametophyte in glossy, whitish-green to golden-green tufts; stems creeping, irregularly branching; branches very stout and turgid, julaceous, pointed, sometimes ending in flagellae, 1–3 cm. long; leaves loosely appressed imbricate, somewhat decurrent, lanceolate to broadly ovate-lanceolate, 2.5–3.5 × 0.9–1.2 mm., entire, gradually narrowed to a long filiform acumination, stongly plicate, costate to middle; margins reflexed below; median leaf-cells 12–15:1; basal broader and shorter; alar rhomboid-quadrate; stem and branch leaves little different: monoicous; perigonial leaves entire, sharply acuminate, ecostate; antheridia short-stipitate: perichaetial leaves sheathing, long-acuminate, entire, ecostate. *Sporophyte* 1–2 cm. high; seta red-brown, smooth, twisted to the right below to the left above; capsule 3–3.5 mm. long, 3:1, sub-horizontal, curved, somewhat contracted under the mouth when dry; operculum conic; annulus of one row of cells; cilia one or two, nodose; spores 18–24μ, nearly smooth, maturing in autumn.

Type locality European.

In alpine or boreal regions in grassy or stony places. Battle Harbor, Labrador (Waghorne); Stephen, Rocky Mts. (Macoun); Greenland (Fl. Gr.). This species has much the appearance of *B. glareosum* but differs in its more turgid branches, entire leaves and in being monoicous. Not yet found fruiting in America. The description of the sporophyte is adapted from Limpricht.

10. BRACHYTHECIUM RUTABULUM (L.) Br. & Sch. Bryol. Eur. fasc. 52–54, *pl. 543 and 544.* 1853.

Hypnum rutabulum L. Sp. Pl. 1124. 1753.

Hypnum dentatum var. vul. latissimum operculis obtusis. Dill. Hist. Musc. 295. *pl. 38. f. 29.* 1741.

Brachythecium leucoglaucum C. Muell. & Kindb. Macoun, Cat. Can. Pl. 198. 1892.

Gametophyte robust, in wide, loose mats, glossy yellow-green; stems decumbent, arcuate, 5–10 cm. long, stoloniferous at the ends, irregularly divided, subpinnately branching; branches erect or ascending, 1–2 cm. long, gradually attenuate, terete-foliate to somewhat complanate-foliate; branch leaves loosely erect-spreading, ovate-lanceolate, very slightly decurrent, 1.5–2 × 0.5–0.7 mm., gradually long-acuminate, distantly serrate, slightly concave, scarcely plicate; costa extending ⅔ length of leaf, sometimes toothed on the back above; median cells linear, 15 : 1; basal cells little differentiated, somewhat shorter; stem leaves broadly ovate, more abruptly acuminate, 2–3 × 1–1.5 mm., less strongly serrate; basal leaf cells conspicuously broader and shorter; a few of the cells at the extreme angles enlarged and inflated: monoicous or rarely polygamous; male branches frequent, cylindric, more or less curved; perigonial leaves ovate-lanceolate, gradually long-acuminate, denticulate above: perichaetium about 3 mm. long; leaves sheathing at base with squarrose points; the inner oblong-ovate, rather abruptly narrowed to a very long filiform acumination, denticulate above, ecostate, the outer leaves often short costate. *Sporophyte* 2–3 cm. high; seta red-brown, very rough throughout; capsule red-brown, oblong, arcuate and horizontal, not contracted under the mouth when dry, 2.5–3.5 mm. long, about 1 mm. thick; operculum long-conic, apiculate to subrostellate; annulus of two rows of cells, persistent; teeth of peristome red-brown, margined, stout; segments nearly as long as the teeth; cilia 2 or 3, nodose, some often imperfectly developed; spores roughened, 13–16μ, maturing in winter.

Type locality European.

On the ground and stones in wet places, less frequently on roots and stems of trees and decaying logs. Northern United States and Canada; south to New Jersey and Pennsylvania. Columbia Falls, Montana (R. S. Williams).

Illustrations.—Hedw. Descr. 4: *pl. 12;* Br. & Sch. l. c.; Wils. Bryol. Brit. *pl. 26;* Husnot, Musc. Gall. *pl. 92.*

Exsiccati.—Sull. Musc. Allegh. 45; Sull. & Lesq. Musc.

Bor. Am. (Ed. 1) 331, (Ed. 2) 494 and 495; Austin, Musc. Appal. 318; Ren. & Card. Musc. Am. Sept. Exsic. 243.

Quite variable in size and shape of leaves and in gross appearance. Macoun's Can. Musc. 591 on which *B. leucoglaucum* C. Muell & Kindb. was founded has the seta very rough and cannot be distinguished from this species.

10a. BRACHYTHECIUM RUTABULUM FLAVESCENS (Brid.) Br. and Sch. Bryol. Eur. fasc. 52–54. *pl. 544.*

Hypnum flavescens Brid. Spec. Musc. h. f. 185. 1812.

Brachythecium platycladum C. Muell. & Kindb. Macoun, Cat. Can. Pl. 6: 195. 1892. Can. Musc. 287, in part.

Plants straw-colored, very stout; stem and branches loosely foliate, turgid; stem leaves very broadly ovate, concave, abruptly short-acuminate. With the typical form. Montana (R. S. Williams); Jamaica Plains, Mass. (E. Faxon).

At first sight this form seems distinct from *B. rutabulum* but there is a complete gradation of forms from the typical plant to the variety. The stem leaves often resemble those of *B. rivulare* but they are longer acuminate and some of the branch leaves are not much different from those of typical *B. rutabulum.*

This variety seems imperfectly dioicous, as both Kindberg and R. S. Williams describe it as dioicous. The Columbia specimen of Macoun's 287 (which is undoubtedly the same as that described by Kindberg) contained plants which bore both male and female branches.

11. BRACHYTHECIUM ASPERRIMUM Mitt. Journ. Linn. Soc. **8**: 33. 1865.

Hypnum vallium Sull. & Lesq. Musc. Bor. Am. Ed. 2, 506. 1865.

Brachythecium Villardi R. & C. Bot. Centralbl. **44**: 442. 1890.

Brachythecium gemmascens C. Muell. & Kindb. Macoun, Cat. Can. Pl. 195. 1892.

Brachythecium spurio-rutabulum C. M. & Kindb. l. c. 197.

Brachythecium Columbico-rutabulum Kindb. l. c. 198.

Brachythecium subintricatum Kindb. Rev. Bryol. **22**: 86. 1895.

Gametophyte in wide loose mats, yellow-green; stems 5–11 cm. long, decumbent or ascending and arcuate, stoloniferous at the ends, sparingly radiculose, pinnately branching; branches 5–15 mm. long, attenuate at the ends, terete-foliate; branch leaves rather distant, erect-open, long decurrent, ovate-lanceolate, gradually long and narrowly acuminate, strongly serrate above, somewhat concave and plicate, 1.6 × 0.45–0.6 mm., costate to beyond the middle; median cells linear, 10–15: 1; basal and alar cells little differentiated, somewhat shorter and broader; stem leaves varying from broadly ovate and rather abruptly acuminate to elongated triangular-ovate and gradually long and slenderly acuminate, strongly plicate and decurrent, less strongly serrate, often nearly entire, basal cells more differentiated: dioicous; male plants smaller and more slender; leaves more distant and narrower; antheridial branches large, subglobose; antheridia numerous, large; inner perigonial leaves ovate, abruptly long-acuminate, bordered below by a row of elongated cells, nearly ecostate; the outer obovate and costate: perichaetium 2.5 mm. long; the leaves with sheathing bases and squarrose recurved points; inner leaves oblong-ovate, rather abruptly long filiform-acuminate, costate. *Sporophyte* 2–4.5 cm. high; seta red-brown, very strongly papillose; capsule red-brown, 2.5 mm. long, 2.5–3 : 1, oblong-ovoid, arcuate and horizontal, somewhat contracted under the mouth when dry and empty; operculum conic-apiculate; annulus present; cilia 2 or 3, strongly nodose; spores roughened, 13–20μ, maturing in early winter.

Type locality, British Columbia (Lyall and Douglas.)

On moist rocks and soil. California, Idaho, Montana and intervening territory. Not yet reported east of the Rocky Mts.

ILLUSTRATIONS.—Sull. Icon. Musc. *pl 76*; Mitt. l. c.

EXSICCATI.—Sull. and Lesq. l.c.

Distinguished from *B. rutabulum*, which it resembles by being dioicous and having a much more slender habit. I have examined a portion of the type and find that it has long filiform-acuminate perichaetial leaves, although this is not in accordance with either Sullivant's or Mitten's figures. Specimens of *B. spurio-rutabulum* from Burrard's Inlet (Macoun, Can. Musc. 651) contain *B. asperrimum* mixed with another sterile moss which has very strongly plicate leaves. Authentic specimens of *B. Columbico-rutabulum* from type collection can be separated from *B. asperrimum* by nothing excepting that they are said to be monoicous: no male branches could be found on any of the plants examined. Type specimens of *B. gemmascens* are certainly dioicous; they grew on a wet log and were apparently submerged at times, thus giving an unusual appearance to the plant: its principal leaf characters are identical with those of *B. asperrimum.* Cardot writes that he is sure *B. Villardi* is distinct from *B. asperrimum*, as he found male and female branches on the same plant. I, however, am not able satisfactorily to differentiate it and a specimen from Cardot himself seems dioicious, as a great abundance of male branches were found on one of the plants examined, but not a single female branch. Specimens of *B. subintricatum* from type collection are not distinguishable from *B. asperrimum.* Macoun, Can. Musc. 560 issued as *B. subintricatum* has long, creeping, pinnately branching stems; branch leaves very narrowly lanceolate; sterile. Almost certainly a different moss from the original.

12. BRACHYTHECIUM LAMPROCHRYSEUM C. Muell. & Kindb. Macoun, Cat. Can. Pl. 6: 199. 1892.

Gametophyte in wide thick tufts, glossy golden-yellow to yellow-green, brown underneath; stems very stout, 5–10 cm. long, creeping and long persisting, ascending at the ends, irregularly divided, sending up numerous secondary stems; secondary stems 3–5 cm. high, irregularly branching, often slightly curved at the ends; branches few or numerous, 5–10 mm. long, terete-foliate; branch leaves distant, open, ovate to ovate-lanceolate, not decurrent, 1.2 x 0.6 mm., acuminate with apex twisted, denticulate all around, strongly plicate; costa stout, extending $\frac{2}{3}$–$\frac{3}{4}$ length of leaf; median cells linear-oblong, 7–10:1; basal somewhat shorter and broader; alar not differentiated; stem leaves triangular-ovate, slightly auricled, 2–2.5 × 0.8–1.2 mm., more loosely areolate, very strongly plicate; basal and alar cells oblong to elliptical; costa extending $\frac{4}{5}$ the length of the leaf, very slender above: dioicous; male branches gemmiform; perigonial leaves broadly ovate, ecostate, narrowed to a long linear-lanceolate acumination which is 1–2 times as long as the body of the leaf; antheridia oblong, short stipitate: perichaetium 2–3 mm. long; leaves sheathing at base, with squarrose-reflexed tips; inner leaves lanceolate, long filiform-acuminate, nearly ecostate. *Sporophyte* 2–3 cm. high; seta brown, very rough; capsule brown, oblong-cylindric, 2–2.5 mm. long, 2.5–3:1, suberect to horizontal, unsymmetric to arcuate; operculum, annulus and inner peristome unknown; peristomal teeth long filiform-pointed; spores nearly smooth, 16–20μ.

Type locality, Vancouver, Id. (Macoun).

On decaying wood in moist places, Calif. (Bolander); Mt. Shasta and Graham's Ranch, Calif. (Howe); Colorado (Brandegee).

The plant from Comox, Vancouver, Id. from which Kindberg evidently described the sporophyte is *B. asperrimum*, hence some discrepancies in the description. The sterile specimens from Mt. Benson and Mt. Finlayson should be regarded as the type. I have described the sporophyte from one of the collections of Mr. M. A. Howe. This species has much the aspect of *B. turgidum*, but has dentate, shorter pointed leaves and rough seta. It is distinguished from *B. rivulare* by its much longer-pointed leaves.

12a. BRACHYTHECIUM LAMPROCHRYSEUM GIGANTEUM n. var.

Stems much stouter, secondary stems with fewer branches; stem leaves distant, longer, 3–3.5 mm. long, very strongly plicate; extreme alar cells inflated. Capsule ovoid; operculum conic-rostrate; annulus large, persistent; segments as long as teeth, from a very broad basal membrane; cilia 2 or 3, well developed, nodose; spores maturing in winter. Atku Id., Behring Sea. (U. S. S. Albatross, No. 44. June 10, 1894.)

13. BRACHYTHECIUM RIVULARE Br. and Sch. Bryol. Eur. fasc. 52–54. *pl. 546.* 1853.

Gametophyte very robust, in wide thick intricate mats, dark green to yellow-green; stems woody, filiform, creeping, rather sparingly radiculose; young stems distantly foliate with minute leaves, the older apparently leafless, irregularly divided, sending up dendroid secondary stems; secondary stems stout, ascending-arcuate, 3–6 cm. long, nearly free from branches below, irregularly branching above; branches 5–15 mm. long, loosely terete-foliate, tapering; branch leaves erect spreading, ovate to ovate-lanceolate, somewhat decurrent, 1.2–1.5 × 0.5–0.6 mm., acute to short acuminate, dentate above with small sharp pointed teeth, strongly concave or somewhat plicate; margins plain or slightly reflexed below; costa extending ⅔ length of leaf; median cells linear, 10–15 : 1; basal broader and shorter; exteme alar cells abruptly enlarged; leaves of secondary stems very characteristic, distant, broadly ovate, rather abruptly short acuminate, 1.6–2 × 1.1–1.4 mm., concave, more or less plicate, denticulate; costa often forking; median cells

8–10 : 1 ; alar cells abruptly enlarged and inflated ; leaves of primary stems triangular-lanceolate, 0.8 × 0.5 mm., loosely areolate, without chlorophyl : dioicous ; male branches stipitate, inner perigonial leaves acuminate with broad much twisted apices : perichaetium 2.5 mm. long ; leaves sheathing at base with squarrose points ; the inner oblong-ovate, rather abruptly long subfiliform acuminate, entire or slightly denticulate, ecostate. *Sporophyte* 1.5–2 cm. high ; seta red-brown, very rough ; capsule 2–3 by 1 mm., oblong-ovoid, unsymmetric to arcuate, inclined to horizontal ; operculum conic-apiculate ; annulus large ; segments as long as the teeth ; cilia one or two, well developed, strongly nodose ; spores 13μ, smooth, maturing in early autumn.

Type locality European.

On moist earth in woods ; banks of rivers ; on stones in springs and brooks ; subaquatic. Northern U. S. and Canada, across the continent south to Virginia ; Pribiloff Islands (C. H. Merriam). Not yet reported from California or the extreme western United States. Several plants in the Columbia herbarium from California which have been referred to this species, are *B. lamprochryseum.*

Illustrations.—Br. & Sch. l. c. ; Husnot, Musc. Gall. *pl. 92.*

Exsiccati.—Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 337, (Ed. 2) 505 ; Austin, Musc. Appal. 319, 320, 321 and 317 (*B. rutabulum*) ; Macoun, Can. Musc. 288 ; Ren. & Card. Musc. Am. Sept. Exsic. 244.

This species is easily distinguished by its short acuminate stem leaves.

A very interesting form from New Brunswick (Fowler) and Bradford, Pa. (Burnett) has secondary stems 8–10 cm. long and apparently erect ; the leaves of these specimens are much more distant than usual. Mr. Burnett states that his plant grew in several inches of water, shaded by grasses and sedges. A rather uncommon form has the secondary stems simple and long flagelliform.

13a. Brachythecium rivulare cataractarum Sauter, Fl. Herzogth. Salzburg. **3** : 60. 1870.

Floating, dark green to golden green, brown underneath ; secondary stems much elongated, simple or sparingly branched ;

branches short, directed forward at an acute angle; leaves much more closely imbricated, especially at the tips of the branches.

On timbers of old dam, Staley's Creek, Virginia; sterile. (Dr. J. K. Small.)

14. BRACHYTHECIUM ACUMINATUM (Hedw.) Kindb. Can. Rec. Sci. **1894**: *72*. 1894.

Leskea acuminata Hedw. Sp. Musc. 224. *pl. 56.* 1801.

Leskea setosa Hedw. Sp. Musc. 226. *pl. 57.* 1801.

Leskea Beyrichii Hampe. Linnaea, **13**: 47. 1839.

Hypnum acuminatum C. Muell. Syn. **2**: 334. 1851.

Hypnum erectum Drumm. Musc. Am. 224.

Homalothecium acuminatum Jaeger & Sauer. St. Gall. Nat. Gesell. **1877–1878**: 309.

Gametophyte in wide, rather densely caespitose tufts, green to glossy yellow-green; stems creeping, radiculose, primary branches erect or ascending, 1–3 cm. long, sparingly divided, somewhat radiculose, often with radiculose tips; branchlets unequal, tapering, subjulaceous, terete-foliate; branch leaves erect-imbricated, open and appressed when dry, lanceolate to ovate-lanceolate, somewhat decurrent, 1–1.6 × 0.4–0.6 mm., acuminate, more or less serrate above, concave, somewhat plicate; margins often somewhat revolute; costa extending above middle; median cells linear, 9: 1; marginal cells broader; basal enlarged, quadrate; leaves of main branches deltoid ovate, broader: dioicous; male branches borne on the stem, gemmiform; antheridia oblong, stipitate; perigonial leaves ovate-lanceolate, long-acuminate, concave: perichaetium 2–2.5 mm. long; leaves loosely erect, the inner ovate-lanceolate to oblong-lanceolate, long filiform-acuminate, distantly dentate above, costate nearly to middle. *Sporophyte* 1.5–2 cm. high; seta red-brown, smooth; capsule brown, cylindric, erect or very slightly curved, varying greatly in size, 1.5–3 mm. long; operculum conic to short rostrate; annulus none; teeth of peristome united at base, lanceolate, with slender hyaline papillose-roughened points, red-brown below, margined; segments linear-lanceolate from a narrow basal membrane, slightly papillose-roughened above, about the length of the teeth; cilia very rudimentary or none; spores minutely roughened, 12–16μ, maturing in autumn.

Type locality, Lancaster, Pa. (Muhlenburg).

On decaying wood, bases of trees, rocks and earth, in woods or shady places. Eastern North America west to Minnesota, south to Missouri and Louisiana; not rare.

ILLUSTRATIONS.—Sull. Icon. Musc. *pl. 116;* Hedw. l. c.; Hampe, Icones Musc. *pl 7*.

EXSICCATI.—Drumm. Musc. Am. (S. States) 124 (*Leskea setosa* var.), 125 (*L. setosa*), 126 (*L. acuminata*); Sull. Musc. Allegh. 72; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 330, (Ed. 2) 491, 492 and 493; Austin, Musc. Appal. 310; Macoun, Can. Musc. 282.

This species is very variable in width of basal membrane, width of segments, shape of leaves and length of acumination, but no one of these variations seems to be correlated with any other.

Hedwig's type has lanceolate branch leaves, becoming broadly lanceolate below; basal membrane of medium width; the plants are small and slender, leaves serrulate above and more contracted at base than usual. The form ordinarily distributed as the species corresponds to Hedwig's *setosa*, but the two cannot be distinguished except as extreme forms of one species. The leaf of *acuminata* figured by Hedwig must be a stem leaf, as the branch leaves of his type are lanceolate. The varieties of the Musc. Bor. Am. of Sull. and Lesq. do not correspond with the original plants.

14a. BRACHYTHECIUM ACUMINATUM RUPINCOLUM (Sull. and Lesq.) Ren. & Card. Rev. Bryol. **20**: 17. 1893.

Hypnum acuminatum rupincolum Sull. and Lesq. Mosses of North America, 336. 1884.

Leskea rupincola Hedw. Sp. Musc. 227. *pl. 54.*

Characterized by an extremely narrow basal membrane. Probably having the range of the species but found most frequently in the southeastern United States.

Var. FILIFORME E. G. Britton, Mem. Torr. Bot. Club, **4**: 185. 1893, is not a *Brachythecium*.

15. BRACHYTHECIUM SPLENDENS Aust. Bot. Gaz. **2**: 111. 1877.

Brachythecium acuminatum subalbicans Ren. & Card. Bot. Gaz. **15**: 60. 1890.

Gametophyte in dense glossy yellow-green mats; stems creeping, closely applied to the substratum, rhizome like, 4–6 cm. long, sending up erect julaceous, densely foliate branches; branches terete-foliate, 5–20 mm. long; branchlets few; branch leaves erect, closely and regularly imbricate, broadly ovate-lanceolate to triangular-ovate, cordate-auriculate, $1.5–2 \times 0.6–0.8$ mm., concave, 2 to 4 times plicate, distantly and finely denticulate; costa extending ⅔–¾ length of leaf; median leaf-cells linear, 12–15 : 1; basal and alar cells rhomboidal to quadrate; stem leaves broader, deltoid to triangular-ovate: dioicous (?); perichaetium 2.5 mm. long; the leaves sheathing at base with loosely erect tips; the inner ovate to ovate-lanceolate, abruptly narrowed to a long filiform acumination, distantly dentate-serrate above, thinly costate; the outer more strongly serrate and nearly ecostate. *Sporophyte* 15 to 25 mm. high; seta smooth, dark chestnut; capsule dark chestnut, 2–2.5 mm. long without operculum, oblong-cylindric, erect and symmetric; teeth of peristome dark red-brown; segments narrowly linear, from a rather narrow basal membrane, yellow-brown; cilia single, slender.

Type locality, on palmetto trunks, St. Augustine, Fla., Feb., 1877 (J. Donnell Smith); on roots of cypress, Roseville, Fla. (J. D. S.); Louisiana (Langlois).

No capsules except such as were old and deoperculate have been seen. The species is beautiful and distinct. It is distinguished from *B. biventrosum* by its much greater size and brilliant color and lustre. Austin's type is a small form of the species; this, perhaps, led him to confuse it with *B. biventrosum.*

16. Brachythecium biventrosum C. Muell. Bull. Torr. Club, **5**: 49. 1874.

Gametophyte loosely caespitose, light green; plants small and slender; stems creeping, subpinnately branching; branches slender, 3–8 mm. long, julaceous, terete-foliate; branch leaves appressed-imbricate, lanceolate to narrowly ovate-lanceolate, gradually narrowed to a long slender point, serrulate with small distant teeth, concave or bisulcate at base; costa extending ⅔ the length of the leaf; median cells linear, 10–13:1; basal cells shorter and broader; alar quadrate, indistinct: dioicous; inner perichaetial leaves sheathing at base, more or less abruptly narrowed into a filiform reflexed acumination, dentate above, ecostate. *Sporophyte* 10–15 mm. high; seta red-brown, smooth; capsule red-brown, oblong, about 1.8 mm. long and less than half as thick, erect and symmetric; operculum conic, apiculate; annulus lacking; segments of peristome attached to a narrow basal membrane, split between the articulations; cilia single, rudimentary.

Type specimen on trunks and roots of trees in woods near Baton Bouge, La. (Dr. Joor). (Type seen; specimens examined by Mueller were communicated to the Columbia Herbarium by Dr. Mohr.)

B. biventrosum is closely allied to *B. acuminatum*, from which it is distinguished by its smaller size and by its very narrowly pointed leaves with fewer and indistinct alar cells.

17. BRACHYTHECIUM CYRTOPHYLLUM Kindb. Ottawa Nat. 4: 63. 1890.

Gametophyte caespitose; tufts glossy-green, usually densely intricate; stems irregularly divided and branching; branches filiform, subjulaceous, 5–10 mm. long; branch leaves open-erect, appressed-imbricate when dry, ovate to ovate-lanceolate, acute or short acuminate, 0.7×0.3 mm., serrulate, very concave; margins reflexed below; costa extending ⅔–¾ length of leaf; median cells fusiform, 4–8 : 1; many basal cells shorter and broader; quadrate alar cells numerous; stem leaves broadly ovate, acuminate, 0.7×0.4 mm.; median leaf-cells 3–5 : 1 : dioicous. Sporophyte unknown.

Type locality, Brighton, Northumberland Co., Ontario, October 6, 1888 (Macoun). Type seen.

Roots of trees and old logs. Belleville, Ont. (Macoun); Waterloo, N. Y., Austin, 602; *Hypnum* (*Brachythecium*) *julaceum* sp. nov. (Ms. notes in Austin's herbarium.)

EXSICCATI.—Aust. Musc. Appal. 311. (*Brachythecium acuminatum* var. *setosum*.)

Closely allied to *B. acuminatum*, distinguished by its filiform stems and branches and small leaves with shorter cells.

18. BRACHYTHECIUM PLUMOSUM (Sw.) Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 537.* 1853.

Hypnum plumosum Sw. Disp. Musc. Suec. 66. 1799. Not Huds. or Hedw.

Hypnum pseudo-plumosum Brid. Musc. Rec. **2**^{2}: 108. 1801.

Hypnum flagellare Hedw. Sp. Musc. 282. *pl. 73, f. 1–3.* 1801. (*Fide* Limpricht). Not Dicks.

Hypnum chrysostomum Mx. Fl. Bor. Am. **2**: 319. 1803. (*Fide* Limpricht).

Brachythecium rutabuliforme Kindb. Macoun, Cat. Can. Pl. 6: 198.

Gametophyte robust, in wide loosely-intricate mats, brownish-green to golden-green, usually glossy on the surface, brown underneath; stems 3–6 cm. long, creeping, pinnately branching, clinging closely to the substratum at the borders of the mats; branches ascending or erect, straight or somewhat curved, 5–10 mm long; branch leaves equally spreading or somewhat secund, rather loosely erect-spreading, lanceolate to broadly ovate-lanceolate, long-acuminate, 1.1–1.5 × 0.4–0.5 mm., entire or serrulate near apex, more or less concave, decurrent; costa extending ⅔ the length of the leaf; median cells linear, 8–12 : 1; a few basal cells broader and shorter; quadrate alar cells few; stem leaves narrowly triangular-ovate to broadly ovate, acuminate, more loosely areolate, nearly entire: monoicous; male branches abundant; antheridia oblong; inner perigonial leaves ovate-acuminate, bordered by a row of narrow cells, generally costate: perichaetium 1.5–2 mm. long; leaves sheathing with spreading points, oblong-ovate to oblong-lanceolate, rather abruptly narrowed to a long slender acumination, nearly entire, more or less distinctly costate. *Sporophyte* 7–20 mm. high; seta dark red-brown to almost black, rough above, nearly smooth below; capsule chestnut brown, black when old, oblong-ovoid, 2.2–2.5 mm. long, 2.5 : 1, horizontal to suberect, nearly symmetric or slightly curved, slightly contracted under the mouth when dry; operculum conic, almost rostrate; annulus narrow, of a single row of cells; cilia 2 or 3, well developed, appendiculate; spores nearly smooth, 13–16μ, maturing in late autumn.

Type locality European.

Subaquatic, on moist rocks in woods and in brooks, especially in mountain regions. Northeastern United States and Canada; west to Minnesota; British Columbia (Macoun); south to North Carolina.

ILLUSTRATIONS.—Br. & Sch. l. c.; Hedw. l. c.; Wils. Bryol. Brit. *pl. 25;* Husnot, Musc. Gall. *pl. 94.*

EXSICCATI.—Sull. Musc. Allegh. 40; Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 332, (Ed. 2) 496 and 498; Austin, Musc. Appal. 325, 326, 327; Macoun, Can. Musc. 289; Ren. & Card. Musc. Am. Sept. Exsic. 110.

18a. B. PLUMOSUM HOMOMALLUM Br. & Sch. l. c. Branches curved at apex, leaves falcate-secund, smaller. With the ordinary form.

EXSICCATI.—Sull. Musc. Allegh. 41 (*Hypnum pseudo-plumosum;* Sull.& Lesq. Musc. Bor. Am. (Ed. 1) 332[b], (Ed. 2) 497.

Distinguished from most of the species by having the seta smooth below and rough above; from *B. campestre* by having the leaves shorter, more abruptly pointed, nearly entire and not plicate; from *B. populeum* by the shorter costa, which does not extend into the apex; all the accessible descriptions speak of the perichaetial leaves as ecostate, but the perichaetial leaves of Limpricht's Bryol. Sil. 242 and Husnot's Musc. Gall. 277a were very conspicuously costate and such was the case in all the American specimens examined. Specimens of *B. rutabuliforme* from the type collection have the seta nearly smooth below instead of very rough and are certainly referable to *B. plumosum.*

19. BRACHYTHECIUM POPULEUM (Hedw.) Br. & Sch. Bryol. Eur. fasc. 52–54, *pl. 535* and *536.* 1853.

Hypnum populeum Hedw. Sp. Musc. 270. *pl. 70. f. 1–6.* 1801.

Hypnum Stereodon Laureri Funck; Brid. Bryol. Univ. **2**: 595. 1827. (*Fide* Limpricht).

Hypnum saxicola Voit; Sturm, Deutschl. Fl. **2**: fasc. 12. 1812.

Brachythecium nanopes C. Muell. & Kindb. Macoun, Cat. Can. Pl. 6: 201. 1892.

Eurhynchium populeum Kindb. Can. Rec. Sci. **1894**: 23. 1894.

Gametophyte in wide, loosely intricate mats, dark green to yellowish green; stems 2–5 cm. long, creeping, stoloniferous, attached to the substratum by dense fascicles of radicles, subpinnately branching; branches 3–10 mm. long, terete-foliate; branch leaves erect-spreading; the upper lanceolate; the lower broadly ovate-lanceolate, 1–1.2 × 0.25–0.4 mm., slightly decurrent, subulate acuminate, more or less concave, nearly entire or finely serrate above, margins revolute below; costa stout, extending into the apex; median leaf-cells linear-oblong, 5–8 : 1; several rows of basal and alar cells rhomboidal to quadrate; stem leaves 1.4–1.8 × 0.5–0.6 mm., broadly ovate, slenderly acuminate with apex usually more or less contorted, nearly entire, not plicate or sulcate; leaf-cells broader and shorter: autoicous; male branches gemmiform, abundant; perigonial leaves ovate, abruptly acuminate; the inner faintly costate and serrate at the apex: perichaetium 1.5–2 mm. long; the leaves sheathing at the base, with spreading points, oblong-lanceolate, rather abruptly narrowed to a subfiliform acumination, entire or slightly serrate above; costa well developed. *Sporophyte* 10–15 mm. high; seta red-brown, roughened above with low broad papillae, nearly smooth below, (sometimes nearly smooth throughout); capsule brown, short-ovoid, unsymmetric, horizontal, 2 : 1; operculum very long-conic; annulus persistent, of a single row of cells; segments as long as the teeth, split between the articulations; cilia stout, variable, 1–3, more or less appendiculate; spores finely roughened, about 15μ, maturing in early winter.

Type locality European.

On stones, roots and trunks of trees, northeastern United States and Canada; Revelstoke, B. C. (Macoun); North Carolina (Brid. l. c.).

ILLUSTRATIONS.—Br. & Sch. l. c.; Wilson, Bryol. Brit. *pl. 24*; Husnot, Musc. Gall. *pl. 94*.

EXSICCATI.—Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 333, (Ed. 2) 499. Austin, Musc. Appal. 328; Macoun, Can. Musc. 441, 548 (*B. nanopes*).

Quite variable in size and shape of leaves and robustness of growth. Distinguished by its long-conic operculum, percurrent costa and partially roughened seta.

19a. BRACHYTHECIUM POPULEUM MAJUS Br. & Sch. l. c. *pl. 536. β.*

Stouter glossy, nearly bronze-colored, densely foliate, leaves longer; habit of *B. plumosum.*

On damp stones, Newfoundland (Waghorne).

19 b. BRACHYTHECIUM POPULEUM RUFESCENS Br. & Sch. l. c. ζ

Mats depressed, closely adhering to the substratum; branches short, numerous, erect or ascending; stem leaves appressed, shorter and narrower, broadly lanceolate, bronze colored, seta shorter.

On rocks, New Haven, Ct. (Pease).

19c. BRACHYTHECIUM POPULEUM OVATUM n. var.

Often having the appearance of var. *rufescens*, but with the stem leaves broadly cordate-ovate 1.4 by 0.8 mm., concave, margins reflexed below, rather abruptly narrowed to a much shorter subulate acumination; costa very stout, often ending below apex; branch leaves ovate-lanceolate, median cells 5 : 1.

On dry rocks in woods with *Grimmia apocarpa.* Johnson, Vt. (Grout); Peacham, Vt., (Dr. Blanchard); Indian Falls, Owen Sound (Macoun); New Harbor, Newfoundland, Jan. 30, 1891, (Rev. A. C. Waghorne).

