THE

JOURNAL

OF

THE LINNEAN SOCIETY.

BOTANY.

VOL. XXV.

LONDON:
SOLD AT THE SOCIETY'S APARTMENTS, BURLINGTON HOUSE,
AND BY
LONGMANS, GREEN, AND CO.,
AND
WILLIAMS AND NORGATE.
1890.

Dates of Publication of the several Numbers included in this Volume.

Nos. 165–169,	pp. 1–106,	published	Feb. 2,	1889.
No. 170,	,, 107–210,	,,	June 8,	,,
,, 171,	,, 211–306,	,,	July 27,	,,
,, 172,	,, 307–483,	,,	Jan. 28,	1890.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

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THE JOURNAL

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THE LINNEAN SOCIETY.

On the Plants of Kohima and Muneypore.

By Charles Baron Clarke, M.A., F.R.S., F.L.S.

[Read 16th June, 1887.]

(Plates I.–XLIV.)

The present paper contains a list of the plants (with descriptions of the new species) collected on a march from Golaghat (in Central Assam) *viâ* Kohima and Muneypore to Cachar, in October and November 1885. From Kohima I wrote a letter published in the Linnean Society's Journal (Botany), vol. xxii. p. 128. The present list contains 1050 species of Flowering Plants and Ferns, which is probably less than one fifth of the whole Flora of the tract traversed; but it is published as a first contribution to the knowledge of it.

The plants of the Khasi and Naintea Hills are known by the collections of Dr. Wallich, Griffith, and especially of Sir J. D. Hooker and Dr. T. Thomson. In the spring of 1837 Dr. Griffith marched from Sudiya in Upper Assam, *viâ* Hookoom Valley, to Bhamo in Upper Burmah. Between these routes, *i. e.* between Khasia and Hookoom, we have no botanic collections except that here enumerated and the collection of Dr. Watt.

Mr. J. W. Masters published in 1848 (Journal of the Agri-Horticultural Society of India, vol. vi. p. 34) a paper on the Vegetable Productions of the Naga Hills. My attention was kindly directed to this paper by Dr. Prain, the Curator of the Calcutta Herbarium; but I find that it refers to the Terai vegetation, which marks the boundary between the plain of Assam and the Naga Hills; in 1848 it was not possible to penetrate across the Hills into Muneypore.

Dr. Watt marched along the same route in spring that I traversed in autumn. His collection, after a rough examination and tabulation, has been distributed in the General Herbarium at Kew. Mr. Thiselton Dyer wished me to take up Dr. Watt's plants, so that the present paper might contain all that is known concerning the plants of Kohima and Muneypore. I found, however, that Dr. Watt did not wish me to name and describe his collection; and I therefore have not adopted Mr. T. Dyer's suggestion. In comparing my plants in the Kew Herbarium, I have in several cases found that Dr. Watt had named in MS. the same species which I have collected; in these cases I have accepted Dr. Watt's name for the species if undescribed. Dr. Watt's collection being distributed in the Kew Herbarium, I have not compared it thoroughly; but, so far as I have seen it, I should infer that we, collecting along the same route, have collected mainly the same plants.

I need not repeat here the general remarks of my letter from Kohima, already printed by the Society; the present paper is the justifying piece of that letter, with various corrections of detail. The principal phytographic result to be deduced from my Kohima visit is that the Himalayan Flora at this point crosses the Bruhmapootra valley to the southern side of Assam. Jakpho, the mountain I visited near Kohima, is 9980 feet high; about 50 miles east and south-east from Jakpho is a tract of elevated country wholly unexplored; the highest point of this on the map is Saramethi, marked 12,500 feet high. This Saramethi country will be almost immediately accessible, and may be expected to supply an assemblage of new plants allied to the Himalayan Flora at 10,000–12,000 feet altitude. The magnificent Yunnan collections now in the hands of M. Franchet are a further eastward extension of the same character of Flora.

The list appended contains a very few Chinese and Malayan species not known before from British India; it consists in the main of Sikkim and Khasia species, there being an additional 50 new species all allied to Sikkim and Khasia plants.

In comparing and naming the list I have been assisted most kindly by all the officers of the Kew Herbarium, and by Prof. Oliver in particular. Also Mr. Ridley, of the British Museum, who looked at two Orchids for me, and Prof. Reichenbach, who supplied me with a full description of an Orchid which he considers undescribed.

Ranunculaceæ.

Clematis montana, *Buch.-Ham.*
Jakpho, alt. 9500 feet.

C. acutangula, *Hook. f. et T. Thoms.*
North Muneypore, alt. 4000–5000 feet.
Kohima, alt. 4750 feet.

C. apiculata, *Hook. f. et T. Thoms.*
North Muneypore, alt. 3000 feet.

C. Buchananiana, *DC.*
Kohima, alt. 6000 feet.

C. puberula, *Hook. f. et T. Thoms.*
Kohima, alt. 5800 feet.

Anemone rivularis, *Buch.-Ham.*
Kohima, alt. 5000 feet.

Thalictrum javanicum, *Blume.*
Jakpho, alt. 6500 feet.

Ranunculus fibrosus, *Hook. f. et T. Thoms. Fl. Ind.* vol. i. p. 37, *non Wall.*—R. obtectus, *Wall. Cat.* n. 4703 B.—R. pennsylvanicus, *Hook. f. Fl. Brit. Ind.* vol. i. p. 9 (as to the high-level Khasi examples), *non Linn.*—R. diffusus, *Hook. f. MS. in h. Griffith.*
Kohima, alt. 4750 feet [n. 41494].

Aconitum ferox, *Wall.*
Jakpho, alt. 9900 feet.

Dilleniaceæ.

Delima sarmentosa, *Linn.*
West Muneypore, alt. 750 feet.

Magnoliaceæ.

Michelia excelsa, *Blume.*
Kohima, alt. 7000 feet.

M. lanuginosa, *Wall.*
West Muneypore, alt. 1000 feet.

KADSURA WATTII, sp. nova. (Plate I.)

Scandens, gigantea, ramulis lenticellatis. Folia elliptica aut ovata, acumine parvo, fere integra; nervi primarii in utroque latere 10, venulis intermediis conspicuis nexis. Fructus capita in pedunculis brevibus lateralibus solitaria, $1\frac{1}{2}$–2 uncias in diam.; carpella matura clavato-obovoidea, longa $\frac{1}{2}$–$\frac{2}{3}$ unciam, 2–3-sperma. Semina obovoidea emarginata, compressa, pallida; inferius ope falsi dissepimenti horizontalis a superiore (vel 2 superioribus) sejunctum.

North Muneypore, alt. 1000 metr. *C. B. Clarke*, n. 42082.

Bentham (Fl. Hongk. p. 8) has united two plants which I separate as below; the second (*K. Championi*) is near *Kadsura Wattii*, but has much smaller fruit-heads and carpels.

KADSURA CHINENSIS, *Hance*, n. 601; folia elliptico-oblonga acuta subcoriacea, nervi primarii in utroque latere 6–8 venulis intermediis obscuris. Fructus caput (ex icone Hancei neque aliter notum) 3–$3\frac{1}{2}$ uncias in diam.

Hongkong, *Hance, Millett.*

KADSURA CHAMPIONI, sp. nova; folia elliptico-oblonga acuta, nervi primarii in utroque latere 10 aut numerosi, venulis intermediis conspicuis nexis. Fructus maturi caput 1 unciam in diam.; carpella globosa, $\frac{1}{4}$–$\frac{2}{3}$ unciam in diam.

Hongkong, *Champion*, n. 36.

ANONACEÆ.

GONIOTHALAMUS SESQUIPEDALIS, *Hook. f. et T. Thoms.*
Kohima, alt. 4500 feet.

UNONA LONGIFLORA, *Roxb.*
West Muneypore, alt. 1600 feet.

MELODORUM BICOLOR, *Hook. f. et T. Thoms.*
West Muneypore, alt. 1000 feet.

MENISPERMACEÆ.

STEPHANIA HERNANDIFOLIA, *Walp.*
Kohima, alt. 5800 feet.

S. ELEGANS, *Hook. f. et T. Thoms.*
Kohima, alt. 5500 feet.

CISSAMPELOS PAREIRA, *Linn.*
North Muneypore, alt. 3500 feet.

BERBERIDEÆ.

HOLBOELLIA LATIFOLIA, *Wall.*
Kohima, alt. 5500 feet.

BERBERIS NEPALENSIS, *Spreng.*
Kohima, alt. 4500 feet.

B. WALLICHIANA, *DC.*
Jakpho, alt. 9000 feet.

CRUCIFERÆ.

NASTURTIUM INDICUM, *DC.*
Nambre Forest (Naga Hills), alt. 400 feet.

CARDAMINE HIRSUTA, *Linn.*, var. SYLVATICA (sp. Link).
North Muneypore, alt. 5800 feet.

CAPPARIDEÆ.

GYNANDROPSIS PENTAPHYLLA, *DC.*
Nambre Forest (Naga Hills), alt. 400 feet.

CAPPARIS MULTIFLORA, *Hook. f. et T. Thoms.*
North Muneypore, alt. 4500 feet.

ROYDSIA SUAVEOLENS, *Roxb.*
North Muneypore, alt. 3000 feet.

VIOLACEÆ.

VIOLA PATRINII, *DC.*
Kohima, alt. 4500 feet.

V. SERPENS, *Wall.*
Kohima, alt. 6000 feet.

POLYGALEÆ.

POLYGALA ARILLATA, *Buch.-Ham.*
Kohima, alt. 5800 feet.

P. TRIPHYLLA, *Buch.-Ham.*, var. GLAUCESCENS (sp. Wall.).
North Muneypore, alt. 3500 feet.

P. LEPTALEA, *DC.*
North Muneypore, alt. 3750 feet.

P. PERSICARIÆFOLIA, *DC.*
Kohima, alt. 5500 feet.

POLYGALA SIBIRICA, *Linn.*
Kohima, alt. 5500 feet.

P. GLOMERATA, *Lour.*
Kohima, alt. 5000 feet.

SALOMONIA CANTONIENSIS, *Lour.*
Kohima, alt. 1500–4750 feet.
West Muneypore, alt. 1000 feet.

CARYOPHYLLEÆ.

SILENE VAGANS, sp. nova. (Plate II.)

Planta minute pubescens. Rami 2–3-pedales, vagantes vix scandentes. Folia lanceolata, basi attenuata, vix trinervia. Inflorescentia terminalis, laxe composite cymosa, foliis juxta trichotomias parvis. Calyx cylindricus, prope basim breviter contractus, in ipsa basi truncatus. Capsula cylindrica, subovoidea, dentibus 6 breviter recurvatis, in carpophoro brevi sustenta.

Kohima, alt. 5500 feet. *C. B. Clarke*, nn. 41915, 41771.

This species is near *S. khasiana*, Rohrb., Hook. f. Fl. Brit. India, vol. i. p. 221; but it is more pubescent, has more compound cymes and leaves attenuate at the base.

CUCUBALUS BACCIFERUS, *Linn.*
Kohima, alt. 5800 feet.

STELLARIA PANICULATA, *Edgew.*
North Muneypore, alt. 3250–6500 feet.

DRYMARIA CORDATA, *Willd.*
Kohima, alt. 4750 feet.

HYPERICINEÆ.

HYPERICUM NAPAULENSE, *Choisy.*
Kohima, alt. 5500 feet.

H. JAPONICUM, *Thunb.*
Kohima, alt. 4750 feet.

GUTTIFERÆ.

GARCINIA CORNEA, *Roxb.*
Kohima, alt. 4500 feet.

MESUA FERREA, *Linn.*
West Muneypore, alt. 350 feet.

TERNSTRŒMIACEÆ.

EURYA SYMPLOCINA, *Blume.*
Kohima, alt. 6000 feet.

E. ACUMINATA, *DC.*
Kohima, alt. 4750 feet.

ACTINIDIA CALLOSA, *Lindl.*
Jakpho, alt. 9000 feet.

SAURAUJA NAPAULENSIS, *DC.*
Kohima, alt. 4500 feet.

S. ROXBURGHII, *Wall.*
West Muneypore, alt. 350 feet.

SCHIMA WALLICHII, *Choisy.*
Kohima, alt. 5000 feet.

Thiselton Dyer (in Fl. Brit. Ind. vol. i. p. 289) diagnoses, "Flowers in a short terminal raceme." I would rather say, "Peduncles axillary, solitary, sometimes crowded towards the ends of the branches."

CAMELLIA DRUPIFERA, *Lour.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 1800 feet.

MALVACEÆ.

SIDA RHOMBIFOLIA, *Linn.*
Kohima, alt. 4750 feet.

URENA CALLIFERA, sp. nova. (Plate III.)

Folia late rotundata, breviter angulato-subdigitata, summa lanceolata. Calyx bracteolas (epicalycem) triangulari-lanceolatas multo superans; sepala usque ad dimidiam partem basi coalita, carinata, in medio callum dense albo-pilosum proferentia. Quoad cætera cum *U. lobata*, Linn., congruens.

Kohima, alt. 4750 feet [n. 41657].

This may be only one more variety of *U. lobata*; but in the ample series of *U. lobata* at Kew I find no tendency in any one to the hairy calli on the calyx-segments of this new species; and moreover in all the Kew material, as noted by Dr. Masters (in Hook. Fl. Brit. India, vol. i. p. 329), the bracteoles are about as long as the calyx.

KYDIA CALYCINA, *Roxb.*
North Muneypore, alt. 4000 feet.

Sterculiaceæ.

Sterculia coccinea, *Roxb.*
West Muneypore, alt. 2500 feet.

Tarrietia (simplicifolia, *Mast.*?).
West Muneypore, alt. 350 feet [n. 42312].
Fruits only were obtained fallen from a very large tree; these Prof. Oliver matched with fruits obtained from a large tree in Khasia by Sir J. D. Hooker, who got fruits only which he referred to *Tarrietia*. The tree is *Tarrietia* and probably *T. simplicifolia*, Mast., but on fruits *only* it cannot be safely determined.

Buettneria pilosa, *Roxb.*
West Muneypore, alt. 2000 feet.

Pterospermum lanceæfolium, *Roxb.*
Neechoogard, alt. 500 feet [Naga Hills].
Matched only by a branch without flower or fruit.

Tiliaceæ.

Columbia floribunda, *Wall.*
West Muneypore, alt. 2500 feet.
Neechoogard, alt. 500 feet [Naga Hills].

Grewia abutifolia, *Juss.*
North Muneypore, alt. 3500 feet.

Triumfetta pilosa, *Roth.*
Kohima, alt. 4750 feet.
Said by Dr. Masters (in Fl. Brit. Ind. vol. i. p. 395) to have "Flowers $\frac{3}{4}$ in."; but I have never seen them even half that size.

Corchorus acutangulus, *Lam.*
Muneypore, alt. 2650 feet.

Elæocarpus Braceanus, *Watt MS.*
Arbor 30-pedalis, novellis pilosis. Folia elliptica acuminata serrata, subtus sparsim pilosa. Bracteæ sub calyce ovatæ, fimbriato-serratæ. Petala fimbriata. Stamina c. 30, scabrida. Fructus ellipsoideus, $1\frac{1}{4}$ unciam longus.
Kohima, alt. 5000 feet.
West Muneypore, alt. 4000 feet.
[Kupra, alt. 6000–7000 feet, *Watt* n. 5876.]

Sir J. D. Hooker determined my specimens to be *Elæocarpus* and a new species; and I found subsequently the plant had been collected and named in MS. by Dr. Watt. The species is easily separated from all other *Elæocarpus* by the remarkable bracts.

LINEÆ.

REINWARDTIA TRIGYNA, *Planch.*

North Muneypore, alt. 4000 feet.

Gen. Collett, in a paper read before the Simla Natural History Society [and published] 1886, has shown that this plant is dimorphic in a very complex way; that the number of styles is variable; and that *R. tetragyna*, Planch., is almost certainly identically = *R. trigyna*, as, indeed, Sir J. D. Hooker was inclined to esteem it in Fl. Brit. Ind. vol. i. p. 412.

MALPIGHIACEÆ.

ASPIDOPTERYS ROXBURGHIANA, *A. Juss.*

Kohima, alt. 5000–5500 feet.

West Muneypore, alt. 1000 feet.

GERANIACEÆ.

GERANIUM NEPALENSE, *Sweet.*

Kohima, alt. 5500 feet.

North Muneypore, alt. 5500 feet.

OXALIS CORNICULATA, *Linn.*

Kohima, alt. 4750 feet.

IMPATIENS SALICIFOLIA, *Hook. f. et T. Thoms.*

West Muneypore, alt. 2300 feet.

I. STENANTHA, *Hook. f.*

Kohima, alt. 5500–6500 feet.

Jakpho, alt. 9500 feet.

Var. n. 2 ?, *Hook. f.*

Kohima, alt. 6000 feet.

North Muneypore, alt. 5500 feet.

I. ARGUTA, *Hook. f. et T. Thoms.*

Kohima, alt. 4750 feet.

I. LATIFLORA, *Hook. f. et T. Thoms.*

Kohima, alt. 2600 feet.

IMPATIENS PORRECTA, *Wall.*
Kohima, alt. 3000–5800 feet.
North Muneypore, alt. 3500–5500 feet.

I. LÆVIGATA, *Wall.*
Kohima, alt. 3000 feet.
West Muneypore, alt. 1600 feet.

I. BELLA, *Hook. f. et T. Thoms.*
West Muneypore, alt. 1600 feet.
Leaves whitened underneath; flowers pale yellow or (when fully expanded) quite white. Creeping and rooting, forming large patches, as usually it does in Khasia.

IMPATIENS sp. [n. 42326].
Caulibus erectis, teneris, 2-pedalibus, fere indivisis, puberulis, in inferiore parte subefoliatis; racemulis parvis debilibus pauci-floris, apice foliigeris; foliis alternis, 2 uncias longis, petiolatis lanceolatis, crenato-serrulatis, setuloso-puberulis; bracteis caducis; floribus $\frac{2}{3}$ unciam longis, roseis, latiusculis in calcar breve lineare curvatum subito angustatis; capsulis vix $\frac{1}{2}$ unciam longis, latiuscule linearibus.
West Muneypore, alt. 750 feet.
This plant was in my old Khasi collection (n. 15141) and I, some years ago, pasted it down into the Kew Herbarium. I am tolerably sure that it is new; but I refrain from making new species in such a genus as *Impatiens*, until I may be able to devote some weeks to getting my eye in and learning up thoroughly the material already named.
The balsams in Muneypore are not equal in number, either species or individuals, to those in Khasia.

RUTACEÆ.

BOENNINGHAUSENIA ALBIFLORA, *Reichb.*
Kohima, alt. 6000 feet.
Jakpho, alt. 7500 feet.

ZANTHOXYLON ALATUM, *Roxb.*
North Muneypore, alt. 5500 feet.

TODDALIA ACULEATA, *Pers.*
North Muneypore, alt. 5500 feet.

SKIMMIA LAUREOLA, *Hook. f.*
Jakpho, alt. 9000 feet.

ACRONYCHIA LAURIFOLIA, *Blume.*
West Muneypore, alt. 2000 feet.

CLAUSENA EXCAVATA, *Burm.*
Nambre Forest, alt. 400 feet [Naga Hills].

C. WILLDENOVII, *Wight et Arn., var.* PUBESCENS?
Kohima, alt. 5500 feet [n. 41119].
A tree 40 feet high, with lateral inflorescence; collected with ripe fruit, which is smaller than that of *C. Willdenovii*, nor do the leaves match well.

SIMARUBEÆ.

BRUCEA MOLLIS, *Wall.*
West Muneypore, alt. 4500 feet.

MELIACEÆ.

DYSOXYLON PROCERUM, *Hiern.*
West Muneypore, alt. 500 feet.

OLACINEÆ.

ERYTHROPALUM SCANDENS, *Blume.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 1500 feet.