20. BRACHYTHECIUM DIGASTRUM C. Muell & Kindb. Macoun, Cat. Can. Pl. 6: 190. 1892.

Gametophyte in wide, olive-green mats, not glossy; stems radiculose, creeping and closely applied to the substratum, pinnately branching; branches 5–10 mm. long, subjulaceous, terete-foliate; branch leaves loosely appressed-imbricate when dry, erect-open when moist, ovate to oblong-ovate, acute to short acuminate with apex more or less twisted, 0.8–1 mm. long and about ½ as broad, decurrent, bisulcate, very concave; margins reflexed below, serrulate; costa stout, extending ⅔–¾ length of leaf; median cells fusiform-hexagonal, 5–7 : 1; basal much shorter; quadrate alar cells numerous; stem leaves triangular-ovate, longer acuminate, more loosely areolate at base, less conspicuously serrulate, 1.2 × 0.8 mm.: monoicous; perichaetium 2–2.5 mm. long, sheathing; leaves slightly or not at all reflexed at apex, oblong-ovate, thinly costate, very loosely areolate, rather abruptly contracted into a long filiform flexuous acumination, slightly denticulate or entire. *Sporophyte* 15–20 mm. high; seta red-brown, smooth; capsule brown, oblong-arcuate, subhorizontal, 2–2.5 mm. long, 3 : 1; operculum long-conic, apiculate; segments shorter than the teeth; "cilia nodulose, not appendiculate, annulus none."

Type locality, McKay's bush, Ottawa, Ont., Oct. 12, 1889, (Macoun); Canaan Forks, N. B., 1889, (J. Moser). On rocks.

Authentic specimens from McKay's bush have been carefully studied. The species is entirely distinct from *B. oxycladon*. It is distinguished from that species by the shorter and shorter acuminate leaves, shorter leaf-cells, more numerous quadrate alar cells and shorter capsule. In general appearance it resembles *B. Novae Angliae*, but it is easily distinguished by its being monoicous and having a large area of clearly differentiated quadrate alar cells. Its microscopic characters place it clearly in the section with *B. populeum* from which it is distinguished by the broader branch leaves with shorter costa and by its smooth seta.

21. BRACHYTHECIUM REFLEXUM (Starke) Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 539.* 1853.

Hypnum reflexum Starke; Web. & Mohr. Bot. Taschenb. 306 and 476. 1807.

Leskea laxifolia Hook. Musc. Exot. *pl. 30.* 1818.

Hypnum laxifolium Schwaegr. Musc. Frond. Suppl. 2, **1**: 159. *pl. 143.* 1824. Lesq. & James, Man. 342. 1884.

Hypnum subtenue James, Proc. Acad. Phila. **1855**: 447. 1855.

Rigodium reflexum Kindb. Laubm. Schwed u. Norway, 14. 1883.

Eurhynchium reflexum Kindb. Can. Rec. Sci. **1894**: 22. 1894.

Gametophyte in wide, loosely intricate, dark green mats (occasionally yellow-green in sunny places); stems filiform, 5–10 cm. long, arcuate-procumbent, radiculose at points of contact with substratum, pinnately branching; branches filiform, about 5 mm. long, ascending, terete-foliate, attenuate at apex, not radiculose; branch leaves erect-open, loosely appressed-imbricate when dry, lanceolate, decurrent, 0.6–0.9 × 0.25–0.4 mm., gradually acuminate, serrate above, slightly concave; costa stout, extending into apex; median cells oblong-rhomboidal to oblong-hexagonal, 3–5 : 1; quadrate alar cells very numerous, extending up the sides of the leaf; stem leaves 0.8–1.2 × 0.5–0.8 mm., deltoid-ovate, long acuminate; acumination equaling ⅓ to ½ entire length of leaf: monoicous; male branches abundant, borne on the stem; antheridia oblong; perigonial leaves ovate, acuminate, very loosely areolate: perichaetium 2 mm. long; leaves sheathing at base with spreading tips; inner leaves oblong-ovate, long-acuminate, entire or serrate at apex, nearly ecostate. *Sporophyte* 10–15 mm. high; seta red-brown, very rough, twisted to the right below and usually to the left above; capsule red-brown to nearly black when old, 2 mm. long, 2 : 1, ovoid, horizontal, not constricted under the mouth when dry; operculum conic, apiculate; annulus of two rows of cells; cilia 2 or 3, stout, appendiculate; spores nearly smooth, 15–18μ, maturing in autumn or early winter.

Type locality European.

On decaying logs, roots of trees and detritus of siliceous rocks. Mountains of northern United States and eastern Canada; west to Lake Huron (Macoun) and Montana (R. S. Williams); Maryland (J. D. Smith).

Illustrations.—Br. & Sch. l. c. Husnot, Musc. Gall. *pl. 94*; Rab. Krypt. Fl. 4^3 : *f. 373*.

Exsiccati.—Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 503; Austin, Musc. Appal. 540; Macoun, Can. Musc. 286.

Limpricht l. c. states that the spores are papillose but I have been unable to find rough spores in either European or American material. Easily distinguished from the other American species by its filiform stems and branches and the areolation of the leaves approaching that of *Amblystegium.*

Hooker's type of *Leskea laxifolia* from the Northwest Coast (Menzies) has been seen and Dr. Best, Mrs. Britton and myself are agreed that it is this species.

22. Brachythecium glaciale Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 542.* 1853.

Gametophyte in loose glossy mats, yellow-green to brownish green; stems creeping or decumbent, subpinnately branching;

branches 5–8 mm. long; branch leaves often somewhat secund, loosely erect-spreading, decurrent, lanceolate, $1–1.2 \times 0.4–0.6$ mm., smaller toward the end of the branches, narrowly acute to acuminate, serrate, faintly or not at all plicate; costa extending nearly or quite to apex, often toothed on the back above and ending in a spine; median leaf-cells linear-oblong, 8–10 : 1; quadrate alar cells very numerous; stem leaves ovate, long-acuminate monoicous; perigonial leaves ovate, acuminate, serrulate at apex; antheridia short oblong: perichaetium sheathing, about 2 mm. long; inner leaves oblong-lanceolate, rather abruptly filiform acuminate with acumination erect or spreading, serrulate at apex, nearly or quite ecostate. *Sporophyte* 2–3 cm. high; seta red-brown, rough; capsule horizontal, unsymmetric, short-ovoid to subglobose, about 2.5 mm. long, 2 : 1; operculum conic-apiculate; annulus of two rows of cells, persistent; segments a little shorter than the teeth; cilia 2 or 3, long appendiculate in the American specimens; spores nearly smooth, about 12μ, maturing in winter.

Type locality European.

ILLUSTRATIONS.—Br. & Sch. l. c.; Husnot, Musc. Gall. *pl. 94;* Rab. Krypt. Fl. 4^3: *f. 372.*

Collected at Middle Arm, Bay of Islands, Newfoundland, February 11, 1896, by Rev. A. C. Waghorne.

Possesses characters intermediate between *B. Starkii* and *B. reflexum.* From *B. reflexum* it is easily distinguished by its more robust habit, and from *B. Starkii* by the usually percurrent costa. The length of the costa varies considerably even in the same plant.

Through the kindness of Professor Eug. Warming, of Copenhagen, specimens of the Greenland moss referred to *Brachythecium glaciale* Br. & Sch. (Fl. Gr. p. 337) have been seen. They are sterile and are certainly not *B. glaciale.* They resemble slender specimens of *B. rutabulum* more closely than they do any other American species.

23. BRACHYTHECIUM STARKEI (Brid.) Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 541.* 1853.

Hypnum Starkei Brid. Musc. Rec. 2^2: 107. 1801.

Eurhynchium Starkei Kindb. Can. Rec. Sci. **1894**: 23. 1894.

Gametophyte in wide, loose mats, dark green, seldom whitish-green; stems irregularly divided, pinnately branching, decumbent or ascending, arcuate and rooting at the tips; branches 5–20 mm. long, ascending and arcuate at the ends, more or less complanate-foliate; middle branch leaves distant, spreading, ovate-lanceolate, 1.4–1.7 × 0.7–0.9 mm., narrowly acute to acuminate, with apex often twisted, somewhat decurrent, strongly serrate, not plicate or sulcate when moist; costa extending beyond the middle; median cells linear-fusiform, 13 : 1; basal shorter and broader; a few of the alar cells rhomboidal to quadrate; stem leaves broadly ovate, broadly long-acuminate, less strongly serrate, more loosely areolate with a much larger area of rhomboid-quadrate cells at the base and alar angles: monoicous; male branches frequent, gemmiform; perigonial leaves ovate, acuminate, the outer with a well-defined costa: perichaetium 2.5 mm. long; leaves loosely sheathing with squarrose points; inner leaves oblong-lanceolate, gradually long and narrowly acuminate, costate, nearly entire; outer leaves shorter, ecostate. *Sporophyte* 2–2.5 cm. high; seta red-brown, roughened with large distinct papillae; capsule oblong-ovoid, dark red-brown, 2–2.5 mm. long, ½ as thick, strongly arcuate, horizontal, slightly narrowed under the mouth when dry; operculum conic; annulus of about two rows of cells; segments a little shorter than the teeth; cilia 2 or 3, appendiculate; spores nearly smooth, about 14μ, maturing in winter.

Type localities European.

On decaying logs and stumps in moist mountain regions. Northern United States and Canada across the continent; Vancouver Island (Macoun); Montana (R. S. Williams); south to New Jersey and Pennsylvania.

ILLUSTRATIONS.—Br. & Sch. l. c.; Husnot, Musc. Gall. *pl. 94*; Rab. Krypt., Fl. 4^3. *f. 368.*

EXSICCATI.—Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 336, (Ed. 2) 504; Austin, Musc. Appal. 323.

Fragmentary specimens of *Hypnum oedipodium* Mitt. (Journ. Linn. Soc. **8**: 32. 1865) of the type collection and from both the localities cited in the original description have been examined and could not be differentiated from the ordinary American *B. Starkei.* Specimens of *B. curtum* Lindb. identified by Lindberg himself, have been accessible through the kindness of V. F. Brotherus. The costa of the upper branch leaves was often found ending in a spine, and the cilia were also appendiculate. I have thus far been unable to differentiate *B. curtum* from *B. Starkei* in either American or European material. All the characters given as distinctive are quite variable, even on the same plant in many cases. The majority of the specimens of *B. Starkei* from northeastern North America are more loosely intricate and straggling than the typical European plant, they are also markedly complanate foliate and the costa often ends in a spine and is toothed on the back above. These forms are probably referable to var. *complanatum* Limpr. l. c.

24. Brachythecium Novae-Angliae (Sull. & Lesq.) Jaeger & Sauer. St. Gall. Nat. Gesell. **1876–1877**: 328.

Hypnum Novae-Angliae Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 338. 1856. Sull. Mosses of U. S. 76. 1856.

Eurhynchium Novae-Angliae Kindb. Can. Rec. Sci. **1894**: 23. 1894.

Gametophyte in wide loosely intricate mats, bright green on the outside, dirty brownish-green below, stems decumbent; secondary stems sub-erect, about 5 cm. long, subpinnately branching; branches erect-ascending, terete-foliate, subjulaceous, not attenuate, 5–10 mm. long; branch leaves erect-open, loosely appressed-imbricate when dry, ovate, decurrent, 0.8 × 0.4–0.5 mm., serrulate, very concave, not plicate, long acute to short acuminate; apex twisted ½ turn to the right; costa thick, extending beyond the middle of the leaf; median leaf-cells oblong-hexagonal, 5 : 1; alar and basal cells little differentiated; each leaf-cell with a small papilla at one end; stem leaves broadly ovate to triangular-ovate, 1 × 0.8 mm., longer acuminate; leaf-cells shorter: dioicous; male branches gemmiform; antheridia oblong; perigonial leaves oblong-ovate, gradually long-acuminate: perichaetium about 2 mm. long; the leaves with sheathing bases and squarrose points; inner leaves oblong, long filiform-acuminate, somewhat serrulate above, costate. *Sporophyte* 1–2 cm. high; seta dark red-brown, very rough with broad low papillae; capsule dark red-brown, almost black when old, oblong cylindric, 3–3.5 mm. long, 4–5 : 1, somewhat arcuate, horizontal to suberect; operculum long-conic, subrostellate; annulus large; segments nearly as long as the teeth; cilia one or two, nearly as long as the segments, strongly nodose; spores minutely roughened, 17–19μ, maturing in autumn.

Type locality, mountains of New England.

On earth and stones in wet shady places, especially in mountain regions. Northeastern United States and eastern Canada; south to Maryland; west to Wisconsin.

ILLUSTRATIONS.—Sull. Icon. Musc. *pl. 118.*

EXSICCATI.—Sull. & Lesq. Musc. Bor. Am. (Ed. 1) 338, (Ed. 2) 507; Aust. Musc. Appal. 329; Macoun, Can. Musc. 440; Ren. & Card. Musc. Am. Sept. Exsic. 109.

Easily distinguished by its rostellate capsule, short leaf-cells and twisted leaf apices. The species varies considerably in length of the acumination of leaves so that var. *Delamarei* Ren. & Card. Fl. Miq. 50, does not seem worthy of special mention, although I have not seen specimens of that form.

25. BRACHYTHECIUM VELUTINUM (L.) Br. & Sch. Bryol. Eur. fasc. 52–53. *pl. 538.* 1853.

Hypnum velutinum L. Sp. Pl. 358. 1753.

Hypnum intricatum Schreb. Sp. Flor. Lips. 1771.

Hypnum declivum Mitt. Journ. Linn. Soc. **8**: 33. *pl. 6.* 1865.

Brachythecium pseudo-erythrorrhizon Kindb. Hedwigia, **35**: 68. 1896.

Gametophyte in wide, dark green to light yellowish-green mats; primary stems about 5 cm. long, creeping, radiculose with fascicled radicles, irregularly divided, very sparingly leafy, leaves often reduced or even wanting in places, branching irregularly pinnate; branches short, 2–5 mm. in length; branch leaves loosely spreading, somewhat falcate-secund at the ends of the branches, lanceolate to ovate-lanceolate, 1–1.3 × 0.25–0.30 mm., gradually long-acuminate; apex usually falcate or twisted; margin serrate; costa extending beyond the middle, often toothed above on the back; median cells linear, 12:1; quadrate alar cells very few, confined to the extreme angles; stem leaves more narrowly lanceolate, usually longer acuminate, often much reduced in size: monoicous; male branches gemmiform; antheridia short-oblong, nearly sessile; inner perigonial leaves ovate-lanceolate, acute, bordered by a row of elongated cells: perichaetium 2 mm. long; leaves few, sheathing at base, the inner oblong-ovate, rather abruptly narrowed to a long acumination, sharply dentate above; costa wanting or short and slender. *Sporophyte* 15 mm. high; seta light brown, sometimes reddish, very rough, slightly or not at all twisted; capsule brown, short-oblong, arcuate, horizontal, contracted under the mouth when dry, 2–2.5 mm. long, 2–3:1; operculum conic; annulus large, easily detachable; segments lanceolate, as long as the teeth, attached to a basal membrane of median width, more or less split along the keel; cilia 2 or 3, nodose or subappendiculate; spores yellow-brown, minutely roughened, 10–13μ, maturing in autumn or winter.

Type locality European.

On earth or stones and trunks of trees at the base, in shady places. Northern United States and Canada, south to New Jersey; Calif. (Howe).

Illustrations.—Dill. Hist. Musc. *pl. 42, f. 61;* Br. & Sch. l. c.; Mitt. l. c.; Wils. Bryol. Brit. *pl. 26;* Husnot, Musc. Gall. *pl. 95.*

Exsiccati.—Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 500; Austin Musc. Appal. 324; Macoun, Can. Musc. 379.

Varying a great deal in robustness, roughness and length of seta and color of capsule, capsule often yellow-green. "A very variable species, plants slender or robust; stems more or less divided, and the branchlets varying in length; leaves close or more distant, bright green or yellow, opaque or glossy; capsule subglobose or oblong, on a short or long pedicel." Lesq. & James, Mosses of N. A., p. 340. *B. pseudo-erythrorrhizon* Kindb. is inserted as a synonym on the authority of M. Cardot (*Vide* Hedwigia **35**: 308, 1896) as no specimens have been accessible.

26. Brachythecium Leibergii n. sp.

Gametophyte in wide densely intricate green mats; stems decumbent or ascending, 3–5 cm. long, pinnately branching; branches 5–10 mm. long; branch leaves falcate-secund, decurrent, 1.2 × 0.4 mm., lanceolate, bisulcate or often plicate, gradually very slenderly acuminate, serrate, costate to beyond the middle; median cells fusiform, 8–10: 1; basal shorter and broader; quadrate alar cells numerous; stem leaves ovate to ovate-lanceolate, more strongly plicate: monoicous; male branches abundant, perigonial leaves ovate, acuminate, 1.4–1.6 × 0.6 mm.; costa lacking or faint: perichaetium 2.5 mm. long, loosely sheathing; leaves oblong-ovate, abruptly filiform-acuminate, nearly ecostate. *Sporophyte* 1.5–2 cm. high; seta red-brown, roughened with rather low blunt papillae, little twisted; capsule light brown, 1.5 mm. long, 1.5–2 : 1, short-ovoid, unsymmetric, horizontal; operculum short conic; annulus present; segments as long as teeth, cilia two or three, well-developed, appendiculate; spores smooth, 10–12μ, maturing in winter or early spring.

Type locality, summit of "Bareknob" Traille River Basin, Idaho, alt. 5500 ft. (J. B. Leiberg, 288. July, 1891).

The gametophyte closely resembles *B. erythrorrhizon*, from which it differs in the rough seta and in being monoicous. Easily distinguished from *B. velutinum* by the larger stem leaves.

27. Brachythecium Idahense R. & C. Bot. Gaz. **15**: 60. 1890.

Gametophyte in bright green, loosely intricate tufts; stems creeping, irregularly pinnate, branches ascending, somewhat curved at the ends, about 5 mm. long; branch leaves loosely erect-spreading, subsecund, more or less falcate, 0.6–0.9 × 0.3–0.4 mm., ovate-lanceolate, acuminate, strongly serrate, concave; margins reflexed below; costa stout, extending ⅔–¾ length of leaf; median cells linear-vermicular, 6–8 : 1; basal cells broader and shorter, alar quadrate; stem leaves larger, 0.8–1 × 0.35–0.5 mm., lanceolate from an ovate base, long-acuminate, plicate; basal cells more enlarged: monoicous; perichaetium 2 mm. long, sheathing; inner leaves nearly erect, oblong-lanceolate, very abruptly acuminate, serrate, nearly ecostate. *Sporophyte* 10–17 mm. high; seta red-brown, smooth; capsule 1.5–2.5 × 1 mm., ovoid, unsymmetric and horizontal; operculum obtusely conic; annulus large, of two rows of cells; segments as long as teeth; cilia 2, long, nodulose to subappendiculate; spores roughened, 10–12μ maturing in autumn.

Type locality, Lake Pend d'Oreille, Idaho, on logs. (Leiberg No. 130 in part); also Belt Mts. Montana, November 3, '91 (R. S. Williams).

Type specimens examined. This moss is clearly one of the *velutinum* group and is most likely to be mistaken for *B. suberythrorrhizon* or *B. collinum;* it differs from the former in the smaller, shorter leaves and abruptly acuminate perichaetial leaves; from the latter in the more robust habit and the less abruptly acuminate and falcate stem and branch leaves. The seta often bears traces of papillae. The author remarks, l. c., that "This species rather resembles *B. Bolanderi*, from which it is distinct by the smooth pedicel, monoecious inflorescence, the thicker capsule, the larger size and bright green tint of the tufts. It is more closely allied to the European *B. olympicum* Jur. from which it differs in the larger size, the larger broader plicate leaves, the basal areolation looser, with angular cells more numerous, quadrate, thin-walled, the costa narrower and shorter and the lid obtuse, not apiculate."

28. BRACHYTHECIUM SUBERYTHRORRHIZON Ren. & Card. Bot. Gaz. **19**: 238. 1894.

Gametophyte in thin tricate mats, green; stems creeping, subpinnately branching; branches 3–5 mm. long, decumbent or ascending; branch leaves oblong-lanceolate, long and slenderly acuminate, somewhat falcate, 1–1.2 × 0.3–0.35 mm., strongly serrate above, strongly concave or bisulcate, margins reflexed; costa extending beyond the middle; median cells linear, 10–15:1; basal broader and shorter; quadrate alar cells numerous; stem leaves oblong-lanceolate to ovate-lanceolate, 1.4 × 0.4–0.5 mm.: monoicous; perichaetium about 2 mm. long; leaves sheathing at base with erect-spreading points, ovate to ovate-lanceolate, filiform-acuminate, serrate at apex. *Sporophyte* 12–15 mm. high; seta smooth, red-brown; capsule brown, ovoid, suberect to horizontal, 2–2.5 by 1 mm., little or not at all contracted under the mouth when dry; operculum conic; annulus large, easily detachable, often coming off with operculum; segments as long as the teeth; cilia 1 or 2, well developed, nodose; spores 13μ, slightly roughened.

Type locality, Springdale, Boulder Co., Colorado (Mary Holzinger). Type seen.

"Nearly allied to *B. erythrorrhizon* Br. & Sch. from which it differs in the narrower leaves and the looser areolation." Also in the shorter pointed leaves and in being monoicous. Too close to *B. Idahense* from which it is distinguished by the larger, narrower leaves and gradually acuminate perichaetial leaves.

29. BRACHYTHECIUM COLLINUM (Schleich.) Br. & Sch. Bryol. Eur. fasc. 52–54, *pl. 548.* 1853.

Hypnum collinum Schleich. Cat. 1815.

Leskea Fendleri Sull. Mem. Am. Acad. **4**: 169. *pl. 1.* 1849.

Hypnum Fendleri Sull. Icon. Musc. 189. *pl. 117.* 1864.

Brachythecium Hillebrandi Lesq. Mem. Calif. Acad. **1**^{1}: 33. 1868.

Eurhynchium collinum Kindb. Can. Rec. Sci. **1894**: 22. 1894.

Gametophyte small, slender, in thin intricate mats, bright green and glossy above, often dirty green below; stems creeping, radiculose, much branched; branches erect, slender, usually julaceous, often subdivided, 3–6 mm. long, terete-foliate; branch leaves closely imbricate, ovate to broadly ovate-lanceolate, 0.3–0.5 × 0.7–0.9 mm., rather abruptly acuminate, serrulate at base, sharply serrate above, concave; costa extending to middle; median cells linear-oblong to fusiform, 3–6:1; quadrate alar cells numerous, usually chlorophyllose, extending up the margin; stem leaves broadly ovate: monoicous; male branches gemmiform, numerous, borne on the branches; antheridia oblong; inner perigonial leaves ovate-lanceolate, acuminate, serrate, ecostate: perichaetium 1.8–2 cm. long; inner leaves oblong-ovate, abruptly narrowed to a slender acumination, serrate; costa thin and short or wanting; upper leaf cells linear, the lower broader. *Sporophyte* 5–12 mm. high; seta yellow-brown, smooth or slightly roughened; capsules brown, ovoid, unsymmetric to arcuate, contracted below the mouth when dry, 2 mm. long, 2:1; operculum conic; annulus broad, of two rows of cells, easily detached; the segments as long as the teeth, lanceolate, attached to a basal membrane of medium width; cilia well developed, one or two, with sometimes rudiments of a third, nodose; spores yellow-brown, very nearly smooth, 10–12μ, maturing in autumn.

Type locality European.

On earth and rocks in mountains of western United States and

Canada; Peace River, Mt. Shasta, Colorado, Montana, New Mexico, and intermediate points; Greenland (Fl. Gr.).

ILLUSTRATIONS.—Br. & Sch. l. c.; Sull. l. c.

EXSICCATI.—Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 501, (*Hypnum Fendleri*); Macoun, Canadian Musci, 398; Röll 1540, 1540[a], 1565[a]. Ren. & Card. Musc. Am. Sept. Exsic. 107.

After a critical examination of two sets of Fendler's collection from the type locality of *Leskea Fendleri*, no valid distinction between this and *B. collinum* could be detected as the setae of *B. collinum* is usually slightly roughened in both European and American specimens. Also one capsule of Fendler's plant had two well developed cilia. No specimens of *Brachythecium Hillebrandi* of the original collection have been accessible and all the specimens examined which have been referred to this are undoubtedly *B. collinum*. There are no distinctions except the shorter capsule, rough seta and simple annulus. The length of capsule is always subject to considerable variation.

B. collinum frequently has a rough seta and the terms simple and compound, as applied to the annulus, have been used in a very loose way.

30. BRACHYTHECIUM UTAHENSE James, Bot. King Exped. 409. 1871.

Hypnum Utahense Lesq. & James, Mosses of North America, 339. 1884.

Eurhynchium Utahense Kindb. Can. Rec. Sci. **1894**: 22. 1894.

Gametophyte light green, loosely caespitose, small and slender; stems short, creeping, radiculose, irregularly branching; branches 3–5 mm. long; branch leaves pluriseriate, loosely imbricate, oblong-lanceolate to ovate-lanceolate, 0.9 × 0.3–0.4 mm., acuminate, serrulate below, serrate above, somewhat concave; margins slightly reflexed below; costa extending to the middle or beyond; median cells linear-fusiform, length 6–9 : 1; quadrate alar cells numerous: synoicous; antheridia mixed with the archegonia, oblong: perichaetium 0.8 mm. long; inner leaves serrate, acuminate from a broad sheathing base, ecostate. *Sporophyte* about 5 mm. high; seta brown, smooth; capsules brown, subglobose to oblong-ovoid, erect, nearly or quite symmetric, 2 mm. long, 3 : 1; operculum long-conic; annulus obscure; segments linear-lanceolate, as long as the teeth; basal membrane comparatively narrow; cilia rudimentary, 1 or 2; spores yellow-brown, very slightly roughened, 10–15μ, maturing in winter.

Type locality, sandstone rocks overhanging a dry stream bed near Hanging Rock Station, Echo Canyon, Utah, Alt. 6000 feet (Watson); also found at Bald Mt., western Montana (Watson); Arizona (Pringle).

ILLUSTRATIONS.—Sull. Icon. Musc. Suppl. *pl. 73.*

Closely allied to *B. collinum* but easily distinguished by the erect capsule and rudimentary cilia.

31. BRACHYTHECIUM ERYTHRORRHIZON Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 547.* 1853.

Eurhynchium erythrorrhizon Kindb. Can. Rec. Sci. **1894**: 23. 1894.

Gametophyte in wide, intricate mats, light green, somewhat glossy; stems slender, 4 cm. or more long, radiculose, pinnately branching, not stoloniferous; branches 3–8 mm. long, ascending, the longer often arcuate and decumbent; branch leaves erect-spreading, 1–1.5 × 0.3–0.5 mm., more or less falcate-secund, lanceolate to ovate-lanceolate, gradually long and narrowly acuminate, serrate above, often plicate, costate to above the middle; margins more or less reflexed; median cells linear-vermicular, 8–10 : 1; quadrate alar cells distinct; stem leaves larger, ovate to ovate-lanceolate, plicate, nearly entire: dioicous; perichaetial leaves loosely erect, ovate to oblong-lanceolate, long and narrowly acuminate. *Sporophyte* 10–15 mm. high; seta red-brown, smooth; capsule red-brown, ovoid, unsymmetric and horizontal, 2 mm. long, 2–2.5 : 1; operculum conic, apiculate; annulus present; segments somewhat shorter than the teeth; cilia 1 or 2, well developed; spores 14–20μ, roughened, maturing in autumn.

Type locality European.

Washington, Clealum Lake Ridge (Röll) no. 933; Belt Mountains and Columbia Falls, Montana (R. S. Williams); Colorado (Brandegee); White Mountains (Austin, 1872); Newfoundland (Rev. A. C. Waghorne).

ILLUSTRATIONS.—Br. & Sch. l. c.

Careful comparisons of this species with specimens of *B. harpi-*

dioides C. Muell. & Kindb. Macoun, Cat. Can. Pl. 6 : 194, make it almost certain that the two are identical. Although Prof. Macoun assures me that the specimens sent are identical with Kindberg's types, the plant from New Brunswick is not the same as that from British Columbia which appears to be *B. erythrorrhizon.*

31a. BRACHYTHECIUM ERYTHRORRHIZON THEDENII (Br. & Sch.) Lindb. Musc. Scand. 36. 1879.

Brachythecium Thedenii Br. & Sch. Bryol. Eur. fasc. 52–54. *pl. 17.* 1853.

Stems 5–10 cm. long, slender and creeping, often stoloniferous; branching regularly pinnate; branch leaves long filiform-acuminate; perichaetial leaves very long filiform-acuminate. Seta distantly but distinctly papillose.

Errol Dam, Androscoggin River, N. H. (James).

The variety is one of the rarest of mosses, found in Europe. only in Finland and Sweden.

James' plant has been carefully compared with authentic European specimens and differs chiefly in the larger leaves which approach the typical form. The slightly scabrous seta is a character not heretofore noted, but it is quite conspicuous in specimens from Sweden which were identified by Schimper himself.

Schimper's figure exaggerates the serration of the perichaetial leaves.

32. BRACHYTHECIUM BOLANDERI (Lesq.) Jaeger & Sauer. St. Gall. Nat. Gesell. **1877–78** : 324.

Hypnum Bolanderi Lesq. Trans. Am. Phil. Soc. **13** : 12. 1869.

Eurhynchium Bolanderi Kindb. Can. Rec. Sci. **1894** : 22. 1894.

Gametophyte in wide, pale green mats; stems 3–5 cm. long, irregularly divided, creeping, subpinnately branching, sparsely radiculose; branches 3–6 mm. long, ascending, terete-foliate; branch leaves erect-spreading, rather distant, ovate-lanceolate, gradually acuminate, 0.6–0.8 × 0.25–0.3 mm., serrate all around, not concave or plicate, costa extending beyond the middle; median leaf-cells rhomboidal-fusiform, 5–10 : 1; basal cells shorter and broader; quadrate alar cells few; stem leaves smaller, less distinctly serrate, often nearly entire: dioicous; perichaetium 2 mm. long, loosely sheathing; inner leaves oblong-lanceolate, long filiform-acuminate, serrate with a few distant teeth, costa slender or lacking. *Sporophyte* 1–1.5 cm. high; seta blood red, very rough; capsule brown, 1.5–2 mm. long, 2 : 1, ovoid, unsymmetric, horizontal; operculum conic-apiculate; annulus large, compound; teeth of peristome red-brown below; segments a little shorter than the teeth, from a broad basal membrane; cilia 2, as long as the segments, nodose; spores nearly smooth, about 10μ, maturing in April.

Type locality, on shaded ground, Calif. (Bolander); also collected at Olema, Marin Co. (Howe).

Exsiccati.—Sull. & Lesq. Musc. Bor. Am. (Ed. 2) 502.

DOUBTFUL AND IMPERFECTLY KNOWN SPECIES.

33. Brachythecum mirabundum C. M. & Kindb. Macoun, Cat. Can. Pl. 6: 194. 1892.

"Tufts large, very laxly cohering, nearly without rhizoids, silky or yellowish-green, faintly shining. Stem elongate, irregularly divided or prolonged into sciuroid-curved, obtuse branches. Leaves loosely imbricate, crowded, when dry subrugose, when moist patent, short decurrent, indistinctly auriculate, faintly plicate, from the concave, ovate and gradually acuminate base long-cuspidate; borders broadly recurved at least at one side of the nearly entire base to the involute and distinctly denticulate acumen; cells pale, elongate, and narrow, the alar subquadrate and not much wider than the other basal ones, all sparingly chlorophyllose; costa vanishing in the acumen. Capsule small, at the base indistinctly gibbous, narrow, cylindric, and curved; lid elongate-conic; pedicel very short, 0.5–0.8 cm., very faintly muriculate. Perichetial leaves nerveless, longer filiform-cuspidate, irregularly sinuolate, the point patent or arcuate; basal cells larger, rectangular; archegonia numerous, about 20. Monoicous."

"This species is allied to *Brachythecium rutabulum*, differs principally in the minutely muriculate and short pedicel of the small, narrow capsule, also in the leaves."

"On old logs in woods, Canaan Forks, Queen's Co., and Elmwood, King's Co., N. B., July, 1888 (J. Moser)."

Although I have had all of Professor Macoun's material of this species, I have not found any trace of the sporophyte and am unable clearly to differentiate this species from *B. rutabulum*. The stem leaves are more slender-pointed than is usual with *B. rutabulum* and are also somewhat plicate.

34. BRACHYTHECIUM PSEUDO-STARKEI Ren. & Card. Bot. Centralbl. **44**: 423. 1890.

"Dioicous, loosely caespitose, green; stem erect or ascending, flexuous, laxly pinnate, branches elongate, attenuate: leaves not close, patulous, ovate-lanceolate, plicate, acuminate, acumen long, sometimes tortuous; margin generally serrate all around; costa extending into the acumen; cells linear-rhomboidal, elongate, attenuate, alar lax, soft, quadrate, hyaline: not fruiting."

Washington. (Röll.)

Evidently aquatic, very lax and distantly foliate, with the habit of an *Amblystegium*. Related to *B. rivulare* and *B. rutabulum;* distinguished from both by its slender habit; from the first by its more slender-pointed leaves; from the second by having the leaves plicate and the branch leaves shorter-pointed. Stem leaves 1.8–2 by 1 mm.; middle branch leaves 1.4 by 0.8 mm.

35. BRACHYTHECIUM RÖLLII Ren. & Card. Bot. Centralbl. **44**: 422. 1890. Hedwigia, **32**: 263. 1893.

"Dirty or yellowish-green: stems soft, depressed, scarcely radiculose, subpinnate; branches elongate, flexuous: leaves ovate-lanceolate, decurrent, quite long and narrowly acuminate, faintly plicate; margin sinuate or denticulate, plane in middle, revolute at base and at acumen; costa reaching beyond middle to ⅔ length; cells narrow, elongate, linear, alar cells few subquadrate; evidently dioicous."

Vancouver. (Röll.)

The leaves of this species are shaped much like those of *B. plumosum*, but they are conspicuously dentate.

36. BRACHYTHECIUM CAVERNOSUM Kindb. Rev. Bryol. **22**: 86. 1895.

"Differs from *B. rutabulum*: leaves very concave, plicate, recurved on both sides to the acumen; lower basal and alar cells small, green and not well defined; lid of the capsule longer apiculate or rostellate."

"Amer. Canada: White, com. Macoun."

37. BRACHYTHECIUM CALCAREUM Kindb. l. c.

"Resembles *B. intricatum* (*Hypnum* Hedw., *Brachythecium velutinum* (var.) Schimper) in the habit; differs from *B. laetum* (Brid.) Kindb. (non Schimp.), not occurring in Europe, in the entire stem-leaves, the larger alar cells and the shorter costa, from *B. salebrosum* also in the leaves curved or secund in dry state."

"Leaves crowded, long-acuminate and filiform-pointed, denticulate at the acumen or (the stem-leaves) nearly entire, more or less recurved, incurved falcate when dry, patent when moist; cells linear, the angular short, the alar ones few, much larger and hyaline. Stem-leaves with a broad base; costa short, mostly vanishing near the middle. Branch leaves narrow; costa nearly reaching to the acumen. Capsule small, arcuate; cilia not appendiculate; lid apiculate; pedicel smooth, about 1 centim. long. Tufts dense and radiculose, green and faintly glossy. Stem irregularly divided; branches not compressed; monoicous."

"Limestone rocks, Canada, Ottawa; 1892, Macoun."

38. BRACHYTHECIUM FITZGERALDI (C. Muell.) Ren. & Card. Rev. Bryol. **20**: 17. 1893.

Hypnum (*Brachythecium, Cavernularia*) *Fitzgeraldi* C. Muell. Flora, **70**: 224. 1887.

"Dioicous; tufts low, pulvinate, broad, yellow, loosely interwoven: stem with branches short, more or less parallel, slender, round-julaceous; branchlets very short, rather spreading, single: stem leaves closely appressed, when moist scarcely spreading with cordate base semi-circularly impressed, rather broad ovate, short-acuminate; more or less ventricose-concave on both sides of the narrow vanishing deeply canaliculate green costa; margin nearly plane, everywhere slightly denticulate; cells very narrow, long, pale yellow; alar cells many, small, hexagonal; fruit unknown."

Type locality, Florida. Collected by Fitzgerald. Specimens not seen.

No specimens of *B. Fitzgeraldi*, *B. cavernosum* or *B. calcareum* have been accessible and the original descriptions are quoted.

EXCLUDED SPECIES.

M. Cardot was the first to discover that *Brachythecium Donnellii* Aust. Bot. Gaz. **4**: 162, is not a *Brachythecium* at all, but a *Stereophyllum*, closely related to *Stereophyllum leucostegium* (Brid.) from Mexico and the Antilles.

Professor Warming also communicated specimens of the Greenland plant referred to *Brachythecium trachypodium* (Funck) Br. & Sch. (*Fl. Gr. p. 336*). They are sterile and I can see no reason why they should be referred to *B. trachypodium* rather than to the closely related *B. velutinum.*

Specimens of Ren. & Card. Musc. Am. Sept. Exs. 108. (*B. latifolium* Lindb. Philib.), seem to me to be nothing but slender forms of *B. rivulare.* The stem leaves have the characteristic short acumination of that species. The plants do not agree either with Limpricht's description of *B. latifolium*, or with European specimens of that species determined by Brotherus and kindly communicated by M. J. Cardot.

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MEMOIRS

OF THE

TORREY BOTANICAL CLUB

VOL. VI No. 3

THE LIFE HISTORY

OF

SPHAERELLA LACUSTRIS

(HAEMATOCOCCUS PLUVIALIS)

PLATES 86, 87

BY TRACY ELLIOT HAZEN

ISSUED June ~~MAY~~ 8, 1899

PRICE, - - - 50 CENTS

MEMOIRS

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TORREY BOTANICAL CLUB

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The Life History of Sphaerella lacustris (Haematococcus pluvialis)

By Tracy Elliot Hazen

(Plates 86, 87)

Sphaerella lacustris has often been employed in biological text-books (generally under the name *Haematococcus* or *Protococcus pluvialis*) as the lowest type of plant life. It is a type which is of particular value for elementary study because of its clear morphological characters and interesting development and also because this development may be regulated with comparative ease for class work.

Unfortunately, however, the treatment of the life history in the text-books is meagre and more or less marred by errors. Furthermore, although numerous memoirs and abstracts on this subject have been published, they are for the most part inaccessible to American students, or (especially in the case of abstracts) are so filled with misconceptions due to insufficient personal observation as to be of little value.

It was with the purpose of clearing up such errors, and of furnishing an account of the life history of this type that might be available for students, that the present study of *Sphaerella* was undertaken over two years ago.

In this report the first person has been frequently used because it was believed that the value of the account would be increased by thus clearly separating personal observations from previously published opinions.

I wish to express my gratitude to Professor L. R. Jones, of the

University of Vermont, and to Professor L. M. Underwood, of Columbia University, for their encouragement and aid in this study; and to the several botanists and zoölogists who have furnished information regarding the distribution of *Sphaerella* and especially those who have sent specimens for comparison.

General Account

Sphaerella lacustris is usually found in urns or shallow pools formed in rock hollows which are either periodically filled with rain or supplied by water oozing from overhanging ledges. In these pools a blood-red crust composed of an infinite multitude of minute spherical cells covers every loose fragment of rock and the sides of the basin. The bottom is usually less densely coated, partly because the motile forms in seeking air and light are left at the edges of the water as it evaporates, and partly because the plants resting on the dirt accumulating at the bottom are more easily washed out by storms than those adhering to the solid rock.

If a portion of the red crust after being scraped off and dried for a short time is placed in a dish of water over night, it will be found in the morning that many of the cells are in process of division. During this process the cell mass, whose inner contents are entirely obscured by the blood-red pigment, increases in size and elongates and the outer layer of the thick cellulose cell-wall ruptures and allows the inner layer to be pushed out in a bladder-like expansion (Fig. 3). This gives space for growth and also facilitates the complete rupture of the membrane. Division proceeds until four, eight, or sixteen daughter-cells are produced. These daughter cells increase somewhat in size by absorption of fluid and usually I have found that they form very delicate cell-walls about themselves before leaving the mother-cell-wall (Fig. 5). Each develops a pair of cilia which may sometimes be seen fifteen or twenty minutes before the time of escape.

In some way a rent is made in the attenuated part of the mother-membrane, or less frequently it becomes softened and the daughter-cell bursting out rapidly swims off, ciliated end foremost. These zooids which are often angular and irregular in shape at first, soon become ovoid in consequence of the pressure from within and the tension of the cilia. The forward movement is accompanied by a constant rotation on the longer axis, from right to left, so that the path described is a spiral. The cellulose investment of the zooid, which was at first indistinct or invisible, soon becomes separated from the colored contents by an accumulation of water and appears as a delicate colorless bounding line (Fig. 6). Sometime later under favorable circumstances this cell-wall becomes still further distended and very delicate strands of protoplasm may be seen radiating from the colored mass to the cell-wall (Fig. 7).

Meanwhile a border of yellowish-green chlorophyl has been forming about the zooid replacing the outer part of the haematochrom. After a longer or shorter period ot movement the zooids come to rest, usually adhering to some object by their cilia at first; the radial protoplasmic strands and cilia disappear, but often at the anterior end the sheaths which rigidly supported the bases of cilia remain, connecting the cell-wall with the protoplasmic body (Fig. 8). This quiescent cell may quickly divide again. The process, however, differs slightly from that of the original division as no appreciable distention of the mother-cell-wall occurs (Fig. 9); furthermore, the daughter-cells early develop cilia and move about within the mother cell-wall, often for half an hour or longer before going out; the daughter-cell-walls, also, are more likely to be well developed than those of the first generation. These zooids after breaking out increase in size forming more chlorophyl from the periphery inward like those of the first generation (Fig. 10). They also may arrive at a brief quiescent condition and repeat the process of division by which they were themselves formed (Figs. 11–14).

The time elapsing between these divisions is variable; sometimes the second generation is produced on the same morning as the first, but more frequently it appears that new generations are formed on successive mornings. How long this frequent division may continue has not been determined, but the colony may remain in the motile condition for three or four weeks.

At any point in the cycle, cells may go into a permanent resting stage. In that case, after the cessation of movement and disappearance of the protoplasmic processes (Fig. 16), a new thick cellulose coat is secreted close about the protoplasmic body (Fig. 17), while the distended cell-wall of the zooid gradually softens and decomposes. At the end of a long cycle of generations the cells have only a small central globule of haematochrom, but as the permanent resting stage advances the haematochrom increases from the center toward the periphery, the color passing through shades of golden green and brown (Fig. 18), until the whole cell is of the blood-red color of the original individual (Fig. 19). Such resting-cells do not develop further—except to increase in size—unless desiccation or freezing takes place.

If these cells are dried or subjected to a low temperature, even for a short time, and then again supplied with water, a new cycle of development begins. This may proceed in just the same way as the former cycle; under certain conditions, however, which have not been fully determined, the red resting-cell may divide into a number (4, 8, 16, 32) of microzooids which, unlike the megazooids, swarm actively within the mother-cell-wall for some time before coming out (Fig. 20). These microzooids shoot through the water in a very erratic manner; their shape is narrowly cylindrical or fusiform (Fig. 21), or somewhat ovoid in case their movement is less rapid; they have no visible cell-wall and their period of motility is much shorter than that of the megazooids. Many microzooids soon die, others come to rest, secrete a cellulose investment and probably grow into normal resting cells (Fig. 22).

HABITAT AND DISTRIBUTION

Sphaerella lacustris is reported as very common and widely distributed in Europe, where it is found from Scandinavia to Venice. It seemed quite probable, therefore, that investigation would prove an equally wide distribution in America, even though Wolle, in his Fresh Water Algae of the United States, was unable to furnish any information as to its occurrence here.

Inquiry among leading botanists and zoölogists has shown that the alga is distributed from Vermont to Texas and from Massachusetts to Nebraska (Professor C. E. Bessey) and probably farther west. All the specimens mentioned below, obtained from widely separated stations and from different types of habitat, I have kept under observation in cultures until there was not the slightest doubt that all were referable to the one species, *Sphaerella lacustris.*

I first collected this alga at Burlington, Vermont, in hollows of a red sandstone quarry where it had been obtained during several seasons for the use of classes in biology at the University of Vermont. I also found it in similar hollows of limestone ledges in the vicinity. I have made a careful study of these pools and found that in all cases they were small basins filled by rain or water oozing from the ledges above, but so shallow as frequently to be dried up during the summer. Similar but deeper basins side by side with these contained *Hydrodictyon* and *Spirogyra*, but no *Sphaerella*. The apparent reason was twofold: (1) The deeper pools did not furnish the condition of frequently alternating wetness and dryness which culture experiments show is favorable for prolonged vitality, and (2) If the *Sphaerella* did cover the bottom of these deeper basins as they dry up in the hottest weather, when they are re-filled by a heavy rain the cells would be so deeply buried as to be unable to get sufficient air for development.

Professor G. H. Hudson has sent me *Sphaerella* material from Plattsburgh, New York, where he collects it in hollows of an abandoned quarry in Chazy limestone and in a pot-hole of the Saranac River; he says "these pools become dry in summer and the stones look as if red paint had been spilled upon them."

Sphaerella is rather abundant in rock hollows near streams and about the lake at Ithaca, New York. Material collected there in December by Professor F. A. Waugh divided so rapidly that after two weeks I found all the zooids were of a comparatively small size.

Professor W. L. Bray has sent me material from Austin, Texas, where it is found in a pond which lasts almost all the year, forming part of a creek in winter, and also in creek pools near the Colorado River. Chodat ('97) finds that *Haematococcus* is present though not abundant even in the plankton of Swiss lakes, but he considers that in such cases it has been washed out of the rock basins which form its natural home along the shore.

I have *Sphaerella* material obtained in cemetery urns in Chicago by Professor C. B. Atwell, and in Baltimore by Mr. H. F. Perkins. Professor E. G. Conklin has also found it in such urns in Delaware, Ohio, Evanston, Ill., and Philadelphia. A note in Dr. Harriet Randolph's "Laboratory Directions in General Biology" suggests that the occurrence of *Haematococcus* in marble urns may be due to the lime in the water. It seems more probable, however, that it is simply because the urns provide the conditions of light, aëration, and evaporation demanded by *Sphaerella.* Further support of this view is found in the fact that Alexander Braun ('51) records the occurrence of this alga not only in basins of granite and sandstone, but also in holy water urns of iron and in a tin roof-gutter.

Dr. H. M. Richards has obtained *Sphaerella* from dripping rocks above high tide at Nahant, Mass. I have found it in a similar place in New York under an overhanging cliff, where the supply of moisture frequently fails even in winter.

This alga was distributed as *Haematococcus lacustris* (Girod) Rostaf. in the Phycotheca Boreali Americana (no. 114). The material was collected at Bridgeport, Conn., by Mr. Isaac Holden, who informs me that it "formed a soft coating on the vertical face of rough-hewn stones of the abutment of the dam, where the water percolated through the crevices and trickled down the surface. It was very abundant for several seasons, but has not appeared lately. On sloping and horizontal rocks, which had become dry and exposed to the sun, I have seen it forming a closely adherent thin red film, which could not be removed without difficulty." I have scraped such a red coating from a sloping ledge at Richmond, Vermont, which was washed by a very small spring in summer. At certain times, after an increase in the volume and force of the water, much less of the *Sphaerella* was to be seen.

Some years ago the fountain in the college yard at Cambridge, Mass., was green with zooids of *Sphaerella* for a time in the spring, but Dr. Farlow informs me that last year none could be found.

It will be noticed that in the last three localities conditions were unfavorable for the persistence of an organism which may be so easily swept away by an unusual force of water. We are, therefore, justified in concluding that the small rock basins provide the most secure home for *Sphaerella.*

THE RESTING CONDITION

In the typical resting-cells of *Sphaerella* which vary from eight to eighty microns in diameter, the only structure visible is the spherical mass of protoplasm closely enveloped in a thick membrane of cellulose. (Fig. 1.) By typical resting-cells are meant the entirely red cells, in which the vital processes are at a minimum; for often non-motile cells are found, in which considerable chlorophyl and pyrenoids and a nuclear area are seen, but these cells represent simply a transition between the motile condition and that of complete rest, or a state of non-motile vegetative propagation.

The nucleus and pyrenoids are, indeed, present in the typical resting-cells, but are hidden by the haematochrom, which, partly in solution in oil drops, and partly in micro-crystalline form (Zopf, '95), penetrates the whole mass of protoplasm. That some chlorophyl also is present, even in the pure red cells, is indicated by the researches of Englemann and Zopf.*

REPRODUCTION

Reproduction is accomplished in three ways:

1. By the formation of large motile daughter-cells or megazooids.
2. By the formation of non-motile daughter-cells.
3. By the formation of smaller motile-cells or microzooids.

THE FORMATION OF MEGAZOOIDS: THE FIRST GENERATION

Alexander Braun ('51) apparently was the first to note that the production of zooids under natural conditions occurs early in the morning. The time varies with the season of the year. In the summer the zooids leave the mother-cell-wall so early that I have found it hard to observe the act even by examining the material before sunrise. In early spring and in autumn division does not often take place in the open air before seven or eight o'clock. This variation is undoubtedly to be explained by the difference in the time of sunrise; but that the escape of the megazooids is due not to the atttainment of a certain intensity of light, but rather to the conditions of temperature is indicated by the fact that megazooids may be produced in absolute darkness. When dry material is placed in water in the morning and kept dark for a few hours, megazooids will be formed in abundance. At a temperature of 22°–26° C. five or six hours is sufficient time, while at 16°–20° six to nine hours may be required.

* See the section on the coloring matters.

In cloudy weather one is likely to find cases of division at almost any hour of the day if the temperature is favorable. This fact indicates that the light which promotes photosynthesis hinders the resorption of materials in preparation for division.

The time required for the formation of megazooids after the actual beginning of division varies with different conditions of light and temperature. In all cases that I have observed continuously under the microscope, the process has occupied at least an hour, often several hours. But there is good reason to believe that light retards the process of division, even as it is unfavorable to the preparatory process, for in completely darkened cultures I have repeatedly found that nearly all division is completed within an hour after its beginning is observed, while in cultures left in ordinary light dividing cells will be found for several hours.

Alexander Braun ('51) says that even before the beginning of division the red color begins to be replaced by a yellowish-green layer from the periphery inwards, but I have not found this to be the fact except when division is delayed, and in case of cells which have not gained the entirely red color of typical resting-cells. When division is accomplished promptly red cells produce red zooids.

After the first cleavage which is transverse, the division follows no constant rule; the second cleavage, though in a plane perpendicular to the first, may begin at both poles simultaneously or division may be completed in one hemisphere before it begins in the other. Often when four daughter-portions appear to be completely formed they divide again so as to form eight zooids, but more frequently when eight or sixteen zooids are to be produced the division is so irregular that it cannot be followed easily, or the mass may even appear to break up all at once into numerous daughter-cells.

Dangeard ('88) suggests as an explanation for such cases that possibly the resting cells contain several nuclei, and he also thinks that when more than four daughter-cells are formed, the reason may be that the mother-cells have been for some cause prevented from dividing at the normal point and have continued to increase in size. This explanation does not appear to me quite sufficient, for not infrequently eight or sixteen zooids are produced by cells no larger than those which produce four or eight.

I have been unable to find a record of the production of more than eight megazooids in one cell and it has even been stated in some of the text-books that when more than four daughter-cells are produced they are to be regarded as microzooids. Nevertheless I have frequently found in one cell-wall sixteen typical megazooids, each possessing a distinct cell-wall and in point of size equaling and sometimes surpassing the individuals produced in groups of four and eight (Fig. 23). Division often begins before there is any appreciable increase in the size of the cell-mass (Fig. 2), but very soon so much fluid is taken in by endosmosis that the cell-wall is distended until its outer layer is ruptured or softened and an inner layer is pushed out, doubling the original space (Fig. 46). That the amount of distention is not dependent on the amount of increase in the size of the daughter-cells is indicated by the fact that often much more space is formed than they can fill (Fig. 5). Probably this distention is of service also in rendering the membrane thin enough so that it can be ruptured easily when the zooids escape. Generally, however, this part of the cell-wall remains considerably rigid, for when, as sometimes happens, only a small slit is made for the escape of the zooids they are unable to stretch it, but are themselves compressed into a dumb-bell shape in squeezing out (Fig. 34).

It is said by both Cohn and Braun that the daughter-cells possess no cell-wall at the time of escape from the mother membrane. Parker ('93) states that the cell-walls and cilia of megazooids are formed sometimes before, sometimes after they leave the mother-cell-wall. In a great number of cases of division into four, eight and sixteen daughter-cells, the cell-walls have been distinguishable at the moment of escape, if not some time before; in other cases only the deceptive line of color refraction can be distinguished outside the boundary of the protoplasmic mass, but so delicate a structure might easily escape observation under ordinary objectives. As for the cilia it is difficult to imagine how the zooids could swim away from the mother-cell-wall if they were not formed before the escape.

THE FORMATION OF MEGAZOOIDS: THE LATER GENERATIONS

The second generation is normally produced after the zooid has passed through a very short quiescent stage, which is by no means equivalent to the regular resting stage since no thick cell-wall is formed.

Most frequently in all generations of megazooids after the first, I have found only two daughter-cells produced, but on two occasions I found that nearly all the megazooids of the second generation were produced in fours (Figs. 9, 52). Braun ('51) says this is the usual number and that more rarely two or eight are formed.

It is almost impossible in the later stages unless they are produced in drop cultures, to say certainly whether zooids belong to the second or a later generation, for the process of formation is similar in all cases after the first generation.

Braun ('51) states that in the later generations division often begins before the zooid comes to rest. I once found such a case where the mother-cell was swimming rapidly by means of its cilia which were still attached to one of the daughter-zooids, although each of these was moving independently by means of its own cilia (Fig. 38). Perty ('52) says that the cilia of the mother-cell continue to move until the protoplasm breaks up into the daughter-cells, and Cohn ('50) states that the movement may continue even after the cilia are detached from the daughter-cells; but in cases where I have seen these detached cilia remaining they have been quite rigid (Fig. 37), and the movement of the cell-wall was caused simply by the motion of the daughter-zooids within.

Perty ('52) has described a figure which he says represents division of a motile cell where the anterior part of the cell-wall is divided by constriction into two beaks, each of which possesses a pair of cilia, while the posterior part is still entire. This, however, must be considered a monstrosity, for normally only the protoplasmic part of a zooid is affected by division.

VEGETATIVE DIVISION

At the time of his first publication on *Protococcus*, Cohn ('50) undoubtedly thought that the production of non-motile cells from resting cells formed a regular part of the cycle of development; he indicates that the contents of the resting-cell divide into two parts, each of which becomes invested with a cellulose wall; each of these daughter-cells in turn forms two cells, all four become clothed with cell-walls and remain enclosed in the enlarged membrane of the original cell; each of these four cells may divide again to produce a third generation of daughter-cells which may become motile. In a later supplementary description, Cohn ('54) illustrates the development of *Chlamydococcus* by figures showing the formation of the zooids in a manner esssentially like that which I have observed (Figs. 2–5, 46–48), that is by successive divisions without the formation of cell-walls in the intermediate stages.

Later still Cohn * said there was need of further proof of the development of resting-cells directly from resting-cells (*Selbsttheilung*) which he had first described.

Braun ('51) asserted that a vegetative division does take place, but not as a part of the regular cycle of development previously described. He found that where the cells are kept simply moist and exposed to the air, as is the case under natural conditions, especially in the milder intervals of winter and on the moist edges of rock basins at other seasons, the cells multiply either by simple division or by double halving, but the daughter-cells thus formed do not slip out of the mother-cell-wall; they gradually acquire thick, close cell-walls, while the mother cell-wall expands and disappears. By the frequent repetition of such a process masses of cells become pressed together so that thick crusts of cells bounded by flat surfaces may be formed. This vegetative division is very rarely found in cultures in the laboratory, because of the difficulty of producing artificially the conditions which foster it.

Cohn ('50) notes that temperature is one of the factors which determine whether resting or motile cells shall be produced. On one occasion I found in a glass jar kept on a window ledge a large number of red cells which had developed daughter-cells indistinguishable from ordinary zooids in form. None of them, however, became motile (Fig. 49) and the only possible explanation was that after division had begun a sudden drop in the temperature prevented the daughter-cells from becoming zooids.

I have frequently examined the *Sphaerella* growing on a moist

* Cohn and Wichura. Ueber *Stephanosphaera pluvialis*. Nov. Act. Acad. Caes. **26**[1]: Nachtrag. 23. 1857.

rock during the present winter. Sometimes I have found large, scattered cells, at other times numerous clusters of small cells clearly indicating recent division, but never any zooids, even though at times there was sufficient water for movement. The reason here again appeared to be that the more abundant water supply was accompanied by so low a temperature that the motile state was not acquired. Material collected from the rock at such times and placed in a slightly warmer atmosphere produced abundant zooids (Figs. 23, 45–48).

Rostafinski ('75), indeed, reports that when he placed vessels containing many zoöspores outside a window at a temperature between 6° and 2° multiplication and production of zoöspores continued in normal fashion; when during the night the temperature fell and a mass of purple ice was formed, he found after slow thawing, a large number of zoöspores which showed active vibratory movements. I have repeatedly attempted to confirm these results but I have never been able to discover zooids produced at a temperature lower than 12°–15° C. I have always found that if a vessel containing zooids is slowly frozen the zooids may still continue to live under a crust of ice where the temperature of the water is about 1° C., but when actually imprisoned in ice they invariably die. Cohn ('50) also found that motile cells were killed by freezing. It is quite possible that Rostafinski thawed his cultures so slowly that new zooids were formed.

I have never found any evidence of any other type of vegetative propagation than the endogenous division already described. Cohn's figure 15 which has been copied by Bennett and Murray and others as the palmella-condition of *Protococcus* may be interpreted as a case of endogenous division in which the daughter-cells have been pressed together so as to be bounded partially by flat surfaces, while the mother-cell-wall has disappeared.

It is to be concluded then, that vegetative division plays an important part in the multiplication of *Sphaerella lacustris*, but that the process does not differ from that by which zooids are produced except that the motile condition is not acquired because of insufficient water, aëration, or temperature.

THE FORMATION OF MICROZOOIDS

Alexander Braun ('51) was apparently the first to distinguish accurately the microzooids from megazooids. He found that during the latter stages of the cycle of generations many cells, instead of producing only four daughter-cells, continued to divide so as to produce a mulberry-like mass which was finally broken up into sixteen or thirty-two minute cells. These "microgonidia" then began swarming actively within the mother-cell-wall and finally burst out; they were of longer shape than the large swarmers, only about 6.6 microns long, of yellowish green color with reddish ciliated points; they did not increase in size or acquire a perceptible membrane but most of them died after coming to rest; others turned into little red globules whose further development was uncertain. My own observations as to the character and manner of formation of the microzooids agree with Braun's account. Sometimes a zooid which has recently come to rest appears to be forming four megazooids but further watching discloses eight or sixteen active microzooids (Figs. 24, 25). I have, however, found microzooids developed most abundantly from red resting-cells which before being dried had been subject to unfavorable conditions (Fig. 20). The shape of microzooids varies from fusiform or cylindrical when they are most active to ovoid when they are more sluggish. Their rate of movement, nearly always more rapid than that of megazooids, is perhaps to be explained by the fact that their cilia are as long as those of megazooids while their bodies are much smaller. The color varies with that of the mother-cells from which they are produced, but usually when considerable of the yellowish green color is present the red pigment does not form a central mass as in megazooids but is collected at the anterior end (Fig. 28) or in a central girdle (Fig. 26). The movement of one brood of microzooids appears never to continue longer than through one day, though a new brood may be produced from other resting-cells in the same vessel on successive days for a week. Generally most of the microzooids die but sometimes after coming to rest they acquire a thick cell-wall and gradually increase in size as they grow red. I have been unable to develop them further.

By supplying nutriment to these red globules in Van Tieghem cells, Rostafinski ('75) succeeded in causing them to increase to the size of the ordinary resting condition, and then by transferring them to pure water obtained megazooids through the ordinary mode of division. Rostafinski discovered no conjugation and concluded that *Haematococcus* is an asexual plant. I have frequently found forms presenting the appearance of two microzooids fused at their anterior ciliated ends but no actual meeting has been observed and such forms may be explained as monstrosities resulting from incomplete division.

From the conditions of their formation, however, it seems to me that the microzooids must be potentially gametes. Their formation does not appear to depend entirely on the conditions which affect the water at the time the microzooids are produced, for megazooids may be produced in the same cultures at the same time. On the contrary, when, from lack of nourishment or of a sufficient temperature, the resting-cells are unable to grow to the usual size and strength, microzooids are produced much more abundantly. I have found particularly that when cultures containing *Sphaerella* are allowed to evaporate more rapidly than under natural conditions, the resting-cells collected on the sides of the vessel, if again supplied with water, nearly always produce microzooids in countless numbers. I have also obtained only microzooids from certain material collected (in Burlington) on rocks where it had been frozen most of the winter, but which, at milder intervals, had probably been able to produce small resting-cells. Material collected from the same place in May and June produced megazooids.

In addition to previous conditions of growth, at the time of division light seems to be favorable for the formation of microzooids. Sachs states that when a certain light intensity is reached swarm-spores will break forth. I have rarely been able to produce microzooids in cultures kept dark, as I have megazooids, but the same material, when subjected to a preparatory darkness over night and allowed to receive the natural gradual increase of light in the morning, produces abundant microzooids. On one occasion I found a recently motile cell in which division was beginning at nine o'clock in the evening; I kept it under observation for two hours, during which sixteen micro-daughter-cells were formed; but they did not become motile, perhaps because the light (from an ordinary student-lamp) was not sufficiently intense.

Since, therefore, microzooids of *Sphaerella* are formed under the conditions which Klebs found were necessary for the production of the sexual cells in the closely related genus *Chlamydomonas*, viz., lack of nutriment and presence of light, the assumption that they are potentially gametes appears to be justifiable. If no conjugation really takes place, its absence may be accounted for by the fact that in the successive conditions of activity, slow growth, and rest, a sufficient opportunity for rejuvenescence is found.

The so-called Conjugation of Megazooids

Velten ('71) has described and illustrated with considerable detail a process which he considered conjugation of megazooids. This does not differ essentially from cases which I have frequently observed. Two zooids are found attached together by their posterior ends (Fig. 42) and the content of one cell passes over into the other (Fig. 43), the cilia of each cell meanwhile keeping up active movement, at least for a part of the time. Finally a spherical zygote is produced which does not differ from the ordinary resting-cell (Fig. 44), the fate of which Velten did not learn. I have not been able to get any further development from such a product of fusion by cultivating it in a Van Tieghem cell.

Rostafinski ('75) rejects Velten's interpretation of this phenomenon on the ground that it is contrary to all previous observations, in that not microzoöspores, but megazoöspores conjugate, and by their posterior ends instead of by the ciliated points. So far Rostafinski's objection holds good; but when he goes on to say that Velten's conjugation is to be interpreted as a case of a parasitic monad swallowing a zoöspore of *Chlamydococcus*, I think he is entirely wrong, for the cases (*cf.* Figs. 39–44) I have observed admit of no such explanation. On the contrary, I think they are cases in which the original division was incomplete and the two-headed monster, after struggling in vain to complete the separation, fuses again to form one cell. This interpretation receives support from one case where I observed the actual formation of such a monstrosity. When the division had reached a stage similar to that shown in Fig. 47, the mother-cell-wall burst and one perfect zooid escaped while the rest of the cell-content issued forth in the form of a large ciliated mass with a smaller one attached, each part being invested with a cellulose membrane. Probably the premature rupture in this case was due to the pressure of the cover-glass; the double zooid, however, was vigorous enough to swim about actively after more water was supplied. Very frequently dumb-bell shaped pairs are found which are ciliated at both ends (Fig. 40) and which do not fuse but sometimes do succeed in becoming separate. More rarely three- or four-headed monstrosities of a similar nature are found (Fig. 41).

Velten said that these conjugating pairs were always to be found in glass vessels placed in sunlight. I have found these malformations more abundant under such conditions, but sometimes also even in darkened cultures.

THE ALLEGED AMOEBOID CONDITION

White ('80) has described what he thought might be the transformation of *Sphaerella* (*Protococcus pluvialis*) into an amoeboid condition. He found amoeboid organisms containing in the center a colored mass like that of *Sphaerella*, and he supposed that "the structureless envelope becomes the homogeneous part of the *Amoeba* while the granular center becomes the granular *Amoeba*." He says further, "I have to-day seen an *Amoeba* with a well-defined homogeneous circular zone having within it a pale green area with the red oil spot but to one side rather than centrally situated, evidently a *Protococcus* undergoing change to an *Amoeba*. Now the well-defined circle has broken up into the usual amoeboid projections and it has passed beneath some decayed vegetation and become invisible."

Dangeard ('88) discredits this amoeboid state, and there can be little doubt that it represents the case of an *Amoeba* digesting a zooid of *Sphaerella*. I have several times found such cases. I once observed a rhizopod (*Actinophrys*) devour eight megazooids in a short time; the green pigment was quickly digested, the red more slowly.

SPECIAL MORPHOLOGY OF MEGAZOOIDS.—THE CELL-WALL AND SHEATHS OF CILIA

The cellulose character of the cell-wall was doubted by Busk ('53). Cohn ('52), however, states positively that he succeeded in demonstrating the cellulose character of the cell-wall, particularly in the case of the motile cells. The test is not always convincing, but by using rather strong sulphuric acid followed after a few minutes with dilute iodin according to Cohn's directions, I have obtained a blue color which could leave no doubt in one's mind. Although the test is less satisfactory with the resting-cells, probably because they are somewhat coated with a gelatinous substance, yet even here the cellulose reaction is unmistakable.