LEPIONURUS OBLONGIFOLIUS, *Mast.*
Neechoogard, alt. 500 feet [Naga Hills].

CARDIOPTERIS LOBATA, *R. Br.*
Neechoogard, alt. 500 feet [Naga Hills].

ILICINEÆ.

ILEX AQUIFOLIUM, *Linn.*?
Jakpho, alt. 8000–9000 feet.
Trees 40 feet high, without flower or fruit in October. The branchlets with leaves match accurately the common English holly.

CELASTRINEÆ.

EUONYMUS BULLATUS, *Wall.*
Kohima, alt. 4500 feet.

MICROTROPIS DISCOLOR, *Wall.*
Kohima, alt. 4500 feet.

LOPHOPETALUM sp.

Neechoogard, alt. 500 feet [Naga Hills].

My specimen had fruit, not flowers, while several of the described species are without ripe fruit.

CELASTRUS PANICULATA, *Willd.*

Jakpho, alt. 9500 feet.

C. CHAMPIONII, *Benth. Fl. Hongk.* p. 64.

Kohima, alt. 4500 feet.

There is a good deal of this species in the old-collected Indian Kew bundles; but it seems not to have been taken up in Hook. f. Fl. Brit. Ind.

GYMNOSPORIA sp.

Kohima, alt. 5500 feet.

There is good material, too, of this species in the Kew bundles, collected by Griffith and by Hook. f. et T. Thoms., and marked "sp. near *G. acuminata*"; but it seems again not to have been taken up in Hook. f. Fl. Brit. Ind. The species is very near, if not equal to, *G. Thomsoni*, Kurz.

RHAMNEÆ.

ZIZYPHUS INCURVA, *Roxb.*

North Muneypore, alt. 5500 feet.

Z. ŒNOPLIA, *Mill.*

North Muneypore, alt. 5000 feet.

RHAMNUS NIPALENSIS, *Wall.*

North Muneypore, alt. 5500 feet.

GOUANIA NAPALENSIS, *Wall.*

Kohima, alt. 5800 feet.

AMPELIDEÆ.

VITIS REPENS, *Wight et Arn.*

Kohima, alt. 4750 feet.

V. BRACTEOLATA, *Wall.*

Nambre Forest, alt. 400 feet [Naga Hills].

This plant is always dioicous with me. The male flowers are very small.

V. TENUIFOLIA, *Wight et Arn.*

Kohima, alt. 4750 feet.

VITIS DUBIA, *Lawson*? [n. 41849.]
Jakpho, alt. 6500 feet.
The berries are 3–4-seeded, whereas Lawson diagnoses the species as 2-seeded. This n. 41849 must be very near *V. dubia* at all events.

V. PEDATA, *Vahl.*
Kohima, alt. 5800 feet.

V. LANCEOLARIA, *Roxb.*? [n. 42190.]
West Muneypore, alt. 1500 feet.
The fruits are much smaller than in the named specimens at Kew and than Lawson's description, and are 4-seeded. The seeds (quite ripe) are $\frac{1}{10}$–$\frac{1}{8}$ inch long (instead of $\frac{1}{4}$ inch as stated, Fl. Brit. Ind. vol. i. p. 660); the fruit-corymb is large, very lax, with distant fruits.

LEEA TRIFOLIATA, *Lawson.*
West Muneypore, alt. 300–400 feet.
This plant grows gregariously from a much-divided creeping rhizome, in wet places in forest, in deep mountain-gorges; the stems not more than 1–2 feet, as correctly described by Lawson. The flowers are green-white; in Trimen, Journ. Bot. N. S. vol. x. [1881] p. 102, I have arranged the species in the red-flowered group. Since that date I have seen it alive in quantity; it abounds in the Garo Hills.

L. ACUMINATA, *Wall.*
Nambre Forest, alt. 400 feet [Naga Hills].
West Muneypore, alt. 300–1500 feet.
Some of this is very large (*i. e.* for the species), 7 feet high, but scarcely woody, with the leaves occasionally 3-pinnate.

L. HERBACEA, *Buch.-Ham.*
Neechoogard, alt. 750 feet [Naga Hills].
West Muneypore, alt. 1500 feet.

L. BRACTEATA, *C. B. Clarke in Trimen, Journ. Bot.* N. S. vol. x. [1881] p. 164.
Neechoogard, alt. 500 feet [Naga Hills].

SAPINDACEÆ.

ACER SIKKIMENSE, *Miq.*
Jakpho, alt. 7500 feet.

Acer caudatum, *Wall.*
Jakpho, alt. 9000 feet.

Dobinæa vulgaris, *Buch.-Ham.*
Kohima, alt. 5500 feet.

Turpinia pomifera, *Wall.*
Kohima, alt. 4000 feet.

Sabiaceæ.

Sabia purpurea, *Hook. f. et T. Thoms.*
Kohima, alt. 5500 feet.
West Muneypore, alt. 4000 feet.

S. lanceolata, *Colebr.*
West Muneypore, alt. 2300 feet.

Meliosma simplicifolia, *Roxb.*
West Muneypore, alt. 1000–1500 feet.

M. Wallichii, *Planch.*
West Muneypore, alt. 2000 feet.

Anacardiaceæ.

Rhus succedanea, *Linn.*
Kohima, alt. 4500 feet.

R. semialata, *Murray.*
Kohima, alt. 4500–6500 feet.
Forma *ludens.*
Kohima, alt. 5500 feet [nn. 41755, 41757].
Panicle large, very dense, with innumerable small green flowers passing into bracteoles. Plentiful for many miles at this particular level.

Leguminosæ.

Priotropis cytisoides, *Wight et Arn.*
Kohima, alt. 4750 feet.

Crotalaria humifusa, *Graham.*
Kohima, alt. 2500–4500 feet.

C. mysorensis, *Roth* ?
Kohima, alt. 4750–5500 feet.
This plant is common also in Khasia. The flowers are very small for *C. mysorensis.*

CROTALARIA OCCULTA, *Graham.*
Kohima, alt. 4500 feet.
Corolla white in this specimen.

C. SESSILIFLORA, *Linn.*
Kohima, alt. 4500 feet.

C. ASSAMICA, *Benth.*
Kohima, alt. 4750 feet.

C. TETRAGONA, *Roxb.*
North Muneypore, alt. 2750 feet.

INDIGOFERA LEPTOSTACHYA, *DC.*
North Muneypore, alt. 3500 feet.

I. ATROPURPUREA, *Buch.-Ham.*
North Muneypore, alt. 5500 feet.

MILLETTIA PACHYCARPA, *Benth.*
Kohima, alt. 4000 feet.

M. FRUTICOSA, *Benth.*
North Muneypore, alt. 5000 feet.

LESPEDEZA SERICEA, *Miq.*
Kohima, alt. 4750 feet.
North Muneypore, alt. 4000 feet.

SMITHIA CILIATA, *Royle.*
Kohima, alt. 4750 feet.

S. BLANDA, *Wall.*
North Muneypore, alt. 3500–4500 feet.

ÆSCHYNOMENE INDICA, *Linn.*
North Muneypore, alt. 3500 feet.

PYCNOSPORA HEDYSAROIDES, *R. Br.*
West Muneypore, alt. 2000 feet.

URARIA HAMOSA, *Wall.*
Nambre Forest, alt. 400 feet [Naga Hills].

U. PANICULATA, sp. nova. (Plate IV.)

Villosa. Foliola 3, anguste ovata, acuta, mucronata. Panicula usque ad 1 pedem longa, 10 uncias lata, ramis lateralibus pluribus divaricatis. Bracteæ caducæ. Fructus articuli c. 6, e calyce omnino exserti.

Kohima, alt. 3000 feet [n. 40924].

A plant 3–6 feet high, with beautiful panicles of many rose-purple flowers, so like a *Desmodium* both as to leaf and inflorescence that Mr. Baker observed that nothing but the fruit attached as it is would have satisfied him that it was not a *Desmodium*. It is really near *Uraria hamosa*, Wall., but the leaves do not agree, and the panicle has many lateral branches instead of a number of racemes subdigitately collected.

ALYSICARPUS RUGOSUS, *DC.*, var. LUDENS.
Nambre Forest, alt. 400 feet [Naga Hills].

DESMODIUM TRIQUETRUM, *DC.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 2000 feet.

D. PODOCARPUM, *DC.*
Nambre Forest, alt. 400 feet [Naga Hills].

D. SCALPE, *DC.*
North Muneypore, alt. 6000 feet.

D. LATIFOLIUM, *DC.*
Kohima, alt. 4000 feet.

D. TERES, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

D. SINUATUM, *Blume.*
Kohima, alt. 3000–4750 feet.

D. CONCINNUM, *DC.*
Kohima, alt. 5500 feet.

D. POLYCARPUM, *DC.*
Kohima, alt. 4750 feet.

D. PARVIFOLIUM, *DC.*
Kohima, alt. 4500–5800 feet.

AMPHICARPÆA EDGEWORTHII, *Benth.*
Kohima, alt. 5500 feet.

SHUTERIA VESTITA, *Wight et Arn.*
Kohima, alt. 5800 feet.
North Muneypore, alt. 5000 feet.

DUMASIA VILLOSA, *DC.*
North Muneypore, alt. 3000 feet.

DUMASIA CORDIFOLIA, *Benth.*
North Muneypore, alt. 5500 feet.

MUCUNA IMBRICATA, *DC.*
West Muneypore, alt. 2000 feet.

BUTEA MINOR, *Buch.-Ham.*
Kohima, alt. 6500 feet.

PUERARIA THOMSONI, *Benth.*
Nambre Forest, alt. 400 feet [Naga Hills].
Kohima, alt. 2000–3000 feet.

P. PHASEOLOIDES, *Benth.*
Nambre Forest, alt. 400 feet [Naga Hills].
Neechoogard, alt. 1000 feet [Naga Hills].
North Muneypore, alt. 3500 feet.

P. PEDUNCULARIS, *Grah.*
Kohima, alt. 5800 feet.

PHASEOLUS CALCARATUS, *Roxb.*
Kohima, alt. 4750 feet.
North Muneypore, alt. 2000 feet.

CLITORIA MARIANA, *Linn.*
Kohima, alt. 5500 feet.

DOLICHOS LABLAB, *Linn.*
Kohima, alt. 3000 feet.

DUNBARIA CONSPERSA, *Benth.*
West Muneypore, alt. 2000 feet.

D. DEBILIS, *Baker.*
North Muneypore, alt. 3500 feet.

ERIOSEMA CHINENSE, *Vogel.*
Kohima, alt. 4500 feet.

FLEMINGIA SEMIALATA, *Roxb.*
Kohima, alt. 4750 feet.
Muneypore, alt. 2700 feet.

DALBERGIA RIMOSA, *Roxb.*
Neechoogard, alt. 750 feet [Naga Hills].

D. WATTII, sp. nova. (Plate V.)
Arbor vagans, alta 30-pedalis. Foliola c. 9-petiolulata, longa $2\frac{1}{2}$–3 uncias, lanceolata acuta, glabriuscula, subtus tenuissime

pilosula. Legumen longum $2\frac{1}{4}$ uncias, latum $\frac{3}{4}$ unciam, multum compressum tenue, 1-spermum, glabrum, vix pedicellatum, supra semen paullo venosum.

North Muneypore, alt. 3500 feet [n. 42034].

The leaflets are much acuter than in any Indian species of the genus.

Dalhousiea bracteata, *Graham.*

West Muneypore, alt. 2000 feet.

Mezoneuron cucullatum, *Benth.*

Kohima, alt. 5500 feet.

Cassia mimosoides, *Linn.*

Kohima, alt. 4500 feet.

Bauhinia acuminata, *Linn.*

Kohima, alt. 4750 feet.

B. divergens, *Baker.*

Neechoogard, alt. 500 feet [Naga Hills].

B. tenuiflora, *Watt, MS.* (Plate VI.)

Scandens. Folia breviter biloba, lobis obtusis, matura subtus rubiginoso-puberula. Racemi multiflori, rubiginoso-villosuli; pedicelli longi. Calycis tubus linearis, lobis 3–4plo longior; lobi 4, longi $\frac{1}{4}$ in., unus cæteris duplo latior apice furcatus. Petala $\frac{1}{2}$–$\frac{2}{3}$ unciam longa, alba. Stamina 3 fertilia, 7 ad sterilia filamenta reducta. Legumen longum $8\frac{1}{2}$ uncias, latum $1\frac{3}{4}$ in.; multum compressum, tenue, fere glabrum.

West Muneypore, alt. 1500–2500 feet [nn. 42304, 42255, 42342].

A very handsome, profusely flowering *Bauhinia*, easily separated from all others by the great length of the calyx-tube in proportion to its lobes.

Mimosa pudica, *Linn.*

Muneypore, alt. 2650 feet.

Acacia arabica, *Willd.*

Muneypore, alt. 2650 feet.

Albizzia stipulata, *Boiv.*

Kohima, alt. 4500 feet.

A. procera, *Benth.*

Kohima, alt. 4500 feet.

ROSACEÆ.

PRUNUS JENKINSII, *Hook. f. et T. Thoms.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 2750 feet.

SPIRÆA CALLOSA, *Thunb.*
Jakpho, alt. 8000 feet.

NEILLIA THYRSIFLORA, *D. Don.*
Kohima, alt. 4750 feet.

RUBUS ACUMINATUS, *Sm.*
Kohima, alt. 5800 feet.

R. MOLUCCANUS, *Linn.*
Kohima, alt. 4750 feet.

R. ALPESTRIS, *Blume.*
Kohima, alt. 6000 feet.
Jakpho, alt. 9000 feet.

R. CALOPHYLLUS, sp. nova. (Plate VII.)
Folia simplicia, oblonga acuminata, nervis 20 paribus parallelis, subtus adpresse albido-sericea. Flores in axillis fasciculati, pedicellis brevibus. Sepala triangularia, caudato-acuminata, intus dense minute griseo-tomentosa, extus proventu parum pilosa. Fructus e drupis paucis rubris constans.
Jakpho, alt. 9900 feet [n. 41351].
A beautiful shrub, with complanate foliage, allied to *R. lineatus*, Reinw., but with simple leaves.

R. LINEATUS, *Reinw.*
Jakpho, alt. 9000 feet.

R. LINEATUS, *Reinw.*, var. LUTEO-DRUPA ?
Jakpho, alt. 9500 feet.
This has a yellow fruit, whereas *R. lineatus* has always a red fruit. But as to leaves &c., the plant exactly agrees with the small narrow-leaved forms of *R. lineatus*.

R. ELLIPTICUS, *Sm.*
Kohima, alt. 4750 feet.

R. NUTANS, *Wall.*
Jakpho, alt. 9000 feet.

R. LUCENS, *Focke.*
Kohima, alt. 1500 feet.
West Muneypore, alt. 2000 feet.

RUBUS LASIOCARPUS, *Sm.*
Kohima, alt. 4500–6500 feet.

R. NIVEUS, *Wall.*
North Muneypore, alt. 3500 feet.

POTENTILLA FULGENS, *Wall.*
Kohima, alt. 4750–7000 feet.

P. KLEINIANA, *Wight et Arn.*
Jakpho, alt. 6000 feet.

POTENTILLA sp. from Shillong, *Hook. f. Fl. Brit. India*, vol. i. p. 360.
North Muneypore, alt. 3500 feet.
Also collected by Dr. Watt in Muneypore, and named by him in MS. *P. manipurensis.*

AGRIMONIA EUPATORIA, *Linn.*
Kohima, alt. 4750 feet.

DOCYNIA INDICA, *Decne.*
North Muneypore, alt. 5800 feet.

POURTHIÆA ARGUTA, *Hook. f. et T. Thoms.*
North Muneypore, alt. 5500 feet.

PYRUS PASHIA, *Buch.-Ham.*
North Muneypore, alt. 5500 feet.

P. KOHIMENSIS, *Watt MS.*
Arbor majuscula. Folia decidua, anguste ovato-lanceolata, integra serrulata; nervi 8–10 pares, conspicui, subparalleli. Folia juniora dense cinnamomeo-lanata, matura supra glabrata, subtus lanata (lana autem proventu omnino detergibili). Inflorescentia (ante folia expansa) arcte paniculata, dense cinnamomeo-lanata. Fructus angulatim globosus, $\frac{1}{5}$ unciam diam.
Kohima, alt. 5800 feet.
Dr. Watt has collected this tree in the same place, and I have taken the description of the fruit from his specimen. The tree is near *Pyrus vestita*, Wall., and its var. *P. khasiana*; but the leaves do not match and the cuboid fruit is unlike that of any neighbouring species.

P. FOLIOLOSA, *Wall.*
Jakpho, alt. 9900 feet.

PHOTINIA NOTONIANA, *Wight et Arn.*
Kohima, alt. 4500–7000 feet.

COTONEASTER SIMONDSII, *Baker.*
Jakpho, alt. 9900 feet.
This is one of the few Khasia plants that escaped Sir J. D. Hooker. I have collected much of it in Khasia, as at Lailankote, alt. 5500 feet.

SAXIFRAGACEÆ.

ASTILBE RIVULARIS, *Buch.-Ham.*
Jakpho, alt. 9000 feet.
Kohima, alt. 5800 feet.

DICHROA FEBRIFUGA, *Lour.*
Kohima, alt. 5800 feet.

ITEA MACROPHYLLA, *Wall.*
West Muneypore, alt. 2500 feet.

I. CHINENSIS, *Hook. et Arn.*
Kohima, alt. 4500 feet.

CRASSULACEÆ.

KALANCHOE ROSEA, sp. nova. (Plate VIII.)
Fere glabra. Folia petiolata, elliptica, integra crenata. Cyma multiflora. Calyx usque ad basim fere divisus; segmenta anguste lanceolato-linearia. Corolla rosea, tubus calycem 2plo (et ultra) superans.
Kohima, alt. 5000 feet.
North Muneypore, alt. 5500 feet.
All the Bengal Kalanchoes have yellow corollas.

SEDUM TRIFIDUM, *Wall.*
Jakpho, alt. 9000 feet.

S. MULTICAULE, *Wall.*
Kohima, alt. 5500 feet.
Jakpho, alt. 7000 feet.

HAMAMELIDEÆ.

BUCKLANDIA POPULNEA, *R. Br.*
Kohima, alt. 4500–6000 feet
Jakpho, alt. 7500 feet.

Combretaceæ.

Combretum flagrocarpum, *C. B. Clarke.*
Kohima, alt. 4750 feet.

C. pilosum, *Roxb.*
West Muneypore, alt. 1750 feet.

Illigera Kurzii, *C. B. Clarke.*
North Muneypore, alt. 5500 feet.

I. villosa, sp. nova. (Plate IX.)
Caulis (cum innovationibus) fulvo-villosus. Foliola elliptica acuta, subtus tenuiter pilosa. Fructus latus $1\frac{1}{2}$–2 uncias, fere glaber, sæpius 3-alatus, alis 2 latis 1 angusta.
Kohima, alt. 5500 feet [n. 41843].
The leaves of this are much like those of *I. pulchra*, Blume, or of *I. khasiana*, C. B. Clarke; the fruits vary from 4-winged to 2-winged. Several of these species of *Illigera* are very nearly allied; none of them, however, has a hairy stem like this, nor do the leaves match. The present species may nevertheless prove a variety only of *I. khasiana*.

Melastomaceæ.

Osbeckia chinensis, *Linn.*
Kohima, alt. 4500 feet.

O. crinita, *Benth.*
Kohima, alt. 4750 feet.

Oxyspora paniculata, *DC.*
Kohima, alt. 5000 feet.

O. vagans, *Wall.*
West Muneypore, alt. 2000 feet.

Sonerila stricta, *Hook.*
Kohima, alt. 2500 feet.
North Muneypore, alt. 3500 feet.

S. maculata, *Roxb.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 1700 feet.

Sarcopyramis nepalensis, *Wall.*
Kohima, alt. 6000 feet.

ANPLECTRUM ASSAMICUM, *C. B. Clarke.* (Plate X.)
West Muneypore, alt. 750 feet [n. 42323].

A shrub 6 feet high. Corolla-lobes 4, $\frac{1}{4}$ inch long, a pale mauve. Stamens 8, all subsimilar. At the base of the anther are two small auricles, subconfluent, and a short ovate appendage behind.—I described imperfectly this plant in Hook. f. Fl. Brit. Ind. vol. ii. p. 546, from Griffith's Kew Distrib. n. 2285, which has no flowers. As the genera *Anplectrum*, *Dissochæte*, &c. are diagnosed by the appendages at the base of the anthers, I placed the plant in *Anplectrum* with doubt. But since I have seen the plant in full flower alive, the doubt is rather increased; for it will not go either into *Anplectrum* or *Dissochæte* unless the characters of one of those genera be widened. The plant very greatly resembles *Anplectrum cyanocarpum*, Blume [Korth. in (Temminck) Verh. Nat. Gesch. p. 238, t. 56]; the anthers are appendaged nearly as there (the auricles a little wider), but in Blume's plant four out of the eight stamens are rudimentary.

LYTHRACEÆ.

AMMANNIA PEPLOIDES, *Spreng.*
Kohima, alt. 3000 feet.

A. BACCIFERA, *Linn.*
Kohima, alt. 3000 feet.

ONAGRACEÆ.

EPILOBIUM ROSEUM, *Schreb.*
Kohima, alt. 4000 feet.
Jakpho, alt. 9900 feet.

LUDWIGIA PARVIFLORA, *Roxb.*
Muneypore, alt. 2750 feet.

CIRCÆA QUADRISULCATA, *Franch. et Savat.*
Kohima, alt. 4500–5800 feet.

This is *C. lutetiana*, Linn., var. *quadrisulcata*, Maxim. This is separable from *C. lutetiana* (among other characters) by the lanceolate leaves narrowed at base. My specimens agree well with the Japanese, and there is the same thing at Kew from China.

C. ALPINA, *Linn.*
Kohima, alt. 6000 feet.

Passifloreæ.

Passiflora Leschenaultii, *DC.*
Jakpho, alt. 6500 feet.

P. nepalensis, *Wall.*
North Muneypore, alt. 5500 feet.

Modecca cardiophylla, *Mast.*
North Muneypore, alt. 4000 feet.
Fruit ovoid, acute, smooth, red, 2 by $1\frac{1}{4}$ inch, splitting to the base (and down the carpophore) into three persistent thick almost corky valves.

M. trilobata, *Roxb.*
Nambre Forest, alt. 300 feet [Naga Hills].

Cucurbitaceæ.

Hodgsonia heteroclita, *Hook. f. et T. Thoms.*
North Muneypore, alt. 4500 feet.

Trichosanthes multiloba, *Miq.*
Neechoogard, alt. 500 feet [Naga Hills].

T. macrosiphon, *Kurz.*
Nambre Forest, alt. 400 feet [Naga Hills].
My plant is like Kurz's, a female in flower (and young fruit), and I have nothing to add to Kurz's imperfect description, by which I name my specimen. I think it is nearly surely identified rightly; it is rather more pubescent than Kurz indicates.

Momordica, sp. [N. 41763.]
Folia longe petiolata, ovata, sublobata, scabra. Fuctus long pedunculatus ovoideus, breviter acutus, 2 uncias in diam., lævis aurantiacus, parum succulentus, subtrivalvis. Semina numerosa, $\frac{1}{4}$ unciam longa, ellipsoidea, compressa, nec marginata neque angulata.
Kohima, alt. 5500 feet.
From the seeds I think this is almost certainly a *Momordica*, but I know no *Momordica* with a smooth fruit of this kind.

M. dioica, *Roxb.*
Nambre Forest, alt. 400 feet [Naga Hills].

Cucumis sativus, *Linn.*
Nambre Forest, alt. 400 feet [Naga Hills].

ZEHNERIA UMBELLATA, *Thwaites.*
Kohima, alt. 5000 feet.

MELOTHRIA ODORATA, *Hook. f. et T. Thoms.*
Kohima, alt. 5000 feet.

M. INDICA, *Lour.*
Neechoogard, alt. 500 feet [Naga Hills].

THLADIANTHA CALCARATA, *Colebr.*
Neechoogard, alt. 500 feet [Naga Hills].
North Muneypore, alt. 5500 feet.
Fruit brown, hirsute, *cf.* Cogn. in DC. Monogr. vol. iii. p. 423.

T. HOOKERI, *C. B. Clarke.*
Nambre Forest, alt. 400 feet [Naga Hills].
Neechoogard, alt. 1000 feet [Naga Hills].

GYNOSTEMMA PEDATA, *Blume.*
Nambre Forest, alt. 400 feet [Naga Hills].
Kohima, alt. 4500 feet.

G. PEDATA, *Blume*, var. ? SIMPLICIFOLIA.
North Muneypore, alt. 3500 feet.
Leaves ovate, undivided, sometimes slightly lobed.

BEGONIACEÆ.

BEGONIA JOSEPHI, *A. DC.*
Jakpho, alt. 7000 feet.

B. LACINIATA, *Roxb.*
Kohima, alt. 4500–6000 feet.

B. BARBATA, *Wall.*
West Muneypore, alt. 750–2000 feet.

B. MEGAPTERA, *A. DC.*
Neechoogard, alt. 500 feet [Naga Hills].

B. SIKKIMENSIS, *A. DC.*
Kohima, alt. 3000 feet.

B. GRIFFITHI, *Hook.*
Kohima, alt. 5700 feet.
This is the Begonia on Polly Badgeley highly admired by the European residents of Kohima for its strongly marked leaf.

B. REX, *Putzeys* ?
West Muneypore, alt. 500 feet.

The specimen suits *B. Rex* well, but it is in flower, without even young fruit, so that the determination cannot be sure. The specimen shows the highly apiculate anthers; but also shows a long repent rhizome, about $\frac{1}{5}$ inch thick, covered with broad scales.

BEGONIA WATTII, sp. nova. (Plate XI.)

Planta 4-12 uncias alta, tenera, pubescens. Rhizoma breve, lignosum. Folia longe petiolata, cordato-ovata, acuta, integra duplicato-serrata. Flores numerosi, minusculi, rosei. Antheræ vix apiculatæ. Capsula 3-alata, anguste oblonga, pubescens, cum alis longa $\frac{1}{2}$ unciam, lata $\frac{2}{3}$ unciam, loculis 2, inter alas 2 angustissimas dehiscens; alæ tertiæ magnæ margo superior rectus horizontalis; placentæ bifidæ.

Neechoogard, alt. 500 feet [Naga Hills], [nn. 40859, 40873].

North Muneypore, alt. 3500–5500 feet [nn. 41414, 42124].

A *Platycentrum*, but not very near any of the Indian species. Its capsule dehisces nearly as the capsule of *B. gigantea*; but from the weakness of the plant and the non-apiculate anthers it should perhaps stand near *B. procridifolia.*

B. OBVERSA, sp. nova. (Plate XII.)

Subacaulis, rubro-pubescens. Rhizoma breve, lignosum. Petioli 8 uncias longi; folia 6–8 uncias longa, cordato-ovata acuta, integra minute serrulata. Flores non visi. Pedunculi fructigeri 6 uncias longi. Capsula longa $\frac{1}{2}$ unciam, lata $\frac{1}{3}$ unciam, subquadrata, loculis 2, anguste 1-alata, in tribus lateribus dehiscens; placentæ bifidæ.

West Muneypore, alt. 350 feet [n. 42315].

The capsule is unlike that of any other *Platycentrum* known to me, as it is widest in the plane which is at right angles to the plane containing the principal wing. The principal wing is here too very small.

B. ADSCENDENS, sp. nova. (Plate XIII.)

Subacaulis, fere glabrata. Petioli longi 4–6 uncias; folia longa 4 uncias, cordato-ovata acuta, integra aut obscure angulata denticulata. Flores non visi. Pedunculi fructigeri longi 8–10 uncias, interdum prope basim foliigeri. Capsula longa $\frac{1}{4}$ unciam, trialata, alis 2 admodum angustis 1 longissima adscendente, loculis 3, in tribus faciebus dehiscens; placentæ bifidæ.

Jakpho, alt. 8500 feet [nn. 41240, 41247].

A *Knesebeckia*, near *B. parvuliflora*, A. DC., but differing (*inter alia*) by the principal wing being long ascending.

BEGONIA, sp. [N. 40960.]
Kohima, alt. 3000 feet.

This is probably next to *B. megaptera*, but as the specimen is without fruit, I do not give it a name. The habit and general appearance is that of *B. megaptera*, and it has strongly apiculate anthers. The leaves are very inæquilateral, with the nerves beneath pubescent, so that it can hardly be equivalent to *B. megaptera*.

BEGONIA, sp. [N. 41163.]
Kohima, alt. 5800 feet.

Leaves all radical, on petals 8–12 inches long, orbicular, deeply digitate incised, the oblong lobes incise serrate and often again pinnatifid, with (very usually in autumn) a large brown-red compound bulbil at the apex of the petiole. The material (leaves only to be got when I passed that way) indicates a new species.

UMBELLIFERÆ.

HYDROCOTYLE JAVANICA, *Thunb.*
Kohima, alt. 6000 feet.

H. ASIATICA, *Linn.*
Kohima, alt. 4500 feet.

SANICULA EUROPÆA, *Linn.*
Kohima, alt. 6000 feet.

BUPLEURUM TENUE, *D. Don*, var. KHASIANA.
Kohima, alt. 5500 feet.
Jakpho, alt. 6500 feet.

VICATIA MILLEFOLIA, *C. B. Clarke.*
Jakpho, alt. 9500 feet.

PIMPINELLA TENERA, *Benth.*, var. EVOLUTA. (Plate XIV.)
Jakpho, alt. 9900 feet [nn. 41277, 41329, 42015].

This plant is considerably larger, and with larger fruit, than any of the Himalayan *P. tenera*, and the cutting of the leaves does not match. In making this (and some other plants of this paper) varieties only of established species, I have had the favour of the opinion of Prof. Oliver and other talent at Kew. In the present case, one reason for leaving it a var. is that the question is now raised whether, under the *P. tenera* of Hook. f. Fl. Brit. India, p. 686, I have not already included two nearly allied plants.

PIMPINELLA FLACCIDA, sp. nova. (Plate XV.)

Flaccida, erecta, 2–3-pedalis, partibus tenerioribus minute pilosis. Folia 1-pinnata, 3–7-foliata; pinnæ petiolatæ, in foliis inferioribus ovatæ basi truncatæ, in foliis intermediis ovato-oblongæ incisæ aut subpinnatifidæ, in foliis summis oblongæ aut lineari-oblongæ. Fructus parvus, glaber, mericarpiis ovoideis 5-costatis.

Kohima, alt. 5300 feet [n. 41139].

P. DIVERSIFOLIA, *DC.*

Kohima, alt. 4750 feet.

North Muneypore, alt. 5500 feet.

CHÆROPHYLLUM REFLEXUM, *Lindl.*, var. ORIENTALIS. (Plate XVI.)

Jakpho, alt. 7000 feet [n. 41861].

C. reflexum, Lindl., is a Dalhousie plant, so that the present may prove a separable species; but though my material is plentiful I can detect no difference except that the cutting of the leaves is not quite so fine.

ŒNANTHE STOLONIFERA, *Wall.*

Kohima, alt. 5500 feet.

Œ. BENGALENSIS, *Benth.*

Kohima, alt. 4000 feet.

HERACLEUM BARMANICUM, *Kurz.*

Kohima, alt. 2500–5000 feet.

ARALIACEÆ.

ARALIA ARMATA, *Seem.*

Kohima, alt. 1500 feet.

ACANTHOPANAX ACULEATUM, *Seem.*

Kohima, alt. 5000 feet.

North Muneypore, alt. 5800 feet.

HEPTAPLEURUM HYPOLEUCUM, *Kurz.*

Kohima, alt. 5800 feet.

North Muneypore, alt. 5500 feet.

Heptapleurum venulosum, *Seem.*
Jakpho, alt. 7500 feet.

Brassaiopsis speciosa, *Decne. et Planch.*
West Muneypore, alt. 500 feet.

Macropanax oreophilum, *Miq.*
North Muneypore, alt. 5500 feet.

M. undulatum, *Seem.*
West Muneypore, alt. 1500 feet.

Hedera Helix, *Linn.*
North Muneypore, alt. 5500 feet.

Gamblea ciliata, *C. B. Clarke.*
Jakpho, alt. 9900 feet.

Cornaceæ.

Marlea begoniæfolia, *Roxb.*
Kohima, alt. 5800 feet.

Caprifoliaceæ.

Sambucus javanica, *Blume.*
Kohima, alt. 5000 feet.

Viburnum fœtidum, *Wall.*
Kohima, alt. 5000 feet.

V. Colebrookianum, *Wall.*
West Muneypore, alt. 500 feet.

V. coriaceum, *Blume.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 5000 feet.

Rubiaceæ.

Anthocephalus Cadamba, *Miq.*
West Muneypore, alt. 2500 feet.

Uncaria sessilifructus, *Roxb.*
Kohima, alt. 4000 feet.

U. macrophylla, *Wall.*
West Muneypore, alt. 13,000 feet.

LUCULIA PINCEANA, *Hook.*
Kohima, alt. 5500 feet.

WENDLANDIA WALLICHII, *Wight et Arn.*
Kohima, alt. 5000 feet.

W. NOTONIANA, *Wall.*, var. ZEYLANICA, *Hook. f.*
Panicula laxissima. Pedicelli 0-½ in. longi, multi-bracteolati. Calyx parvus, dentibus minutis. Corolla parva, lobis quam tubus multo minoribus. Antheræ exsertæ. Stipulæ latæ persistentes, apice reflexa interdum bifida.
Kohima, alt. 4000 feet [n. 41525].
This is a strange identification; but the exceeding laxness and thinness of the panicle with the flowers all solitary pedicelled is such that if the present plant is not Hooker's var. *zeylanica* (known only from Ceylon) it is nothing else in the Kew collection.

HEDYOTIS SCANDENS, *Roxb.*
Kohima, alt. 4750 feet.

H. SCANDENS, *Roxb.* ?, var. SOLUTA.
Folia angusta. Flores umbellati, pedicellis ⅓ unciam longis. Calycis dentes lineari-lanceolati, tubo multo longiores.
West Muneypore, alt. 1000 feet [n. 42303].
This plant is also common in Khasia, though I do not find it in the Kew collection. It is so very like the universal *H. scandens* in habit that I have always regarded it in the field as a sportive form thereof. But besides the loose umbellate ir florescence, Prof. Oliver attaches much importance to the lon and narrow calyx-segments, and it may be a good species.

H. VESTITA, *R. Br.*
Kohima, alt. 4750 feet.

H. LINEATA, *Roxb.*
Kohima, alt. 4500 feet.

H. TENELLIFLORA, *Blume.*
Neechoogard, alt. 750 feet [Naga Hills].
Kohima, alt. 4500 feet.
The low-level plant has linear leaves, the high-level plant has longer, much broader leaves. These two forms are included in the Kew bundle.

HEDYOTIS HISPIDA, *Retz.*
Kohima, alt. 4750 feet.

H. MONOCEPHALA, *Wall.*
Kohima, alt. 4750 feet.

OLDENLANDIA DIFFUSA, *Roxb.*
Kohima, alt. 4750 feet.

O. HEYNEI, *R. Br.*
Kohima, alt. 4000 feet.

ANOTIS CALYCINA, *Hook. f.*
Kohima, alt. 5000 feet.

A. WIGHTIANA, *Wall.*
Kohima, alt. 4750 feet.

SPIRADICLIS BIFIDA, *Kurz.*
West Muneypore, alt. 1000–2500 feet.

S. CYLINDRICA, *Hook. f.*
Kohima, alt. 3000 feet.
West Muneypore, alt. 1500 feet.
Forma *submersa.*
Neechoogard, alt. 500 feet [Naga Hills, n. 40883.]
I found this form growing on rocks in the centre of a mountain-stream in a situation where the plants must be frequently submersed for days, perhaps for weeks, and I collected it for a new species. It has narrow crowded leaves, but I can discover no tangible character to separate it even as a var. from *S. cylindrica.*

POLYURA GEMINATA, *Hook. f.*
Neechoogard, alt. 500 feet [Naga Hills].

OPHIORRHIZA GRACILIS, *Kurz.*
Kohima, alt. 5800 feet.
Stipules $\frac{1}{3}$–$\frac{1}{2}$ in., bipartite, filiform. Corolla purplish.

O. SUCCIRUBRA, *King.*
Kohima, alt. 6000 feet.

O. FASCICULATA, *D. Don.*
North Muneypore, alt. 3500 feet.

O. CALCARATA, *Hook. f.*
Kohima, alt. 5800 feet.

CARLEMANNIA TETRAGONA, *Hook. f.*
Kohima, alt. 4750 feet.

SILVIANTHUS BRACTEATUS, *Hook. f.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 1000 feet.

A round coarse shrub, 6–8 feet in diam., with the clusters of fruit in the upper axils. Fruits red, fleshy, yet regularly dehiscent. Seeds greenish. Leaves minutely but definitely denticulate.

S. RADICIFLORUS, sp. nova.

Folia integra. Inflorescentia radicalis aut e caule inferiore nuda exorta. Calycis segmenta elongato-lanceolata caudato-acuminata.

Neechoogard, alt. 500 feet [Naga Hills, n. 40847].
Kohima, alt. 6000 feet [n. 41805].

A shrub consisting of poor-looking wands 2–4 feet high. I describe the leaves as entire, a matter of terminology perhaps, but they are more entire than the leaves of some Ophiorrhizas in the Kew collection.

MUSSÆNDA MACROPHYLLA, *Wall.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 1500 feet.

M. GLABRA, *Vahl.*
West Muneypore, alt. 1000 feet.

POLYSOLENIA WALLICHII, *Hook. f.*
West Muneypore, alt. 750–1500 feet.

ADENOSACME LONGIFOLIA, *Wall.*
Kohima, alt. 1500 feet.
North Muneypore, alt. 3500 feet.
West Muneypore, alt. 1500 feet.

A. STIPULATA, *Hook. f.*
West Muneypore, alt. 500–1500 feet.

MYRIONEURON NUTANS, *Wall.*
Nambre Forest, alt. 400 feet [Naga Hills].
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 1000 feet.

RANDIA GRIFFITHII, *Hook. f.*
Kohima, alt. 5500 feet.

KNOXIA BRACHYCARPA, *R. Br.*
West Muneypore, alt. 2300 feet.

OCTOTROPIS ? TERMINALIS, sp. nova. (Plate XVII.)
Glabra. Ramuli quadranguli. Folia petiolata, lanceolata, aut elliptica utrinque angusta; stipulæ breves, a basi triangulari subulatæ, persistentes. Pedicelli longi inter 2 summa folia fasciculati. Calycis margo integer supra stylobasin productus. Corolla alba; tubus anguste cylindricus, longus $\frac{3}{4}$ unciam; lobi 5, in æstivatione imbricati, angusti, longi $\frac{2}{3}$ unciam, expansi horizontales rotati. Antheræ 5, oblongæ, intra corollæ tubum inclusæ. Stigma oblongum, subintegrum, exsertum. Ovarium 2-loculare, aut deorsum 1-loculare? Ovula solitaria ex angulo interiore superiore loculorum pendentia.

Nambre Forest, alt. 400 feet [Naga Hills, n. 40812].

The septum which divides the ovary into two cells is exceedingly thin, and probably fails altogether near the base of the ovary. There is certainly no placental thickening near the centre of the ovary, and the ovules are attached near its summit.

IXORA SUBSESSILIS, *Wall.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 1500 feet.