The sheaths which surround the bases of the cilia (Figs. 15, 16) usually disappear in the distortion produced by the action of sulphuric acid, but there can be little doubt of the truth of the statement by Kerner* that they consist of cellulose, for they do not take up protoplasmic stains.

THE RADIAL STRANDS OF PROTOPLASM

The use of iodin or other proper stains demonstrates very clearly the protoplasmic character of the threads which radiate from the central colored mass. These threads often appear to end in a slight enlargement without coming into connection with the cellulose wall, but more careful examination often shows that they are finely branched at the end (Fig. 15) and probably these branches anastomose to form an exceedingly fine network close to the cell-wall. This structure is so delicate, however, that I have been unable to demonstrate it by staining or plasmolysis.

The protoplasmic strands are not always visible, even in mature zooids. Zacharias† intimates that zooids showing this structure are generally found in the stagnant water of old cultures, and suggests that they exhibit a strong approach to *Amoeba*-like organisms. I have found, however, that even young zooids in fresh cultures when kept in sunlight, show the threads well developed, so that it appears to be a condition accompanying vigorous assimilation and growth.

THE CHROMATOPHORE AND PYRENOIDS

Cohn ('50), considering the colored protoplasmic mass homologous with the "primordial utricle" of plant cells, applied to it the

* Kerner-Oliver. Natural History of Plants, 2: 630. 1895

† O. Zacharias. Experimentelle Untersuchungen über Pseudopodien-Bildung. Biol. Centralb. 5: 261. 1885.

name "primordial cell." Taking into account the radial strands of protoplasm and the network which they probably form, this term is hardly suitable. The protoplasmic mass must be regarded as the single chromatophore (Vines, '86, Bütschli, '84). This chromatophore, at first solid, may in the later stages become vacuolated so as to present the form of a hollow green sphere inclosing the red nuclear globule (Fig. 30). Frequently the chlorophyl of this hollow shell becomes reduced in places so that it appears to be pierced with holes (Fig. 15). It is such conditions which have given rise to the statement that the zooids contain several chromatophores.

The extent to which the haematochrom is changed into chlorophyl appears to depend on the conditions which ordinarily affect the production of chlorophyl. The zooids do not need the haematochrom but much of it may be retained for a day or two if the temperature is not favorable for the formation of chlorophyl. Light is apparently not so essential a factor as warmth, for zooids kept in the dark may develop considerable chlorophyl. Under such circumstances it is noticeable that the haematochrom is more scattered and mixed with the chlorophyl, but when these zooids are brought into the light the haematochrom soon becomes collected into a central globule.

When the conditions are favorable for the formation of chlorophyl the haematochrom may disappear altogether in the later stages (Fig. 32); it never seems to have the character of the red "eye-spot" of other genera, but gradually fades out.

In the green chromatophore are embedded several (4–8) pyrenoids. These were called *Chlorophyllbläschen* by Cohn ('50), who expressed doubt as to the presence of starch in this alga. Braun ('51) recognized their true nature in relation to starch formation. Frequently the presence of starch cannot be demonstrated by application of iodin, but the test is successful if the culture has been furnished with sufficient light and aëration. The pyrenoids are especially prominent after freezing; they then show a clear nuclear spot in the center.

A CONTRACTILE VACUOLE NOT PRESENT

The presence of a contractile vacuole in this organism is alleged by Cienkowski* and Bennett and Murray ('89). They are, however, undoubtedly in error on this point, for nothing of the kind has been recorded by the men who have become thoroughly acquainted with *Sphaerella;* in fact, the existence of a contractile organ is expressly denied by Cohn ('54).

There is also one of Bütschli's figures (*Pl. 43. f. 9a*) representing a contractile vacuole in *Haematococcus lacustris*—a figure which has been copied by Hansgirg ('88) as *Sphaerella lacustris,* by Parker ('93) as *Haematococcus lacustris,*† and by Lankester as *Haematococcus palustris!* in the article Protozoa in the Encyclopaedia Brittanica. The figure which has caused all this confusion was copied by Bütschli from Stein's figure (*Pl. 15. f. 58*) of *Chlamydococcus fluviatilis* Stein, and was never intended to represent the species to which Bütschli applied it. It appears to me, indeed, that Stein's figure does not even represent a *Chlamydococcus* (*Sphaerella*) for it has the red eye-spot, contractile vacuole, prominent nucleus‡ and single large pyrenoid which are characteristic of *Chlamydomonas,* and in its development also, Stein's species is like this genus rather than like *Sphaerella;* it corresponds very closely to the *Chlamydomonas rostrata* described by Cienkowski in the article above referred to, a form which I have collected several times near New York.

THE COLORING MATTERS

Cohn ('50) first described the pigment of the resting-cells as a scarlet red oil, soluble in alcohol and ether, and turned blue by iodin. Some years later Cohn ('67) gave to this pigment the name haemato-

* L. Cienkowski. Ueber einige chlorophyllhaltige Gloeocapsen. Bot. Zeit. **23**: 25–27. 1865.

† Parker was evidently unaware that *Haematococcus lacustris* and *H. pluvialis* are synonyms, for he remarks that a contractile vacuole, though absent in *H. pluvialis,* is present in *H. lacustris.* This confusion might have been avoided had he noticed the footnote in which Bütschli accepts Cohn's objection to the name *H. lacustris* and re-adopts *H. pluvialis.*

‡ The nucleus is never distinguishable in living zooids of *Sphaerella* and it is even difficult to demonstrate it by simple staining processes. I have met with success by using osmic acid and carmine as suggested by McNab. Ann. and Mag. Nat. Hist. **12**: 124. 1883.

chrom and further defined it as a substance different from the coloring matter of the red algae (which is soluble in water) and the purple pigment found in many Oscillatoriaceae. He inferred that haematochrom is a substance very closely related to chlorophyl since at certain times it appears to be built up directly into chlorophyl; he also supposed that the coloring matter found in *Trentepohlia* and the red "eye-spots" of zoöspores was haematochrom.

Rostafinski ('81)* declared that *Haematococcus* in the snow-fields of the Alps never grows green, but the green appearance sometimes ascribed to it is due to a species of *Chlamydomonas*; since, however, the red cells increase rapidly, he thought it was clear that their plasma could assimilate without chlorophyl and without organic matter in solution. Rostafinski, furthermore, extracted the red pigment (apparently from *Trentepohlia*) and finding that it had a spectrum similar to that of chlorophyl and also became green when exposed to light, he concluded that it was a reduced chlorophyl, and in order to indicate this relationship suggested for it the name *chlororufin.*

During the next year Engelmann ('82) made careful investigations to confirm or overthrow Rostafinski's assumptions. By means of his bacterial method† he proved that the pure red cells are able to decompose carbon dioxid under the influence of light, but the reaction was stronger in the greener cells. Next, by research in the microspectrum, Engelmann found that even in the case of the red cells the rays most effective in photosynthesis are those which his previous experiments‡ had shown to be the most effective in the case of green cells, viz., the red rays between *B* and *C*. Finally he found that the pure red cells gave a strong continuous absorption from the yellow to the violet end of the

* It should be noted that Rostafinski considered the "red snow" species *Sphaerella nivalis* (Bauer) Sommerf. identical with his *Haematococcus lacustris*

† A drop of water filled with red cells of *Haematococcus* was mixed with a drop containing many active bacteria and mounted under a cover-glass and sealed with vaseline. When placed in the light, after a few minutes most of the red cells were surrounded by swarms of bacteria eagerly seeking the oxygen given off by the cells through the decomposition of CO_2 under the influence of light acting on the coloring matter. In the dark the movement quickly stopped.

‡ T. W. Engelmann. Über Sauerstoffauscheidung von Pflanzenzellen im Mikrospectrum. Bot. Zeit. **40**: 417–426. 1882. (See Vines, Physiology of Plants, 225–257. 1886.)

spectrum, and only a feeble darkening in the position of the characteristic chlorophyl band between *B* and *C*; while the more the cells changed from red to green, the stronger was the absorption between *B* and *C*, and the feebler that in the yellow and green. Engelmann's experiments therefore quite justified his conclusion that the photosynthesis in the red cells of *Haematococcus* is due not to the red color but to the presence of chlorophyl mixed with it.

The experiments of Engelmann with living cells have been confirmed by Zopf's researches on the extracted coloring matters. Zopf ('95) collected about a kilo of red *Haematococcus* and extracted the coloring substances with warm absolute alcohol. From this alcoholic solution he separated* a chlorophyl solution, a yellow pigment solution, and a red pigment solution. Zopf also extracted the so-called haematochrom of *Trentepohlia* but found that it formed a yellow solution similar to the yellow solution from *Haematococcus* if not identical with it. This yellow pigment, or carotin, is to be sharply distinguished from the red pigment; it constitutes only a small element in the coloring matters of the red cells of *Sphaerella*. The red pigment forms a brick- to blood-red colored combination with alkalies and alkaline earths; the solution in alcohol, ether, and petroleum-ether, as well as the evaporation residue, shows the same red tint; and the spectrum gives a single but broad absorption band in the green and blue, strongest in the line *F*. The yellow carotin of *Trentepohlia*, on the other hand, forms no combination with alkalies and alkaline earths; the extracts in alcohol, ether, and petroleum-ether as well as the evaporation residue are yellow; and the spectrum shows two narrow absorption bands in the blue and indigo.

Zopf thus shows that the assumption by Cohn ('67) and Rostafinski ('81) that the reddish pigment of *Trentepohlia* and the haematochrom of *Haematococcus* are identical was not warranted by facts. He considers the yellow carotin one of the eucarotins, pigments which are carbohydrates: the red pigment, for which the name haemotochrom may still be used in the restricted sense, is a repre-

*The raw alcoholic mixture was treated with a solution of caustic soda and the chlorophyl formed a combination with sodium the yellow pigment became free and the red combined with sodium. A separation was then effected by taking advantage of the fact that the chlorophyl-sodium is soluble in water, the yellow pigment easily soluble in petroleum-ether and the red less soluble in petroleum-ether.

sentative of the carotinins, a class of pigments which show much greater stability; the carotin of *Trentepohlia* keeps its color in the dried state for only two months at the longest, while the haematochrom retains its color for years.

It appears to me not unreasonable to conclude that in its chemical nature haematochrom is closely allied to chlorophyl in spite of the fact that it gives the starch reaction with iodine.

FUNCTION OF THE HAEMATOCHROM

When we consider what the value of haematochrom may be to *Sphaerella* we come to a very perplexing problem. Haematochrom is especially an accompaniment of diminished vitality, and it is, therefore, mainly in connection with the resting stage that we must study its function. Nevertheless, the red color of *Sphaerella* must have a greater significance, it seems to me, than that found in the winter spores of other fresh-water algae, since it forms so much more constant and permanent a feature.

It has been very generally supposed that red coloring matters have some relation to light. MacDougal* thinks the red color substance of *Haematococcus* is a protection against the disintegrating effect of light on chlorophyl and protoplasm. That it may serve such a purpose in the pure red cells is quite probable, especially as I have nearly always found only such cells in the pools which are exposed to the glaring sun, even though they were filled with water, while on the rock in New York, scantily supplied with water but turned away from the sun, I have generally found many green cells.

In the partly green cells, as Engelmann has remarked, the red color can have little effect as a protective screen, since it occupies a central position in the cell, and the supposed disintegrating rays which it absorbs, viz., those from the green to the violet end of the spectrum, must pass through most of the chlorophyl and protoplasm before they are acted on by the red pigment.

The researches of Kny and of Kerner show that red coloring matters probably play an important rôle in converting light rays into heat. It is entirely possible that the haematochrom serves this pur-

* J. C. Arthur and D. T. MacDougal. Living Plants and their Properties, 185. 1898.

pose both in the greener and in the pure red cells. In the case of the red cells of *Sphaerella nivalis** especially it appears that such a function would be of great value, since the heat created would be available in melting the snow. Moreover, I have been struck with the fact that, in cultures kept under precisely the same conditions in the laboratory, material from milder climates, *e. g.* from New York and Baltimore, habitually develops more chlorophyl than material collected in places which are frozen a large part of the winter, as at Burlington, Vermont, and Plattsburgh, New York.

From the fact that the haematochrom is wrapped about the nucleus, and except in rare cases (Fig. 33) envelops each daughter-nucleus during the process of division, it might be suspected that it has some food value.

The key to its most important function, however, may lie in the chemical nature of the haematochrom. It possesses much greater stability than chlorophyl and therefore probably plays an important part in enabling the cells to endure adverse circumstances. I have found that zooids furnished with considerable haematochrom are less quickly destroyed by sudden changes of light and temperature than greener ones.

IRRITABILITY OF ZOOIDS

The zooids of *Sphaerella* furnish very interesting material for studies in sensitiveness. In general they are strongly attracted toward light so that, when they are cultivated in glass vessels, the margin of the water nearest the light will be colored red or green by the accumulation of zooids in that part, while very few will be found in other parts of the vessel.

This light-seeking tendency, however, varies somewhat with circumstances. Strasburger ('78) found that the young zooids would swim towards a light from which they would move away when older, and that though zooids sought the light at a temperature of 16°–18°, they shunned light of the same intensity at 4°. I have found, on the contrary, that when reduced gradually

* Dr. J. G. Hunt (Am. Nat. **9**: 575. 1875) states that the coloring matter of "red snow" leaves unchanged the red, orange and yellow portions of the spectrum but entirely absorbs the violet portion. It may be assumed, then, that the coloring-matter of *Sphaerella nivalis* is identical with the haematochrom of *S. lacustris*.

from a temperature of 18° even to the point where the surface of the water became coated with ice the zooids all the time sought the lighter side of the glass dish. Some of the variations in experiments with zooids may be due to currents in the water, for Sachs ('76) was able to produce many of the phenomena exhibited by zoöspores by means of minute oil globules.

Microzooids are usually more positively attracted to light than megazooids, so that in cultures where both are present, as Sachs ('76) has noted, the microzooids are sometimes found only on the more illuminated margin while most of the megazooids accumulate on the other side. I have found that, when taken from the light of a north window and placed in bright sunlight at a south window, megazooids will at first be neutral or even shun the light, but later will recover from the shock and swim toward the more intense light; red zooids recover most quickly and young green ones more quickly than older ones of the same color. The microzooids, on the other hand, from the very first swim toward the increased light, and when the slide is turned around they instantly turn and swim to the newly illuminated side. If, while they are moving from one side to the other, the sunlight is cut off they will go to all parts of the drop, but when the sunlight is again admitted they will immediately swim toward it.

Zooids transferred from the light of a north window to bright sunlight will not live for more than an hour, and the microzooids usually not so long as that, though they thrive when cultivated in sunlight from the first or when the change is gradual.

Conditions affecting Vitality

The difficulty of obtaining a long cycle of development in drop cultures, owing probably to insufficient aëration, has prevented the determination of the number of generations that may be produced in a cycle. There is every reason to believe, however, as Braun and Cohn supposed, that a considerable number of successive motile generations may be formed in a colony. The colony may remain in the motile state for a few days or even for three or four weeks. The length of this period depends in some measure, at least, upon the food supply. My best results have been obtained in cultures containing decaying vegetable matter; somewhat less successful has been the use of Sachs' food solution. Good light and aëration also encourage longer movement. It has been thought (Cohn '50) that zooids kept in the dark would not produce secondary generations, and very generally I have found this to be the case; such a condition might easily be accounted for by the fact that the darkness does not allow a growth vigorous enough to promote this asexual division. Zcoids kept in darkened cultures generally remain small, and after some days it will be found that they are narrower and more attenuated anteriorly than those kept under normal conditions (Fig. 36). That secondary division is not impossible, however, in cultures to which light has not been admitted, is proved by the fact that I have sometimes found cells producing zooids of the second or third generation after two days in such cultures (Fig. 31). After the zooids have finally come to rest and acquired a thick, permanent cell-wall no further division will take place until after some change in the environment. Alexander Braun ('51) stated that desiccation must intervene; otherwise the cells would become blanched and lifeless. Often my cultures have confirmed this opinion, but during the present winter I have repeatedly found that freezing will meet the requirement just as well; in fact, propagation has been more vigorous after freezing than after drying, possibly because desiccation is sometimes too rapid in a warm room.

Dangeard ('88) says that he kept resting cells in the bottom of a vase for a year without desiccation and then, when they were transferred to damp cells, division occurred. Nevertheless it is not impossible that freezing or a new food supply brought about the required change in this case.

RELATION OF SPHAERELLA NIVALIS TO S. LACUSTRIS

Rabenhorst ('68) expressed a doubt as to the distinctness of these two species. Rostafinski ('75) after studying for four years the development of the species then called *Chlamydococcus pluvialis*, but without having seen *C. nivalis*, united the latter with the former under the name *Haematococcus lacustris* (Girod) Rostaf. The grounds for making this union were (1) The similarity of the development of the two species as shown by the comparison of some (apparently unpublished) drawings of *C. nivalis* by Schimper with what Rostafinski knew in regard to *C. pluvialis*; (2) The fact (?)* that he was able to cultivate *Chlamydococcus pluvialis* in snow and to produce zoöspores at a low temperature.

Now in making this physiological point, which remains unconfirmed, a ground of identity, more important points of difference of a similar nature have been left out of account. There is no record to show that *Sphaerella nivalis* may be cultivated at an ordinary temperature; on the contrary, Chodat ('96) was unable to cultivate a red snow alga (which he supposed to be *S. nivalis*) except at a very low temperature. Furthermore, Cohn ('54) was unable to produce any development from "red snow" material either when preserved in snow water or dried, while Braun ('51) records that motile cells were obtained from material of *Sphaerella lacustris* after it had been preserved seven years in a herbarium.

I have myself attempted without success to cultivate in snow some of the "red snow" cells which have preserved their color and normal appearance in spite of being kept in the melted snow for over two years.

The only important morphological difference seems to be that no protoplasmic threads connecting the central mass with the cell-wall have been observed in *Sphaerella nivalis*. This, together with the physiological difference mentioned above, has seemed to Chodat ('96) sufficient ground for maintaining even the generic distinctness of the two species, and he, therefore, retains the name *Haematococcus lacustris* to separate this species from *Sphaerella nivalis*. It appears to me, however, that no more than a specific distinctness between the two forms can be maintained.

NOMENCLATURE

The nomenclature of *Sphaerella* is in such a confused state that it has given rise to some serious errors in regard to the life history. A brief historical sketch may therefore be found desirable.

In 1828 Agardh† established the genus *Haematococcus* and transferred to it the species he had previously called *Protococcus nivalis*.‡ When Flotow published his memoir in 1844, not being

* See section on vegetative division.

† C. A. Agardh. Icon. Alg. Eur. Nos. 21–23, 1828.

‡ Syst. Alg. 13. 1824.

able to identify his plant with any described earlier, he called it *Haematococcus pluvialis.*

Kützing ('45) rejected the genus *Haematococcus* and placed the species of Flotow under Agardh's first genus *Protococcus*, and this name was adopted by Cohn ('53).

Alexander Braun ('51), considering our species generically distinct from *Haematococcus* (*Protococcus*) *nivalis*, founded for it a new genus and gave it the name *Chlamydococcus pluvialis.*

In 1875 Rostafinski decided that this species was generically and even specifically identical with the "red snow" species and therefore restored it to the genus *Haematococcus*; he further identified it with the *Volvox lacustris* described by Girod-Chantrans in 1802, and made the new combination *Haematococcus lacustris.* Perty ('52) had anticipated Rostafinski in recognizing Girod's *Volvox lacustris* as the commonly known species, but he regarded it as an animal when in the motile condition and gave it the name *Hysginum pluviale*, placing it in his class Phytozooidia.

In 1883 Wittrock* revived for the "red snow" species the name *Sphaerella nivalis* Sommerf. which, though four years older than *Haematococcus nivalis* Ag., had never come into general use. In 1886 Wittrock changed our rainwater species which he had previously called *Haematococcus lacustris*† to *Sphaerella pluvialis.*‡

It is not clear why he did not keep the specific name *lacustris*: it may be that he was influenced by the fact that Cohn ('81, '82) had refused to accept it, mainly on the ground that Girod's *Volvox lacustris* was found in salt water while the common species is now known only in fresh water. Finally, however, Wittrock§ returned to the first specific name with the combination *Sphaerella lacustris* (Girod) Wittr.

Objection to the revival of Sommerfelt's generic name *Sphaerella* was made by Berlese and De Toni ('87) on the ground (1) That the genus was poorly defined, and (2) That it would cause

* V. B. Wittrock. Om snöns och isens flora särskildt i artiska trakterna. Stockholm. 1883.

† Wittrock and Nordstedt. A'g. Exsic. No. 156. 1878.

‡ Ibid. No. 733. 1886.

§ A. Hansgirg. Prodromus der Algen Flora von Böhmen. Arch. d. Nat. Land. v. Böhm. 6^6: 105. 1888.

a great increase of synonyms if this revival were to hold, for it would necessitate the change of name of the large number of species of the fungus genus *Sphaerella* established by Cesati and De Notaris in 1863.

As for the first objection, in spite of the fact that the original characterization of Sommerfelt's genus is brief and under it is included a species now known to belong to another genus (*Palmella botryoides* (Lyngb.) Kütz.), nevertheless the well-known species *Sphaerella nivalis* is placed first and the genus was evidently founded on it. The second objection has no weight, certainly at the present time, for most of the species of the genus of Cesati and De Notaris have now been transferred* to *Mycosphaerella*, a genus established in 1885 by Johanson† to take the place of the genus of Cesati and De Notaris.

It is clear, then, that the name *Haematococcus* established by Agardh in 1828 must give way to *Sphaerella* established by Sommerfelt ('24) four years earlier.

In the following list I have omitted *Haematococcus mucosus* Morr., first identified with our species by Rabenhorst ('68) because I cannot recognize in Morren's description or figures any sufficient resemblance to *Sphaerella*. I have added *Disceraea purpurea* Morr. which, though it is identical with our species and was so regarded by Cohn ('50) and Perty ('52), has been omitted from other lists of synonyms, probably because Morren considered his organism an animal.

It may be remarked that among modern zoölogists Stein and Bütschli have included our alga, together with the rest of the Volvocaceae, in the Protozoa, but Saville-Kent and most authors of biological text-books have—with more justice as it appears to us—relegated it to the plant realm.

SYNONOMY

Volvox lacustris Girod. Rech. chim. et mic. 54, 186. 1802.

Protococcus monospermus Corda; Sturm's Deutschland's Flora **2**[25]: 1829–32.

Disceraea purpurea Morren. Rech. phys. sur les Hydroph. d. Belg. 3: 37–43; 4: 42–45. Nouv. Mem. Acad. Roy. Sci. Brux. **14**: 1841.

* See Engler and Prantl. Die nat. Pflanzenfam. 1[1]: 423–426. 1897.

† Öfvers. af K. Svensk. Vet. Akad. Förhand. **41**[9]: 163, 164. 1885.

Haematococcus Cordae Meneghini. Mem. R. Accad. Sci. di Tor. II. **5**: 20. 1843.

Haematococcus pluvialis Flotow. Nov. Act. Acad. Caes. **20**^{2}: 413–606. 1844. Sachs ('76, '87), Cohn ('81, '82), Bütschli ('84), Parker ('93), Zopf ('95).

Protococcus pluvialis Kützing. Phyc. Germ. 146. 1845. Tab. Phyc. **1**: 2. 1849. Cohn ('50), White ('80), Gibson ('89), Bennett and Murray ('89), Huxley and Martin ('92).

Protosphaeria pluvialis Trevisan. Atti Congr. Sci. Ital. in Ven. 28. 1848.

Protosphaeria Cordae Trevisan. Atti Congr. Sci. Ital. in Ven. 28. 1848.

Chlamydococcus pluvialis Al. Braun. Betracht. über die Erschein. d. Verjüng. in d. Nat. 219. 1851. Cohn ('52, '54, '67), Pritchard ('61), Rabenhorst ('68), Velten ('71), Rostafinski ('71), Stein ('78), Kirchner, Krypt.-Flor. Schles. 1878. Wolle, Fresh-Water Alg. U. S. 164. 1887. Cooke, Brit. Fresh-Water Alg. 51. 1882. Demetzky ('83), De Toni and Levi, Flor. Alg. Ven. 1888. Dangeard ('88).

Hysginum pluviale Perty. Zur Kentn. kleinst. Lebensf. 87–95. 1852.

Haematococcus lacustris (Girod) Rostafinski. Mem. Soc. Nat. Sci. Nat. Cherb. II. **9**: 140. 1875. De Toni ('89), Chodat ('96, '97), Phyc. Bor. Am. No. 114. 1895. Bütschli ('84, *Pl. 43*).

Sphaerella pluvialis (Flot.) Wittrock. Wittr. and Nordst. Alg. Exsic. No. 733. 1886. Wille; Engler and Prantl, Die nat. Pflanz. **1**^{2}: 39. 1897.

Sphaerella lacustris (Girod) Wittrock. Arch. d. Nat. Land. v. Böhm. **6**^{6}: 105. 1888.

SUMMARY

A. Life History

I. THE ORDINARY CYCLE OF DEVELOPMENT

1. The normal resting-cell forms by endogenous division four, eight, or sixteen daughter-cells.

2a. Under unfavorable conditions these daughter-cells remain in the resting condition and return to stage 1.

2b. Under favorable conditions these daughter-cells escape from the mother-cell-wall as free-swimming megazooids, which may while motile grow to four times their original size.

3*a*. These megazooids may return immediately to the resting condition 1, by secreting a new thick cell-wall inside the distended wall which they possess as zooids, or

3*b*. The megazooids may come to rest temporarily, not forming any thick cell-wall.

4*a*. These temporarily resting zooids may divide into two or four new megazooids which repeat the development of 2*b*, indefinitely, or

4*b*. They may form eight, sixteen, thirty-two, or sixty-four (?) microzooids which swarm actively inside the mother-cell-wall and finally break out.

5*a*. These microzooids frequently die.

5*b*. Sometimes they come to rest, form a cell-wall and increase to the size of ordinary resting-cells.

II. THE CYCLE OF MICROZOOIDS

Certain resting-cells (probably poorly nourished) form instead of megazooids, eight, sixteen, thirty-two, or sixty-four (?) microzooids which die or conjugate (?) or grow into the ordinary resting-cells.

B. General Conclusions

1. There are two forms of motile cells produced by *Sphaerella lacustris*: megazooids and microzooids.

2. The megazooids are asexual.

3. No conjugation of microzooids has been observed, but from the conditions of their formation we should expect to find such a process.

4. The vegetative division does not differ in manner from the formation of megazooids; unfavorable conditions prevent the assumption of the motile state.

5. *Sphaerella lacustris* does not pass into an amoeboid form.

6. The cell-wall both in motile and resting conditions consists of cellulose.

7. Several pyrenoids about which starch is deposited are embedded in the chromatophore.

8. No contractile vacuole is present.

9. Haematochrom is a substance closely allied to chlorophyl

but more stable; its value probably lies in this stability and perhaps also in its protective and heat-producing power.

10. The zooids are generally strongly attracted toward the light.

11. Some interruption of development such as desiccation or freezing is necessary for preservation of vitality.

12. *Sphaerella lacustris* is to be regarded as a plant because of the possession of a cellulose cell-wall and chlorophyl and the holophytic mode of nutrition.

13. The "red snow" species *Sphaerella nivalis* is regarded as distinct from *S. lacustris* on the grounds of morphological and physiological differences.

LITERATURE

In the following list the important papers relating to the life history and nomenclature of *Sphaerella lacustris* are collected. It has been intended also to note all original illustrations.

The memoir of Braun ('51) gives by far the clearest and most accurate account of the life history, but it has been little used by later writers. The work of Cohn ('50) which has been chiefly drawn upon for brief accounts, though of great value, is nevertheless not so clear, and has been misrepresented in translations and abstracts. There are several minor accounts in text-books, which, possessing no merit of originality and in some cases the positive demerit of inaccuracy, have not been included in this list.

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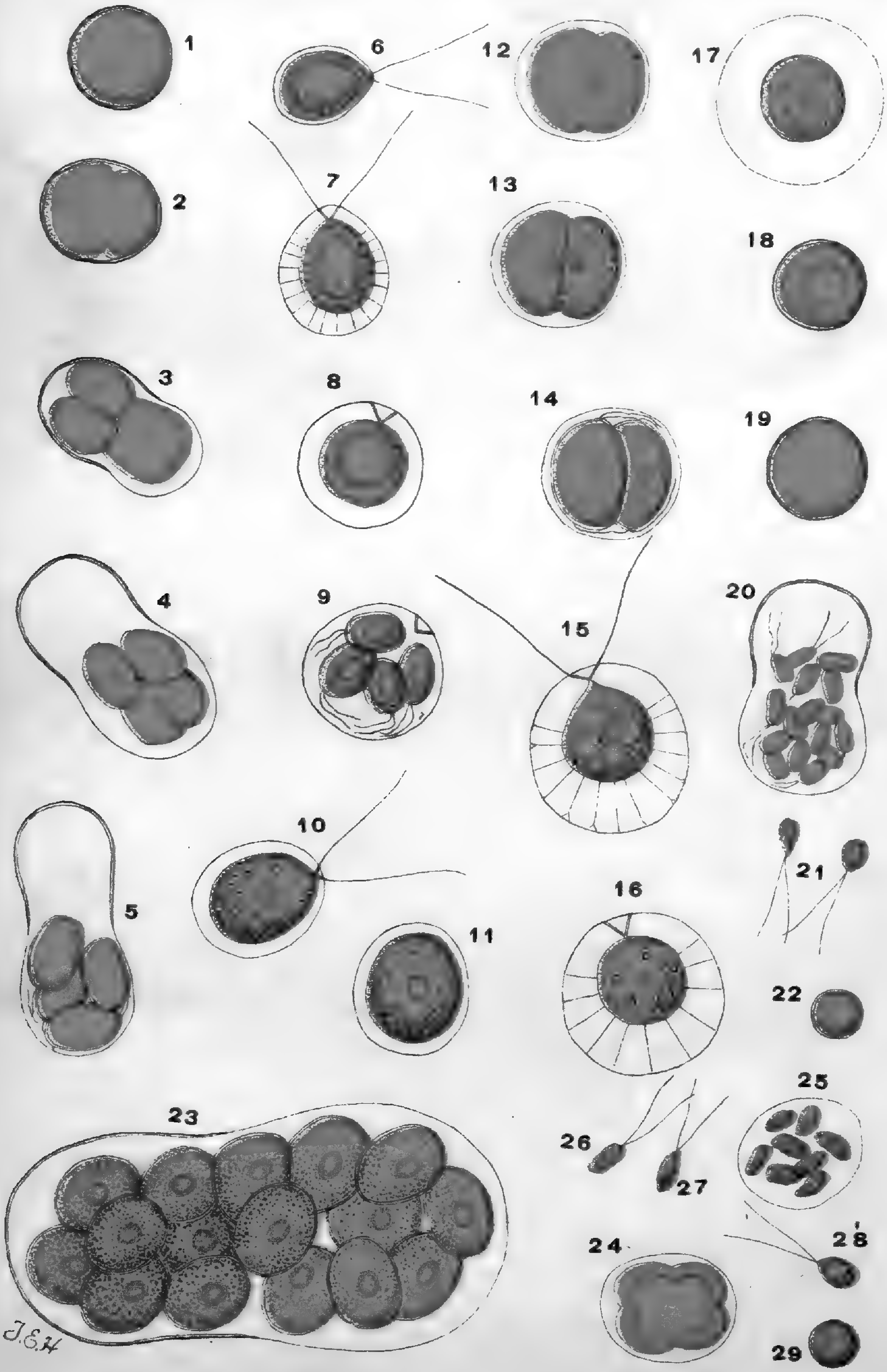

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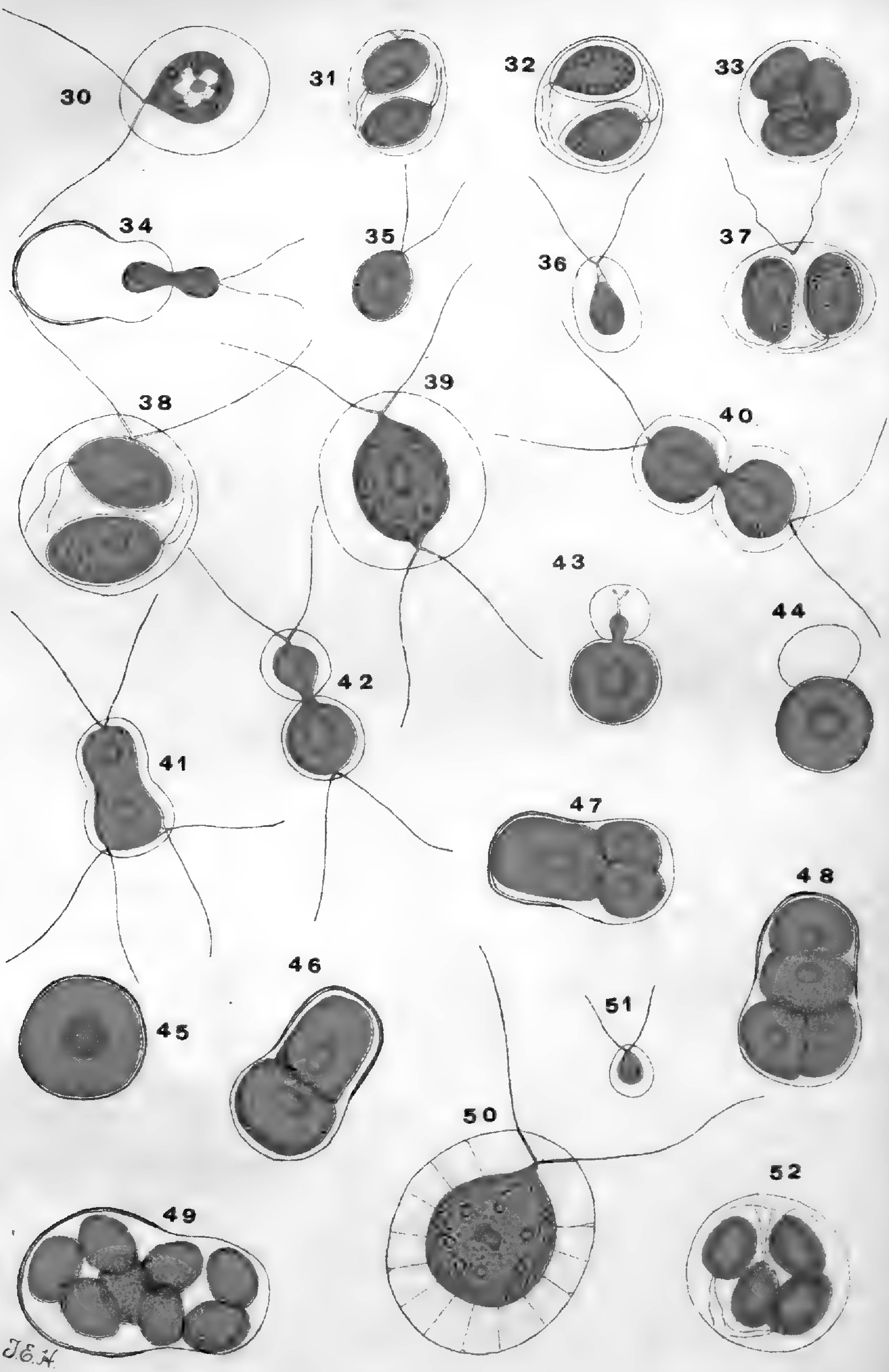

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Explanation of Plate 86

Figures 1–19 have been placed in a series so as to illustrate the ordinary cycle of development. Figures 19–22 represent the cycle of the microzooids as far as it has been observed.

FIG. 1. A typical resting cell.

FIG. 2. The beginning of division. 8:00 a. m.

FIG. 3. The transverse division completed, longitudinal division completed in one hemisphere; the outer layer of the cell-wall has ruptured and the thin inner layer is pushed out. 8:30 a. m.

FIG. 4. Division nearly completed. 9:00 a. m.

FIG. 5. The daughter-cells are clothed with delicate cell-walls and their cilia are seen just before they break out. 9:15 a. m.

FIG. 6. One of the megazooids after swimming freely for an hour or two, has acquired a narrow yellowish-green border of chlorophyl.

FIG. 7. A megazooid several hours older, showing the radial protoplasmic threads and widely distended cell-wall.

FIG. 8. A quiescent megazooid whose protoplasmic processes have disappeared in preparation for division; the sheaths which invested the bases of the cilia remain.

FIG. 9. Four megazooids produced on the second morning. 9:15 a. m.

FIG. 10. A megazooid of the second generation which has developed considerable chlorophyl and prominent pyrenoids.

FIG. 11. The same become quiescent for division.

FIG. 12. Beginning of division to form the third (or a later ?) generation. 8:30 a. m.

FIG. 13. Continuation of division. 8:45.

FIG. 14. The daughter-cells completely formed turn inside the mother cell-wall. 11:30. No further growth was perceptible before 2:15 p. m. when the megazooids escaped.

FIG. 15. A mature megazooid showing a vacuolated chromatophore, and finely branched protoplasmic threads.

FIG. 16. The same become quiescent.

FIG. 17. The thick, permanent cell-wall formed; the distended wall of the zooid disintegrating.

FIG. 18. Increase of haematochrom as resting condition advances.

FIG. 19. The resting-cell; the cycle of development closed.

Fig. 20. After desiccation or freezing the resting-cell of Fig. 19 forms sixteen microzooids.

FIG. 21. Microzooids.

FIG. 22. A microzooid come to the resting condition.

FIG. 23. A cell taken from resting vegetation (frozen) producing sixteen large megazooids in the laboratory. [Dec. 2, New York.]

FIG. 24. A first-generation megazooid beginning to divide. 9:30 a. m.

FIG. 25. Continuation: eight microzooids swarming. 10:30.

FIGS. 26, 27, 28. Different forms of microzooids.

FIG. 29. One of these microzooids going into the resting state.

Explanation of Plate 87

Fig. 30. Optical section of a mature megazooid of average size. [Baltimore.]

Fig. 31. Two zooids produced in a megazooid kept in the dark two days. [Burlington.]

Fig. 32. Megazooids devoid of haematochrom, from a colony two weeks old. [Baltimore.]

Fig. 33. Production of a secondary generation where the haematochrom has all gone into one daughter-cell, uncommon. [Burlington.]

Fig. 34. So small a slit is made that the zooid is compressed in squeezing out, but

Fig. 35. It soon resumes the usual form.

Fig. 36. A zooid developed in darkness three days. [Burlington.]

Fig. 37. A late generation in which the lifeless cilia of the mother-cell remain during division. [Baltimore.]

Fig. 38. The mother-cilia, still active, are attached to one of the daughter-zooids, both of which move independently. [Baltimore.]

Fig. 39. A megazooid ciliated at each end. [New York.]

Fig. 40. A pair of megazooids incompletely separated. [Burlington.]

Fig. 41. A similar monstrosity with three heads [Burlington.]

Figs. 42–44. Fusion of a pair of incompletely formed megazooids. [Burlington.]

Fig. 45. A cell from resting vegetation in open air. [Feb. 1, New York.]

Fig. 46. The same cell commencing division, the next morning. 9:00 a. m.

Fig. 47. Continuation of division. 9:10.

Fig. 48. Later stage. 9:30. No further growth except that the formation of cell-walls was visible when the magazooids escaped at 10:30.

Fig. 49. Eight daughter-cells of the first generation; prevented from becoming motile apparently by cold. [Burlington.]

Fig. 50. An extremely large megazooid (48 μ long) with a solid chromatophore. [New York.]

Fig. 51. A very small mature megazooid, 10 μ long. [Ithaca.]

Fig. 52. Four megazooids of the second generation from a zooid which had remained red twenty-four hours. [Burlington.]

Note. All the figures are magnified about 630 times; in all cases the living plants were carefully measured by means of an eyepiece micrometer and drawn to scale as though projected by a camera lucida. The colors represent the average, but do not ndicate the great variety of tints shown in the living plants under different conditions. In most cases the source of the material from which each figure was drawn is appended to its description.

MEMOIRS

OF THE

TORREY BOTANICAL CLUB

VOL. VI NO. 4

A REVIEW

OF THE

GENERA OF FERNS

PROPOSED PRIOR TO 1832

BY LUCIEN MARCUS UNDERWOOD

ISSUED DECEMBER 1, 1899

PRICE, - - - 35 CENTS

MEMOIRS

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A Review of the Genera of Ferns proposed prior to 1832

By Lucien Marcus Underwood

The problem involved in the natural limitations of fern genera has given rise to as much difference of opinion as any question connected with the systematic study of plants, as the amount of literature bearing on the subject fully attests. With slight modifications and differences, the later Hookerian * system of a few genera founded mostly on purely artificial characters has hitherto been followed in America and has no doubt been productive of advantage in the study of so limited a flora as our own, because of its simplicity; but the time has passed for this sort of contraction and we must look at fern genera from the broader standpoint of other English and continental writers and attempt to replace the unjust, unnatural, and unscientific system that has become stereotyped worldwide by its advantage of utility, by other and better systems that have been proposed.

We have characterized this system as the *later* Hookerian system since it is strikingly in contrast with the one faithfully portrayed in the elder Hooker's *Genera Filicum*, whose merit was really due, as stated in the preface to that work, to its high artistic character, reflecting through the power of Bauer's splendid delineations the system already proposed by Presl in a masterly yet far more simple manner.

* As expressed by Sir W. J. Hooker in *Species Filicum*, and Hooker and Baker in *Synopsis Filicum*. The leading differences heretofore maintained by American botanists have been: (1) The separation of *Phegopteris* from *Polypodium*, (2) The separation of *Camptosorus* from *Scolopendrium* and (3) The unfortunate union of *Aspidium* and *Nephrodium*.

We have spoken of the later Hookerian system as unjust because it ignores in too many cases the claims of prior publications; as unnatural because it associates together in the same genera forms of growth, that have no natural association or alliance whatever, but are thrown together because they possess the accidental peculiarity of some such secondary or trivial character as "no involucre" or "sori following the veins and like them free, forked or anastomosing," thus making of genera unholy alliances of unrelated entities instead of natural groups of closely associated species. One has only to compare the heterogeneous assemblages of plants arrayed in *Synopsis Filicum* under such generic names as *Gymnogramme*, *Acrostichum*, *Polypodium*, *Dicksonia*, and *Davallia*, to appreciate the unnatural character of these generic concepts. The members of a natural genus should resemble one another sufficiently to enable one to attribute to them a monophyletic origin. We have spoken of the system as unscientific for the same reason, added to the fact that it has largely ignored anything except the superficial leaf form and soral arrangement of the sporophyte in the separation of genera and the determination of affinities, leaving in the background the biological characters of the stem, habit alliances, and the subject of venation, so important in the study of affinities in any modern sense. In short, the whole later Hookerian system of genera is the natural result of a too exclusive study of herbarium sheets and a convenient method of rapidly "pigeon-holing" a lot of plants that must be named for correspondents, rather than a logical scientific study of the living fern world and the interrelations of its diversified forms.

If we are to have genera simply as a matter of convenience for naming plants, then this system is, perhaps, as good as any that has been proposed; but if we are to look upon genera as natural groups of allied species, then we must seek for a more exact representation of the fern world, holding ever in view the fact that in many cases where the links of the evolution are still in existence certain genera like some species will necessarily intergrade. It must further be borne in mind that no system founded with Linnaean concepts of species can fit an organic world of progressing organisms formed on a Darwinian or Lamarckian plan.

No one can question two facts stated by Hooker, namely, that his own herbarium collection (since his day greatly augmented by the vast accumulation of recent and much more perfect examples from all parts of the world) is the richest in existence,* and that the collection of growing ferns at Kew Gardens is one of the largest collections in the world, but with the last circumstance in mind, it seems incredible that this collection of living plants has played so insignificant a part in the system of generic classification of any of the Kew workers, with the single exception of John Smith, so long head gardener at Kew, whose review of fern genera† presents a system infinitely more natural, logical, and scientific than that of the system under discussion. The merits of Smith's system were indeed recognized by Hooker, but unfortunately not followed in the slightest particular in Hooker's later publications nor in those which have followed him, as these have faithfully carried out the plans which Hooker so clearly laid down. And thus it is that we in America have too long continued to speak of the delicate *Nephrodium punctilobulum* of Michaux as a *Dicksonia*—a genus based on tree ferns of the Southern Hemisphere and belonging to an entirely different family from our own species, because, forsooth, all the plants of these genera agree in having "inferior cup-shaped or bivalved indusia," and in our newly acquired Sandwich Island territory we are asked to regard the noble species of *Cibotium* in the same category! In short the *Synopsis Filicum* of 1874 with its supplements extending to the present time, while describing often in too comprehensive a manner (and with little regard for geographic distribution as a factor in specific distinctions) five times the number of species of ferns of the first *Synopsis Filicum* of 1806,‡ in its representation of genera is little in advance of its original namesake. And while Hooker's *Species Filicum* will always stand as a classic in the characterization of species, in its

* The fern collection at Kew is contained in thirty-six cases, each with sixteen compartments 13.5 cm. deep. *Pteris* fills nearly two cases, *Asplenium* four cases, *Aspidium* and *Nephrodium* together six cases, *Phegopteris* and *Polypodium* together five cases, and *Acrostichum* about two cases. These data will enable those who have never visited Kew to form some idea of the vastness of the collection.

† *Historia Filicum*, 1875; and earlier papers commencing with his first discussion of Fern genera, Hooker's Journ. Bot. 4: 38–70; 147–198. 1841; London Journ. Bot. 1: 419–438; 659–668. 1842.

‡ Swartz, *Synopsis Filicum*, 1806.

treatment of genera, it is systematically as unsatisfactory as is *Synopsis Filicum* in its treatment of species.

With the purpose then of arriving at the foundations of the problem of fern genera, and actuated by the spirit of Lincoln's aphorism, "If we could first know where we are and whither we are tending, we could better judge what to do, and how to do it," we shall seek for a rational basis for the system by reviewing historically the fern genera that successive authors have proposed, with a view of recognizing in accord with principles of justice the earlier established genera and the foundations on which they rest. To do this more satisfactorily we have thought it wise to separate the problem into two periods and treat the earlier and more fundamental somewhat independently. We have selected the year 1832 as a convenient line of separation, as that will place in the second period all the wholesale establishments of genera by the later writers, especially Presl, Fée, Moore, and John Smith. The period commences with 1753 and closes with the completion of Hooker and Greville's *Icones Filicum*, 1831.

In this study of generic foundations there is necessarily little that is novel except that the principles which we shall follow in this recognition of genera involve certain elements in which there is neither uniformity of practice among taxonomists nor authoritative ruling. It is, therefore, best to state the basis on which the recognition of the rights of genera will here proceed. We will give sufficient data, however, selected after an extended bibliographic research which includes all the original publications of fern genera* so that others working from other principles may be enabled from these data to base their own conclusions.

The principles here followed are:

1. Only genera established in Linnaeus' *Species Plantarum*; 1753, or later are considered. (Rochester Rules.)

2. No genus is considered as established unless it is: (*a*) Based on one or more previously described species which are referred to

* In addition to home facilities, the libraries of Kew Herbarium and the Berliner Hof-Museum, together with the splendid collection of serials at the British Museum (Cromwell Road) have furnished most of the rarer references, but a few were not to be found even in these extensive collections. For one of Kaulfuss' rarer papers we were indebted to the unique library of the Surgeon-General's Office at Washington, and Professor E. L. Greene's library furnished the only available copy of *Deliciae Pragenses*.

with sufficient directness as to be recognizable, or (*b*) Based on some species which is described for the first time at the establishment of the genus itself. Generic names founded with no hint of a species on which they can rest as a type will not be considered as holding any priority rights against genera capable of being anchored to definite type species.*

3. For each genus established the first named species will be regarded as the type, and to insure stability of nomenclature, and to prevent the shifting of generic names to groups of species wholly unlike those for which the original author founded the name,† it will be regarded as essential that the type species and the generic name shall be inseparable and shall be maintained or reduced to synonymy according to the necessities of the case.

In the application of this rule the following exceptional cases must be noted: (*a*) In the genera of Linnaeus' *Species Plantarum* of 1753, the fact must be borne in mind that while the genera date from 1753, they did not all originate with *Species Plantarum* or even with Linnaeus. These Linnaean genera must then be traced to their type species wherever they originated. In case the original generic name was used in another sense than that in which it was adopted by Linnaeus,‡ the type of the genus *in the Linnaean sense* must be determined wherever it was first used; and (*b*) In genera established with a definite statement of the type on which the author founded the genus, this type must have preference even tho in a subsequent list of species it is not the first enumerated.§

* Previous discussion of the subject of generic stability has appeared hitherto by O. F. Cook in Bull. Torrey Bot. Club, **22**: 431–434. 31 O. 1895, and in Science, II. **8**: 186–190, 12 Au. 1898; 513–516. 14 O. 1898. Dr. B. L. Robinson has also partially stated the problem in Bot. Gaz. **25**: 437–445. Je. 1898.

† That this has often happened in the past can be shown in many cases, *e. g.*, *Nephrodium*. This genus, the § *Eunephrodium* of Synopsis Filicum, has been limited to species of *Aspidieae* with reniform indusia and veinlets of contiguous groups united, whereas the genus *Nephrodium* as established by Richard in Michaux's Flora Bor. Am. was based entirely on free veined species of *Polystichum* and *Dryopteris* and does not contain a single species of the group to which it has been thus limited!

‡ As, *e. g.*, *Trichomanes*, whose type was *Asplenium Trichomanes* as known to Linnaeus. *Hemionitis* and *Lonchites* are other examples; see below under 1753.

§ While no general ruling has ever been made on this question, many botanists profess to use the so-called "method of residues"; but even here, no systematic attempt has ever been made to carry out this principle, and many known exceptions occur in prac-

4. While homonyms that may in the future interfere with stability are not to be admitted as valid genera, the extreme and inflexible application of the law to those cases where interference is clearly impossible is neither necessary nor desirable. Such cases as that of *Angiopteris* Hoffm. will not be displaced because of a homonym of this nature.

5. In general, the laws of evidence and interpretation usually recognized will be followed with the view of ascertaining an author's intended meaning. Mere technicalities based on legal quibbles have no place in a rational system of nomenclature. Here, as elsewhere, it is "the letter that kills but the spirit that maketh alive."

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* *

With these principles in view we proceed to a brief historical

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tice. The method of "residues" works on the principle that the last species remaining in the genus from those originally named by its author when the genus was founded shall constitute the type of the genus and shall hold the generic name. This method, moreover, has the disadvantage of being variously interpreted by different people. While it may be true that early writers did not always name the most typical species first, it is equally true that the last species to remain in the genus after division has taken place is less likely to be a typical form; in fact, if doubtful or little known species are placed in a genus originally, these are the very ones which are unlikely to be taken away from the original group to form other genera. The system of "residues," moreover, has a shifting instead of a fixed type, varying as more and more of the original species are taken out to form other genera, thus leaving a smaller and smaller residue.

A few of the many reasons for accepting the principle of the first species under a genus, instead of that of "residues" are the following:

1. It is more direct, simple, and natural in its application.

2. It is strictly in accord with a system which recognizes priority of publication as a fundamental principle. It conforms with the practice generally in use for recognizing the type of a species originally described from composite material.

3. It is in accord with a starting point for genera (1753) which in the absence of generic descriptions can only base its original genera on species instead of generic descriptions.

4 It is of universal application, while the principle of residues, besides being capable of various interpretations, cannot be applied to the many cases in which several genera each containing numerous species were organized independently at nearly the same time. As a test of this, let the believer in residues attempt to adjust generic limitations on the groups involved in *Polystichum* Roth (1800), *Aspidium* Swz. (1801), *Tectaria* Cav. (1801), and *Nephrodium* Rich. (1803)—generic groups based on similar but varying aggregates of species.

5. It is the least unjust to the author of genera based originally on several species.

6. It anchors a generic name to a species with which it must rise or fall, according as that type species is or is not a part of a distinct generic group, and prevents it from being shifted along to a smaller and smaller group, or even of being shifted to a group of species of which its original describer knew nothing.

review of the 189 fern genera proposed by the forty-three authors who wrote on ferns during the period 1753–1831 arranged in chronological order, and suppemented by an alphabetical tabular summary of the resulting necessary synonymy:

1753

Linnaeus (*Species Plantarum*) recognized the following genera of ferns:

1. ONOCLEA (1062) with a single species, *O. sensibilis*. The generic name was established in Amoen. Acad. **3**: 20. 1751, and Linnaeus needlessly displaced an earlier name, *Angiopteris* Mitch., which he quotes as a synonym. The practice thus early inaugurated by Linnaeus of arbitrarily replacing well-established names for others was commonly followed by his successors, and even yet is practiced in some quarters, and has been the cause of much of the present unsettled condition.

2. OPHIOGLOSSUM (1062) with *O. vulgatum* and five other species of which two are now species of *Lygodium*. The genus was founded by Tournefort (Inst. 548. *pl. 325*. 1700), on the European *O. vulgatum*, and was thence accepted by Linnaeus (Gen. Pl. 322. 1737) and in Hort. Cliff. 472, where three species were noted. According to Sprengel this name was first used by Tragus, 1551.

3. OSMUNDA (1063) was a curious composite based on seventeen species* now distributed among many diverse genera. The genus dates back to Tournefort (Inst. 547. *pl. 324*. 1700) and is based on the European *O. regalis*; it was first adopted by Linnaeus (Gen. Pl. 322. 1737) who cites Tournefort, and in Hort. Cliff. 472, five species are noted. According to Sprengel, the name was first employed by Lobel in 1571.

4. ACROSTICHUM (1067) included twenty-five species which are known to-day under the genera *Asplenium*, *Woodwardia*, *Notholaena*, *Woodsia*, *Gymnogramma*, *Schizaea*, *Todea* and others.

The original *Acrostichum* appears to be that of Linnaeus (Gen. Pl. 322. 1737) who cites numerous figures of Plumier, and Tour-

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* We have already discussed the generic limitation *Cf.* Bull. Torrey Bot. Club, **25**: 522–525. 1898. The recent attempt to abandon the generic name, *Osmunda*, is contrary to both the spirit and the letter of nomenclature. *Cf.* Proc. Biol. Soc. Washington, **13**: 63. 1899.

nefort's genus *Ruta Muraria.* In Hort. Cliff. 475, five species are cited of which the first is the one we know as *A.* (*Chrysodium*) *aureum* which may justly stand as the type of the genus, a conclusion reached by Moore* and others who properly divide the composite as recognized by Hooker into its numerous well-marked genera.

A. lanceolatum, the first species mentioned by Linnaeus in *Species Plantarum*, is a *Polypodium* (§ *Niphobolus*).

5. PTERIS (1073) was adopted with nineteen species all but three of which were American. Linnaeus appears to have first used the generic name as such (Gen. Pl. 322. 1737) citing Plumier's plates 5, 14, 15, 29, 37, 51, 68, 69, 105, 132, 140, 141, 152, and in Hort. Cliff. 473, six species were cited from Plumier's plates 152, 75, 106, 69, 29, and one European species. As Plumier's plate 5 represents *Pteris arborea* L. the fifth species in *Species Plantarum* we may safely regard that as the type of the genus.

6. BLECHNUM (1077) was the only genus founded in *Species Plantarum* and was based on two species, *B. orientale* (Amer. Merid.) and *B. occidentale* (China)† and forms a well-defined genus. *B. orientale*, the American species, will form the generic type, and both species are fortunately congeneric.

7. HEMIONITIS (1077) was adopted for two species, *H. lanceolata* and *H. palmata*, both from tropical America. The original *Hemionitis* of Bauhin and Tournefort‡ was the plant from southern Europe now known as *Asplenium Hemionitis* to which alliance it was correctly relegated by Linnaeus himself. The Linnaean genus was established in Cor. Gen. Pl. 20. 1737, based on Plumier's *pl. 151* and in Hort. Cliff. 477, he cites the same species. As these references are to *H. palmata* that plant must be regarded as the type of the Linnaean genus.

8. LONCHITIS (1078) was based on three tropical American species, *L. hirsuta*, *L. aurita*, and *L. repens*. The original *Lonchitis*§ of Tournefort|| is *Polypodium Lonchitis* L., which afterwards became

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* *Index Filicum*, xxi. 1857.

† Later writers have curiously interchanged these original names perhaps not wisely.

‡ Inst. 546. *pl.* 322, 323. 1700.

§ The *Lonchitis aspera* of Bauhin's Pinax, 359.

|| Inst. 538. *pl.* 314. 1700.

the type of the genus *Polystichum* Roth. Linnaeus adopted the name *Lonchitis* (Gen. Pl. 322. 1737) for Plumier's plants represented in *pl. 17, 20*, the former being *L. aurita* and the latter *L. hirsuta*. It is thus rational to regard *L. aurita* as the type of the Linnaean genus.*

9. ASPLENIUM (1078) appears to have originated generically with Tournefort (Inst. 544) where *Ceterach*, a somewhat common European fern, is its only foundation. Linnaeus first used the name in *Genera Plantarum*, 322, in which he cites numerous plates from Plumier (13, 19, 41, 46, 59–61, 67, 74, 103, 106, 124, 133†) and adds *Lingua cervina* (= *Phyllitis Scolopendrium*) and *Trichomanes* (= *Asplenium Trichomanes*) of Tournefort. In Hort. Cliff. published the same year, he included five species of which *Lingua cervina, Trichomanes, Marina*, and *Ceterach* are European and Plumier's plate 59 forms the fifth. The name *Asplenium* was used by Matthiolus, 1560, and even by Dioscorides.

In *Species Plantarum* twenty species are enumerated and as is usual the list commences with those with simple leaves, *rhizophylla* (= *Camptosorus*) being first named; curiously enough this involves three species which range in distribution from Jamaica to Siberia! The genus, however, is a more natural group than many of the Linnaean genera, altho several genera have been properly separated from among these twenty species.

We must historically then limit the type of *Asplenium* to the *Ceterach officinarum* of Bauhin's Pinax and of the other pre-Linnaean herbalists. As this is surely a clearly defined generic group distinct from *Asplenium* although united to it with many other strange bedfellows in *Synopsis Filicum*, the acceptance of the principles of historic interpretation and generic types here followed will necessitate the relegation of the numerous species of *Asplenium* to another generic alliance. While changes in nomenclature are

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* This genus well illustrates the ridiculous and confusing practice of the botanists of the past generation with reference to generic limits. The genus "*Lonchitis* Linn." of Hooker and Baker's Synopsis Filicum contains the two species *L. pubescens* Willd. and *L. occidentalis* Baker with no reference to the original species except a doubtful comment on *L. aurita* in a note.

† While the greater part of these belong to *Asplenium* as used by modern writers, plate 13 represents a sterile plant of *Pteris pungens* Willd. and plate 19 represents a species of *Diplazium*.

always unfortunate, they are our inheritance from the lack of system of the past generations of botanists, and can never be rationally used in an argument where principles of nomenclature only are involved.* In this case many of the species have already been placed under the genus *Athyrium* which appears to be the next in line.

10. POLYPODIUM (1082) as a genus took its origin from Tournefort (Inst. 540. *pl. 316*), tho the name had been used by Theophrastus, and is based on *P. vulgare*, the common European species. Linnaeus (Gen. Pl. 1737) included *Lonchitis* Tourn. (*Polystichum Lonchitis* Roth) in the genus. In Hort. Cliff. 474 *P. vulgare* is the fourth species mentioned. In *Species Plantarum* 58 species (of which over 60 per cent. are American) are included, of which *P. lanceolatum* (§ *Phymatodes*) is the first named and the genus includes species of *Phegopteris*, *Polystichum*, *Dryopteris*, *Filix*, *Cyathea* and other modern genera.

11. ADIANTUM (1094) also takes its origin from Tournefort (Inst. 543, *pl. 317*), tho the name had been used by Dioscorides, and is naturally based on the common European species *A. capillus-Veneris*. Linnaeus (Gen. Pl. 322. 1737), quotes Tournefort, and in Hort. Cliff. 473 includes four West Indian and Bermuda species. In Species Plantarum 15 species are included, two-thirds of which are American; as in all his fern genera the simple species are first described, *A. reniforme* of Madeira is naturally the first named.

12. TRICHOMANES (1097) was established by Linnaeus (Cor. Gen. Pl. 20. 1737, and Hort. Cliff. 476), as a monotypic genus based on Plumier's plate 86 which is *Trichomanes crispum*. The original *Trichomanes* of Tourn. (Inst. 539. *pl. 315*. 1700) was *Asplenium Trichomanes* as recognized by Linnaeus when he established the latter genus. In *Species Plantarum*, Linnaeus gives eleven species of *Trichomanes*, of which six are American, but includes besides filmy ferns of the genus *Hymenophyllum*, certain thin leaved species of *Davallia*; the first species mentioned is *T. membranacum*, also a true *Trichomanes*, but *T. crispum* is clearly the legitimate type of the Linnaean genus.

* Unfortunately one of the first questions that arises in many minds in considering any question of nomenclature is not "Is the principle a correct or rational one" but "How much change will it involve." So long as this mental condition is rampant a stable rational system is practically impossible.

1756

Hill, in his British Herbal, recognized a series of genera, one of which Professor Greene has recently accepted, and he restored the name *Lunaria*, based on what is now *Botrychium lunaria*, but which was unfortunately adopted by Linnaeus for a genus of flowering plants, and used *Phyllitis* for *Asplenium Scolopendrium;* while most of Hill's plants are figured and clearly recognizable, it still remains a patent fact that his generic groups are arranged to correspond to the usage of the apothecary shops and not named in the Linnaean sense, and certainly such generic (?) names as *Lonchitis-aspera*, *Capillus-Veneris* and *Adiantum-nigrum* cannot be accepted as properly published genera.

1757

Ludwig (Inst. Hist. Phys. Reg. Veg. 142), in his synoptic tables adopted the genus *Phyllitis* based on Tournefort's "*Lingua Cervina*," which appears to be the earliest botanical use of this name as applied to our "Hart's tongue" fern. No other novelties appeared in this little-known work; many later writers of the last century adopted the same generic name which must replace the later *Scolopendrium*.

1760

Scopoli (in the original edition of Flora Carniolica 168), established the genus *Struthiopteris* based on *Osmunda spicant* L., which many years later was placed in *Lomaria*, tho many still refer it to *Blechnum*. The genus was well described, giving full synonymy, and was accepted by many subsequent writers like Haller, Wiggers, Weiss and others, until Willdenow usurped the name for a different plant and established *Lomaria* in its place. There is every reason why a restoration should be made. The specific combination apparently first appeared in Scopoli's second edition.

1764

Gleditsch (Syst. Pl.) established the genera *Cincinalis* (290) and *Pyxidaria* (291), neither of which is based on any species and must therefore be relegated to the domain of nonentities. The former is usually referred to *Pteris*, altho it was characterized as having "Invol. nullum," and the latter is evidently a direct synonym of *Trichomanes*.

1763

Adanson (Famille des Plantes, **2**: 20, 21) recognized twelve genera of ferns of which the following were new: 1. *Thelypteris*, citing "Filix-foemina Fuchs, 596" and "*Pteris* Lin.," among other references, but characterized as having "membrane que borde comme une ligne tout le contour de chaque division des feuilles," and thus being a clear equivalent of *Pteris!*; 2. *Scolopendrium*, clearly based on *Lingua-cervina* Tourn.;* 3. *Ceterac*, based on *Asplenium* of Tournefort which was the common ceterach of Europe; 4. *Filix*, based on *Filix baccifera* Cornut, 5, which is unmistakably our *Cystopteris bulbifera* which Cornut figured in 1635, and which Linnaeus correctly quoted under *Polypodium bulbiferum*; 5. *Dryopteris*, based on *Filix-mas* of Fuchs and Tournefort, *pl. 311, 312*; 6. *Angiopteris*, adopted from Mitch. Gen. 29, and exactly synonymous with *Onoclea* L.

1782

Berg[ius] (Acta Acad. Sci. Imp. Petrop. **6**: 248. *pl. 7, f. 1–3*) established the genus *Caenopteris* based on *Caenopteris furcata* from Bourbon, *C. rutaefolia* from Cape Colony and *C. vivipara* (*Acrostichum viviparum* L.) also from Bourbon. These species have usually been relegated to *Asplenium* (§ *Darea*).

1783

Lamarck (Encyclop. method. Botanique) commenced his treatment of the ferns which continued until 1808 when the work was completed by Poiret. They accepted only the twelve original Linnaean genera, but added considerably to the number of ferns, their enumeration reaching 444 species. (*Cf.* footnote under 1806, Swartz.)

1786

Thouin, according to Pfeiffer, established the genus *Celanthera* "Act. Ac. Paris (?)"; this genus Pfeiffer refers to *Marattia* Swz., which if a true citation it antedates by two years. We have been unable to locate the original of this citation.

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* Nearly every writer of the present century has wrongly attributed this name to Smith 1793; it is high time that its original source be publicly noted.

1788

L'Heritier (Sertum Anglicum, 30, 31) established the genus *Dicksonia* based on *D. arborescens* from St. Helena and *D. culcita* of Madeira. This in later times has been widely extended to include plants of the greatest diversity of structure and habit and from it certain genera have justly been separated.

1788

Swartz (Nova Genera et Species Pl. 128) established the genus *Marattia* based on *M. alata* of the West Indies. The genus is usually credited to Smith, 1793. The above date prevents the genus from yielding to *Myriotheca* Comm. 1789, which is probably the same altho it was founded with no type species as a voucher.