IXORA, sp.
Fere glabrata. Folia anguste obovata aut fere lanceolata. Inflorescentia subsessilis, condensata. Bacca majuscula, ovoidea, coccinea, a calycis dentibus filiformibus coronata.

West Muneypore, alt. 300 feet [n. 42373].

This is in fruit. The stipules are those of *Ixora* and will not do for *Psychotria*. I have failed to match it.

COFFEA KHASIANA, *Hook. f.*
Kohima, alt. 6000 feet.

PSYCHOTRIA ERRATICA, *Hook. f.*
Kohima, alt. 6000 feet.

P. SYMPLOCIFOLIA, *Kurz.*
Kohima, alt. 4500 feet.

P. DENTICULATA, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].
North Muneypore, alt. 3000 feet.
West Muneypore, alt. 1500 feet.

Chasalia curviflora, *Thwaites.*
Kohima, alt. 4500 feet.

Lasianthus Wallichii, *Wight.*
West Muneypore, alt. 1000 feet.

L. Biermanni, *King.*
Kohima, alt. 6000 feet.

Pæderia fœtida, *Linn.*
Nambre Forest, alt. 400 feet [Naga Hills].
Kohima, alt. 4750 feet.
West Muneypore, alt. 2000 feet.

Paprosma ternatum, *Hook. f.*
West Muneypore, alt. 300–1000 feet.

Leptodermis Griffithii, *Hook. f.*
Jakpho, alt. 7500 feet.
North Muneypore, alt. 5500 feet.

Spermacoce stricta, *Linn. f.*
Kohima, alt. 4500 feet.

Rubia sikkimensis, *Kurz.*
Kohima, alt. 3000 feet.

Galium rotundifolium, *Linn.*
North Muneypore, alt. 5500 feet.

Valerianeæ.

Patrinia monandra, *C. B. Clarke.*
North Muneypore, alt. 4500 feet.

Valeriana Hardwickii, *Wall.*
Kohima, alt. 4500 feet.

Dipsaceæ.

Dipsacus asper, *Wall.*
North Muneypore, alt. 3500 feet.

Compositæ.

Vernonia Roxburghii, *Less.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 3500 feet.

VERNONIA BRACTEATA, *Wall.*

West Muneypore, alt. 2300 feet.

Attaining 10 feet in the savannahs, with very numerous heads in a large compound corymb. There are 85 heads on one of my herbarium fragments, and the specimen is hardly covered by the description in Hook. f. Fl. Brit. Ind. vol. iii. p. 232.

V. CINEREA, *Less.*

Kohima, alt. 4750 feet.

V. DIVERGENS, *Benth.*

North Muneypore, alt. 2750 feet.

West Muneypore, alt. 2750 feet.

V. PEGUENSIS, *C. B. Clarke.*

Kohima, alt. 3000 feet.

V. SALIGNA, *DC.*

West Muneypore, alt. 3000 feet.

V. VOLKAMERIÆFOLIA, *Wall.*

Kohima, alt. 4500 feet.

West Muneypore, alt. 2500 feet.

V. CYLINDRICEPS, sp. nova.

Frutex magna erecta aut arborescens. Folia anguste obovata aut lanceolata, utrinque angusta, serrata, tenuia, viridia, minute pubescentia. Corymbi axillares et subterminales, densiusculi, pubescentes. Capitula longa $\frac{1}{3}$ unciam lata vix $\frac{1}{6}$ unciam, 4–5-flora; phyllaria multiseriata, obtusa, interiora sensim longiora. Achænia angulosa, pilosa ; pappus bi-triserialis, serie exteriore longiuscula, ante capitis explicationem intense rufus. Corollæ tubus puberulus.

Kohima, alt. 5800 feet [n. 41182].

North Muneypore, alt. 4500 feet.

My specimens were collected in very early flower, at which time it is rare for a *Vernonia* to show the pappus so intense a red. There is no Indian *Vernonia* (nor can Mr. Baker suggest any other *Vernonia*) that has so cylindric heads as this. In the young flowers the styles are very long, narrow, conical, hairy, and not yet separated ; in some heads the styles are small, show no sign of separating, and Mr. Hemsley (observing also the large pollen in these flowers) thinks these heads probably functionally male.

Elephantopus scaber, *Linn.*
West Muneypore, alt. 2000 feet.

Adenostemma viscosum, *Forst.*
Kohima, alt. 4750 feet.

Ageratum conyzoides, *Linn.*
Kohima, alt. 4750 feet.

Eupatorium punduanum, *Wall.* ?
Kohima, alt. 2000–2750 feet.

Sir J. D. Hooker has, in Fl. Brit. Ind. vol. iii. p. 243, reduced the whole of the Indian Eupatoriums (except *E. Reevesii*) to the common European *E. cannabinum*, Linn. The plant I have here called *E. punduanum* ? is one of the characteristic plants about Kohima; it grows in large tall clumps, having most pure white flowers, which make it prominent and locally well-separable from the other Eupatoriums. I do not suppose that Wallich ever collected it, but in the dried state it is hardly distinguishable from his *E. punduanum* (a Khasi plant).

E. cannabinum, *Linn.* (E. nodiflorum, *Wall.*)
Kohima, alt. 4500 feet.
Jakpho, alt. 6500 feet.

Cyathocline lyrata, *Cass.*
Kohima, alt. 4750 feet.

Myriactis nepalensis, *Less.*
Kohima, alt. 4750 feet.

Dichrocephala latifolia, *DC.*
Kohima, alt. 4750 feet.

Rhyncospermum verticillatum, *Reinw.*
Kohima, alt. 3000 feet.

Boltonia indica, *Benth.*, forma cærulescens.
North Muneypore, alt. 3250 feet.

The descriptions all say that the ray in *B. indica* is white; in my specimens n. 42018 it was certainly blue, as noted on the field-ticket.

Aster Wattii, sp. nova.

Caulis erectus, 2–4-pedalis, crassus, undulatus, striatus, villosus. Folia anguste ovata, utrinque acuta, serrata, breviter petiolata, obscure trinervia, supra scabra aut scabro-hirta, subtus mollit villosa. Corymbus magnus, capitulis numerosis; pedunculi villosi. Phyllaria multi-serialia, oblonga, obtusa, sicca. Achænia pilosa; pappus (imo junior) rufus. Radii ligulæ albæ, longæ $\frac{1}{3}$ unciam.

Kohima, alt. 4000–6500 feet.

North Muneypore, alt. 3500 feet.

Closely allied to *A. trinervius*, Roxb., from which it differs in its stouter stems, greater hairiness, and larger heads.

MICROGLOSSA ALBESCENS, *C. B. Clarke*, var. NIVEA.

Jakpho, alt. 9900 feet.

Leaves with white woolly tomentum beneath. Ray-florets white. Otherwise as *M. albescens* typical.

CONYZA VISCIDULA, *Wall.*

North Muneypore, alt. 5000 feet.

BLUMEA PROCERA, *DC.*

Kohima, alt. 4750 feet.

B. AROMATICA, *DC.*

Kohima, alt. 5500–6500 feet.

B. DENSIFLORA, *DC.*, var. EXCISA (sp. *DC.*)

Kohima, alt. 4500 feet.

LAGGERA FLAVA, *Benth.*

Kohima, alt. 4500 feet.

ANAPHALIS ARANEOSA, *DC.*

Kohima, alt. 4750 feet.

A. CINNAMOMEA, *C. B. Clarke.*

Kohima, alt. 4750 feet.

A. CONTORTA, *Hook. f.*

Kohima, alt. 3000–5800 feet.

North Muneypore, alt. 5800 feet.

Var. TENELLA, (sp. *DC.*).

Jakpho, alt. 9900 feet.

A. ADNATA, *DC.*

Kohima, alt. 4750 feet.

GNAPHALIUM LUTEO-ALBUM, *Linn.*

Kohima, alt. 4750 feet.

INULA NERVOSA, *Wall.*
Kohima, alt. 4500 feet.
Jakpho, alt. 6500 feet.

I. CAPPA, *DC.*
Kohima, alt. 5000 feet.

I. EUPATOROIDES, *DC.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 5500 feet.

ANSIOPAPPUS CHINENSIS, *Hook. et Arn.* (Plate XVIII.)
Kohima, alt. 4500 feet [n. 41469].
North Muneypore, alt. 4000 feet [nn. 41930, 41965, 41985].

In the grass savannahs common. It attains sometimes 4 feet in height with 12 heads. The ray is golden. The outer pappus is of four linear bristles, rising from the four angles of the achene; the inner pappus, of 8–12 much shorter oblong-serrate scarious scales, spreads outwards between the bristles of the exterior pappus.

CARPESIUM CERNUUM, *Linn.*, var. NEPALENSIS (sp. *Less.*).
Kohima, alt. 6000 feet.

SIEGESBECKIA ORIENTALIS, *Linn.*
Kohima, alt. 4500 feet.

ECLIPTA ALBA, *Hassk.*
Kohima, alt. 4750 feet.

WEDELIA BIFLORA, *DC.*, *non Hook. f.*
Kohima, alt. 4750 feet.

In Hook. f. Fl. Brit. India, vol. iii. pp. 306, 307, two Wedelias, there called *W. biflora* and *W. Wallichii*, very distinct from each other, are rightly described and the plants correctly sorted by Sir J. D. Hooker; but the one called *biflora* has the heads constantly ternate. The *Verbesina biflora* of Linn. is in fact the *W. Wallichii* of Hook. f., which is a very common and widespread plant, has a great number of forms, and has been subdivided into several species. The *W. biflora* of Hook. f. was not known to Linnæus nor to DC.; and is *Verbesina scandens*, Roxb., a name not taken up by J. D. Hooker. The confusion in the synonymy has arisen from a curious misprint in Roxb. Fl. Ind. iii. p. 441, where for *white* followed by a comma should be read *while* followed by no comma. The context will satisfy any one of this.

SPILANTHES ACMELLA, *Linn.*
Muneypore, alt. 2650 feet.

BIDENS TRIPARTITA, *Linn.*
Kohima, alt. 4750–5500 feet.

B. PILOSA, *Linn.*
Kohima, alt. 4750 feet.

B. BIPINNATA, *Linn.*
Kohima, alt. 4750 feet.
This has a yellow ray, while *B. pilosa* has a white ray. I joined or rather mixed the two in my 'Compositæ Indicæ,' and Sir J. D. Hooker followed me in the 'Flora of British India.' The two species are difficult to sort herbarium fragments of.

ARTEMISIA VULGARIS, *Linn.*
Kohima, alt. 4750 feet.

A. PARVIFLORA, *Roxb.*
Kohima, alt. 4750 feet.

SENECIO ARANEOSUS, *DC.*
Kohima, alt. 7000 feet.
Jakpho, alt. 6500 feet.
North Muneypore, alt. 3500 feet.

S. SCANDENS, *D. Don.*
North Muneypoor, alt. 5500 feet.

S. TETRANTHUS, *Wall.*
Jakpho, alt. 9900 feet.

S. DENSIFLORUS, *Wall.*
Kohima, alt. 5800 feet.
Jakpho, alt. 6500 feet.

S. NAGENSIUM, sp. nova,=S. densiflorus, var., *Hook. f.*
Folia supra tenuiter araneosa, subtus cinnamomeo-lanata, basi exauriculata. Capitula, quam in *S. densifloro* majora, ebracteolata, *i. e.* phyllaria extima longa apice haud nigro-caudata. Radii flores parvuli ligulati, phylariis breviores. Achænia laxe villosula (in *S. densifloro* glabra).
North Muneypore, alt. 4000 feet [n. 41984].
Wands 6 feet high. This species is very near *S. densiflorus*, Wall., but differs from it (and its var. *Lobbii*) in the apparently

rayless heads, the white fluted involucres without bracteoles, and the other small points above diagnosed.

SENECIO SAXATILIS, *Wall.* [S. pilosiusculus, *C. B. Clarke.*]

North Muneypore, alt. 5000 feet.

S. TRILIGULATUS, *Wall.*

Kohima, alt. 4750–5500 feet, common.

Wands 6–8 feet high, a mass of flowers, much more luxuriant than the material described in Hook. f. Fl. Brit. India, vol. iii. p. 356. Ligulate florets usually 3, hardly longer than the phyllaries, in which it differs from *S. vagans*, Wall., the heads whereof are radiate.

S. RHABDOS, sp. nova. (Plate XIX.)

Virgæ 6-pedales, sursum a corymbis axillaribus dense floridæ. Folia breviter petiolata, elliptica utrinque acutata, serrata, fusce pubescentia, in imo petiolo biauriculata. Inflorescentia pubescens; corymbi multicipites bracteolis parvis subulatis. Capitula parva; bracteolæ minutæ subulatæ; phyllaria 5–6 oblonga, in marginibus scariosa, in dorso incrassata, subglabra; flores tubulosi 5, ligulati 3 phyllaria multo superantes, lutei. Antheræ basi ecaudatæ, *i. e.* loculi basi paullo producti polleniferi, cauda sterili obsoleta. Achenium subquadrangulum, in angulis præsertim pilosum; pappus albus.

Kohima, alt. 4500 feet [n. 41829].

North Muneypore, alt. 5500 feet [n. 41296].

The affinity of this fine species would seem to be with *S. densiflorus* and *S. triligulatus*; but the anthers are, according to Bentham's careful definition, tailless.

S. RETUSUS, *Wall.*

Jakpho, alt. 9900 feet [nn. 41314, 41324].

S. DUX, sp. nova. (Plate XX.)

Fere glabra. Caulis robustis 2–4-pedalis. Folia radicalia, longe petiolata (petiolo haud alato) rotunda integra serrata, 1–5 uncias in diam. Corymbus puberulus, admodum compositus, ramis erectis, capitulis proventu nutantibus. Capitula oblonga, 4-flora, ligulis nullis aut inconspicuis. Phyllaria 5, longa $\frac{1}{3}$–$\frac{1}{2}$ unciam, anguste oblonga, bracteolata. Corollæ minusculæ tubus cum parte superiore inflata subæquilongus. Achænium $\frac{1}{3}$ unciam longum, anguste lanceolatum utrinque angustatum, striatum; pappus fuscus, vix rufescens.

Jakpho, alt. 9900 feet [nn. 41310, 41326, 41282].

This species is near *S.* (§ *Ligularia*) *amplexicaulis*, Wall., and *S. Thomsoni*, C. B. Clarke—nearer these than any of the Japan or Chinese species.

CNICUS GRIFFITHII, *Hook. f.*
Kohima, alt. 4750–5500 feet.

The "Kohima thistle" of the English denizens, common; running 15 feet high, and I am told in places 25 feet high. Corollas yellow.

C. SINENSIS, *Gardn. et Champ.*
Kohima, alt. 2000–4000 feet.
North Muneypore, alt. 5000 feet.

SAUSSUREA DELTOIDEA, *C. B. Clarke*, var. NIVEA.
Kohima, alt. 5000 feet.

AINSLIÆA APTERA, *DC.*
Jakpho, alt. 9000 feet.

A. PTEROPODA, *DC.*
Kohima, alt. 6000 feet.
Jakpho, alt. 7000 feet.
North Muneypore, alt. 6500 feet.

GERBERA PILOSELLOIDES, *Cass.*
Kohima, alt. 4500 feet.

LACTUCA BREVIROSTRIS, *Champ.*
Kohima, alt. 2000–3000 feet.

L. HASTATA, *DC.*
Kohima, alt. 5800 feet.

L. GRACILIS, *DC.*
Kohima, alt. 4750 feet.

PRENANTHES KHASIANA, *C. B. Clarke.*
Kohima, alt. 5800 feet.

CAMPANULACEÆ.

PRATIA BEGONIFOLIA, *Lindl.*
Kohima, alt. 4750 feet.

LOBELIA AFFINIS, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

LOBELIA TRIALATA, *Buch.-Ham.*
Kohima, alt. 4750 feet.

L. PYRAMIDALIS, *Wall.*
Kohima, alt. 4750–5500 feet.

L. ROSEA, *Wall.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 3500 feet.

CEPHALOSTIGMA SCHIMPERI, *Hochst.*
Kohima, alt. 4500 feet.

C. HOOKERI, *C. B. Clarke.*
Kohima, alt. 4500 feet.

CYANANTHUS INFLATUS, *Hook. f. et T. Thoms.*
Jakpho, alt. 9900 feet.
Growing much larger than in Sikkim.

CAMPANUMŒA JAVANICA, *Blume.*
Kohima, alt. 3000 feet.

C. PARVIFLORA, *Benth.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 750 feet.

CAMPANULA COLORATA, *Wall.*
Kohima, alt. 4750–5800 feet.
Jakpho, alt. 6500 feet.

VACCINIACEÆ.

VACCINIUM NUMMULARIA, *Hook. f. et T. Thoms.*
Jakpho, alt. 9900 feet.

V. RETUSUM, *Hook. f.*
Kohima, alt. 6000 feet.
Jakpho, alt. 9900 feet.

V. SERRATUM, *Wight.*
Kohima, alt. 6000 feet.

ERICACEÆ.

GAULTHERIA FRAGRANTISSIMA, *Wall.*
Jakpho, alt. 9900 feet.

G. GRIFFITHIANA, *Wight.*
Jakpho, alt. 9900 feet.

PIERIS OVALIFOLIA, *D. Don.*
Kohima, alt. 4500 feet.
Jakpho, alt. 7000 feet.

P. FORMOSA, *D. Don.*
Jakpho, alt. 9500 feet.

RHODODENDRON ARBOREUM, *Sm.*
Kohima, alt. 4500–6000 feet.

R. FALCONERI, *Hook. f.*
Jakpho, alt. 9900 feet.

R. BARBATUM, *Wall.*
Jakpho, alt. 9000–9900 feet.

R. MADDENI, *Hook. f.*
Jakpho, alt. 9500–9900 feet.

R. CILIATUM, *Hook. f.*
Jakpho, alt. 9500 feet.

PLUMBAGINEÆ.

PLUMBAGO ZEYLANICA, *Linn.*
Muneypore, alt. 2650 feet.

PRIMULACEÆ.

LYSIMACHIA RAMOSA, *Wall.*
Kohima, alt. 6000 feet.

L. EVALVIS, *Wall.*
Kohima, alt. 6000 feet.

L. EVALVIS, *Wall.*, var. ? SESSILIFLORA.
Kohima, alt. 3000 feet.
North Muneypore, alt. 3500 feet.

I have collected this plant frequently at the same level in the Khasi Hills; and one sheet of the same plant is in the Kew bundle and is marked *L. evalvis* by Hook. f., who collected it in Khasia. I question whether it should not be specifically separated. In Fl. Brit. India, vol. iii. p. 504, Sir J. D. Hooker says of *L. evalvis*: "Peduncles very variable, sometimes only $\frac{1}{2}$ inch long," which is correct for the rest of the *L. evalvis* bundle, but in this var. *sessiliflora* the peduncles are not $\frac{1}{6}$ in., the calyx-segments are much enlarged erect in late fruit (whereas in *L. evalvis* they are finally reflexed), and are ovate protractedly acuminate (whereas in *L. evalvis* they are narrowly obovate, suddenly acuminate). These minute differences accompany a difference in habit; the var. *sessiliflora* is smaller, creeping, with more zigzag stems and closer leaves.

Lysimachia japonica, *Thunb.*
Kohima, alt. 6000 feet.

Myrsineæ.

Maesa Chisia, *D. Don.*
North Muneypore, alt. 6500 feet.

M. indica, *Wall.*
Kohima, alt. 6000 feet.
North Muneypore, alt. 3000–5500 feet.

Myrsine semiserrata, *Wall.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 5500 feet.

Embelia parviflora, *Wall.*
Kohima, alt. 4500 feet.

E. Ribes, *Burm. f.*
Kohima, alt. 5000 feet.

Ardisia neriifolia, *Wall.*
Kohima, alt. 4750 feet.

A. virens, *Kurz.*
Kohima, alt. 6000 feet.
North Muneypore, alt. 5500 feet.
West Muneypore, alt. 300 feet.

A. khasiana, *C. B. Clarke.*
West Muneypore, alt. 850 feet.

A. membranacea, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

A. humilis, *Vahl.*
Neechoogard, alt. 500 feet [Naga Hills].

Sapotaceæ.

Sarcosperma arboreum, *Hook. f.*
West Muneypore, alt. 1500 feet.

Ebenaceæ.

Diospyros Kaki, *Linn. f.*
Kohima, alt. 4500–5800 feet.

D. amœna, *Wall.*? [n. 41420].
North Muneypore, alt. 5000 feet.
The *Diospyros amœna*, Wall., is only known from his specimens, which do not show fruit. Hiern united it with *D. lanceæfolia*, Roxb. In Flora Brit. Ind. vol. iii. p. 562, I separated *D. amœna* as a var. on the ground that its fruit was unknown, while the leaves did not exactly match those of *D. lanceæfolia*. The leaves of my n. 41420 match those of *D. amœna*, Wall.; the fruit is nearly the same as that of *D. lanceæfolia* but glabrous, while the calyx-lobes are 5.

Styraceæ.

Symplocos cratægoides, *Buch.-Ham.*
Kohima, alt. 5000–5800 feet.

S. glomerata, *King.*
Kohima, alt. 6000 feet.

S. theæfolia, *Buch.-Ham.*
Jakpho, alt. 6500 feet.

Styrax serrulatum, *Roxb.*
Kohima, alt. 4500 feet.

Oleaceæ.

Jasminum subtriplinerve, *Blume.*
West Muneypore, alt. 2000 feet.

J. attenuatum, *Roxb.*, var.?
North Muneypore, alt. 5500 feet.
Leaves narrower than in *J. attenuatum*, thicker, more protractedly acuminate caudate, widest near the base—resembling much those of *J. latipetalum*; but the flowers are just as those of *J. attenuatam* (and rose-red).

J. heterophyllum, *Roxb.*
Kohima, alt. 5000 feet.
North Muneypore, alt. 5500 feet.

Linociera terniflora, *Wall.*
North Muneypore, alt. 6500 feet.
A large climber, with copious many-flowered panicles of male flowers (no rudiment of an ovary).

LIGUSTRUM ROBUSTUM, *Blume.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 3000 feet.

MYXOPYRUM SMILACIFOLIUM, *Blume.*
West Muneypore, alt. 1700 feet.

ASCLEPIADEÆ.

PENTASACME CAUDATUM, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

CYNANCHUM WALLICHII, *Wight.*
Nambre Forest, alt. 400 feet [Naga Hills].

GONGRONEMA NEPALENSE, *Decne.*
North Muneypore, alt. 3500 feet.

G. VENTRICOSUM, *Hook. f.*?.
North Muneypore, alt. 4500 feet.
The fruit is right for the genus, and the leaves match well; but, as my specimens show no flowers, the identification is by no means sure.

HOYA LONGIFOLIA, *Wall.*
Kohima, alt. 6000 feet.

H. LANCEOLATA, *Wall.* ? [n. 41023].
Kohima, alt. 6000 feet.
This is the same as the Khasi species collected by Sir J. D. Hooker, and placed by him with the West Himalayan *H. lanceolata*, but I am not sure that it is conspecific; the stems and inflorescence are very pubescent, whereas in *H. lanceolata* they are, as Hooker states (Fl. Brit. Ind. vol. iv. p. 54), nearly glabrous. This n. 41023 is one of the "tassel" Hoyas. The stems are slender, 1–2 feet long, pendent in large bundles with terminal inflorescence. As you look vertically up at them, gently waving in the wind, they appear a mass of flower, and are reckoned by the Khasis the most beautiful plant their country produces. In n. 41023 the corolla is white, the corona rose-red. I do not recollect the colour of the flowers in *H. lanceolata*, Wall., but I believe (and the herbarium fragments indicate) that this has the ordinary straggling habit of the common Hoyas.

LOGANIACEÆ.

GELSEMIUM ELEGANS, *Benth.*
West Muneypore, alt. 1000–2250 feet.

MITREOLA OLDENLANDIOIDES, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

BUDDLEIA MACROSTACHYA, *Benth.*, var. GRIFFITHII.
Kohima, alt. 5500 feet.

FAGRÆA OBOVATA, *Wall.*
West Muneypore, alt. 300 feet.

GENTIANACEÆ.

EXACUM TERES, *Wall.*
Kohima, alt. 3000 feet.

SEBÆA KHASIANA, *C. B. Clarke.*
Jakpho, alt. 7500 feet.

CANSCORA ANDROGRAPHIOIDES, *Griff.*
Muneypore, alt. 2750 feet.

CRAWFURDIA CAMPANULACEA, *Wall. et Griff.*
Kohima, alt. 5000–6000 feet.
North Muneypore, alt. 4000–5000 feet.

C. ANGUSTATA, *C. B. Clarke.*
Kohima, alt. 5500 feet.

C. AFFINIS, *Wall.*
Kohima, alt. 6000 feet.

SWERTIA (§ OPHELIA) WATTII, sp. nova. (Plate XXI.)

Herba tenuior erecta, fere glabra. Folia late lanceolata, basi attenuata vix petiolata. Flores 5-meri, solitarii, pedicellati, cærulescentes. Calyx fere ad basin partitus, segmentis ovato-lanceolatis acutis. Corollæ tubus brevis, segmenta ovato-lanceolata acutissima, singulum in basi a glandula nuda viridi unica notatum. Stamina breviter coalita in basi corollæ sita, filamenta minute scabrida, infra paullo dilatata. Stigmata subsessilia. Ovula pauca (6–10).

Jakpho, alt. 9900 feet.

A very neat copiously flowering species, in habit resembling *S. paniculata* and *S. dilatata*; but the calyx is smaller, the corolla larger than in those species. It is really more nearly allied (by the few ovules) to *S. macrosperma*.

Swertia bimaculata, *Hook. f. et T. Thoms.*
Kohima, alt. 5250 feet.

S. nervosa, *Wall.*
Kohima, alt. 5250–5750 feet.

S. pulchella, *Buch.-Ham.*
Kohima, alt. 4000–5500 feet.

Boragineæ.

Trichodesma khasianum, *C. B. Clarke in Hook. f. Fl. Brit. Ind.* vol. iv. p. 154.
Kohima, alt. 4500 feet.
North Muneypore, alt. 5500 feet.

Cynoglossum furcatum, *Wall.*
Kohima, alt. 5500 feet.

C. glochidiatum, *Wall.*
North Muneypore, alt. 4500 feet.

C. micranthum, *Desf.*
Kohima, alt. 4750 feet.

Trigonotis microcarpa, *Benth.*
Kohima, alt. 5500 feet.

T. Hookeri, *Benth.*
Kohima, alt. 5500 feet.

Convolvulaceæ.

Argyreia argentea, *Wall.*
Nambre Forest, alt. 400 feet [Naga Hills].

A. Wallichii, *Choisy*, var. coriacea.
Kohima, alt. 4500 feet.
North Muneypore, alt. 3000 feet.

A. splendens, *Sweet.*
Nambre Forest, alt. 400 feet [Naga Hills].

LETTSOMIA STRIGOSA, *Roxb.*
Kohima, alt. 2000–3000 feet.
North Muneypore, alt. 3000 feet.
West Muneypore, alt. 3000 feet.

L. BARBIGERA, *Wall.*
Muneypore, alt. 2750 feet.

IPOMŒA BONA-NOX, *Linn.*
West Muneypore, alt. 300 feet.

I. PILEATA, *Roxb.*
West Muneypore, alt. 2000 feet.

I. PORANOIDES, *C. B. Clarke.*
Kohima, alt. 2000 feet.

I. WATTII, sp. nova. (Plate XXII.)
Folia cordato-ovata acuta, supra in lamina subtus in nervis tenuiter hirtula. Pedunculi 3–5 uncias longi; pedicelli 3–5 corymbosi, longi 1 unciam. Calycis fere 5-partiti, lobi late oblongi acuti, hirsuti. Corolla longa $1\frac{1}{4}$ unciam, lata $1\frac{1}{4}$ unciam, alba vix purpurea. Capsula glabra $\frac{1}{4}$–$\frac{1}{3}$ unciam lata; semina glabra.
Kohima, alt. 5000 feet [n. 41307].
A common looking *Ipomœa*; but I cannot find any plant with glabrous seeds and hirsute calyx to match it.

I. CYMOSA, *Roem. et Sch.*, var. MACRA, *C. B. Clarke.*
Kohima, alt. 2000 feet.
These specimens are identical with Griffith's Assam specimen [h. Kew n. 5865], on which I described the var. *macra*. But I doubt whether it is not a distinct species. The corolla in these Kohima specimens is over 2 inches long.

LEPISTEMON WALLICHII, *Choisy.*
West Muneypore, alt. 1500–2000 feet.

PORANA SPECTABILIS, *Kurz.*
Neechoogard, alt. 500 feet [Naga Hills].
One of the most beautiful of plants. It is difficult to define how the Poranas are more beautiful than the Ipomœas; but the white *P. spectabilis* of Neechoogard, like the mauve *P. grandiflora* of Darjeeling, is noticed and prized by both Europeans and natives before all other Convolvulaceæ.

PORANA PANICULATA, *Roxb.*
Kohima, alt. 5500 feet.

P. RACEMOSA, *Roxb.*
Kohima, alt. 2000–4750 feet.
North Muneypore, alt. 4000 feet.

SOLANACEÆ.

SOLANUM SUBTRUNCATUM, *Wall.*
Nambre Forest, alt. 400 feet [Naga Hills].

S. BIFLORUM, *Lour.*
Kohima, alt. 5500 feet.

S. KHASIANUM, *C. B. Clarke.*
Kohima, alt. 4750 feet.

SCROPHULARINEÆ.

SCROPHULARIA URTICÆFOLIA, *Benth.*
Jakpho, alt. 7000 feet.

MAZUS RUGOSUS, *Lour.*
Kohima, alt. 4750 feet.

MIMULUS GRACILIS, *R. Br.*
Kohima, alt. 4000 feet.
North Muneypore, alt. 3500 ped.

LINDENBERGIA URTICÆFOLIA, *Lehm.*
Neechoogard, alt. 500 feet [Naga Hills].
Kohima, alt. 4750 feet.

ADENOSMA CAPITATUM, *Buch.-Ham*
Kohima, alt. 4500 feet.
West Muneypore, alt. 2250 feet.

LIMNOPHILA HIRSUTA, *Benth.*
Muneypore, alt. 2750 feet.

L. CONFERTA, *Benth.*
Kohima, alt. 4000 feet.

TORENIA PEDUNCULARIS, *Benth.*
Kohima, alt. 1500 feet.

T. VAGANS, *Roxb.*
Kohima, alt. 4750 feet.

VANDELLIA HOOKERI, *C. B. Clarke.*
Kohima, alt. 4750 feet.

V. MOLLIS, *Benth.*
Kohima, alt. 3000–5000 feet.

V. NUMMULARIFOLIA, *D. Don.*
Kohima, alt. 3000–4750 feet.

BONNAYA REPTANS, *Spreng.*
Kohima, alt. 4750 feet.

HEMIPHRAGMA HETEROPHYLLUM, *Wall.*
Jakpho, alt. 9900 feet.

ALECTRA INDICA, *Benth.*
Kohima, alt. 4750 feet.

BUCHNERA CRUCIATA, *Buch.-Ham.*
Kohima, alt. 4500 feet.

SOPUBIA TRIFIDA, *Buch.-Ham.*
Kohima, alt. 4500 feet.

PEDICULARIS GRACILIS, *Wall.*, var. KHASIANA.
Jakpho, alt. 6500 feet.

PEDICULARIS, sp. [n. 42044].
Caulis 6–8 uncias erectus, pubescens. Spicæ elongatæ, interruptæ; bracteæ verticillatæ, pinnatifidæ, segmentis pinnatifidis pubescentes. Flores sessiles, albi. Corolla $\frac{3}{4}$ unciam longa, tubus calycem longe superans, labium superius breve, breviter uncinatum, inferiore longius.
North Muneypore, alt. 6500 feet.
I give this no name, as I got but one piece of it. It is nearest to *P. denudata*, Hook. f., but is pubescent, and has considerably larger flowers.

P. CURVIPES, *Hook. f.*
Jakpho, alt. 9000–9900 feet.

GESNERACEÆ.

ÆSCHYNANTHUS SUPERBA, *C. B. Clarke.*
West Muneypore, alt. 1600 feet.

Æ. BRACTEATA, *Wall.*
Jakpho, alt. 8000 feet.

ÆSCHYNANTHUS GRACILIS, *Parish.*
North Muneypore, alt. 3000 feet.

LYSIONOTUS SERRATA, *D. Don.*
Neechoogard, alt. 500 feet [Naga Hills].

L. PUBESCENS, sp. nova. (Plate XXIII.)

Frutex vagans aut dependens, ramosus, 6–8 pedes longus. Rami cum innovationibus pubescentes. Folia breviter petiolata, oblonga, crenata, subtus in nervis pubescentia. Pedunculi longi, tenues. Cætera *L. serratæ.*

North Muneypore, alt. 5500 feet [n. 41283].

The dried fragments of this do not appear to have much to separate them from *L. serrata* besides the points stated; but the living shrub seems distinct enough.

LOXOSTIGMA GRIFFITHII, *C. B. Clarke.*
North Muneypore, alt. 4500 feet.

DIDYMOCARPUS MOLLIS, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

CHIRITA BREVIPES, *C. B. Clarke.*
West Muneypore, alt. 500 feet.

TETRAPHYLLUM BENGHALENSE, *C. B. Clarke.*
West Muneypore, alt. 750–1500 feet.

STAURANTHERA GRANDIFLORA, *Benth.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 500 feet.

RHYNCOTECHUM VESTITUM, *Hook. f. et T. Thoms.*
West Muneypore, alt. 1500 feet.

R. ALTERNIFOLIUM, *C. B. Clarke.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 5000 feet.

BIGNONIACEÆ.

STEREOSPERMUM CHELONOIDES, *DC.*
West Muneypore, alt. 1500 feet.

ACANTHACEÆ.

THUNBERGIA GRANDIFLORA, *Roxb.*
Nambre Forest, alt. 400 feet [Naga Hills].
North Muneypore, alt. 5500 feet.

EBERMAIERA STAUROGYNE, *Nees*.

West Muneypore, alt. 500–2000 feet.

Corolla $\frac{1}{3}$ in. long, cylindric, with small subequally 5-fid limb, blue-purple, pale downwards.

ÆCHMANTHERA LEIOSPERMA, *C. B. Clarke*.

North Muneypore, alt. 4000 feet.

STROBILANTHES PECTINATUS, *T. And.*

Kohima, alt. 6000 feet.

Also common in Muneypore, forming often gregariously a weak scrub about 5 feet high; very rarely in flower in 1885.

S. ACROCEPHALUS, *T. And.*

Kohima, alt. 5000 feet.

Muneypore, alt. 2750–5500 feet.

S. IMBRICATUS, *Nees* [n. 42146].

West Muneypore, alt. 2000 feet.

This is identical with Wall. Cat. n. 7156, in which the leaves are at most 2 in. long, and the nutant axillary spikes $\frac{1}{3}$ in. long. (The flowers in my n. 42146 are $\frac{1}{4}$ in. long, white.) The *S. pterocaulis*, Kurz, which I have united with this (in Hook. f. Fl. Brit. Ind. vol. iv. p. 455), is, as there stated, much larger in every way; and my description is mainly taken from Kurz's specimens. Of my n. 42146 I saw copious luxuriant examples; and I believe it is the full size of the species, and that I have erred in joining it specifically with *S. pterocaulis*.

S. RECURVUS, sp. nova. (Plate XXIV.)

Molliter pubescens, 18-uncialis. Folia ovata acuta crenata, inferiora longius petiolata. Spicæ cylindricæ laxæ, continuæ, longæ 2 uncias, latæ $\frac{1}{2}$ unciam, a causa bractearum apice recurvatarum conspicuæ. Bracteæ late ovatæ subpetiolatæ, persistentes, virides, a pilis glandulosis, ciliatæ. Bracteolæ parvulæ lineares. Calycis sub-5-partiti segmenta linearia apice dilatata, glanduloso-pilosa. Corolla longa $1\frac{1}{4}$ unciam, fere recta, purpurea. Capsula $\frac{1}{2}$ unciam longa, apice pilosa; semina 4, villosa.

Kohima, alt. 4500 feet [n. 41379].

This species will stand next *S. longipes* [Hook. f. Fl. Brit. Ind. vol. iv. p. 455]. It differs in the leaves not acuminated at base, and in the prominent recurved much wider bracts.

STROBILANTHES MULTIDENS, *C. B. Clarke.*
Kohima, alt. 6000 feet.

S. RHOMBIFOLIUS, *C. B. Clarke.*
North Muneypore, alt. 3500–5500 feet.

S. DISCOLOR, *T. And.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 4000 feet.

S. ANISOPHYLLUS, *T. And.*
Kohima, alt. 3000–4000 feet.
West Muneypore, alt. 3500 feet.
I have collected much of this plant, as it does not match *S. anisophyllus* well. The leaves vary from equal to very unequal and pseudo-alternate; and instead of being subovate product acuminate, as in all the *S. anisophyllus*, Kew material, they are oblong narrow-triangular upwards.

S. HELICTUS, *T. And.*
Kohima, alt. 6000–7000 feet.

S. PTERYGORRHACHIS, sp. nova. (Plate XXV.)
Frutex 10-pedalis, fere glabrata, ramis ramulisque subteretibus. Folia longe petiolata, magna, ovata, utrinque acuta, serrata. Spicæ elongatæ, laxe interruptæ, anfractuosæ, rhachide rhacheolisque conspicue alatis. Bracteæ bracteolæque inconspicuæ. Calyx sub-5-partitus, segmenta longa 1 unciam, anguste oblonga lineari-caudata. Corolla $1\frac{1}{4}$ unciam longa, curvata, superne inflata, lutea.
Kohima, alt. 5500 feet.
Forming a strong scrub 12 feet high by the stream in one of the gorges under Jakpho. The most remarkable plant that I gathered on this Muneypoor excursion, the winged rhachis being unlike any rhachis among the 150 known Indian *Strobilanthes*, and the stems and branches being obscurely quadrangular, without any tendency to become winged.

BARLERIA CRISTATA, *Linn.*
Kohima, alt. 2500 feet.
North Muneypore, alt. 4000 feet.
The North Muneypore specimens are typical. The plant from the Zubzub (below Kohima) is much finer, with much finer flowers and softer finer bracts and bracteoles than any example in the Kew bundles.

ASYSTASIA NEESIANA, *Nees.*
North Muneypore, alt. 3000 feet.
West Muneypore, alt. 300–2000 feet.

A. PUSILLA, sp. nova. (Plate XXVI.)
Gracilis, 1–2-pedalis, fere glabra innovationibus pubescentibus. Folia 3–4 uncias longa, petiolata, late lanceolata, utrinque acuminata, fere integra. Racemi tenues, laxæ, parcius paniculatæ; bracteæ bracteolæque $\frac{1}{8}$ unciam longæ, lineares. Calycis segmenta longa $\frac{1}{6}$ unciam, linearia. Corolla $\frac{1}{2}$ unciam longa, alba, tubi parte constricta brevissima, parte superiore inflata curvata. Stamina 4, subsimilia perfecta; antheræ 2 symmetricæ, minute pedicellatæ. Capsula 1 unciam longa, 4-sperma, parte inferiore sterili longa $\frac{1}{2}$ unciam.
Kohima, alt. 3000 feet [n. 40946].
North Muneypore, alt. 4000 feet [n. 42155].
I would have preferred to have described this plant under the name of *Codonacanthus tetrandrus.* I am not sure that it is not a 4-stamened form of *Codonacanthus pauciflorus*; but it has *always* 4 subsimilar stamens in Muneypore; and Prof. Oliver thinks it would be better to keep it in *Asystasia* in a fragmentary paper like the present. The anthers in my nn. 40946, 42155 are exactly as in the perfect stamens af *Codonacanthus*, and unlike the anthers of *Asystasia*, and the corolla is also that of *Codonacanthus*. In Hook. f. Fl. Brit. Ind. vol. iv. p. 497, in order to separate *Asystasia* (with 4 stamens) sharply from *Eranthemum* (with 2 stamens), I removed the old *Asystasia thyrsacanthus* (a 2-stamened species) into *Eranthemum*; but the corolla being that of *Asystasia*, I find this translation is not approved; and except for mere index purposes, the distinction, in Acanthaceæ at least, between "stamens 4 subsimilar" and "stamens 4 whereof 2 small barren" can hardly be maintained.