1789

Jussieu (*Genera Plantarum*) established the genus *Darea* mentioning no type, and quoted *Myriotheca* Comm. also with no type, in addition to the twelve original Linnaean genera. In the second edition (1791) the same genera are repeated, but in a footnote is a question if *Caenopteris* Berg. is not the same as *Myriotheca* Comm. Later writers have usually referred *Darea* and *Caenopteris* to *Asplenium*, possibly without the best of reasons.

1790

Necker (Elementa Botanica, **3**:) added the genera *Achomanes* (313), *Gleichenia* (314), *Psidopodium* (315), *Onopteris* (316), and *Oetosis* (318). None of these are based on types and no earlier references are cited. Pfeiffer regards *Fsidopodium* as the equivalent of *Aspidium*, and *Onopteris* of *Asplenium*, and Moore holds the same opinion regarding the latter. *Oetosis* and *Glechenia*, Pfeiffer regards as doubtful, but Moore places the latter as a synonym of *Aspidium*. *Achomanes* was later taken up by Presl for a subgenus of Hymenophyllaceae but is commonly regarded as a synonym of *Trichomanes*. Since these genera are neither represented by types nor can be recognized with certainty, it is best to regard them for what they are worth—nonentities—in other words to disregard them as mere names with no bearing on the question of priority.

1791

Schreber (Gen. Pl. 757) established the genus *Meniscium* founded on *Polypodium reticulatum* L.

1792

Richard (Ann. Soc. Hist. Nat. Paris, 114) proposed the genus *Lophidium* based on *L. latifolium* from Guiana. This is therefore the earliest name for a member of the genus *Schizaea* as limited by Hooker, and this portion of the genus may well be separated generically.

1793

Sir J. E. Smith (Mem. Acad. Roy. Sci. Turin, **5**:) established genera: 1. *Woodwardia* (411) based on four species, *W. angustifolia* (*Acrostichum areolatum* L.), *W. Japonica*, *W. Virginica* and *W. radicans*. 2. *Vittaria* (413) based on *Pteris lineata* L. 3. *Davallia* (414) based on eight species of which *D. Canariensis* (*Trichomanes Canariensis* L.) is first named. 4. *Cyathea* (416) based on six species of which *C. horrida* (*Polypodium horridum* L.) and *C. multiflora* are first named, with *C. arborea* and *C. Capensis*, followed by such species as *C. fragilis* and *C. montana*. To show the liberties taken with generic types, as well as Smith's hazy conception of affinities, the first two named are now to be looked for under *Hemitelia* and the last two under *Filix* (*Cystopteris*); or in other words a delicate polypodiaceous fern united generically with a group of tree ferns of a wholly distinct family alliance. 5. *Hymenophyllum* (418) based on *Trichomanes Tunbridgense* L. and *T. asplenoides* Swz. together with six others. 6. *Schizaea* (419) based on *Acrostichum pectinatum* L., *A. dichotomum* L. and *A. elegans* Vahl. 7. *Gleichenia* (419) based on *Onoclea polypodioides* L. and 8. *Danaea* (420) based on *Asplenium nodosum* L. and *D. alata*. *Lindsaea* Dryander must also be considered as published here (413) with *Adiantum Guianense* Aubl. as a type since Dryander's paper, altho read 1794 did not appear until 1796. Smith is usually credited with the genus *Scolopendrium* but that, as we have seen, was used long before by Adanson. He is frequently credited also with *Marattia* which originated with Swartz five years earlier.

1793

G. F. Hoffman (Comm. Soc. Reg. Sci. Gött. **12**: 29. *pl. 5*) established the genus *Angiopteris* with a single species based on *Polypodium erectum* Forst. Since the existence of *Angiopteris* Adans. 1763 (adopted from Mitchell) makes this a homonym, the strict application of the Rochester code would necessitate the selection of a new name for this long established and well-known genus. Since *Angiopteris* Adans. is based on *Onoclea sensibilis* and that is the sole species of *Onoclea* L. as published, *Angiopteris* Adans. is absolutely a dead name, with no possibility of resurrection, so long as 1753 remains a starting-point. Only a quibble over a technicality more worthy a pettifogger than a botanist would needlessly displace the name well established by Hoffman.

1796

Dryander published a paper: On *Lindsaea*, a new Genus of Ferns (Linn. Trans. **3**:). The preliminary diagnosis of the genus had already been outlined by Smith (see above, 1793), whence the genus must date, but in this paper Dryander gives more detail together with five plates illustrating the species; nine species are included, commencing with the simple leaved *L. sagittata*, *L. Guianensis* forming the seventh. The paper was read November 4, 1794, and the addition containing the ninth species is dated April 23, 1796, evidently added just before printing. The volume bears the date noted above, which constitutes publication according to modern ideas.

1799

Bernhardi (Schrader's Journ. **1**: 297) established the genus *Gymnopteris* based on *Acrostichum rufum* (*Pteris rufa* L. Sp. Pl. 1074. 1753) a name which has been unfortunately replaced by *Gymnogramma*. He further characterized twenty genera besides *Lindsaea* and *Schizaea* which he had not seen. *Pteris, Blechnum, Woodwardia* and *Darea* were merged with *Asplenium* while *Ceterac* was united with *Vittaria*. As he quotes *Polystichum* Roth, the work in which that genus was published (or at least a part of it) must have appeared at an earlier date than is usually attributed to it, or than appears on its title page.

1800

Roth (Tent. Fl. Germ. **3**:) published (1) *Athyrium* (58) based on seven species,* viz., *A. fontanum*, *A. Halleri*, *A. molle*, *A. trifidum*, *A. ovatum*, *A. filix-foemina*, and *A. rhaeticum*; and (2) *Polystichum* (69) based on twelve species, viz., *P. Lonchitis*, *P. Phegopteris*, *P. montanum*, *P. Thelypteris*, *P. aculeatum*, *P. Dryopteris*, *P. filix-mas*, *P. cristatum*, *P. frigosum*, *P. multiflorum*, *P. spinosum*, and *P. Marantae*. Moore cites for these genera the date 1788 which is the date of the first volume instead of the third, and Pfeiffer cites the date as 1797. The date on the title page is as above, but as the genera were quoted by Bernhardi in 1799 a part at least of the third volume probably appeared some time before the title page; the preface is dated 14 Sept. 1798. The exact date of issue is still a desideratum.

1800

Hedwig (Filicum Gen. et Sp. *fasc. 2*) proposed the name *Ptychomanes* in place of Smith's *Hymenophyllum* in order to have the genera of the family close with a uniform termination! *Trichomanes asplenoides* Swz. served as the basis for this establishment.

1801

Swartz in his Genera et Species Filicum (Schrader's Journ. 1800[2]:) first elaborated his system. He established:

1. *Grammitis* (17) based on *G. linearis*, *G. marginella*, *G. lanceolata*, *G. serrulata*, *G. graminoides* and *G. myosuroides*.

2. *Aspidium* (29) based on *A. articulatum*, *A. pistillare*, *A. trifoliatum*, *A. Lonchitis*, and some sixty other species among them species now included in *Asplenium* (*A. filix-foemina*), *Filix*, and *Phegopteris*.

3. *Diplazium* (61) based on *D. plantagineum* (*Asplenium plantagineum* L.) and *D. grandifolium*.

4. *Lygodium* (106) based on *L. scandens* (*Ophioglossum scandens* L.) *L. flexuosum*, *L. pedatum* and *L. Japonicum*.

5. *Botrychium* (110) based on *B. Lunaria*, *B. rutaceum*, *B. Virginianum*, *B. ternatum*) and *B. zeylandicum*.

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* Later in the same year Roth (Cat. Bot. **2**: 143) gives *Polypodium bulbiferum* L. as the first species of *Athyrium*.

1801

Bernhardi in a paper published in the pages immediately following that of Swartz (Schrader's Journ. 1800[2]:) recognized twenty-nine genera among which the following new ones were proposed: 1. *Sphaeropteris* * (122) based on *Polypodium medullare* Forst. from New Zealand; 2. *Wibelia* (122) based on *Trichomanes multifidum* Forst. (*Hymenophyllum multifidum* Swz.) from the Pacific Isles; 3. *Struthopteris* (126) based on *Osmunda regalis* and the equivalent of the genus *Osmunda* in its modern sense; 4. *Odontopteris* (127) based on *Ophioglossum scandens* L. (*Lygodium* Swz.); 5. *Ripidium* (127) based on *Acrostichum dichotomum* Forst. (*Schizaea dichotoma* Swz.) from the East Indies; 6. *Gisopteris* (129) based on *Hydroglossum palmatum* Willd. (our own *Lygodium palmatum*); besides two genera of lycopods. He quotes *Todea* and *Hydroglossum* from Willd. (see below under 1802) and it becomes a question for the casuists whether this constitutes publication. It will be noted that Bernhardi arrived independently at the same conclusions as Swartz in several cases and his results only lack priority of place; it is also curious to note how Swartz in his later publications systematically sets aside the work of Bernhardi; later investigators have regarded Swartz's conclusions as unjust, and several of the genera of Bernhardi are now being regarded in their true light.

1801

Cavanilles (Icon. et Descr. Pl. 73)† published *Ugena* based on *U. semihastata*, *U. dichotoma*, *U. macrostachya*, *U. polymorpha*, and *U. microphylla*, thus forming another generic name for *Lygodium*. Later on Cavanilles and likewise Swartz ‡ quote this paper as published in October 1801.

1801

Cavanilles (Description de las Plantas §) established the genera: 1. *Tectaria* (249) based on *Polypodium phymatodes*, *P. trifoliatum*,

* This has nothing to do with *Sphaeropteris* Wall. recognized in Synopsis Filicum as a valid genus.

† Anal. de Cienc. **6**:

‡ Synopsis Filicum, 152. 1806.

§ Swartz quotes this portion of the work under the citation "Prael." with the date 1801. As it cites (p. 282) the generic name *Ugena*, which, according to both Swartz and Cavanilles himself, appeared in October, 1801, this portion of the work must have

P. filix-mas, *P. filix-foemina* and other species described as new from Spanish colonies; 2. *Oleandra* (252) based on a single species, *O. neriiformis*; and 3. *Humata* (272) based on three species described by Cavanilles from the Marian Isles, *viz. H. ophioglossa*, *H. pinnatifida* and *H. trifoliata*.

1802

Bernhardi (Schrader's Journ. 1801[1]: 22) founded the genus *Calypterium* based on *Onoclea sensibilis* L.

1802

Cavanilles (Generos y especies de plantas demonstradas en las lecciones publicas del año de 1802*) established two additional genera: *Clementea* (553) based on a single species from the Marian Isles, which is evidently the exact synonym of *Angiopteris evecta*; and *Aphyllocalpa* (556) based on *Osmunda regalis*, the genus *Osmunda* being reserved for *O. Lunaria* and other species of *Botrychium*, as had been done by Bernhardi a year earlier. In his summary at the close of the work he recognizes twenty-eight genera of ferns.

1802

Willdenow (Act. Acad. Erford. 14 †) established the genera *Todea*, based on *Acrostichum barbarum* L., and *Hydroglossum*, based on *Ophioglossum scandens* L. and seven other species.

1802

Mirbel established the genus *Ramondia* based on *R. flexuosa* and *R. scandens*. The only reference to this publication we have

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appeared late in the year 1801, if, indeed, it was not issued early in 1802, the date cited by Moore for these genera. Pp. 285–625 evidently appeared later in 1802. The "Prologo" dated 1 March, 1802, and the "Principios elementales de Botanica" (pp. vii–cxxxvi) may have appeared between the other two, or possibly earlier than both. In the two copies we have seen, viz., those at the libraries of Columbia University and Kew Herbarium, the title page is dated 1827, but this evidently has nothing to do with the text of the book itself, and, according to Pritzel, belongs merely to the reprint edition of the work. The full title of the work is "Description de las plantas que D. Antonio Josef Cavanilles demonstro en las lecciones publicas del año 1801 precedida de las principios elementales de la botanica."

* Forming a part (pp. 285–625) of the book mentioned in the last footnote in the two copies we have seen.

† This paper was read 3d Feb. 1801. It was published as a separate together with a paper by Bernhardi under the title: "Ueber einige seltene Farrenkräuter und über Asplenium und einige ihm verwandte Gattungen. Mit 4 Kupfertafeln. Erfurt, 1802."

been able to discover is a note on a "Memoire sur Ramondia, nouveau genre de fougére par le C. Mirbel," signed "DC." in Bull. de Sciences par la Soc. Philomatique de Paris **2**: 179, "an 9" no. 47. This publication would be sufficient for the genus, which is only another synonym of *Lygodium.*

1803

Richard (in Michaux: Fl. Bor. Am. **2**:) established the genera: *Nephrodium* (266)* based on *N. acrostichoides, N. thelypteroides, N. marginale, N. punctilobulum, N. bulbiferum, N. filix-foemina, N. asplenioides, N. cristatum, N. tenue, N. rufidulum, N. lanosum* and *N. Dryopteris: Botrypus* (274)† based on *B. Virginicus* and *B. lunarioides;* and *Cteisium* (275) based on *C. paniculatum* (*Lygodium palmatum*). He also established a sub-genus *Hypopeltis* (266) without naming a type.

1803

Mirbel (Hist. Nat. Veg. **5**: [ed. Deterv.]) established the genera *Candollea* (86) based on four species of which *C. heterophylla* (*Acrostichum heterophyllum* L.) is first named; *Pyrrhozia* (91) based on *P. Chinensis* Mirbel; *Riedlea* (71) based on *R. sensibilis* (*Onoclea*); and *Belvisia* (111) based on five species of which *Acrostichum spicatum* L. is first mentioned.

1804

Willdenow (Act. Holm. 165) established the genus *Mertensia* based on five species of which *M. furcata* from Jamaica is first named. Since this group is distinct from *Gleichenia* it is unfortunate that this generic name is preoccupied, there being a previous *Mertensia* (Roth, 1797) in the Borraginaceae.

1804

Bory (Voy. **1**: 282, note 2) published *Callipteris* based on *Asplenium proliferum* Encyc. Dict. with the statement: "Cette plant doit former avec quelques autres un genre nouveau," but in his enumeration he gives four species in the following order: 1. *C. castaneifolia*, 2. *C. sylvatica*, 3. *C. prolifera*, 4. *C. arborescens.*

* It will here be seen how utterly illogical it has been to apply this name to a group of ferns with united veins.

† Richard quotes "Hort. Med. Paris. Cat." which I have not seen. An MS?

This is a case where a proper exception may be made to the rule of accepting the first name cited under the genus as the type, since a definite type was previously mentioned by the author of the genus in the description.

1804

Sprengel (Anleitung, **3**:) described several species in various previously established genera of which he recognized thirty-two, but established no new ones.

1806

Bernhardi (Schrader's Neues Journ. 1^2:) published the following genera: 1. *Cystopteris* (26) based on *Aspidium fragile, A. montanum,* and *A. bulbiferum*; 2. *Hypolepis* (34) based on *Lonchitis tenuifolia* Forst.; 3. *Allosorus* (36) based on "Alle Adianta spuria Sw.;"* *Dicranopteris* (38) based on *Polypodium dichotomum*; and 4. *Ornithopteris* (40)† founded on certain *Osmundae* "welch einen gyrus spurius besetzen," of which *O. hirsuta* and *O. adiantifolia* are mentioned.

1806

Swartz published his *Synopsis Filicum* which was the first completed systematic review of the ferns of the world.‡ Swartz'

* The "Adianta spuria" of Swartz (Schrader's Journ. 1801) are *A. viride* (*Pteris viridis* Forsk.), *A. microphyllum* (Plumier. *pl. 58*), *A. fragrans* (*Polypodium fragrans* L. mant.), *A. caffrorum* L., *A. parvilobum* Swz., *A. Capense* Thumb., *A. pteroides* L., *A. tenuifolium* (*Pteris humilis* Forst.) and *A. multifidum* Swz., all of which except *A. caffrorum* form members of the genus *Cheilanthes* published the same year. It is very evident that Bernhardi's paper appeared in the interval between the printing of the genus *Cheilanthes* in Swartz' Synop. Fil. (p. 126) and the printing of the index (p. 425), which says "*Allosorus* Bernh. est *Cheilanthes.*" In so close and complicated a case as this it would seem reasonable to let the genus *Cheilanthes* stand, especially since *Pteris viridis* Forsk., the first named species under *Allosorus*, is not a *Cheilanthes*. For the same reason *Allosorus* must hold for a good genus. How Moore and others could transfer this name to *Cryptogramma crispa* and *Pellaea Stelleri*, species never included in this genus by Bernhardi, is one of the many anomalies into which a lack of system in systematic work has brought us.

† This is also disposed of in the index of Swartz' Synopsis Filicum as "*Ornithopteris* Bernh. est *Anemia*." It would seem that this antedates *Anemia* and may stand, particularly as its type is in a different section of the composite genus which has hitherto been divided perhaps with good reason.

‡ Poiret did not complete his account of the ferns which was commenced by Lamarck in 1783 in the Encyclopedie Methodique until 1808. He described only 444 species; Swartz described 716 species besides citing many not yet identified, together with 68 Lycopodiaceae.

personal work was based on collections in Jamaica, etc., which had been described by him either in the Prodromus (1788) or his Flora Indiae Occidentalis (1806) The work was edited and annotated by Weber and Mohr. Swartz recognized 38 genera besides three of the Lycopodiaceae of which the following were new: 1. *Taenitis* Willd. (24) founded on *Pteris blechnoides* Willd. 2. *Cheilanthes* (126) based on sixteen species of which *C. micropteris* is first named. 3. *Anemia* (155) based on seventeen species of which *Osmunda phyllitidis* L. is first named. 4. *Mohria* (159) based on *Adiantum Caffrorum* L. which is rebaptized as *Mohria thurifraga*; and 5. *Psilotum* (187) based on *Lycopodium nudum* L. which is rebaptized as *P. triquetrum.*

1809

Willdenow (Berliner Mag. 160) founded the genus *Struthiopteris** based on *Osmunda Struthiopteris* L. "und eine neue noch nicht beschriebene aus Pennsylvanien;" and the genus *Lomaria* based on "Alle von Swartz angeführte Arten, ausser den bereits davon eben getrennten werden, nur dessen *Onoclea Sorbifolium* ist ein wahres *Acrostichum.*" As the reference is to Swartz' *Synopsis Filicum*, *Lomaria* must stand for *O. spicata, O. nodulosa* Mx., *O. discolor, O. Capensis, O. lineata, O. Boryana, O. attenuata* and *O. scandens*, as the residue in the order named by Swartz.

1809

Schkuhr (Crypt. Gewächse, 82) published the genus *Monogramma* Commerson, based on *M. graminea* from Bourbon and figured on *pl. 87* under "*Cenopteris?*"

1810

R. Brown (Prodr. Fl. Nov. Holl. **1**:) established the following genera: 1. *Notholaena* † (145) based on five species of which *N. distans* is first mentioned; a "genus cujus lupus *Poly. umbrosum*

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* This is the third time this generic name was used, *Cf.* 1760, Scopoli, and 1801, Bernhardi above.

† The orthography *Nothochlaena* has been followed by many but Robert Brown wrote the name as above. It is passing strange that with the copy of the Prodromus in hand, Mr. Baker could say of *Nothochlaena* "The above is the original spelling of the name as given by R. Brown." *Cf.* Annals Bot. **5**: 480 (New Ferns, 98).

Hort. Kew, alias sp. ineditas continet." 2. *Allantodia** (149) based on *A. australis* and *A. tenera.* 3. *Doodia* (151) based on *D. aspera, D. media* and *D. caudata.* 4. *Stegania* (152) based on eight species of which *S. Patersoni* is first named; the species are included under *Lomaria* by Baker. 5. *Alsophila* (158) based on *A. australis.* 6. *Platyzoma* (160) based on *P. microphyllum.* In a footnote under *Alsophila, Hemitelia* (158) is proposed for *Cyathea multiflora* Swz., *C. horrida* and *C. Capensis*, and in a second footnote for *Polypodium Ilvense* and *P. hyperborea, Woodia* (sic) is proposed.

1810

Humboldt and Bonpland (see 1810 under Willdenow).

1810

Willdenow published the fourth edition of *Systema Plantarum* of which Vol. 5 contains the ferns in which 43 genera and 1008 species are recognized; the new genera are: 1. *Ceterach* (136) based on three species of which *C. officinarum* is first named, a changed form of the name of a genus, long before adopted from Tournefort by Adanson; 2. *Pleopeltis* H. & B. (211), based on *P. angusta;* and 3. *Polybotra* H. & B. (99) based on *P. osmundacea.*

1811

Desvaux (Berliner Mag. 5:) established the following genera:

1. *Didymochlaena* (393) based on *D. sinuosa* Desv. from India orientalis.

2. *Gymnogramma* (304) based on *G. rufa* (*Pteris rufa*) from Jamaica and twelve other species.

3. *Cincinalis* (311) based on *C. ferruginea* Desv. of the Antilles and eleven others.

4. *Cyclophorus* (300) based on *C. adnascens* (*Poly. adnascens* Swz.) and five others.

These were repeated in the Jour. de Bot. 1813.

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* The inconsistencies of English systematists are forcibly illustrated here; this genus of two species has been returned to *Asplenium* while the generic name has been transferred to *A. Brunoniana*, and the genus ascribed to Wallich! *Cf.* Synopsis Filicum 246, and Moore's Index Filicum, 42.

1811

Aub. du Petit Thours (Melanges de Botanique, **1**:) founded the genus *Scyphofilix* with no type mentioned, but described as follows: "Involucrum calicinum cupuliforme, continens plurimas capsulas annulatas, disco folii inferiore adnatum frons decompositas. An *Davallia* Smith?;" and *Vallifilix* based on *Ophioglossum scandens.* The author considers it necessary to establish this last genus as new, altho he quotes *Lygodium* Swz., *Ugena* Cav., *Odontopteris* Bernh., *Ramondia* Mirbel, and *Hydroglossum* Willd. as synonyms most of which were founded on exactly the same type! If ever a genus was overburdened with synonyms it is the genus *Lygodium;* almost every writer on ferns in the first decade of this century gave it a new name.

1813

R. Brown (Trans. Linn. Soc. **11**: 173) republished* the genus *Woodsia* based on *W. Ilvensis* and *W. hyperborea*, the latter needlessly coined by Swartz, as both he and R. Brown cite *Acrostichum alpinum* Bolton as the original name.

1816

Lagasca (Gen. et Sp. Pl. 33) established the genus *Llavea* based on *L. cordifolia* from Nova Hispania.

1819

Raddi (Op. Sc. di Bol. **3**:) founded the genera *Olfersia* (283, *pl.* 6) based on *O. corcovadensis* from Brazil and *Rumhora*† (290, *pl.* 12. *f.*) founded on *R. aspidioides* from Brazil.

1820

Kaulfuss (Berl. Jahrb. Pharm.‡) established the following genera: 1. *Xiphopteris* (35) based on *Grammitis serrulata* and *G. myosuroides* from Jamaica; 2. *Cochlidium* (36) based on *Grammitis graminoides* Swz. from Jamaica; 3. *Onychium* (45) founded on "nur eine Art vom Vorgeberge der guten Hoffnung"; since

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* Prodr. Fl. Nov. Hall. **1**: 158, note. 1810.

† Evidently a misprint for *Rumohra* as it was named for C. de Rumohr.

‡ The only file of this curious journal which we have been able to find is in the library of the Surgeon General's office at Washington.

no type is mentioned this genus must be cited from 1824; 4. *Saccoloma* (51) based on *S. elegans* from Brazil; and 5. *Cibotium* (53) based on *C. Chamissoi* from the "Südsee."

1821

Brongniart (Bull. Soc. Phil.) founded the genus *Ceratopteris* (186) with two species (1) *Ceratopteris thalictroides* founded on *Pteris thalictroides* Sw. ((a) *Acrostichum siliquosum* and (b) *A. thalictroides* L.) and (2) *Ceratopteris Gaudichaudii* from the Marian Is.

1821

S. F. Gray (Nat. Arr. Brit. Plants, **2**: 9) founded the genus *Cyclopteris* based on *C. fragilis* (= *Filix*).

1822

Presl (Deliciae Pragenses) establishes the genus *Trichipteris* (172) on *T. excelsa* from Brazil. Later he changed the name to *Trichopteris.*

1823

R. Brown (App. Franklin's Journ. 767) established the genus *Cryptogramma* based on *C. acrostichoides;* and *Teleozoma* based on *Pteris thalictroides* Swz. which he had recognized as a good genus thirteen years before but unfortunately had suggested no name.

1824

Kaulfuss (Enumeratio Filicum) published the results of Chamisso's journeys and established the following genera of ferns: 1. *Helmithostachys* (28) founded on *H. dulcis* (*Osmunda Zeylanica* L.); 2. *Chnoophora* (123) based on *C. Humboldtii* Kaulf. (*Cyathea villosa* H. & B.); 3. *Niphobolus* (124) substituted for *Cyclophorus* Desv., because the latter was preoccupied in conchology, based on *N. adnascens* (*Polypodium adnascens*) and six other species; 4. *Hymenolepis* (146) based on *H. ophioglossoides* (*Acrostichum spicatum*); 5. *Leptochilus* (147) based on *L. axillaris;* 6. *Ellobocarpus* (147) based on *E. oleraceus* (*Ceratopteris*); 7. *Sadleria* (161) based on *S. cyatheoides* Kaulf. from the Hawaiian Islands. 8. *Antrophyum* (197) based on *A. pumilum* (*Hemionitis immersa* Willd.), *A. plantagineum* (*Hemionitis plantagineum* Cav.), and three others; 9. *Cas-*

sebeera (215) based on *Adiantum triphyllum* and *C. pinnata* Kaulf.; 10. *Balantium* (228) based on *B. auricomum* and *Dicksonia Culcita.* Besides the above, *Onychium* (144) must be reckoned from this date since it was not fully established by its author in 1820. (*O. auratum* and *O. Capense* are here described.)

1824

Gaudichaud (Ann. Sci. Nat. **3**:) established *Pinonia* (507) based on *P. splendens* from the Sandwich Islands; *Schizoloma* (507) based on *S. cordatum* from the Moluccas and two other species, and *Adenophorus* (508) based on *A. tripinnatifida* from the Sandwich Islands and two other species.

1824

Bory (Dict. Class. Hist. Nat. **6–9**:) founded the genera:

1. *Feea* (**6**: 446, 588. 1824) based on *F. polypodina* and *F. nana.*

2. *Hymenostachys* (**6**: 588. 1824; **8**: 462. 1825) based on *H. diversifrons.*

3. *Lastrea* (**6**: 588. 1824; **9**: 232. 1826) based on *Polypodium Oreopteris, Thelypteris, Phegopteris*, and *Dryopteris* of Europe together with other species.

4. *Selliguea* (**6**: 587. 1824; **15**: 344. 1829) based on a Javan species described but not named.

5. *Marginaria* (*Adenophorus* Gaud.) (**6**: 587. 1824; **10**: 176. 1826) based on *M. scolopendria, Poly. marginatum* Willd., *P. incanum* and two others.

1825

Bory (Ann. Sci. Nat. **5**: 464) established *Drynaria* as a subgenus based on *Polypodium quercifolium* L. and three other species.

1825

Hamilton (in Don: Prod. Fl. Nep.) published:

1. *Neuronia* (6) based on *Aspidium Wallichii* Hook. Exot. Fl. *pl. 5*, changed to *N. asplenoides* (7).

2. *Peranema* (12) founded on *P. cyatheoides.*

3. *Leptostegia* (14) on *L. lucida.*

1825

Hooker (Exotic Flora **2**: 147) established the genus *Parkeria* based on *P. pteridoides* from Guiana, apparently in ignorance of the genus *Ceratopteris* established four years previously, and *Teleozoma* in which Robert Brown had antedated him by two years.

1825

Reinwardt (Syll. Pl. Regensb.*) published:

Onychium (2) based on *O. carnosum.*

Dipteris (3) based on *D. conjugata.*

Ophiopteris (3) based on *O. verticillata.*

Tegularia (3) is proposed by Hornschuch as a substitute for *Ceramium* Reinw. based on *T. adiantifolia* (*Aspidium truncatulum* Swz., Willd.).

Ceramium (3) preoccupied (= *Tegularia* Hornsch.).

1826

Gaudichaud (Freycinet's Voy.) published:

1. *Alcicornium* (307) based on *A. vulgare.*

2. *Monochlaena* (340) based on *M. sinuosa* a needless synonym for *Didymochlaena.* "*Hippodium* Gaud. MS." is also published as an additional synonym.

Adenophorus, *Pinonia* and *Schizoloma* are further characterized altho they were originally published two years earlier.

1827

Eschweiler (Linnaea **2**: 117) established the genus *Poikilopteris* on *Acrostichum scandens* Raddi, the form of which was changed to *Poecilopteris* later by Presl and others.

1827

Desvaux (Ann. Soc. Linn. Paris, **6**:) published a long account of the known ferns † with many new species and the following new genera:

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* Often quoted as Syll. Ratisbon, and published in the Bot. Zeitung (Flora) as one of the early miscellaneous papers of that serial.

† We have recently received a copy of this paper in the original covers, which bears the title *Prodrome de la famille des Fougères;* pp. 171–212 bear the date "Ma 1827" and pp. 213–337 bear the date "Juillet 1827." The text calls for plates 7–11 but only 7 and 8 are present, as is also the case with the copy in the Kew Herbarium, the only other copy seen.

1. *Ophiala* (195) based on *O. Zeylanica* (*Osmunda Zeylanica* L.).

2. *Platycerium* (213) based on *P. alcicorne* and three other species.

3. *Micropteris* (217) based on *M. blechnoides* (*Blechnum seminudum* Willd.), *M. serrulata*, *M. orientalis* Desv. and *M. pectinata* Desv.

4. *Polytaenium* (218) based on *P. lanceolatum* (*Hemionitis lineata* Swz.).

5. *Pteropsis* (218) based on *P. nummularia* (*Acrostichum heterophyllum* L.) and nine other species.

6. *Sitobolium* (263) based on *S. punctilobum* (*Nephrodium punctilobum* Michx.).

7. *Phorolobus* (291) based on *P. crispus* (*Osmunda crispa* L.) and four other species.

8. *Furcaria* (292) based on *F. thalictroides* (*Acrostichum thalictroides* L.) and *F. cornuta* (*Pteris cornuta* Beauv.).

9. *Neuropteris* (292) based on *N. elegans* Desv. from British Guiana.

10. *Didymoglossum* (330) based on *Trichomanes muscoides* and seven others.

11. *Amphoradenium* (335) substituted for *Adenophorus* Gaud. and based on *A. Gaudichaudii* (*Adenophorus tripinnatifida* Gaud.).

1828

Blume (Enum. Pl. Jav. **2**:)* established the following genera: 1. *Lecanopteris* (120) based on *L. carnosa* from the Moluccas; 2. *Stenogramma* (172) based on *S. aspidioides*; 3. *Arachnoides* (241) based on *A. aspidioides*; 4. *Diacalpe* (241) based on *D. aspidioides*; 5. *Gymnosphaera* (242) based on *G. glabra* and *G. squamulata*; 6. *Kaulfussia* (260) based on *K. aesculifolia*. *Paragramma* (119) and *Diagramma* (118) were also published as subgenera of *Grammitis*.

1828

Hocker and Greville (Icones Filicum, *pl. 154*) established the genus *Deparia* based on *Deparia Macraei* from Owhyhee (Hawaii).

* A revised edition was issued in 1830 apparently with the same pagination.

1828

J. E. Smith (Engl. Flora, **4**: 258) established the genus *Cystea* founded on *C. fragilis* and three other British species, and thus introduced the practice of arbitrarily discarding a name already established, "a retrenching of the genus *Cystopteris* Bernhardi as compounded of another already established, *Pteris*, neither the genus or [*sic*] its name having ever been received, such a necessary correction can cause no inconvenience." It is a sufficient condemnation of this egotistic assumption to note that the name *Cystea* has received the merited oblivion it deserves and only its mummy remains in synonymy to remind us that justice in nomenclature is sometime sure to come!

1828

Wallich (*fide* Sprengel: Gen. Pl. 724) established *Arthrobotrys* as a subgenus of *Aspidium* based on *A. Thelypteris* and several other species. Pfeiffer dates the genus 1831. In his catalogue (1832) he established *Actinostachys* based on *Schizaea digitata*.

1828

Blume (Fl. Javae, **2**:*) established *Pleurogramme* (69), based on *Taenitis linearis* Kaulf., *T. pinnata* Kaulf. and *T. graminifolia* Hook.; *Cheilogramme* (70), based on *T. lanceolata* Kaulf., *T. angustifolia* Spreng., *T. furcata* Willd., and *T. tricuspidata* Spreng.; Loxogramme (73), as a subgenus of *Grammitis* based on *G. lanceolata* Swz., *G. coriacea* (Kf.) Spreng., *G. avenia* Blume, and *G. involuta* Don. Under *Polypodium* he also establishes the § *Goniophebium* (132), based on *P. cuspidatum*, *P. subauriculatum* and ? *P. pallens*; and § *Ctenopteris* (132) based on seven species of which *P. Celebicum* is first named.