ERANTHEMUM PALATIFERUM, *Nees.*
Neechoogard, alt. 500 feet [Naga Hills].
Kohima, alt. 3000 feet.
West Muneypore, alt. 500–2500 feet.

E. LATERIFLORUM, sp. nova. (Plate XXVII.)
Frutex ramosus, glaber, pedunculis deflexis e nuda inferiore parte ramorum exortis. Folia 6–9 uncias longa, petiolata, late lanceolata, utrinque acuta. Pedunculi longi 6 uncias, bialati,

parum divisi; bracteæ bracteolæque parvulæ, subulatæ. Calyx subsessilis, fere 5-partitus, segmenta $\frac{1}{6}$ unciam longa linearia. Corolla longa $1\frac{1}{3}$ unciam, fusce purpurascens, superne ventricosa. Stamina 2 perfecta.

West Muneypore, alt. 500 feet [n. 42274].

Congeneric with *E. indicum*, C. B. Clarke (Hook. f. Fl. Brit. Ind. vol. iv. p. 497); but in habit unlike both *Eranthemum* and *Asystasia*.

PHLOGACANTHUS CURVIFLORUS, *Nees*.
West Muneypore, alt. 3000 feet.

P. TUBIFLORUS, *Nees*.
West Muneypore, alt. 1000 feet.

LEPIDAGATHIS HYALINA, *Nees*.
North Muneypore, alt. 3000 feet.

JUSTICIA ANFRACTUOSA, sp. nova. (Plate XXVIII.)

Vagans; 3–4-pedalis, fere glabra. Folia 2–3 uncias longa, subsessilia, oblonga producto-acutata, supra subtrinervia, subtus a rhachidibus horizontalibus læte ornata. Spicæ elongatæ, pedunculatæ, lineares, interruptæ, anfractuosæ; bracteæ bracteolæque parvulæ, lineares. Calyx $\frac{1}{2}$ unciam longus, 5-partitus; segmenta linearia, acuta. Corolla $\frac{1}{3}$–$\frac{1}{2}$ unciam longa, roseo-purpurea, tubo brevi, limbo lato. Stamina 2; antherarum loculus alter multo inferior, longius albo-caudatus.

Kohima, alt. 4500 feet.

North Muneypore, alt. 4000 feet.

This species must stand next *J. Maingayi*, C. B. Clarke (Hook. f. Fl. Brit. Ind. vol. iv. p. 534), which has different leaves and a much smaller calyx.

J. PROCUMBENS, *Linn.*
Kohima, alt. 4750 feet.

DIANTHERA COLLINA, *C. B. Clarke*.
Kohima, alt. 6000 feet.
Jakpho, alt. 6500 feet.

D. VIRGATA, *Benth.*
West Muneypore, alt. 500 feet.

RUNGIA PARVIFLORA, *Nees*.
Muneypore, alt. 2750 feet.

DICLIPTERA ROXBURGHIANA, *Nees*.
Muneypore, alt. 2750 feet.

PERISTROPHE ACUMINATA, *Nees*.
West Muneypore, alt. 500 feet.

P. FERA, *C. B. Clarke*.
Kohima, alt. 3000 feet.

HYPOESTES TRIFLORA, *Roem. et Sch.*.
Kohima, alt. 4750 feet.

VERBENACEÆ.

CALLICARPA ARBOREA, *Roxb*.
Kohima, alt. 4000 feet.

C. RUBELLA, *Lindl*.
Kohima, alt. 4750 feet.

C. PSILOCALYX, *C. B. Clarke*.
West Muneypore, alt. 1750 feet.

PREMNA CORDIFOLIA, *Roxb*.
Nambre Forest, alt. 4000 feet [Naga Hills].

P. MACROPHYLLA, *Wall*.
West Muneypore, alt. 2300 feet.

VITEX LIMONIFOLIA, *Wall*.
West Muneypore, alt. 2300 feet.

VITEX, sp.
Kohima, alt. 4500 feet.
My specimens are only shoots from saplings; they agree closely with a similar example of Griffith's which was not taken up in Hook. f. Fl. Brit. India, as being too fragmentary.

CLERODENDRON VILLOSUM, *Blume*.
Kohima, alt. 4500 feet.

C. SIPHONANTHUS, *R. Br*.
Muneypore, alt. 2750 feet.

C. NUTANS, *Wall*.
West Muneypore, alt. 500 feet.

HOLMSKIOLDIA SANGUINEA, *Retz*.
Kohima, alt. 4500 feet.

Sphenodesma unguiculata, *Schau.*
Neechoogard, alt. 500 feet [Naga Hills].

Labiatæ.

Ocimum sanctum, *Linn.*
West Muneypore, alt. 1000 feet.

Geniosporum strobiliferum, *Wall.*
Kohima, alt. 4500 feet.

Acrocephalus capitatus, *Benth.*
West Muneypore, alt. 2000 feet.

Orthosiphon stamineus, *Benth.*
Nambre Forest, alt. 400 feet [Naga Hills].

O. incurvus, *Benth.*
Nambre Forest, alt. 400 feet [Naga Hills].
There are several "forms" included under *incurvus* already; the Nambre Forest form differs somewhat from all in the corolla being finely pubescent without all over.

Plectranthus Coetsa, *Buch.-Ham.*
Kohima, alt. 5500 feet.

P. Gerardianus, *Benth.*
Kohima, alt. 3000 feet.

P. Patchouli, *C. B. Clarke.*
West Muneypore, alt. 4800 feet.
Corolla orange; upper lip brown.—This was collected in the middle of the jungle at the Haitook Mokong, but just on the ridge where the path crosses it; and I suspect it may have been planted even here. Fruit still unknown; Prof. Oliver suggested to me that this may be a *Cymaria* or allied thereto.

P. hispidus, *Benth.*
North Muneypore, alt. 3750 feet.

P. striatus, *Benth.*
Kohima, alt. 4750 feet.
North Muneypore, alt. 5500 feet.

Anisochilus polystachyus, *Benth.*
North Muneypore, alt. 3500 feet.

A. pallidus, *Wall.*
Kohima, alt. 4500 feet.

HYPTIS SUAVEOLENS, *Poit.*
West Muneypore, alt. 300 feet.

POGOSTEMON ELSHOLTZIOIDES, *Benth.*
Kohima, alt. 5000 feet.

P. WATTII, sp. nova.
Erecta, 2–3-pedalis, adpresso-hirsuta. Folia petiolata; ovato-lanceolata, crenato-serrata, in utraque facie sparsim hirta. Spicæ paniculatæ, basi interruptæ, longæ 1–2 uncias, latæ $\frac{1}{3}$ unciam; bracteæ $\frac{1}{8}$ unciam longæ, oblongæ. Calyces bracteis paullo longiores, verticillatim fasciculati, hirtuli, dentibus minutis. Filamenta a pilis rubris comosa.
Kohima, alt. 4750 feet.
Very nearly allied to *P. tuberculosus, amarantoides, elsholtzioides.*

ELSHOLTZIA FLAVA, *Benth.*
Kohima, alt. 5500 feet.

E. INCISA, *Benth.*
Kohima, alt. 5000 feet.

E. PILOSA, *Benth.*
Kohima, alt. 4750–5500 feet.

E. BLANDA, *Benth.*
Kohima, alt. 4750 feet.

E. STROBILIFERA, *Benth.*
Jakpho, alt. 9000–9900 feet.

E. ERIOSTACHYA, *Benth.*, var. PUSILLA.
Kohima, alt. 5000 feet.

CALAMINTHA UMBROSA, *Benth.*
Kohima, alt. 4750 feet.

CRANIOTOME VERSICOLOR, *Reichb.*
Kohima, alt. 4750 feet.

LEUCAS CILIATA, *Benth.*
Kohima, alt. 4750 feet.

L. MOLLISSIMA, *Wall.*
Kohima, alt. 4750 feet.
North Muneypore, alt. 3500 feet.

NOTOCHÆTE HAMOSA, *Benth.*
Kohima, alt. 5800 feet.

GOMPHOSTEMMA STROBILINUM, *Wall.*
Kohima, alt. 3000–4750 feet.
North Muneypore, alt. 3750 feet.

G. PARVIFLORUM, *Wall.*
North Muneypore, alt. 3000 feet.
West Muneypore, alt. 1750 feet.

LEUCOSCEPTRUM CANUM, *Sm.*
Kohima, alt. 5500 feet.

AJUGA MACROSPERMA, *Wall.*
Kohima, alt. 4750 feet.

PLANTAGINEÆ.

PLANTAGO MAJOR, *Linn.*
Kohima, alt. 4750 feet.

AMARANTACEÆ.

DEERINGIA CELOSIOIDES, *R. Br.*
Kohima, alt. 5300 feet.

CELOSIA ARGENTEA, *Linn.*
Muneypore, alt. 2700 feet.

CYATHULA TOMENTOSA, *Moq.-Tand.*
Kohima, alt. 3000 feet.
North Moneypore, alt. 5500 feet.

C. PROSTRATA, *Blume.*
West Muneypore, alt. 1000 feet.

ACHYRANTHES BIDENTATA, *Blume.*
Kohima, alt. 4750 feet.

STILBANTHUS SCANDENS, *Hook. f.*
Kohima, alt. 5500 feet.
With glabrous stamens.

ALTERNANTHERA SESSILIS, *R. Br.*
Kohima, alt. 4750 feet.

CHENOPODIACEÆ.

CHENOPODIUM BOTRYS, *Linn.*
Kohima, alt. 4750 feet.

Polygonaceæ.

Polygonum delicatulum, *Meissn.*
Jakpho, alt. 9900 feet.

P. virginianum, *Linn.*
Kohima, alt. 3000–4500 feet.
North Muneypore, alt. 6000 feet.

P. barbatum, *Linn.*
North Muneypore, alt. 3500 feet.

P. Posumbu, *Buch.-Ham.*
West Muneypore, alt. 2500 feet.

P. flaccidum, *Roxb.*
Kohima, alt. 4750 feet.

P. nepalense, *Meissn.*
Kohima, alt. 4750 feet.

P. capitatum, *Buch.-Ham.*
Kohima, alt. 4750 feet.

P. chinense, *Linn.*
Kohima, alt. 4750 feet.

P. molle, *D. Don.*
Kohima, alt. 5750 feet.

Fagopyrum cymosum, *Meissn.*
Kohima, alt. 4750 feet.

Rumex nepalensis, *Wall.*
Kohima, alt. 5000 feet.

Aristolochiaceæ.

Bragantia tomentosa, *Blume.*
West Muneypore, alt. 1000–1500 feet.

Aristolochia Cathcartii, *Hook. f.*
North Muneypore, alt. 7000 feet.

Aristolochia, sp.
North Muneypore, alt. 3000 feet.
Leaves only, which are near those of *Aristolochia saccata*, Wall.

Piperaceæ.

Peperomia Heyneana, *Miq.*
North Muneypore, alt. 5500 feet.

PIPER CANINUM, *Blume.*
West Muneypore, alt. 1000 feet.

P. PEEPULOIDES, *Miq.*
West Muneypore, alt. 1000 feet.

P. BŒHMERIÆFOLIUM, *Wall.*
North Muneypore, alt. 5500 feet.

P. SYLVATICUM, *Roxb.*
West Muneypore, alt. 350 feet.

CHLORANTHACEÆ.

CHLORANTHUS OFFICINALIS, *Blume.*
Neechoogard, alt. 500 feet [Naga Hills].

C. TRACHYSTACHYUS, *Blume.*
Kohima, alt. 4750 feet.
West Muneypore, alt. 3000 feet.

MYRISTICEÆ.

MYRISTICA LONGIFOLIA, *Wall.*
West Muneypore, alt. 750–1000 feet.

LAURINEÆ.

CINNAMOMUM OBTUSIFOLIUM, *Nees.*
West Muneypore, alt. 300 feet.

BEILSCHMIEDIA, sp.
Frutex 12–15-pedalis, fere glaber. Folia alterna, 4–7 uncias longa, ovato-lanceolata acuta, coriacea, penninervia, supra lutescentia, subtus albescentia. Inflorescentia puberula; flores hermaphroditi. Perianthii lobi, rotundi, fere glabri. Stamina puberula; antheræ 2-locellatæ.

North Muneypore, alt. 5500 feet [nn. 41431, 43360].

The number of cells to the young anthers is not perhaps certain, but the shrub will match no known *Machilus* or *Phœbe*, and is I think near *Beilschmiedia Brandisii*, Hook. f. In the absence of fruit, I give it no name.

LITSÆA CITRATA, *Blume.*
Kohima, alt. 4750 feet.

L. POLYANTHA, *Juss.*
Muneypore, alt. 2650 feet.

LITSÆA SEBIFERA, *Pers.*
North Muneypore, alt. 5500 feet.

L. SALICIFOLIA, *Roxb.*
West Muneypore, alt. 4500 feet.

L. LÆTA, *Hook. f.*
West Muneypore, alt. 4000 feet.

L. MEISSNERI, *Hook. f.*
Kohima, alt. 4500 feet.

L. UMBROSA, *Nees.*
Kohima, alt. 6000 feet.

L. ZEYLANICA, *C. et Fr. Nees.*
Jakpho, alt. 9500 feet.

LITSÆA, sp.
Frutex 10-pedalis, fere glaber. Folia petiolata, 3 uncias longa, oblonga aut elliptica, utrinque acutata, penninervia, subtus albida. Capitula juvenilia pedunculata, ovoidea acuta, bracteis ab externo fere glabris; pedicelli cum involucris dense sericei.

North Muneypore, alt. 5800 feet [n. 41197].

I have been unable to match this plant either in *Litsæa, Lindera*, or any of the neighbouring involucrate genera. Most of the numerous known species have the young flower-heads globose, very obtuse, which will not match the very acute young flower-heads of n. 41197.

LINDERA LATIFOLIA, *Hook. f.*
Kohima, alt. 5800 feet.

L. BIFARIA, *Benth.*
Kohima, alt. 5500–6000 feet.

ELÆAGNACEÆ.

ELÆAGNUS LATIFOLIUS, *Linn.*
North Muneypore, alt. 5500 feet.
West Muneypore, alt. 1500 feet.

LORANTHACEÆ.

LORANTHUS SCURRULA, *Linn.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 5500 feet.

L. PULVERULENTUS, *Wall.*
Kohima, alt. 4500 feet.

LORANTHUS PSILANTHUS, *Hook. f.*
Kohima, alt. 6000 feet.

VISCUM MONOICUM, *Roxb.*
Kohima, alt. 4500 feet.

V. ARTICULATUM, *Blume.*
Jakpho, alt. 7500 feet.
North Muneypore, alt. 5500 feet.

V. JAPONICUM, *Thunb.*
North Muneypore, alt. 3250 feet.

SANTALACEÆ.

OSYRIS ARBOREA, *Wall.*
Kohima, alt. 4500–9500 feet.

HENSLOVIA GRANULATA, *Hook. f. et T. Thoms.*
Kohima, alt. 5000 feet.

THYMELACEÆ.

DAPHNE PAPYRACEA, *Wall.*
Kohima, alt. 5500 feet.

BALANOPHOREÆ.

BALANOPHORA DIOICA, *R. Br.*
Jakpho, alt. 8500 feet.

EUPHORBIACEÆ.

SARCOCOCCA SALIGNA, *Muell.-Arg.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 5500 feet.

EUPHORBIA KHASYANA, *Boiss.*
Kohima, alt. 4750 feet.

SAUROPUS ALBICANS, *Wight.*
Nambre Forest, alt. 400 feet [Naga Hills].

ANDRACHNE CLARKEI, *Hook. f. Fl. Brit. Ind.* vol. v. p. 285.
Kohima, alt. 4700 feet [n. 41671].

PHYLLANTHUS (§ BRADLEIA), sp. [n. 42129].
West Muneypore, alt. 3000 feet.

P. (§ BRADLEIA), sp. [n. 41731].
Kohima, alt. 4750 feet.

P. RETICULATUS, *Poir.*
West Muneypore, alt. 3500 feet.

PHYLLANTHUS EMBLICA, *Roxb.*
Kohima, alt. 4500 feet.

P. LESCHENAULTII, *Muell. Arg.*
Kohima, alt. 4750 feet.

MELANTHESA TURBINATA, *Miq.*
Kohima, alt. 4750 feet.

FLUEGGEA MICROCARPA, *Blume.*
Nambre Forest, alt. 400 feet [Naga Hills].

ANTIDESMA BUNIUS, *Spreng.*
Kohima, alt. 2000 feet.
North Muneypore, alt. 3500 feet.

OSTODES PANICULATA, *Blume.*
Kohima, alt. 4500 feet.

MALLOTUS PHILIPPENSIS, *Muell. Arg.*
Kohima, alt. 4500 feet.

MACARANGA INDICA, *Wight.*
West Muneypore, alt. 1750 feet.

A few of the Euphorbiaceæ of this collection are here omitted as they are at the present moment buried in the huge mass of material in process of reduction by Sir J. D. Hooker for the 'Flora of British India.'

CELTIDEÆ.

GIRONNIERA THOMSONI, *King MS. in Herb. Kew.*
Kohima, alt. 3000 feet.

URTICACEÆ.

FICUS NEMORALIS, *Wall.*
Kohima, alt. 4500 feet.

F. NEMORALIS, *Wall.*, var. GEMELLA (sp., *Wall.*).
Jakpho, alt. 7000 feet.

F. CUNEA, *Buch.-Ham.*
Kohima, alt. 4500 feet.

F. SILHETENSIS, *Miq.*
Kohima, alt. 4500–5800 feet.

FICUS CLAVATA, *Wall.*, var. TRACHYCARPA.
Kohima, alt. 5000 feet.
North Muneypore, alt. 4000 feet.

F. OPPOSITIFOLIA, *Roxb.*
Kohima, alt. 4000 feet.

F. NIGRESCENS, *King* [n. 41954].
Kohima, alt. 5800 feet.
Figured and described by Dr. G. King in his Monograph of Indian *Ficus* just published.

F. HIRTA, *Vahl.*
Kohima, alt. 4750 feet.

FICUS, sp. [n. 41308].
Kohima, alt. 5000 feet.

FICUS, sp. [n. 42077].
North Muneypore, alt. 3000 feet.

FICUS, sp. [n. 41954].
North Muneypore, alt. 5000 feet.

FICUS, sp. [n. 41817].
Kohima, alt. 6000 feet.
The above *Ficus* specific names I owe to Dr. G. King.

ARTOCARPUS LACOOCHA, *Roxb.*, var.
Kohima, alt. 2500 feet.
Fruit much eaten, even by European denizens. Dr. King thinks this may be separable as a species.

CONOCEPHALUS, sp.
Kohima, alt. 4500 feet.

PILEA MINUTA, sp. nova.
Planta 1–2 uncias alta, tenuissima. Folia $\frac{1}{8}$–$\frac{1}{6}$ unciam longa, opposita, ovata, sæpe acuta, minute sparsim pilosa, a cystolithis ornata. Flores masculi fœmineique dense glomerati; glomeruli in pedunculis filiformibus longi 0–$\frac{1}{8}$ unciam sustenti. Achænium anguste, ellipsoideum, brunneum, fere læve.
North Muneypore, alt. 5500 feet [n. 41788].
This most minute plant is not *P. peploides*, Hook. et Arn.; the leaves are much thinner, more acute, less 3-nerved, smoother; the minute cymes are slenderly pedicelled. Nor is it *P. microphylla*, Liebm., a small species now found in several places in

Bengal, and common in Calcutta itself. Nor is it the *very small Pilea* (catalogued but not given a name) in Journ. Linn. Soc., Bot. vol. xxi. p. 390.

PILEA ANISOPHYLLA, *Wedd.*
Kohima, alt. 6500 feet.
Jakpho, alt. 7000 feet.

P. OXYODON, *Wedd.*
Kohima, alt. 6000 feet.
Jakpho, alt. 6500 feet.

P. SCRIPTA, *Wedd.*
North Muneypore, alt. 4000 feet.

P. TRINERVIA, *Wight.*
Kohima, alt. 5500–6000 feet.

P. ANGULATA, *Blume.*
North Muneypore, alt. 5750 feet.

LECANTHUS PEDUNCULARIS, *Wedd.*
North Muneypore, alt. 5500 feet.

PROCRIS LÆVIGATA, *Blume.*
North Muneypore, alt. 3250 feet.

ELATOSTEMA PLATYPHYLLUM, *Wedd.*
Kohima, alt. 6000 feet.

E. SESSILE, *Forst.*
Kohima, alt. 6000 feet.
West Muneypore, alt. 1500 feet.

E. HOOKERIANUM, *Wedd.*
Kohima, alt. 6000 feet.

E. DIVERSIFOLIUM, *Wedd.*
Kohima, alt. 6000 feet.
Jakpho, alt. 9000 feet.

E. CILIATUM, *Hook. f. in Flora Brit. Ind.* mox edenda.
West Muneypore, alt. 500 feet (nn. 42279, 42284).

E. CLARKEI, *Hook. f. MS. in Flora Brit. Ind.* mox edenda [n. 40834].
Neechoogard, alt. 500 feet [Naga Hills].

ELASTOTEMA, sp. [nn. 41178, 41826].
Kohima, alt. 4500–5750 feet.

This is near *E. Stracheyanum*, Wedd., but it has patent slender hairs on the stem and on the midrib of the leaves beneath: whereas in all the examples of *E. Stracheyanum*, the pubescence is short, dense, somewhat crisped.

BOEHMERIA MACROPHYLLA, *D. Don.*
Nambre Forest, alt. 4000 feet [Naga Hills].

B. PLATYPHYLLA, *Wedd.*
Kohima, alt. 3000 feet.

B. HAMILTONIANA, *Wedd.*
North Muneypore, alt. 4500 feet.

B. ROTUNDIFOLIA, *Buch.-Ham.*
North Muneypore, alt. 5500 feet.

POUZOLZIA VIMINEA, *Wedd.*
Kohima, alt. 4750 feet.

P. INDICA, *Linn.*
Kohima, alt. 4500 feet.

P. HIRTA, *Hassk.*
Kohima, alt. 5000 feet.

VILLEBRUNNEA APPENDICULATA, *Wedd.*
West Muneypore, alt. 1500 feet.

MAOUTIA PUYA, *Wedd.*
Kohima, alt. 3000 feet.

JUGLANDEÆ.

ENGELHARDTIA SPICATA, *Blume.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 5000 feet.

MYRICACEÆ.

MYRICA SAPIDA, *Wall.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 5500 feet.

CUPULIFERÆ.

BETULA CYLINDROSTACHYA, *Wall.*
Kohima, alt. 4500–6000 feet.

ALNUS NEPALENSIS, *D. Don.*
Kohima, alt. 4500–6000 feet.

Very common, and round Kohima much pollarded and used for firewood; but when allowed to grow naturally it attains here a very large size. Many of the trees have large auriculate permanent stipules, and I could not find one of these in flower, though very many of the non-stipulate *Alnus* was in flower. I find similar large permanent stipules on a non-flowering example in herb. Kew.

Quercus Griffithii, *Hook. f. et T. Thoms.*
Kohima, alt. 4000–5500 feet.
North Muneypore, alt. 4000–5500 feet.

Quercus, sp. [n. 42099].
North Muneypore, alt. 3750 feet.
Leaves only; resembling those of *Q. dilatata*, Lindl.

Q. serrata, *Thunb.*
Kohima, alt. 4000–6000 feet.
North Muneypore, alt. 4000–5500 feet.
Abundant. "Pray See" of the Nagas. Much used for timber at Kohima. The tree grows very rapidly and straight up to 40 feet, which is about as large as the Nagas can manage to fell by adzes, *i. e.* without saws.

Q. fenestrata, *Roxb.*
Kohima, alt. 5500 feet.
West Muneypore, alt. 1500–3000 feet.

Q. dealbata, *Hook. f. et T. Thoms.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 3000–3500 feet.

Q. Mannii, *King* [n. 41992].
Kohima, alt. 5800 feet.
This oak will shortly be described by Dr. King.

Q. spicata, *Sm.*
West Muneypore, alt. 3000 feet
We have two forms of this in Assam, viz. (1) leaves very large, base cordate; acorns longer than broad; and (2) leaves smaller, narrowed at base, acorns very large, broader than long (more than an inch broad in my examples).

Q. (§ Pasania) sp. [n. 41226].
Jakpho, alt. 9000 feet.
Acorns very small for *Pasania*, pointed.

QUERCUS TRUNCATA, *King, MS.*
Kohima, alt. 5250–5500 feet.
In high request for timber at Kohima. The "Puddy See" of the Nagas. There is much of it near Kohima, attaining about 50 feet in height.—It will shortly be figured by Dr. King.

Q. PACHYPHYLLA, *Kurz.*
Jakpho, alt. 9000–9500 feet.

Q. XYLOCARPA, *Kurz.*
Kohima, alt. 6000–7000 feet.
Jakpho, alt. 6500–9000 feet.
Attains 80 feet, at least. I saw none felled for timber.

Q. COLLETTII, *King, MS.*
North Muneypore, alt. 5500 feet.
West Muneypore, alt. 3000 feet.
A tree, 40 feet high, near *Q. Lindleyana*, Wall., but with much broader acorns.—It will shortly be figured by Dr. King.

Q. SEMISERRATA, *Roxb.*
Kohima, alt. 6000 feet.

Q. ANNULATA, *Sm.*
North Muneypore, alt. 3500 feet.

Q. LAMELLOSA, *Sm.*
Kohima, alt. 6000–7000 feet.
Jakpho, alt. 6500–8000 feet.
I did not see any of this tree felled by the Nagas.

Q. LANCEÆFOLIA, *Roxb.*
West Muneypore, alt. 3000 feet.

CASTANOPSIS TRIBULOIDES, *A. DC.*
Kohima, alt. 5500 feet.

C. ECHIDNOCARPA, *A. DC.*
West Muneypore, alt. 2000 feet.

SALICACEÆ

SALIX TETRASPERMA, *Roxb.*
Kohima, alt. 3000 feet.
North Muneypore, alt. 3500 feet.

CONIFERÆ.

CEPHALOTAXUS MANNII, *Hook. f.*
Jakpho, alt. 6500–9000 feet.

I have not seen this tree either in Khasia or Muneypore more than 60 feet high; but Dr. Watt wrote to me that it attains an enormous size in North-eastern Muneypore.

PINUS KASYA, *Royle.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 5800 feet.

I saw very few trees of this along my route; but I was told that, at places only a day's march west of my line, there were large patches of this pine, with open grass between, the country much resembling the neighbourhood of Shillong.

ORCHIDEÆ.

OBERONIA IRIDIFOLIA, *Lindl.*
Kohima, alt. 4500 feet.

LIPARIS PARADOXA, *Lindl.*
Kohima, alt. 5000 feet.

L. SPATHULATA, *Lindl.*
North Muneypore, alt. 3000 feet.

L. LONGIPES, *Lindl.*
West Muneypore, alt. 300–3000 feet.

L. DISTANS, sp. nova. (Plate XXIX.)

Pseudobulbi 2–4 uncias longi, radicibus lanosis. Folia sæpius bina lineari-lanceolata plicata, longa $11\frac{1}{2}$ uncias, lata $\frac{2}{3}$ unciam. Scapus robustior, alatus, 15 uncias longus; flores 2–10, inter se $\frac{1}{2}$–$\frac{3}{4}$ unciam distantes, exsiccati 1 unciam (et ultra) in diam. Bracteæ lineares, longæ $\frac{1}{4}$–$\frac{1}{3}$ unciam; pedicelli $\frac{1}{4}$–$\frac{1}{3}$ unciam longi, patentes, proventu recurvati. Sepala longa $\frac{1}{3}$–$\frac{1}{2}$ unciam, angustissime lanceolata luteo-viridia; petala cum sepalis æquilonga filiformia; labellum obovatum, unguiculatum, omnino aurantiaco-brunneum; columna longa $\frac{1}{4}$ unciam, gracilis, cynicollis, apice alatus. Capsula (immatura) longa $\frac{2}{3}$ unciam.

Kohima, alt. 6000 feet (nn. 41105, 41071, 41574, 41099, &c.).

A species allied to *L. bootanensis*, Griff., and to *L. Griffithii*, Ridley, but larger, with larger flowers, much more distant than in other species of this group.

DENDROBIUM FUSCESCENS, *Griff.*
Kohima, alt. 6000 feet.

BULBOPHYLLUM CLARKEI, *Reichb. f.*.—Aff. *Bulbophyllo reptanti*, Lindl., rhizomate elongato funiformi tenui, pseudobulbis valde distantibus gracillime pyriformibus (non conicis abbreviatis), folio cuneata basi lineari obtuse acuto 5-6, pollicari, pedunculo ascendente folium non æquante, basi trivaginato, pro parte majore laxe racemoso, bracteis scariosis ligulatis acutis flores subæquantibus, mento obtuso brevi, sepalis lineari-ligulatis (nec triangulis), tepalis spatulatis (nec oblongis), integerrimis (nec denticulatis) columnam superantibus, labello tenui membranaceo basi hastato ligulato triangulo superne obscure lobato, per lineam mediam incrassato, columna belle biseta.—Flores minores ac lineares, nec trianguli, quales illi *Bulbophylli reptantis*.—Ill. C. B. Clarke grato animo dicatum.

Polly Badgeley 6000 ped., Kohima, 7 Nov. 1885, n. 41813, *C. B. Clarke*; (Mishmee Hills, *Griffith* ! *herb. Lindl.*).—H. G. REICHENBACH.

ERIA CONVALLARIOIDES, *Lindl.*
Kohima, alt. 6000 feet.

ANTHOGONIUM GRACILE, *Lindl.*
Kohima, alt. 5000 feet.

AGROSTOPHYLLUM CALLOSUM, *Reichb. f.*
Kohima, alt. 6000 feet.

A. KHASIANUM, *Griff.*
West Muneypore, alt. 350 feet.

CRYPTOCHILUS LUTEA, *Lindl.*
Kohima, alt. 6000 feet.

CŒLOGYNE FULIGINOSA, *Lindl.*
Kohima, alt. 4500 feet.

OTOCHILUS FRAGRANS, *Wall.*
Kohima, alt. 6000 feet.

PHOLIDOTA CALCEOLATA, *Lindl.*
North Muneypore, alt. 5500 feet.

CALANTHE TRICARINATA, *Lindl.*
Kohima, alt. 6000 feet.

CALANTHE PUBERULA, *Lindl.*
Kohima, alt. 6000 feet.

ARUNDINA BAMBUSÆFOLIA, *Lindl.*
Kohima, alt. 4000 feet.

CYMBIDIUM CYPERIFOLIUM, *Wall.*
Jakpho, alt. 6500 feet.

CYPERORCHIS ELEGANS, *Benth.*
Kohima, alt. 5500 feet.

AERIDES VANDARUM, *Reichb. f.*
North Muneypore, alt. 5500 feet.

VANDA CÆRULEA, *Lindl.*
Kohima, alt. 4750 feet.

SACCOLABIUM AMPULLACEUM, *Lindl.*
West Muneypore, alt. 3000 feet.

ANŒCTOCHILUS ROXBURGHII, *Lindl.*
West Muneypore, alt. 1000 feet.

ZEUXINE NERVOSA, *Benth.* (=Monochilus nervosus, *Lindl.*).
West Muneypore, alt. 2000 feet.

GOODYERA PROCERA, *Lindl.*
West Muneypore, alt. 750 feet.

G. FOLIOSA, *Benth.* (=Georchis foliosa, *Lindl.*).
Jakpho, alt. 8500 feet.

HERMINIUM ANGUSTIFOLIUM, *Benth.* (=Aceras angustifolia, *Lindl.*).
Jakpho, alt. 7000 feet.

HABENARIA, sp., *i. e.* Peristylus n. 11 *herb. Hook. f. et T. Thoms.*
Kohima, alt. 7000 feet.
This is abundant in Khasia, alt. 4500–6000 feet, but much resembles a slender form of *Aceras angustifolia*, and has been little collected.

H. URCEOLATA, sp. nova. (Plate XXX.)
Caulis 3–4-uncialis, arcuatus, folio uncio oblongo acuto 2–3 uncias longo, foliis 2–3 aliis parvulis bracteiformibus. Spica longa 2 uncias, secunda, fere glabra, densius florigera; bracteæ lanceolatæ ovaria superantes. Sepala petalaque subsimilia albida

lanceolata conniventia; labelli saccus pendens, urceæformis, apice angustata cylindracea, basi, subconice acutata.

Jakpho, alt. 9000 feet [n. 41272].

My specimens do not show the rhizome, but the plant is strongly marked, unlike any other *Habenaria*. Sir J. D. Hooker has pointed out to me that I formerly collected this plant in Eastern Sikhim (Yakha Valley), and that I then noted two linear processes pointing obliquely forward in the mouth of the corolla. The species *may* not be a *Habenaria*.

HABENARIA, sp., *i.e.* Peristylus n. 10 *herb. Hook. f. et T. Thoms.*

North Muneypore, alt. 3500 feet.

Also a Khasia plant (not very common there), resembling in general aspect *Aceras angustifolia*, Lindl., but with only two or three broad leaves close to the base of the stem.

H. GENICULATA, *D. Don.*

Kohima, alt. 4500–5000 feet.

Central lobe of the lip long linear oblong, lateral lobes deeply fimbriate.

HABENARIA, sp.

Kohima, alt. 2000 feet.

Central lobe of the lip very small, lateral lobes entire or crenulate.—Both this species and the preceding (*H. geniculata*) were collected in Khasia by Sir J. D. Hooker, and have been pasted down on one sheet at Kew; but he has subsequently noted on the sheet a doubt whether they can be one.

HABENARIA, sp.

Kohima, alt. 4500 feet.

Merely a stout leafy stem, without flower or fruit, sent me by Mr. Rollo, the resident engineer at Kohima; from his description of the flower, the plant will be a *Habenaria* allied to *H. Susannæ* (of which the leafy stem sent has the aspect).

As regards Kohima Orchids it must be recollected that I only paid a short visit in late autumn; the Kohima Europeans, who know Khasia well, reckoned Kohima fully as rich in Orchids as Khasia.

ZINGIBERACEÆ.

GLOBBA, sp.; n. 10 *herb. Hook. f. et T. Thoms.*

Kohima, alt. 4500 feet.

GLOBBA, sp. [n. 41298].
Spica simplex, laxa, floribus omnibus in bulbillos versis.

GLOBBA?
This plant was prominently abundant about Kohima, but without flower or fruit in October and November. It has the habit and leaves of a very slender *Globba*.

HEDYCHIUM (? FLAVUM, *Roxb.*).
Kohima, alt. 3000–4000 feet.
This plant was copiously in flower in October, which is much later than *H. flavum*, Roxb., flowers. Also the heads were more orange (of *H. flavum* yellow), and I did not think it could be *H. flavum*. On comparing it, however, in the herbarium, I find no important differences; the leaves of the Kohima plant are more silky, the flowers smaller than those of *H. flavum*.

HEDYCHIUM (? ELATUM, *Wall.*).
Nambre Forest, alt. 400 feet [Naga Hills].
This plant is widely spread in the Khasi Hills, and is the largest *Hedychium* there, attaining 10 feet high, with leaves 2 feet long, very silky beneath, and very long spikes (18 inches and more) of flowers always a pure white; extends from the Terai to 3000 feet alt. (rarely to 4000). It is in my judgment certainly not a var. of *H. coccineum*, as Wallich has estimated it in his Monograph of *Hedychium*.

H. MARGINATUM, sp. nova. (Plate XXXI.)
Folia lanceolata, subtus sericea. Spica oblonga, densa. Bracteæ 1-floræ, oblongæ obtusæ, glabriusculæ, apice conspicue marginatæ fimbriato-villosæ. Corolla 1–2 uncias longa, lutea; segmenta 5 linearia, labellum obovatum bifidum.
Kohima, alt. 4500 feet [n. 41513].
I cannot find similarly margined bracts among the known Hedychiums.

KAEMPFERIA, sp. (no flowers).
West Muneypore, alt. 750 feet.

HITCHENIA CAREYANA, *Benth.*
Nambre Forest, alt. 400 feet [Naga Hills]
West Muneypore, alt. 350 feet.
Stem tall, leafy, with dense terminal spike 10 by 2 inches. Flowers bluish purple, as of *Hedychium*. Fruit dry, subde-

hiscent, ellipsoid; seeds about 6, exarillate, greenish brown.—In habit this species is like *Hedychium* rather than *Curcuma*.

ZINGIBER ZERUMBET, *Rosc.*
Neechoogard, alt. 1250 feet [Naga Hills].

COSTUS SPECIOSUS, *Sm.*
Kohima, alt. 4500 feet.

AMOMUM, sp.
Kohima, alt. 4500 feet.

CANNA INDICA, *Linn.*
West Muneypore, alt. 1500 feet.

PHRYNIUM IMBRICATUM, *Roxb.*
West Muneypore, alt. 750 feet.

MUSA, sp.
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 500–2000 feet.
The small "elephant" plantain; 3–6 feet high, with small, very red fruits.—Common in East Bengal jungles, but I know no name for it.

HÆMODORACEÆ.

OPHIOPOGON JAPONICUS, *Ker-Gawler.*
Kohima, alt. 6000 feet.
Jakpho, alt. 9000 feet.
North Muneypore, alt. 6500 feet.

CURCULIGO RECURVATA, *Roxb.*
West Muneypore, alt. 300 feet.

TACCACEÆ.

TACCA LÆVIS, *Roxb.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 300 feet.

DIOSCOREACEÆ.

DISCOREA BULBIFERA, *Linn.*
Kohima, alt. 4500 feet.

D. GLABRA, *Roxb.*
West Muneypore, alt. 1500 feet.

Leaves very broad, suddenly caudate, do not match well the narrower-leaved *D. glabra* of the Kew Herbarium ; but the fruits agree well.

DIOSCOREA OPPOSITIFOLIA, *Linn.*
Kohima, alt. 5500 feet.

D. PENTAPHYLLA, *Linn.*
Kohima, alt. 5000 feet.

D. PENTAPHYLLA, *Linn.*, var. ?
North Muneypore, alt. 5500 feet.
Leaflets deeply acutely serrate. Stems, innovations, and leaves beneath very brown-villous. No fruit.

ROXBURGHIACEÆ.

STEMONA TUBEROSA, *Lour.*
West Muneypore, alt. 500 feet.

STICHONEURON MEMBRANACEUM, *Hook. f. et T. Thoms.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 300–1500 feet.

LILIACEÆ.

SMILAX LANCEÆFOLIA, *Roxb.*
North Muneypore, alt. 5750 feet.