1829

Kaulfuss (Flora, **12**[1]: 341) established the genus *Physematium* based on *P. molle* from Mexico, a genus, perhaps, needlessly separated from *Woodsia*.

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* The copy of this folio in the Columbia University bears the double date "1828–36" but the genera are usually assigned to the earlier date whether correctly we cannot say.

1830

R. Brown (in Wallich: Pl. Asiat. rarior. **1**:) established the genus *Matonia* (16. *pl. 16*) based on *Matonia pectinata;* the name *Hypoderris* is mentioned as follows: "The beautiful ramification of the veins and their union from which the sorus originated in *Matonia* is not altogether peculiar to it. Among those genera of Polypodiaceae having an indusium one remarkable example occurs in a genus as yet undescribed (*Hypoderris*) which with an indusium not materially different from that of *Woodsia* has exactly the habit of *Aspidium trifoliatum.*" This is all the basis that exists for assigning the name of Robert Brown and affixing the date 1830 to the genus *Hypoderris*, yet some people who accept this, reject other genera admittedly just as distinct which were elaborately described by their authors, and moreover referred to well-known species as types.

1830

Presl (Reliquaė Haenkeanae, **1**: 76. *pl. 12. f. 1*) established the genus *Botryopteris* based on *B. Mexicana*, based, as afterwards stated by the author, on an erroneous label, as the plant figured is a species of the East Indian genus *Helminthostachys.*

1831

Hooker and Greville (Icones Filicum, *pl. 178*) established the genus *Jamesonia* based on *J. pulchra* from Peru.

Summary

The genera of ferns proposed prior to 1832 with their type species and synonyms arranged alphabetically are the following:

(Genera with claims to validity are in **bold face**; synonyms are in SMALL CAPITALS; the type of each genus follows the date in *Italics*; dead names are in Roman.)

Achomanes Neck, 1790 (no type).
Acrostichum L., 1753 (*A. aureum*).
Actinostachys Wall., 1832 (*Schizaea digitata*).
ADENOPHORUS Gaud., 1824 = Polypodium.
Adiantum L., 1753 (*A. capillus-Veneris*).
Alcicornium Gaud., 1826 (*A. vulgare*).
    PLATYCERIUM Desv., 1827 (*P. alcicorne*).

ALLANTODIA R. Br., 1810 = Athyrium.
Allosorus Bernh., 1806 (*Pteris viridis* Forsk.).
Alsophila R. Br., 1810 (*A. australis*).
CHNOOPHORA Kaulf., 1824 (*C. Humboldtii*).
TRICHIPTERIS Presl, 1822 (*T. excelsa*).
GYMNOSPHAERA Blume, 1828 (*G. glabra*).
AMPHORADENIUM Desv., 1827 = Polypodium.
Anemia Swz., 1806 (*Osmunda phyllitidis* L.).
ANGIOPTERIS Adans., 1763 = Onoclea.
Angiopteris Hoffm., 1793 (*Polypodium erectum* Forst.).
CLEMENTEA Cav., 1802.
Antrophyum Kaulf., 1824 (*Hemionitis immersa* Willd.).
APHYLLOCALPA Cav., 1802 = Osmunda.
Arachnoides Blume, 1828 (*A. aspidioides*) = Polystichum *fide* Hooker.
ARTHROBOTRYS Wall., 1828 = Dryopteris.
Aspidium Swz., 1800 (*A. articulatum*).
OLEANDRA Cav., 1802 (*A. neriiformis*).
NEURONIA Ham., 1825 (*Aspidium Wallichii*).
Asplenium L., 1753 (*A. ceterach*).
CETERAC Adans., 1763 (*C. officinarum*).
CETERACH Willd., 1810 (*C. officinarum*).
Athyrium Roth, 1800 (*A. fontanum*).
ALLANTODIA R. Br., 1810 (*A. australis*).
Balantium Kaulf., 1824 = *B. auricomum.*
Belvisia Mirb., 1803 (Acrostichum spicatum).
LOMARIA Willd., 1809 (Onoclea spicata).
HYMENOLEPIS Kaulf., 1824 (Acrostichum spicatum).
Blechnum L., 1753 (*B. orientale*).
Botrychium Swz., 1800 (*B. lunaria*).
LUNARIA Hill, 1756, not L. 1753.
BOTRYPUS Richard, 1803 (*B. Virginicus*).
BOTRYOPTERIS Presl, 1830 = Helminthostachys.
BOTRYPUS Richard, 1803 = *Botrychium.*
Caenopteris Berg., 1782 (*C. furcata*).
Callipteris Bory., 1804 (*Asplenium proliferum*).
CALYPTERIUM Bernh., 1802 = Onoclea.

Candollea Mirbel, 1803 (*Acrostichum heterophyllum* L.).
PTEROPSIS Desv., 1827 (*P. nummularia* = *Acrostichum heterophyllum* L.).
Cassebeera Kaulf., 1824 (*Adiantum triphyllum*).
Celanthera Thouin, 1786 (?? = Marattia).
CERAMIUM Reinw., 1825 = Didymochlaena.
Ceratopteris Brongn., 1821 (*C. thalictroides*).
TELEOZOMA R.Br., 1823 (*Pteris thalictroides* !).
ELLOBOCARPUS Kaulf., 1824 (*E. oleraceus* = *Ceratopteris thalictroides*).
PARKERIA Hook., 1825 (*P. pteridoides* !).
FURCARIA Desv., 1827 (*Acrostichum thalictroides*).
CETERAC Adans., 1763 = Asplenium.
CETERACH Willd., 1810 = Asplenium.
Cheilanthes Swz., 1806 (*C. micropteris*).
Cheilogramme Blume, 1828 (*Taenitis lanceolata*).
CHNOOPHORA Kaulf., 1824 = Alsophila R. Br.
Cibotium Kaulf., 1820 (*C. Chamissoi* !).
PINONIA Gaud., 1824 (*P. splendens*).
Cincinalis Gled., 1764 (no type).
CINCINALIS Desv., 1811 = Notholaena R. Br.
CLEMENTEA Cav., 1802 = Angiopteris Hoffm.
COCHLIDIUM Kaulf., 1820 = Monogramma.
Cryptogramma R. Br., 1823 (*C. acrostichoides !*).
PHOROLOBUS Desv. ,1827 (*Osmunda crispa* L.).
CTEISIUM Richard, 1803 = Lygodium.
Ctenopteris Blume, 1828 = § Polypodium.
Cyathea J. E. Smith, 1793 (*Polypodium horridum* L.).
Cyclophorus Desv., 1811 (*Polypodium adnascens* Swz.).
NIPHOBOLUS Kaulf., 1824 (*P. adnascens*).
CYCLOPTERIS S. F. Gray, 1821 = Filix.
CYSTEA J. E. Smith, 1828 = Filix.
CYSTOPTERIS Bernh., 1811 = Filix.
Danaea J. E. Smith, 1793 (*Asplenium nodosum* L.).
Darea Juss., 1789 (no type).
Davallia J. E. Smith, 1793 (*D. Canariensis*).

Dennstaedtia Bernh., 1800 (*Trichomanes flaccida* Forst.).
  SITOBOLIUM Desv., 1827 (*Nephrodium punctilobulum* Michx.).
Deparia Hook. & Grev., 1828 (*D. Macraei*).
Diacalpe Blume, 1828 (*D. aspidioides*).
Diagramma Blume, 1828 = § Grammitis Swz.
Dicksonia L'Her., 1788 (*D. arborescens*).
Dicranophlebia Mart., 1828–1834 = sub-genus Alsophila.
Dicranopteris Bernh., 1806 (*Polypodium dichotomum*).
  MERTENSIA Willd., 1804 (*M. furcata*).
Didymochlaena Desv., 1811 (*D. sinuosa*).
  CERAMIUM Reinw, 1825. Not Wiggers, 1780, nor Agardh, 1817.
  TEGULARIA Hornsch., 1825 (*Aspidium truncatulum* Swz.).
  MONOCHLAENA Gaud., 1826 (*M. sinuata*).
  HIPPODIUM Gaud. MS. 1826 (quoted as synonym of *Monochlaena*).
DIDYMOGLOSSUM Desv., 1827 = Trichomanes.
Diplazium Swz., 1800 (*Asplenium plantagineum* L.).
Dipteris Reinw., 1825 (*D. conjugata*).
Doodia R. Br., 1810 (*D. aspera*).
Drynaria Bory., 1825 (*Polypodium quercifolium* L.).
Dryopteris Adans., 1763 (*Polypodium filix-mas*).
  LASTREA Bory., 1824 (*Polypodium oreopteris*).
  ARTHROBOTRYS Wall., 1828 (*Aspidium Thelypteris*).
ELLOBOCARPUS Kaulf., 1824 = Ceratopteris.
Feea Bory., 1824 (*F. polypodina*).
Filix Adans., 1763 (*Polypodium bulbiferum*).
  CYSTOPTERIS Bernh., 1806 (*Aspidium fragilis*).
  CYCLOPTERIS S. F. Gray, 1821 (*C. fragilis*).
  CYSTEA J. E. Smith, 1828 (*C. fragilis*).
FURCARIA Desv., 1827 = Ceratopteris.
GISOPTERIS Bernh., 1800 = Lygodium.
Gleichenia Neck., 1790 (no type).
Gleichenia J. E. Smith, 1793 (*Onoclea polypodioides* L.).
Goniophlebium Blume, 1829 = § Polypodium.
Grammitis Swz., 1800 (*G. linearis*).
GYMNOGRAMMA Desv., 1811 = Gymnopteris Bernh.

Gymnopteris Bernh., 1799 (*Acrostichum rufum* L.).*

GYMNOGRAMMA Desv., 1811 (*Pteris rufa*).

GYMNOSPHAERA Blume, 1828 = Alsophila.

Haplophlebia Mart., 1828–34 = sub-genus Alsophila.

Helminthostachys Kaulf., 1824 (*Osmunda Zeylanica* L. !).

OPHIALA Desv., 1827 (*O. Zeylanica* !).

BOTRYOPTERIS Presl., 1830 (*B. Mexicana*).

Hemionitis L., 1753 (*H. palmata*).

Hemitelia R. Br., 1810 (*Cyathea multiflora* Swz.).

HIPPODIUM Gaud., 1826 = Didymochlaena !

Humata Car., 1801 (*H. ophioglossa*).

HYDROGLOSSUM Willd., 1802 = Lygodium.

HYMENOLEPIS Kaulf., 1824 = Belvisia Mirbel.

Hymenophyllum J. E. Smith, 1793 (*Trichomanes Tunbridgense* L.).

PTYCHOMANES Hedw., 1800 (*Trichomanes asplenoides* Swz.).

WIBELIA Bernh., 1801 (*Trichomanes Tultifidum* Forst.).

Hymenostachys Bory., 1824 (*H. diversifrons !*).

HYMENOTOMIA Gaud., 1826 = Lindsaea.

Hypoderris R. Br., ? 1830 (established later than 1831).

Hypolepis Bernh., 1806 (*Lonchitis tenuifolia*).

Hypopeltis Richard, 1803 (no type).

Jamesonia Hook. & Grev., 1831 (*J. pulchra*).

Kaulfussia Blume, 1828 (*K. aesculifolia*).

LASTREA Bory., 1824 = Dryopteris.

Lecanopteris Blume, 1828 (*L. carnosa !*).

ONYCHIUM Reinw., 1825 (*O. carnosa*).

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* The recent Lieferungen of Engler-Prantl, *Die natürlichen Pflanzenfamilien*, relating to the ferns, have reached us just before the last page proofs of this article were returned to the printer, and while giving us in the main a much more rational classification of the ferns, still contain many interesting muddles which amply illustrate the lack of system among taxonomists who follow a hap-hazard system, or better no system at all in the matter of generic types. A single instance will sufficiently illustrate this point. As noted above *Gymnopteris* Bernh. was based on a single species (*Acrostichum rufum* L.). Now in *Die natürlichen Pflanzenfamilien* " *Gymnopteris* Bernh." appears (pp. 198–202) as a large tropical genus of thirty species, but the only species known to Bernhardi and the one on which he founded the genus does not appear among them! On the contrary, *Acrostichum rufum* L., which stood as the monotype of Bernhardi's *Gymnopteris* in 1799, and headed the list of the dozen species which Desvaux in 1811 marshalled under his new genus *Gymnogramma*, appears in this most recent utterance of the Berlin code under neither of these genera, but with other species under *Neurogramme* (p. 262, *f. 139 B*), a genus founded by Link in 1844 ! ! ! Surely some taxonomists have yet to learn the fundamental principles of stability in nomenclature !

Leptochilus * Kaulf., 1824 (*L. axillaris!*).
Leptostegia Ham., 1825 (*L. lucida*).
Lindsaea Dry.; J. E. Smith, 1793 (*Adiantum Guianense* Aubl.).
    HYMENOTOMIA Gaud., 1826 (*Lindsaea microphylla*).
Llavea Lag., 1816 (*L. cordifolia*).
LOMARIA Willd., 1809 = Belvisia Mirb.
Lonchitis L., 1753 (*L. aurita*).
Lophidium Richard, 1792 (*L. latifolium*).
    RIPIDIUM Bernh., 1801 (*Acrostichum dichotomum*).
Loxogramma Blume, 1828 = § Grammitis.
Lygodium Swz., 1801 (*Ophioglossum scandens* L.).
    ODONTOPTERIS Bernh., 1801 (*O. scandens*).
    GISOPTERIS Bernh., 1801 (*Hydroglosum palmatum*).
    UGENA Cav., 1801 (*U. semihastata*).
    HYDROGLOSSUM Willd., 1802 (*Ophioglossum scandens*).
    RAMONDIA Mirbel, 1802 (*R. flexuosa*).
    CTESIUM Richard, 1803 (*C. paniculata = Lygodium palmatum*).
    VALLIFILIX Aub. du Petit Thours, 1811 (*Ophioglossum scandens*).
Marattia Swz., 1788 (*M. alata!*).
MARGINARIA Bory., 1824. = Polypodium.
Matonia R. Br., 1830 (*Matonia pectinata*).
Meniscium Schreb., 1791 (*Polypodium reticulatum* L.).
MERTENSIA Willd., 1804 = Dicranopteris.
Micropteris Desv., 1827 (*Blechnum seminudum* Willd.).
Mohria Swz., 1806 (*Adiantum Caffrorum* L.!).
MONOCHLAENA Gaud., 1826 = Didymochlaena.
Monogramma Commerson, 1809 (*M. graminea*).
    COCHLIDIUM Kaulf., 1820 (*Grammitis graminoides!*).
Myriotheca Comm., 1789 (no type). (? = Marattia).
NEPHRODIUM Richard, 1803 = Polystichum.
NEURONIA Ham., 1825 = Aspidium.
NEUROPTERIS Desv., 1827 = Saccoloma.

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* The status of this genus is uncertain. Mettenius refers it to *Polypodium*, Hooker to *Acrostichum*, while Moore refers it to *Gymnopteris* which name he adopts from Bernhardi without warrant. Its resting place is thus uneasy and it is quite possible that it represents a good genus by itself.

NIPHOBOLUS Kaulf., 1824 = Cyclophorus.

Notholaena R. Br., 1810 (*N. distans*).

CINCINALIS Desv., 1811 (*C. ferruginea*).

ODONTOPTERIS Bernh., 1800 = Lygodium.

Oetosis Neck., 1790 (no type).

OLEANDRA Cav., 1802 = Aspidium.

Olfersia Raddi, 1819 (*O. corcovadensis* !).

Onoclea L., 1753 (*O. sensibilis* !).

ANGIOPTERIS Adans., 1763, not Hoffm.

CALYPTERIUM Bernh., 1802 (*Onoclea sensibilis*).

RIEDLEA Mirb., 1803 (*R. sensibilis*).

Onopteris Neck., 1790 (no type).

Onychium Kaulf., 1820 (no type).

Onychium Kaulf., 1824 (*O. auratum*).

ONYCHIUM Reinw., 1825 = Lecanopteris.

OPHIALA Desv., 1827 = Helminthostachys.

Ophioglossum L., 1753 (*O. vulgatum*).

Ophiopteris Reinw., 1825 (*O. verticillata*); referred by Moore to *Oleandra*.

Ornithopteris Bernh., 1806 (*Osmunda hirsuta*).

Osmunda L., 1753 (*O. regalis*).

STRUTHOPTERIS Bernh., 1801 (*Osmunda regalis*); not *Struthiopteris* Scopoli, nor Willd.

APHYLLOCALPA Cav., 1802 (*Osmunda regalis*).

Paragramma Blume, 1828 = sect. Grammitis Swz.

PARKERIA Hook., 1825 = Ceratopteris.

Peranema Hamilton, 1825 (*P. cyatheoides*).

PHOROLOBUS Desv., 1827 = Cryptogramma.

Phyllitis Ludwig, 1757 (*P. Scolopendrium*).

SCOLOPENDRIUM Adans., 1763.

PHYSEMATIUM Kaulf., 1829 = Woodsia.

PINONIA Gaud., 1824 = Cibotium.

PLATYCERIUM Desv., 1827 = Alcicornum.

Platyzoma R. Br., 1810 (*P. microphyllum*).

Pleopeltis H. & B., 1810 (*P. angusta*).

Pleurogramma Blume, 1828 (*Taenitis linearis* Kaulf.).

POECILOPTERIS Presl. = Poikilopteris.

Poikilopteris Esch., 1827 (*Acrostichum scandens* Raddi.)

Polybotra H. & B., 1810 (*P. osmundacea*).
Polypodium L., 1753 (*P. vulgare*).
ADENOPHORUS Gaud., 1824 (*A. triprinnatifida*).
MARGINARIA Bory., 1824 (*M. scolopendria*).
AMPHORADENIUM Desv., 1827 (*A. Gaudichaudii*).
Polystichum Roth, 1800 (*P. Lonchitis*).
NEPHRODIUM Richard., 1803 (*N. acrostichoides*).
RUMOHRA Raddi, 1819 (*R. aspidioides*).
Polytaenium Desv., 1827 (*Hemionitis lineata* Swz.).
Psidopodium Neck., 1790 (no type).
Pteris L., 1753 (*P. arborea*).
THELYPTERIS Adans., 1763 (type indefinite).
PTEROPSIS Desv., 1827 = Candollea Mirb.
PTYCHOMANES Hedw., 1800 = Hymenophyllum.
Pyrrhozia Mirb., 1803 (*P. Chinensis* Mirb.).
Pyxidaria Gled., 1764 (no type) = Trichomanes.
RAMONDIA Mirb., 1801 = Lygodium.
RIEDLEA Mirb., 1803 = Onoclea.
RIPIDIUM Bernh., 1801 = Lophidium.
RUMOHRA Raddi, 1819 = Polystichum.
Saccoloma Kaulf., 1820 (*S. elegans !*).
NEUROPTERIS Desv., 1827 (*N. elegans*).
Sadleria Kaulf., 1824 (*S. cyatheoides !*).
Schizaea J. E. Smith, 1793 (*Acrostichum pectinatum* L.).
Schizoloma Gaud., 1824 (*S. cordatum*).
SCOLOPENDRIUM Adans., 1763 = Phyllitis.
Scyphofilix Aud. de Petit Thouars, 1811 (no type).
Selliguea Bory., 1824 (type not named).
SITOBOLIUM Desv., 1827 = Dennstaedtia.
Sphaeropteris Bernh., 1801 (*Polypodium medullare*).
STEGANIA R. Br., 1810 = Struthiopteris Scop.
Stenogramme Blume, 1828 (*S. aspidioides*).
Struthiopteris Scopoli, 1760 (*Osmunda spicant*).
STEGANIA R. Br., 1810 (*S. Patersoni*).
STRUTHIOPTERIS Willd., 1809 = *Matteuccia Todaro !*
STRUTHOPTERIS Bernh., 1801 = *Osmunda*.
Taenitis Willd., 1806 (*Pteris blechnoides* Willd.).
Tectaria Cav., 1802 (*Polypodium phymatodes*).

TEGULARIA Hornsch., 1825 = Didymochlaena.
TELEOZOMA R. Br., 1823 = Ceratopteris.
THELYPTERIS Adans., 1763 = Pteris.
Trichomanes L., 1753 (*T. crispum*).
PYXIDARIA Gled., 1764 (no type).
ACHOMANES Neck., 1790 (no type).
DIDYMOGLOSSUM Desv., 1827 (*Trichomanes muscoides*).
TRICHIPTERIS Presl, 1829 = Alsophila.
Todea Willd., 1802 (*Acrostichum barbatum*).
UGENA Cav., 1801 = Lygodium.
Vittaria J. E. Smith, 1793 (*Pteris lineata* L.).
VALLIFILIX Aud. de Petit Thouars, 1811 = Lygodium.
WIBELIA Bernh., 1801 = Hymenophyllum.
Woodsia R. Br., 1810* (*W. Ilvensis*).
PHYSEMATIUM Kaulf., 1829 (*P. molle*).
Woodwardia J. E. Smith, 1793 (*Acrostichum areolatum* L.).
Xiphopteris Kaulf., 1820! (*Grammitis serrulata*).

* The name usually quoted 1813 really dates from 1810 when it was proposed as *Woodia*.

MEMOIRS

OF THE

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NOTES ON THE LICHEN DISTRIBUTION IN THE UPPER MISSISSIPPI VALLEY

BY BRUCE FINK

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MEMOIRS

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Notes on Lichen Distribution in the Upper Mississippi Valley

By Bruce Fink

Under the above caption I shall discuss briefly certain features regarding past investigations of the distribution of lichens within the northern portion of a somewhat extended biological area, and make certain suggestions as to the amount and kind of work yet needed to an approximate completion of the study of these plants within the area treated. Since it has been the custom, in the region under consideration, for states to engage more or less extensively in botanical surveys, quite a number of papers have appeared, from time to time, dealing wholly or in part with lichen distribution within certain states or parts of states. Titles of these and other papers upon which this report is largely based are given in a bibliography of thirty-two titles.

Since a definite statement as to territory covered may be advantageous at the outset, I may state that I have confined myself to the following states: Missouri, Kansas, Nebraska, South Dakota, Minnesota, Wisconsin, Iowa, Illinois, Indiana, and Ohio. This list of states includes, so far as I have been able to ascertain through published bibliographies and correspondence with botanists, all the states in the upper valley in which any investigations of the lichen flora have been made and which do not extend into the mountainous regions to the east or west of the area selected. If any botanist can suggest to me any paper, bearing upon the subject, which I have overlooked, or any unpublished work which should receive consideration, he will confer a great favor and aid in the study. Portions of states joining those named above on the west and east properly come within the territory as stated in my title, but the enumerations from those states are usually made in such a way that it is not possible to know in what portion of the states the plants were collected.

The work of collecting and classifying these plants in the area under consideration is, except in a few of the best studied localities, only well begun. Minnesota has furnished somewhat more than 350 lichens, and this number will be considerably increased as the survey of the state progresses. The whole area covered in this paper has thus far furnished only 527 lichens, or some 165 not found in the one state named above.

Considerable material collected in the various states is still undetermined, and some of it is the more difficult, containing many interesting species and some new ones. Indeed the numbers for the whole area can doubtless be doubled by more complete exploration. Although states seldom form natural biological areas, botanists residing in the various states will doubtless want to know the number of lichens recorded from each state. They are as follows: Minnesota, 348; Illinois, 248; Iowa, 226; Ohio, 180; Nebraska, 160; South Dakota, 76; Kansas, 47, Indiana, 30; Wisconsin, 29; Missouri, 9. Of those from Wisconsin, 21 are listed from a collection made by Professor L. H. Pammel, at La Crosse, and determined by me, remarkable for the number of interesting plants in so small a collection. The bibliographical reference of W. W. Calkins * to work by J. A. Lapham in Wisconsin was investigated and the conclusion was reached that the reference was incorrect; all the volumes of the series from which the citation is given were searched, and as yet nothing is found in print concerning Wisconsin lichens, except in Tuckerman's Synopsis. Other species added to published lists from the states are eight from Kansas, which I determined for E. Bartholomew and R. Dunlevy, and one of my own collecting in Illinois. These are indicated in the list by adding (P), (B), (D) and (F) respectively, after the name of the state.

The reports upon which this paper is based are in part preliminary, and the specimens collected, some of which I have not

* Calkins, W. W., 5 (number referring to bibliography published herewith).

seen, are deposited in various herbaria. As the determinations were made by various persons, doubtless some of the names of species listed are affected by the personal element in determination, and specimens named differently would in some instances almost certainly prove to be identical specifically could they be compared. However, the reports add much to our knowledge of the distribution of North American lichens as given by Tuckerman,* as much of the work in all of the states considered except Missouri, has been done since his death in 1886.

The papers referred to above have been too frequently mere lists, simply giving species and locality with no notes as to substrata or frequency of occurrence, and much less as to the causes which have led to the various peculiar features of distribution and habitat. So far as I know, the first paper to treat the subject of distribution in anything like a satisfactory manner was that by Mr. T. A. Williams† upon the lichens of the Black Hills. Since that time Professor C. Macmillan‡ has touched upon certain features, and the writer§ has attempted in several papers to consider lichen distribution in a somewhat adequate manner, presenting, to some extent, different phases of the subject in different papers as various localities and the progress of the work brought special problems into prominence.

Some of the interesting questions which may well claim the attention of lichen collectors in the future are as follows: Why are some regions richer in species and individuals than others? Why do certain areas produce a relatively large proportion of epiphytic, lithophytic, or epigeal lichens? Why are lichens commonly epiphytic, lithophytic or epigeal found on other substrata in certain localities? Where are, and what constitute the dividing lines between licheno-biological areas? What particular lichen-floral elements predominate in certain regions and why? Why do we find rapid changes in the lichen-flora in passing a certain distance or in a certain direction from one place and not in going the same distance from some other locality or in a different direction from the

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* Tuckerman, E., 21 and 22.
† Williams, T. A., 28.
‡ Macmillan, C , 18.
§ Fink, B., 11, 12, 13, 14 and 15.

same place? To what extent can one predict as to what species will inhabit certain substrata in one region from knowledge of species found upon like substrata in other localities? To what extent do fruticulose and foliaceous lichens seek different substrata than those occupied by crustaceous species? What evidence does the present composition of a lichen-flora furnish concerning the former composition, the migrations which have taken place and their direction, and the struggle which has brought about the present floral composition?

In answering these questions, the various ecologic factors which influence the distribution of lichens must be kept in mind. Those which have especially attracted notice in my studies are the particular kinds of substrata in a region; changes in these substrata through the destruction of old and the introduction of new ones naturally, or through some animate and commonly human agency; climatic conditions of heat and moisture at present, and, in some instances, in the past as well; amount of illumination; the effects of bodies of water in bringing moisture; direction of prevailing winds influencing temperature; permanency and age of substrata and elevation of land. Other factors will present themselves to the careful observer. What I have outlined here is intended to be merely suggestive, and, for more detailed account, I must give reference to some 250 pages in the papers cited above from the three authors named. It is to be hoped that the important factors suggested above as influencing lichen distribution, and any others which may be brought out in actual work in the field in the future may be kept in mind by lichen collectors; and, if this brief paper shall in any degree aid in bringing about this result, the improvement in results in the lichenological field of work will be ample reward.

Notes regarding new or critical species might be added here, but I prefer to leave such work for future papers, adding here only a list of the 527 lichens hitherto found in the area under consideration and indicating the distribution by states. I have followed the arrangement, and, in general, the synonymy of Tuckerman, the latter of which is faulty in many instances, but which must serve till time is afforded for correcting it by careful research. Regarding the collections made by Dr. C. C. Parry and determined by the writer,* I have not been able to ascertain which were made in Wis-

* Fink, B., 8.

consin and which in Minnesota. Consequently, I have recorded but a single plant from this collection, the plant being otherwise unknown in either state. All of the others collected by him have been found since in Minnesota, and Wisconsin alone suffers in number of lichens by the uncertainty.

LIST OF SPECIES AND VARIETIES

Ramalina calicaris (L.) Fr.—Ia., Ill., O., Neb., Ind.
Ramalina calicaris fraxinea Fr.—Minn., Ia., Ill., Neb.
Ramalina calicaris fastigiata Fr.—Minn., Ia., Ill., O.
Ramalina calicaris canaliculata Fr.—Minn., Ia., O.
Ramalina calicaris farinacea Schaer.—Minn., Ia.
Ramalina polymorpha (Ach.) Tuck.—Minn.
Ramalina pusilla (Prev.) Tuck.—Minn.
Ramalina pusilla geniculata Tuck.—Minn.
Ramalina pollinarella Nyl.—Minn.
Ramalina pollinaria (Ach.) Tuck.—S. D., O.
Cetraria islandica (L.) Ach.—Minn.
Cetraria aleurites (Ach.) Th. Fr.—Ill., O.
Cetraria ciliaris (Ach.) Tuck.—Minn., Ia., Ill., O.
Cetraria lacunosa Ach.—Minn.
Cetraria aurescens Tuck.—Minn., O.
Cetraria juniperina pinastri Ach.—Minn.
Cetraria saepincola (Ehrh.) Ach.—Minn.
Evernia vulpina (L.) Ach.—Neb., Minn. or Wis.
Evernia furfuracea (L.) Mann.—Minn., D.
Evernia prunastri (L.) Ach.—Minn., Ia., O., Neb.
Usnea barbata (L.) Fr.—Ia., Ill., O., Ind., Neb., S. D.
Usnea barbata florida Fr.—Minn., Ia., Ill., O., Neb.
Usnea barbata strigosa Ach.—Ill.
Usnea barbata hirta Fr.—Minn., Ia., O., Neb.
Usnea barbata rubiginea Michx.—Minn., Ill., O.
Usnea barbata ceratina Schaer.—Minn., Ia.
Usnea barbata dasypoga Fr.—Minn.
Usnea barbata plicata Fr.—Minn., Ia.
Usnea angulata Ach.—Minn., Ia., O.
Usnea trichodea Ach.—Minn.
Usnea longissima Ach.—Minn.

Usnea cavernosa Tuck.—Minn., Ia.

Alectoria jubata (L.) Tuck.—Minn.

Alectoria jubata chalybeiformis Ach.—Minn., Ia., Ill.

Alectoria jubata implexa Fr.—Minn., S. D.

Speerschneidera euploca (Tuck.) Trev.—Kan.

Theloschistes chrysophthalmus (L.) Norm.—Minn., Ia., Ill., Neb., Kan., Wis. (P.).

Theloschistes parietinus (L.) Norm.—Ia., Ill., O., Neb., Wis., Kan. (B.).

Theloschistes polycarpus (Ehrh.) Tuck.—Minn., Ia., O., Neb., S. D.

Theloschistes lychneus (Nyl.) Tuck.—Minn., Ia., Ill., Neb., Kan. (B.).

Theloschistes concolor (Dicks.) Tuck.—Minn., Ia., O., Neb., Kan., Ind.

Theloschistes concolor effusa Tuck.—Minn., Ia., Neb., Kan.

Parmelia perlata (L.) Ach.—Minn., Ia., Ill., O.

Parmelia perlata olivetorum Ach.—Ill.

Parmelia perforata (Jacq.) Ach.—Minn., Ia., Ill., O., Neb., Wis., Ind.

Parmelia perforata hypotropa Nyl.—Minn.

Parmelia cetraria Ach.—Minn., Ia., Ill., O.

Parmelia laevigata (Sm.) Nyl.—Ill.

Parmelia aurulenta Tuck.—Ill.

Parmelia crinita Ach.—Minn., Ia., Ill., O., Neb.

Parmelia tiliacea (Hoffm.) Flk.—Minn., Ia., Ill., O., Neb., Ind.

Parmelia tiliacea sublaevigata Nyl.—Minn., Neb.

Parmelia tiliacea sulphurosa Tuck.—Ill., Neb.

Parmelia Borreri Turn.—Minn., Ia., Ill., O., Neb., Kan.

Parmelia Borreri hypomela Tuck.—Minn.

Parmelia Borreri rudecta Tuck.—Minn., Ia., Ill., Neb.

Parmelia saxatilis (L.) Fr.—Ia., Ill., O., Ind.

Parmelia saxatilis rosaeformis Ach.—Ill.

Parmelia saxatilis sulcata Nyl.—Minn., Ia., Ill., O.

Parmelia saxatilis panniformis Ach. Schaer.—Minn.

Parmelia physodes (L.) Ach.—Minn., Ill.

Parmelia encausta (Sm.) Nyl.—Minn.

Parmelia pertusa (Schrank.) Schaer.—O.

Parmelia colpodes (Ach.) Nyl.—Ill., O., Neb., Ind.

Parmelia olivacea (L.) Ach.—Minn., Ia., O., Neb., S. D.

Parmelia olivacea prolixa Ach.—Minn., Ill.

Parmelia olivacea aspidota Ach.—Ia., Ill.

Parmelia caperata (L.) Ach.—Minn., Ia., Ill., O., Neb., S. D., Ind.

Parmelia conspersa (Ehrh.) Ach.—Minn., Ia., Ill., Neb., S. D.

Parmelia molliuscula Ach.—Neb., S. D.

Parmelia centrifuga (L.) Ach.—Minn.

Physcia speciosa (Wulf., Ach.) Nyl.—Minn., Ia., O., Ill., Neb.

Physcia hypoleuca (Muhl.) Tuck.—Minn., Ia., Ill., O.

Physcia granulifera (Ach.) Tuck.—Minn., Ia., Ill.

Physcia comosa (Eschw.) Nyl.—Ia., O., Ill.

Physcia leucomela (L.) Michx.—O.

Physcia ciliaris (L.) DC.—Minn.

Physcia aquila (Ach.) Nyl.—Minn., Ia.

Physcia aquila detonsa Tuck.—Minn., Ill., O.

Physcia pulverulenta (Schreb.) Nyl.—Minn., Ia., Ill., O., Neb., S. D.

Physcia pulverulenta leucoleiptes Tuck.—Minn., O., Neb.

Physcia Leana Tuck.—O.

Physcia stellaris (L.) Tuck.—Minn., Ia., O., Ill., Neb., S. D., Kan., Ind., Wis. (P.).

Physcia stellaris apiola Nyl.—Minn., Ia., Ill.

Physcia astroidea (Fr.) Nyl.—O.

Physcia tribacia (Ach.) Tuck.—Minn., Ia., Ill., O.

Physcia hispida (Schreb., Fr.) Tuck.—Minn., Neb.

Physcia caesia (Hoffm.) Nyl.—Minn., Ia., Ill., O.

Physcia caesia stellata Fr.—Ill.

Physcia obscura (Ehrh.) Nyl.—Minn., Iowa, Ill., O., Neb., Kan.

Physcia adglutinata (Flk.) Nyl.—Minn., Ia., Ill., O., Neb., Wis., Kan.

Pyxine cocoes (Sw.) Nyl.—Ill.

Pyxine sorediata Fr.—Minn., Ia., Ill., O., Neb.

Umbilicaria rugifera Nyl.—Neb., S. D.

Umbilicaria cylindrica (L.) Delis.—S. D.

Umbilicaria Muhlenbergii (Ach.) Tuck.—Minn.

Umbilicaria Muhlenbergii alpina Tuck.—S. D.

Umbilicaria vellea (L.) Nyl.—Minn., S. D.

Umbilicaria Dillenii Tuck.—Minn., O.

Umbilicaria pustulata (L.) Hoffm.—Minn., O., Neb., S. D.

Umbilicaria hyperborea Hoffm.—Minn.

Sticta amplissima (Scop.) Mass.—Minn., O., S. D., Wis., Ind.

Sticta herbacea (Huds.) Ach.—Ill.

Sticta aurata (Sm.) Ach.—O., Neb.

Sticta pulmonaria (L.) Ach.—Minn., Ia., O., Wis., Ind.

Sticta quercizans (Michx.) Ach.—O.

Sticta limbata (Sm.) Ach.—Minn.

Sticta crocata (L.) Ach.—Minn.

Sticta scorbiculata (Scop.) Ach.—Minn.

Nephroma tomentosum (Hoffm.) Koerb.—Minn.

Nephroma helveticum Ach.—Minn., O., Ind.

Nephroma laevigatum Ach.—Minn., Ill., Ind.

Nephroma laevigatum parile Nyl.—Minn.

Peltigera venosa (L.) Hoffm.—Minn.

Peltigera aphthosa (L.) Hoffm.—Minn., O., S. D.

Peltigera horizontalis (L.) Hoffm.—Minn., Ia., O., Neb., S. D.

Peltigera polydactyla (Neck.) Hoffm.—Minn., Ia., Ill., O., Neb.

Peltigera scutata (Dicks.) Leight.—O.

Peltigera rufescens (Neck.) Hoffm.—Minn., Ia., Ill., O., S. D.

Peltigera pulverulenta (Tayl.) Nyl.—Ia., Wis., (P.).

Peltigera canina (L.) Hoffm.—Minn., Ia., Ill., O., Neb., S. D., Kan., Ind.

Peltigera canina spongiosa Tuck.—Minn., O., S. D.

Peltigera canina spuria Ach.—Minn., Ia., O., Neb.

Peltigera canina sorediata Schaer.—Minn., Ia.

Peltigera canina membranacea (Ach.) Nyl.—S. D.

Solorina saccata (L.) Ach.—Minn., S. D.

Heppia Despreauxii (Mont.) Tuck.—Minn., Ia., Ill., O., Neb.

Heppia polyspora Tuck.—Minn., Neb.

Pannaria languinosa (Ach.) Koerb.—Minn., Ia., Neb., Kan. (D.).

Pannaria rubiginosa (Thunb.) Delis.—O.

Pannaria microphylla (Sw.) Delis.—Minn., Ia., Ill., O.

Pannaria leucosticta Tuck.—Ill., O.

Pannaria crossophylla Tuck.—Ill., O.

Pannaria molybdaea cronia Nyl.—Ill.

Pannaria lepidiota Th. Fr.—Minn.

Pannaria flabellosa Tuck.—Minn.

Pannaria Petersii Tuck.—Ia.

Pannaria nigra (Huds.) Nyl.—Minn., Ia., Ill., Neb., S. D., Kan.

Pannaria nigra caesia Nyl.—Ia.

Pannaria byssina (Hoffm.) Tuck.—Ill.

Ephebe pubescens Fr.—Minn., Ill.

Ephebe solida Born. (?)—Minn.

Pyrenopsis Schaereri (Mass.) Nyl.—Ill.

Pyrenopsis phaeococca Tuck.—Minn., Ill.

Pyrenopsis melambola Tuck.—Minn.

Omphalaria Kansana Tuck.—Minn., Kan.

Omphalaria pulvinata Nyl.—Minn., Ia., Neb.

Omphalaria phyllisca (Wahl.) Tuck. (?)—Minn.

Omphalaria umbella Tuck.—Ia.

Collema pycnocarpum Nyl.—Minn., Ia., Ill., O., Neb., Kan.

Collema cyrtaspis Tuck.—Minn., Ill., O., Neb.

Collema laciniatum Ach.—Neb.

Collema microphyllum Ach.—Ill.

Collema verruciforme Nyl.—Ill.

Collema aggregatum Nyl.—Neb.

Collema flaccidum Ach.—Minn., Ia., Ill., O., Neb.

Collema leptaleum Tuck.—Ill., Neb.

Collema nigrescens (Huds.) Ach.—Minn., Ia., Ill., O., Neb.

Collema ryssoleum Tuck.—O.

Collema pulposum (Bernh.) Nyl.—Minn., Ia., Ill., O., Neb., S. D.

Collema tenax (Sw.) Ach.—Minn., Ia., Ill., O., Mo.

Collema crispum Borr.—Minn., Ia., O.

Collema limosum Ach.—Ill.

Collema plicatile Schaer.—Minn., Ia.

Collema furvum (Ach.) Nyl.—Minn., Ia.

Collema granosum (Wulf.) Schaer.—Ill.

Collema pustulatum Ach., Minn.—Ia., Ill.

Leptogium bolacinum Stizenb.—Ill.

Leptogium tenuissimum (Dicks.) Koerb.—Ill.

Leptogium caesiellum Tuck.—Ill.

Leptogium minutissimum (Flk., Schaer.).—Mass., Ill.

Leptogium lacerum (Sw.) Fr.—Minn., Ia., Ill., O., S. D.

Leptogium lacerum pulvinatum Moug. & Nestl.—Minn.

Leptogium pulchellum (Ach.) Nyl.—Minn., Ia., Ill., O., S. D.

Leptogium tremelloides (L.) Fr.—Minn., Ia., Ill., O.

Leptogium juniperinum Tuck.—Ill., O.

Leptogium dactylinum Tuck.—Ill., Neb., S. D., Mo.

Leptogium chloromelum (Sw.) Nyl.—Minn., Ia., Ill., O.

Leptogium myochroum (Ehrh., Schaer.) Tuck.—Minn., Ia., Ill., O.

Leptogium myochroum tomentosum Schaer.—Minn.

Leptogium myochroum saturnium Schaer.—Minn., Ill., O.

Placodium elegans (Link.) DC.—Minn., Ia., Neb., S. D., Wis. (P.).

Placodium murorum (Hoffm.) DC.—Minn., Ia.

Placodium murorum miniatum Tuck.—Minn.

Placodium cirrochroum (Ach.) Hepp.—S. D.

Placodium fulgens (Sw.) DC.—Neb., S. D.

Placodium fulgens bracteatum Ach.—Neb., S. D.

Placodium cinnabarrinum (Ach.) Anz.—Minn., Ia., Ill., O.

Placodium microphyllinum Tuck.—Minn., Ia., Ill., Neb., S. D., O.

Placodium citrinum (Hoffm.) Leight.—Minn., Ia., Neb., S. D., Kan.

Placodium aurantiacum (Light) Naeg. & Hepp.—Minn., Ia., Ill., O., Neb., Kan., Mo., Wis. (P.).

Placodium cerinum (Hedw.) Naeg. & Hepp.—Minn., Ia., Ill., O., Neb., Kan., Wis., (P.).

Placodium cerinum sideritis Tuck.—Minn., Ia., Ill.

Placodium cerinum pyracea Nyl.—Minn., Ia., Neb.

Placodium ferrugineum (Huds.) Hepp.—Minn., Ia., Ill., O., Kan., Wis. (P.).

Placodium ferrugineum Bolanderi Tuck., S. D.

Placodium ferrugineum Pollinii Tuck.—Minn., Ia., Ill., Neb.

Placodium vitellinum (Ehrh.) Naeg. & Hepp.—Minn., Ia., Ill., Neb., S. D., Wis. (P.), Kan. (D.).

Placodium vitellinum aurellum Ach.—Minn., Ia.

Placodium camptidium Tuck.—Ill., O.

Lecanora rubina (Vill.) Ach.—Minn., Ia., Neb., S. D.

Lecanora rubina opaca (Ach.) Fr.—Neb., S. D.

Lecanora rubina heteromorpha Ach.—Minn., Ia.

Lecanora Haydeni Tuck.—Neb., S. D.

Lecanora muralis (Schreb.) Schaer.—Minn., Ill., Neb., S. D., Kan. (D.).

Lecanora muralis versicolor Fr.—Minn., Ia., Neb.

Lecanora muralis saxicolor Schaer.—Minn., Ia., Neb., S. D.

Lecanora muralis Garovaglii Auz.—Neb.

Lecanora muralis diffracta Fr.—Minn.

Lecanora pallida (Schreb.) Schaer.—Minn., Ia., Ill., O., Ind.

Lecanora pallida cancriformis Tuck.—Ia.

Lecanora miculata Ach.—O.

Lecanora frustulosa (Dicks.) Mass.—Minn., S. D.

Lecanora sordida (Pers.) Th. Fr.—Minn., S. D.

Lecanora subfusca (L.) Ach.—Minn., Ia., Ill., O., Neb., S. D., Kan., Ind., Wis. (P.).

Lecanora subfusca discolor Fr.—Ill.

Lecanora subfusca allophana Ach.—Minn., Ia., Ill.

Lecanora subfusca hypnorum Schaer.—Minn.

Lecanora subfusca argentata Ach.—Minn., Ia., Ill., Neb.

Lecanora subfusca coilocarpa Ach.—Minn., Ia., Neb.

Lecanora subfusca distans Ach.—Minn., Ill., O., Neb.

Lecanora atra (Huds.) Ach. ?—Minn.

Lecanora Hageni Ach.—Minn., Ia., Ill., O., Neb., Kan., Mo.

Lecanora Hageni sambuci (Pers.) Tuck.—Minn., Ill.

Lecanora varia (Ehrh.) Nyl.—Minn., Ia., Ill., O.

Lecanora varia symmicta Ach.—Minn., Ia., Ill.

Lecanora varia saepincola Fr.—Minn., Ia., Neb.

Lecanora brunonis Tuck.—Neb.

Lecanora athrocarpa (Dub.) Nyl.—Ill.

Lecanora erysibe Nyl.—Minn., Ia., Ill.

Lecanora perproxima Nyl.—Ill.

Lecanora elatina Ach.—Minn.

Lecanora elatina ochrophaea Tuck.—Ill.

Lecanora punicea (Ach.) Tuck.—Ia.

Lecanora pallescens (L.) Schaer.—Minn., O.

Lecanora pallescens rosella Tuck.—O.

Lecanora tartarea L. Ach.—Minn., Ill., O., Ind.

Lecanora melanaspis (Wahl.) Ach.—Neb., S. D., Kan.

Lecanora cinerea (L.) Sommerf.—Minn., Ia., Ill., S. D.

Lecanora cinerea laevata Fr.—Minn.

Lecanora cinerea gibbosa Nyl.—Minn., Ia.

Lecanora calcarea (L.) Sommerf.—Minn., Ia., Ill., Neb., S. D., Kan.

Lecanora calcarea contorta Fr.—Minn., Ia., Ill., Kan., Wis., (P.).

Lecanora chlorophana (Wahl.) Ach.—Neb., S. D.

Lecanora xanthophana Nyl.—Minn., Ia., Neb., S. D., Kan., Mo.

Lecanora xanthophana dealbata Tuck.—Neb., S. D.

Lecanora Schleicheri (Ach.) Nyl.—Neb.

Lecanora cervina (Pers.) Nyl.—Minn., Ia., Ill., O.

Lecanora cervina pruinosa Ach.—Ill.

Lecanora glaucocarpa (Wahl.) Ach.—Neb., S. D., Kan.

Lecanora fuscata (Schrad.) Th. Fr.—Minn., Neb., S. D.

Lecanora fuscata rufescens Th. Fr.—Minn., Ia., Kan.

Lecanora Bockii (Fr.) Th. Fr.—Minn.

Lecanora privigna (Ach.) Nyl.—Minn., Ia., Ill., O., Neb.

Lecanora privigna pruinosa Auct.—Minn., Ia., Ill.

Lecanora privigna clavus Koerb.—Ia., Kan.

Rinodina oreina (Ach.) Mass.—Minn., Ia., Neb., S. D., Kan.

Rinodina mamillana Tuck.—S. D.

Rinodina ascociscana Tuck.—Minn., Ill.

Rinodina sophodes (Ach.) Nyl.—Minn., Ia., Ill., Neb., Kan.

Rinodina sophodes atrocinerea.—O.

Rinodina sophodes confragosa Nyl.—Minn., Ill.

Rinodina sophodes exigua Fr.—Minn., Ia., Neb.

Rinodina sophodes tephraspis Tuck.—Minn., Ia.

Rinodina Bischoffii (Hepp.) Koerb.—Minn., Ia., Ill., Kan.

Rinodina alboatra Fl.—Ill.

Rinodina lecanorina Mass.—Minn.

Rinodina constans (Nyl.) Tuck.—Ill.

Pertusaria velata (Turn.) Nyl.—Minn., Ia., Ill., O., Ind., Wis. (P.).

Pertusaria multipuncta (Turn.) Nyl.—Minn., Ia., Ill., O., Neb.

Pertusaria ambigens (Nyl.) Tuck.—Ia.

Pertusaria communis DC.—Minn., Ia., Ill., O., Neb., Mo., Kan., Ind.

Pertusaria pustulata (Ach.) Nyl.—Minn., Ia., Ill., O., Neb.

Pertusaria leioplaca (Ach.) Schaer.—Minn., Ia., Ill., O.

Pertusaria glomerata (Ach.) Schaer.—Minn.

Pertusaria globularis Ach.—Ill.

Pertusaria Wulfenii DC.—Ill.

Conotrema urceolatum (Ach.) Tuck.—Ia., Ill.

Gyalecta lutea (Dicks.) Tuck.—Minn., Ia., Neb.

Gyalecta fagicola (Hepp.) Tuck.—Minn.

Gyalecta pineti (Schrad.) Tuck.—Ill.

Gyalecta geoica trivialis Willey.—Ill.

Urceolaria scruposa (L.) Nyl.—Minn., Ia., Ill., Neb., S. D., Kan.

Urceolaria scruposa gypsacea Nyl.—S. D.

Urceolaria scruposa parasitica Sommerf.—S. D.

Urceolaria actinostoma Pers.—Minn., Ia., Kan.

Myriangium Duriaei (Mont. & Berk.) Tuck.—Ill., O.

Stereocaulon coralloides Fr.—Minn.

Stereocaulon paschale (L.) Fr.—Minn.

Stereocaulon condensatum Hoffm.—Minn.

Cladonia alcicornis (Lightf.) Flk.—Ill., S. D.

Cladonia symphycarpa Fr.—Minn., Ia., Ill., O., Neb., Ind.

Cladonia symphycarpa epiphylla (Ach.) Nyl.—Minn., Ia., O.

Cladonia mitrula Tuck.—Minn., Ia., Ill., O., Neb., Kan., Ind.

Cladonia cariosa (Ach.) Spreng.—Minn., Ia., Ill., O., Neb., S. D.

Cladonia decorticata Flk.—Minn.

Cladonia pyxidata (L.) Fr.—Minn., Ia., Ill., O., Neb., S. D., Kan., Ind.

Cladonia pyxidata pocillum Ach.—Ill., S. D.

Cladonia fimbriata (L.) Fr.—Minn., Ia., Ill., O., Neb., Ind.

Cladonia fimbriata tubaeformis Fr.—Minn., Ia., Ill., O., Neb., S. D.

Cladonia fimbriata radiata Fr.—Minn.

Cladonia degenerans Flk.—Minn., O.

Cladonia gracilis (L.) Nyl.—Minn., Ia., Ill., O.

Cladonia gracilis symphycarpia Tuck.—Minn.

Cladonia gracilis verticillata Fr.—Minn., Ia., Ill., O., S. D.
Cladonia gracilis cervicornis Fl.—Minn.
Cladonia gracilis hybrida Schaer.—Minn., Ia., O.
Cladonia gracilis elongata Fr.—Minn.
Cladonia comuta (L.) Fr.—Minn., O., Neb.
Cladonia delicata (Ehrh.) Fr.—Minn., Ia., O., Ind.
Cladonia turgida (Ehrh.) Hoffm.—Minn., Ill.
Cladonia turgida (Ehrh.) var. *conspicua* (Schaer.) Nyl.—Minn.
Cladonia cenotea (Ach.) Schaer.—Minn.
Cladonia papillaria molariformis Hoffm.—O.
Cladonia squamosa Hoffm.—Minn., Ia., Ill., O., Neb.
Cladonia squamosa phyllocoma Rabenh.—Minn.
Cladonia delicata (Ehrh.) Fl.—Minn., Ill., Ia.
Cladonia caespiticia (Pers.) Flk.—Minn., Ia., Ill., O., Ind.
Cladonia furcata (Huds.) Fr.—Minn., Ia., Ill., O., Neb., Kan., Ind.
Cladonia furcata crispata Flk.—Minn., Ill., O.
Cladonia furcata racemosa Flk.—Minn., Ia., Ill., O.
Cladonia furcata pungens Fr.—Minn.
Cladonia furcata subulata Flk.—Ill., O.
Cladonia rangiferina (L.) Hoffm.—Minn., Ia., O., Kan.
Cladonia rangiferina sylvatica L.—Minn., Ia., Ill., O.
Cladonia rangiferina alpestris L.—Minn., O.
Cladonia botrytis (Hag.) Hoffm.—Neb.
Cladonia amaurocraea (Flk.) Schaer.—Minn.
Cladonia uncialis (L.) Fr.—Minn., Ia.
Cladonia cornucopioides (L.) Fr.—Minn., Ia., O.
Cladonia deformis (L.) Hoffm.—Minn.
Cladonia digitata (L.) Hoffm.—Minn.
Cladonia macilenta (Ehrh.) Hoffm.—Minn., Ia., Ill., O., Neb., S. D., Wis.
Cladonia pulchella Schwein.—Ia., Neb.
Cladonia muscigena Eschw.—Ill.
Cladonia cristatella Tuck.—Minn., Ia., Ill., O.
Cladonia cristatella ramosa Tuck.—Ill., O.
Cladonia cristatella paludicola Tuck.—Minn.
Baeomyces byssoides (L.) Schaer.—Minn.
Baeomyces aeruginosus (Scop.) Nyl.—Minn.

Biatora decipiens (Ehrh.) Fr.—Minn., Ia., Neb., S. D., Kan., Mo.

Biatora decipiens dealbata Auct.—Minn., Ia.

Biatora Russellii Tuck.—Ia., O., Neb., S. D., Kan., Mo., Wis. (P.).

Biatora Russellii dealbata Tuck.—Ia.

Biatora icterica Mont.—Minn., Neb., Kan.

Biatora rufonigra Tuck.—Minn., Ill., Mo.

Biatora coarctata (Sm., Nyl.) Tuck.—Minn., Ill., S. D.

Biatora coarctata Brujeriana Schaer.—Minn.

Biatora granulosa (Ehrh.) Hoffm.—Ia., Neb.

Biatora flexuosa Fr.—Minn., Ill.

Biatora viridescens (Schrad.) Fr.—Minn.

Biatora parvifolia (Pers.) Tuck.—Ill.

Biatora vernalis (L.) Fr.—Minn.

Biatora peliaspis Tuck.—Ill.

Biatora russula (Ach.) Mont.—Ill., O., Neb.

Biatora sanguineoatra Fr.—Minn., Ill.

Biatora carnulenta Tuck.—Ia., Ill.

Biatora turgidula (Fr.) Nyl.—Minn., Neb.

Biatora leucophaea Flk.—Minn.

Biatora leucophaea griseoatra Koerb.—Minn.

Biatora uliginosa (Schrad.) Fr.—Minn., Ill.

Biatora myriocarpoides (Nyl.) Tuck.—Minn., Ia., Ill.

Biatora varians (Ach.) Tuck.—Minn., Ia., Ill., O., Neb.

Biatora flavidolivens Tuck.—Minn.

Biatora lucida (Ach.) Fr.—Minn.

Biatora atropurpurea (Mass.) Hepp.—Minn., Ill.

Biatora glauconigrans Tuck.—Minn.

Biatora Heerii Hepp.—Ill.

Biatora oxyspora (Tul.) Tuck.—Minn.

Biatora hypnophila (Turn.) Tuck.—Minn., Ia., Ill., Neb., S. D., Kan.

Biatora Naegelii Hepp.—Minn.

Biatora trachoma Flot.—Ia.

Biatora rubella (Ehrh.) Rab.—Minn., Ia., Ill., O., Neb.

Biatora fuscorubella (Hoffm.) Tuck.—Minn., Ia., Ill., O., Neb., Wis. (P.).

Biatora suffusa Fr.—Minn., Ia., Ill., O., Neb.
Biatora atrogrisea (Delis.) Hepp.—Ia., Kans. (B.).
Biatora Schweinitzii Fr.—Minn., Ia., O.
Biatora inundata Fr.—Minn., Ia., Ill., Neb.
Biatora incompta (Borr.) Hepp.—Minn., Ill.
Biatora effusa (Sm.) Hepp.—Ia.
Biatora stigmatella Tuck.—Neb.
Biatora muscorum (Sw.) Tuck.—Minn., Ia., Ill., Neb.
Biatora umbrina (Ach.) Tuck.—Minn., Ia., Ill., Neb.
Biatora chlorosticta Tuck.—Ill.
Biatora chlorantha Tuck.—Ill., O.
Biatora cyphalea Tuck.—Ill.
Biatora campestris Fr.—Ill.
Biatora geophana Nyl.—Ill.
Biatora fossarum (Duf.) Mont.—Ia., Ill.
Biatora resinae Fr.—Ill.
Heterothecium sanguinarium (L.) Flot.—Minn.
Heterothecium sanguinarium affine Tuck.—Minn.
Heterothecium grossum (Pers.) Tuck.—Neb.
Heterothecium leucoxanthum (Spreng.) Mass.—O.
Lecidea caeruleonigricans (Light.) Schaer.—O., Neb.
Lecidea granosa Tuck.—O.
Lecidea tessellina Fr.—Neb., Ill., Kan., Mo.
Lecidea tessellata Flk.—Neb., S. D.
Lecidea polycarpa Fr.—Neb.
Lecidea lactea Flk.—Minn.
Lecidea crustulata Ach.—Minn.
Lecidea lapicida Fr.—Minn.
Lecidea lapicida oxydata Fr.—Minn., S. D.
Lecidea contigua Fr.—Neb.
Lecidea speirea Nyl.—Minn.
Lecidea albocaerulescens (Wulf.) Schaer.—Minn., Ill., O., Ind.
Lecidea platycarpa Ach.—Minn., S. D.
Lecidea enteroleuca Fr.—Minn., Ia., Ill., O., Neb., S. D., Wis. (P.).
Lecidea enteroleuca achrista Sommerf.—Minn., Neb.
Lecidea enteroleuca theiloplaca Tuck.—Ia.
Lecidea melancheima Tuck.—Minn., Ia.

Lecidea crytidia Tuck.—Ill., Minn., Mo.

Lecidea acclinis Flot.—Minn., Ia., Neb.

Lecidea morio Schaer.—S. D.

Buellia epigaea (Pers.) Tuck.—Neb.

Buellia badia (Fr.) Koerb.—Kan.

Buellia spuria (Schaer.) Arn.—Minn., Ia., Ill., Kan., Mo.

Buellia alboatra (Hoffm.) Th. Fr.—Minn., Ia., Neb.

Buellia alboatra chlorospora Nyl.—Ill.

Buellia alboatra saxicola Fr.—Minn., Ia., S. D., Kan.

Buellia parasema (Ach.) Th. Fr.—Minn., Ia., Ill., O., S. D., Ind.

Buellia parasema triphragmia Nyl.—Minn., Ia., Neb.

Buellia dialyta (Nyl.) Tuck.—Minn.

Buellia myriocarpa (DC.) Mudd.—Minn., Ia., Neb.

Buellia myriocarpa polyspora Willey.—Minn., Ia., Ill., Wis., (P.).

Buellia pullata Tuck.—Minn., Ia.

Buellia turgescens (Nyl.) Tuck.—Minn.

Buellia Schaereri De Not.—Ill.

Buellia coarcina (Hoffm.) Th. Fr.—S. D.

Buellia colludens (Nyl.) Tuck.—O.

Buellia petraea (Flot.) Tuck.—Minn., O.

Buellia petraea Montagnaei Tuck.—Minn., S. D.

Buellia petraea grandis Flk.—Minn.

Buellia geographica (L.) Th. Fr.—Minn., S. D.

Buellia parmeliarum (Sommerf.) Tuck.—Minn., Neb.

Buellia pertusaricola Willey.—Neb.

Lecanactis premnea (Ach.) Tuck.—O.

Opegrapha demissa Tuck.—Ia.

Opegrapha atra (Pers.) Nyl.—Ill., O.

Opegrapha varia (Pers.) Fr.—Minn., Ia., Ill., O., Neb.

Opegrapha varia pulicaris (Hoffm.) Fr.—Minn., Ia., O., Neb.

Opegrapha varia notha Ach.—Minn.

Opegrapha vulgata (Ach.) Nyl.—Ill., O.

Opegrapha pulvinata Rehm.—Ia.

Opegrapha quaternella Nyl.—Ia.

Graphis scripta (L.) Ach.—Minn., Ia., Ill., O., Neb., Ind., Wis. (P.).

Graphis scripta serpentina Ach.—Ia.

Graphis scripta limitata Ach.—Minn., O., Neb.

Graphis scripta recta (Humb.) Nyl.—Minn.

Graphis eulectra Tuck.—Ia., Ill.

Graphis elegans (Sw.) Ach.—Minn.

Graphis dendritica Ach.—Minn., Ill., Neb.

Graphis substriatula Nyl.—Minn.

Arthonia pyrrhula Nyl.—Ill.

Arthonia lecideella Nyl.—Minn., Ia., Ill., O., Wis. (P.).

Arthonia pyrrhuliza Nyl.—Ill., O.

Arthonia dispersa (Schrad.) Nyl.—Minn., Ia., O., Neb., Kan. (B.).

Arthonia lapidicola Tayl.—Neb.

Arthonia radiata (Pers.) Th. Fr.—Minn., Ia., Ill., O., Neb.

Arthonia punctiformis Ach.—Minn., Ia., Ill., O., Neb.

Arthonia polymorpha Ach.—Ia., Ill., O.

Arthonia taediosa Nyl.—Ill., Neb.

Arthonia diffusa Nyl.—Ill.

Arthonia spectabilis Flk.—Ia., Ill., O., Ind.

Arthonia patellulata Nyl.—Minn., Ill.

Mycoporum pycnocarpum Nyl.—Ill., Neb.

Acolium tigillare (Ach.) De Not.—Minn., Ia., Ill., O.

Calicium trichiale Ach.—Minn.

Calicium trichiale stemoneum Nyl.—Minn.

Calicium brunneolum Ach.—Minn.

Calicium chrysocephalum (Turn.) Ach.—Minn., O.

Calicium chrysocephalum filare Ach.—Minn.

Calicium parietinum Ach.—Minn., Ia., Ill.

Calicium curtum Turn. & Borr.—Ill.

Calicium trachelinum Ach.—Ill.

Calicium roscidum trabinellum Nyl.—Ill.

Calicium quercinum Pers.—Minn., Ia.

Calicium hyprellum viride Nyl.—Minn.

Calicium microcephalum (Sm.) Turn. & Borr.—Ill.

Calicium byssaceum Fr.—O.

Calicium populineum De Brogn.(?)—Ill.

Calicium turbinatum Pers.—Minn., Ill.

Calicium tubiforme Mass.—Ill.

Sphinctrina tigillaris B. and Br.—Ia.

Coniocybe pallida (Pers.) Fr.—Minn., Ia., Ill.

Endocarpon miniatum (L.) Schaer.—Minn., Ia., Ill., O., Neb., Ind., Wis. (P.).

Endocarpon miniatum Manitense Tuck.—Ill.

Endocarpon miniatum complicatum Schaer.—Minn., Ia., Ill.

Endocarpon miniatum Muhlenbergii Ach.—Minn., Ia., Ill., O.

Endocarpon fluviatile DC.—Minn., O.

Endocarpon arboreum Schwein.—Minn., Ia., Ill., O.

Endocarpon cinereum Nees.—Ill.

Endocarpon hepaticum Ach.—Minn., Ia., Ill.

Endocarpon rufescens Ach.—Ill., Neb.

Endocarpon pusillum Hedw.—Minn., Ia., Ill., O., Neb., Wis (P..)

Endocarpon pusillum Garovaglii Kph.—Minn., Ia., Ill. (F.).

Thelocarpon prasinellum Nyl.—Minn., Ia.

Segestria Lauveri (Flk.) Tuck.—Ill.

Staurothele Drummondii Tuck.—Minn.

Staurothele umbrina (Wahl.) Tuck.—Minn., Ia., Neb., Wis. (P.).

Staurothele diffractella (Nyl.) Tuck—Minn., Ia., Ill.

Trypethelium virens Tuck.—O.

Sagedia oxyspora (Nyl.) Tuck.—Minn., Ill., O.

Sagedia castrensis Tuck.—Ill.

Sagedia lactea Kbr.—Ill.

Verrucaria epigaea (Pers.) Ach.—Minn., Ia., Ill.

Verrucaria nigrescens Pers.—Minn., Ia., Ill., O.

Verrucaria fuscella Fr.—Minn., Ia., Ill., Wis. (P.).

Verrucaria prospersella Nyl.—Ill.

Verrucaria rupestris Schrad.—Ia., Ill., O., Neb.

Verrucaria rupestris subalbicans Leight.—Neb.

Verrucaria muralis Ach.—Minn., Ia., Ill., O., Wis. (P.), Kan. (B.).

Verrucaria pyrenophora (Ach.) Nyl.—Ia., Ill.

Verrucaria viridula Ach.—Ill.

Pyrenula punctiformis (Ach.) Naeg.—Minn., Ia., Ill., Neb.

Pyrenula punctiformis fallax Nyl.—Minn.

Pyrenula glemmata (Ach.) Naeg.—Minn., Ia., Ill., O.

Pyrenula hyalospora (Nyl.) Tuck.—Minn., Ia.

Pyrenula nitida Ach.—Minn., Ia., Ill., O., Neb.

Pyrenula thaelena (Ach.) Tuck.—Minn., Ia., Ill., O.
Pyrenula cinerella (Flot.) Tuck.—Minn., Ia.
Pyrenula quinqueseptata (Nyl.) Tuck.—Minn.
Pyrenula leucoplaca (Wallr.) Kbr.—Minn., Ia., Ill.
Pyrenula subcinerea (Nyl.) Tuck.—Ill.
Pyrenula glabrata (Ach.) Mass.—Minn., Ia., Ill., O.
Pyrenula lactea (Mass.) Tuck.—Ia., Ill.
Pyrenula fallaciosa Stizenb.—Neb.

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