S. MENISPERMOIDEA, *A. DC.*
Jakpho, alt. 9000 feet.

S. MYRTILLUS, *A. DC.*
North Muneypore, alt. 7000 feet.

S. MACROPHYLLA, *Roxb.*
West Muneypore, alt. 3000 feet.

S. OVALIFOLIA, *Roxb.*
North Muneypore, alt. 5500 feet.

SMILAX, sp.; n. 24 *herb. Hook. f. et T. Thoms.*
Jakpho, alt. 9500 feet.
Leaves narrowly oblong, long acuminate, base cordate.

POLYGONATUM OPPOSITIFOLIUM, *Wall.*
Jakpho, alt. 9000 feet.
North Muneypore, alt. 3500 feet.

POLYGONATUM VERTICILLATUM, *All.*
North Muneypore, alt. 5500 feet.

ASPARAGUS FILICINUS, *Buch.-Ham.*
Kohima, alt. 5750 feet.
North Muneypore, alt. 6500 feet.

CHLOROPHYTON UNDULATUM, *Wall.*
North Muneypore, alt. 350 feet.

. DRACÆNA ANGUSTIFOLIA, *Roxb.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 4000 feet.

D. SPICATA, *Roxb.*
West Muneypore, alt. 300 feet.

CAMPYLANDRA AURANTIACA, *Baker.*
Jakpho, alt. 8500 feet.

C. WATTII, sp. nova. (Plate XXXII.)
Folia altissime lanceolata, utrinque breviter acuminata.—Cætera *T. aurantiacæ.* Flores non visi.
North Muneypore, alt. 6500 feet.
Also collected in Muneypore by Dr. Watt.

DIANELLA ENSIFOLIA, *Red.*
Kohima, alt. 4500 feet.
West Muneypore, alt. 2000 feet.
The berry is a metallic blue, the corolla white, in Assam.

DISPORUM CALCARATUM, *D. Don.*
Kohima, alt. 6000 feet.

D. PULLUM, *Salisb.*
West Muneypore, alt. 1500 feet.
Plant and leaves unusually large.

PARIS POLYPHYLLA, *Sm.*
North Muneypore, alt. 5500 feet.

COMMELINACEÆ.

POLLIA SORZOGONENSIS, *Endl.*, var. INDICA (sp., *Thwaites*).
Neechoogard, alt. 500 feet [Naga Hills].

P. SUBUMBELLATA, *C. B. Clarke.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 500 feet.

POLLIA PENTASPERMA, *C. B. Clarke.*
Kohima, alt. 6000 feet.

COMMELINA OBLIQUA, *Buch.-Ham.*
Kohima, alt. 6000 feet.

ANEILEMA DIVERGENS, *C. B. Clarke.*
North Muneypore, alt. 3500 feet.

A. THOMSONI, *C. B. Clarke.*
Kohima, alt. 6500 feet.

A. NUDIFLORUM, *R. Br.*
Kohima, alt. 1000–5000 feet.

A. MONTANUM, *Wight* [nn. 40826, 40856].
Neechoogard, alt. 500 feet [Naga Hills].

A. PROTENSUM, *Wall.*
Kohima, alt. 4500 feet.

FORRESTIA HOOKERI, *Hassk.*
Neechoogard, alt. 500 feet [Naga Hills].

F. GLABRATA, *Hassk.*
North Muneypore, alt. 3000 feet.

CYANOTIS CRISTATA, *Roem. et Sch.*
Kohima, alt. 3000 feet.

C. AXILLARIS, *Roem. et Sch.*
Neechoogard, alt. 500 feet [Naga Hills].

C. BARBATA, *D. Don.*
Kohima, alt. 4750 feet.

STREPTOLIRION VOLUBILE, *Edgew.*
Jakpho, alt. 8500 feet.

S. VOLUBILE, *Edgew.*, var. KHASIANA.
Karong, alt. 3500 feet [North Muneypore].

FLOSCOPA SCANDENS, *Lour.*
West Muneypore, alt. 750 feet.

JUNCACEÆ.

JUNCUS CONCINNUS, *D. Don.*
Jakpho, alt. 9900 feet.

JUNCUS CLARKEI, *Buchenau.*
Jakpho, alt. 9000–9900 feet.
Seeds (perfected abundantly) whitish, corrugate, with a long lanceolar white appendage at either end.

J. MINIMUS, *Buchenau.*
Jakpho, alt. 9900 feet.
Identified by description only.

LUZULA EFFUSA, *Buchenau.*
Jakpho, alt. 9900 feet.

PALMÆ.

PINANGA GRACILIS, *Hook. f.* (=Areca gracilis, *Roxb.*).
West Muneypore, alt. 300–1000 feet.

LICUALA PELTATA, *Roxb.*
West Muneypore, alt. 750 feet.

WALLICHIA OBLONGIFOLIA, *Grev.*
North Muneypore, alt. 3000 feet.

PANDANUS, sp.
West Muneypore, alt. 2250 feet.

TYPHACEÆ.

TYPHA ANGUSTIFOLIA, *Roxb.*
North Muneypore, alt. 3500 feet.

ALISMACEÆ.

ALISMA PLANTAGO, *Linn.*
North Muneypore, alt. 5500 feet.

CYPERACEÆ.

CYPERUS ERAGROSTIS, *Vahl.*
Kohima, alt. 4750 feet.

C. SULCINUX, *C. B. Clarke.*
Kohima, alt. 5000 feet.

C. LUCIDULUS, *Klein.*
Kohima, alt. 3000–4500 feet.

C. CUSPIDATUS, *H. B. K.*
Kohima, alt. 5000 feet.

CYPERUS FLAVIDUS, *Retz.*
Kohima, alt. 4000 feet.

C. DIFFUSUS, *Vahl.*
Nambre Forest, alt. 400 feet [Naga Hills].

C. ELEUSINOIDES, *Kunth.*
Kohima, alt. 3000 feet.

C. PILOSUS, *Vahl.*
Kohima, alt. 4750 feet.

C. TEGETUM, *Roxb.*
North Muneypore, alt. 3500 feet.

C. AURICOMUS, *Sieber*, var. KHASIANA, *C. B. Clarke.*
Kohima, alt. 5500 feet.
North Muneypore, alt. 3500 feet.

C. UMBELLATUS, *Benth.*
Kohima, alt. 4750 feet.

KYLLINGA BREVIFOLIA, *Rottb.*
Kohima, alt. 4750 feet.

FIMBRISTYLIS QUINQUANGULARIS, *Kunth*, forma *pentagona* (sp., *Roxb.*).
North Muneypore, alt. 3500 feet.

F. DIPHYLLA, *Vahl.*
Kohima, alt. 4750 feet.

F. DIPHYLLA, *Vahl*, var. ?
North Muneypore, alt. 3500 feet.
Stem much thickened at base. Leaves, bracts, and rays very pilose. Bracts very short. Heads subglobose ellipsoid, sometimes paired. Style and young nut as of *F. diphylla.*—This is an interesting plant, but unfortunately too young for certain allocation.

F. COMPLANATA, *Link.*
North Muneypore, alt. 3500 feet.

SCIRPUS GROSSUS, *Linn. f.*
Muneypore, alt. 2650 feet.

S. CAPILLARIS, *Linn.*
Kohima, alt. 5000–7000 feet.

I am inclined with Kunth to keep up *Bulbostylis*, Kunth, as a genus. [The name *Bulbostylis* may now be kept, as *Bulbostyles*, DC., is gone.] If, however, the genus is not to be retained, I would certainly (with Boeckeler) put *Bulbostylis* as a section of *Scirpus* rather than (with Bentham) put it as a section of *Fimbristylis*. The button left on the top of the nut in *Bulbostylis* will usually *ultimately* (as Asa Gray states) rub off; but the whole structure of the style in *Bulbostylis* is remote from that of *Fimbristylis*, where no button is left at all.

RHYNCHOSPORA WALLICHIANA, *Kunth*.
Kohima, alt. 4500 feet.

SCLERIA HEBECARPA, *Nees*, var. VILLOSULA (sp., *Wall.*).
Kohima, alt. 4000 feet.

S. TESSELLATA, *Willd*.
Muneypore, alt. 2750 feet.

S. ELATA, *Thw*.
Nambre Forest, alt. 400 feet [Naga Hills].
Kohima, alt. 4750 feet.
North Muneypore, alt. 3000 feet.

CAREX BACCANS, *Nees*.
Kohima, alt. 5750 feet.

C. COMPOSITA, *Boott*.
Kohima, alt. 5500 feet.

C. NEPALENSIS, *Spreng*.
North Muneypore, alt. 3750 feet.

C. CONDENSATA, *Nees*.
Jakpho, alt. 9900 feet.

C. BENGALENSIS, *Boott partim, et Boeck., non Roxb.*
Kohima, alt. 4750 feet.

C. FILICINA, *Nees*.
Kohima, alt. 5500 feet.

C. SPECIOSA, *Kunth*.
Kohima, alt. 6500 feet.
North Muneypore, alt. 6500 feet.
Var. DILATATA.
Kohima, alt. 6500 feet.
Leaves $\frac{1}{2}$–$\frac{2}{3}$ inch broad. Spikes and fruits unusually large.

CAREX WALLICHIANA, *Prescott.*
North Muneypore, alt. 4000–5500 feet.

Many of the common species of the section *Indicæ* (of *Carex*) will require rearrangement, and probably a transfer of names. I have never been able to find an authentic specimen of Roxburgh's *C. bengalensis*; but I think it is certain that it was not *C. bengalensis*, Boott, and that it highly probably was *C. filicina*, Nees. The Indian species alive in fruit are not in my judgment difficult to sort; but herbarium specimens, without ripe fruit or rhizome, are exceedingly difficult to name; Boeckeler is much more successful at this work than Boott. In the present mere list I have as far as possible stuck (in *Cyperaceæ*) to the names now accepted and have not anticipated the future naming.

GRAMINA.

PASPALUM SCROBICULATUM, *Linn.*
Kohima, alt. 4750 feet.

ISACHNE ALBENS, *Trin.*
Kohima, alt. 4750–5500 feet.

If this is all one species (as appears to be considered in the Kew bundle), it varies greatly in size of leaf and panicle.

PANICUM (§ DIGITARIA) CILIARE, *Retz.*
Kohima, alt. 4750–5750 feet.

P. (§ DIGITARIA) MINUTIFLORUM, *Munro.*
Kohima, alt. 4750 feet.

This naming means that all the large-flowered Indian *Digitaria* goes into *P. ciliare*, Retz., and all the small-flowered into *P. minutiflorum*, Munro—whether the root be creeping or tufted, the fruit black or straw-coloured, &c.

P. (§ HYMENACHNE) INDICUM, *Linn.*
Kohima, alt. 4750 feet.
West Muneypore, alt. 1750 feet.

P. VESTITUM, *Nees.*
Kohima, alt. 4750 feet.

P. REPENS, *Linn.*
Kohima, alt. 4750 feet.

P. UNCINATUM, *Raddi.*
Neechoogard, alt. 500 feet [Naga Hills].
Kohima, alt. 5000 feet.

Panicum radicans, *Retz.*
Kohima, alt. 4750 feet.

P. filipes, *Nees.*
Nambre Forest, alt. 400 feet [Naga Hills].

P. incisum, *Munro MS.* (*in Griffith Kew*, n. 6505). (Plate XXXIII.)

Fere glabra. Culmi 3–5-pedales, ramosi, in stagnis vagi. Folia anguste lanceolata, ligula evoluta. Panicula magna, divaricatim laxissime composita; spiculæ majusculæ, solitariæ, omnes longissime pedicellatæ. Gluma inferior ovata, 3-nervis cum $\frac{2}{3}$ parte glumæ superioris ovatæ 7-nervis æquilonga. Floris masculi palea inferior glumæ superiori similis, superior parva. Flos fœmineus oblonga acuta, matura lucide brunnea.

Nambre Forest, alt. 400 feet [Naga Hills, n. 40799].

P. auritum, *Nees*?
Nambre Forest, alt. 400 feet [Naga Hills].

This has much smaller spiculæ than those of *P. auritum* type, but some of the examples referred at Kew to *P. auritum* do not differ much from my plant.

P. plicatum, *Roxb.*
Kohima, alt. 4750 feet.

P. ovalifolium, *Beauv.*
Neechoogard, alt. 500 feet [Naga Hills].

Oplismenus compositus, *Roem. et Sch.*
Kohima, alt. 4750 feet.

Setaria glauca, *Beauv.*
Kohima, alt. 4750 feet.

Chionachne barbata, *R. Br.*
Muneypore, alt. 2750 feet.

Oryza sativa, *Linn.* var. indigena.
Nambre Forest, alt. 400 feet [Naga Hills].

Leersia hexandra, *Swartz.*
North Muneypore, alt. 3500 feet.

Arundinella nepalensis, *Trin.*
Kohima, alt. 4750–5500 feet.
Varying greatly in size and strength of panicle.

SACCHARUM SPONTANEUM, *Linn.*
Nambre Forest, alt. 400 feet [Naga Hills].

S. PROCERUM, *Roxb.*
North Muneypore, alt. 3500 feet.
West Muneypore, alt. 1500 feet.

S. SEMIDECUMBENS, *Roxb.*
[=Eriochrysis Narenga, *Nees* (*et Munro*).]
Kohima, alt. 4500 feet.

ERIANTHUS LONGISETOSUS, *T. Anderson MS. in h. Kew.* (Plate XXXIV.)

Gramen sacchariforme, 6–8-pedale, nodi villosi. Folia pedalia et ultra, lanceolata; ligula dense villosa. Panicula longa 10 uncias lata 3 uncias, rufo-brunnea; ramuli verticillati, glabri. Spiculæ binæ, altera sessilis, altera pedicellata, consimiles, basi a pilis longis rufo-brunneis circumdatæ. Glumæ ovato-oblongæ, subcorneæ, in humeris villosæ. Floris fertilis arista flavescens, spiculam ter quater superans.—Erianthus mishmeensis, *Munro MS.* Erianthus, *Wall. List* n. 8846. Arthraxon sp., *Benth. in h. Kew.*

West Muneypore, alt. 3000 feet [n. 42160].

This grass is common on the east of Bengal from Upper Assam to Chittagong; abounds on the low hills and the tea-plantations; but appears undescribed.

E. AUREUS, *Nees*?
Kohima, alt. 2000 feet.

This grass is frequent in Khasia at about the 2000-feet level; the example of it collected by Griffith is put in *E. aureus* in the Kew bundle, but I strongly suspect it is a distinct species; the panicle is 8 inches long, oblong, with remote whorls; and the grass is 6–8 feet high, much stouter than *E. aureus*.

POLLINIA LANCEA, *Steud.* (=Leptatherum Royleanum, *Nees*).
Kohima, alt. 4750 feet.

P. MONANTHA, *Steud. Gram.* p. 410 (=P. micrantha, *Nees in Wall. List* n. 8819).
Kohima, alt. 4750 feet.
A frequent grass in East Bengal, Assam, Burma.

P. TRISTACHYA, *Thw. Enum. Pl. Zeyl.* p. 368.
Kohima, alt. 4750 feet.
North Muneypore, alt. 3500 feet.

Add to the synonyms cited by Thwaites, *Andropogon hexastachyus*, Steud. Gram. p. 380.

ARTHRAXON NUDUM, *Benth.*

Caules vagi, e nodis radicosi. Folia 2–2½ uncias longa, oblonga, cordata, basi in marginibus ciliata. Corymbi abbreviati (specie subumbelliformes), glabri; ramuli 10–15 tenues, simpliciter spicati. Spiculæ virides; glumæ superne spinoso-scabræ; aristæ pars exserta cum spicula æquilonga.—Batratherum nudum, *Nees in herb. Kew* (*non* Pollinia nuda, *Steud.*).—*Wall. List* n. 8835.

Kohima, alt. 3000 feet.

An abundant grass throughout the eastern frontier of Bengal; well represented in the collection of Hook. f. et T. Thoms. in the Kew Herbarium, and from the way in which it is written up "*Batratherum nudum*, Nees," I infer that Nees has published that name somewhere, but I cannot find where. As to *Pollinia nuda*, Steud., Steudel himself states that it is equal to *Leptatherum Royleanum*, Nees, and from the description that appears so to be; nor is it any objection to this reduction that Steudel himself on the preceding page has admitted *Leptatherum Royleanum*, Nees, as a good species, the type of a distinct genus.

A. PLUMBEUM, *Arn. in Edinb. New Phil. Journ.* vol. xviii. (1834–35), p. 181 (=Pleuroplitis plumbea, *Nees in Wight herb.* n. 1683=Lucæa plumba, *Steud. Gram.* p. 414).

North Muneypore, alt. 3500 feet.

This grass is abundant in Khasia, and was collected there by Hook. f. et T. Thoms., who have identified it with the South Indian (probably Nilgherry) grass of Wight.

A. VIOLACEUS, *Benth. in herb. Kew.* (=Andropogon violaceus, *Heyne in Wall. List* n. 8833=Lucæa violacea, *Steud. Gram.* p. 414).

Kohima, alt. 4750 feet.

MANISURIS GRANULARIS, *Linn.*

Kohima, alt. 4750 feet.

ROTTBOELLIA ZEA, sp. nova. (Plate XXXV.)

Panicula terminalis, longe pedunculata, 1–2 pedes longa, composita; spicæ 6 uncias longæ, anguste lineares, pedicellatæ. Glumæ obtusæ.—Rottboellia sp. n. 5, *herb. Hook. f. et T. Thoms.*

North Muneypore, alt. 3500 feet [n. 41980].

This fine grass, 6–12 feet high, which occurs in abundance in many parts of Khasia, resembles somewhat maize at a distance. The inflorescence does not suit *Rottboellia* at all; but the glumes (and flowers altogether) are those of *Rottboellia*, not of *Vossia*. It might be made a new genus; but Mr. Bentham after consideration referred it to *Rottboellia*, though he omitted to widen the character of *Rottboellia* (in Gen. Pl.) so as to include it.

HETEROPOGON CONTORTUS, *Roem. et Sch.*
Kohima, alt. 4000 feet.

ANDROPOGON BREVIFOLIUS, *Swartz.*
Kohima, alt. 4500 feet.

A. SCHŒNANTHUS, *Linn.*
Kohima, alt. 4000 feet.
North Muneypore, alt. 3500 feet.

A. ASCINODIS, sp. nova. (Plate XXXVI.)
Andropogoni Schoenantho affinis. Folia angustissima. Paniculæ bracteæ angustæ, inconspicuæ; inflorescentia *Andropogonis Schœnanthi.* Spicarum rhachillæ (pedicellis spicularum mascularum similes) abbreviatæ, complanatæ, asciæformes, in lateribus ciliato-pilosæ. Glumæ inferiores longe tenuiter aristatæ, superiores oblongæ emarginatæ muticæ. Palea inferior floris fertilis longissime robuste aristata; palea inferior floris masculi glumæ inferiori similis.

Jakpho, alt. 7500 feet [n. 41890].

Gen. Munro has admitted two or three species as distinct from *A. Schœnanthus*, after combining many forms under *A. Schœnanthus.* One of these is *A. Gidarba*, Buch.-Ham. MS., a Simla grass, which in the narrow leaves and inconspicuous bracts resembles *A. ascinodis*; but it has the spiculæ much as of *A. Schœnanthus. A. ascinodis* differs from *A. Schœnanthus* (and all its allied forms or species) in the long awn to the lower glume, and the hatchet-like joints of the rhachillæ of the spikes.

A. MUNROI, sp. nova. (Plate XXXVII.)
Gramen erectum, 2–4-pedale; nodi glabri. Folia angusta, sæpe ciliato-villosa. Bracteæ (*i. e.* folia summa) inflatæ, fere *Cymbopogonis*; peduncula longi, sæpius 2-spicigeri. Gluma inferior longe tenuiter aristata, in humeris longe pilosa, superior oblonga emarginata mutica. Palea inferior floris fertilis longe robuste aristata; palea inferior floris masculi glumæ inferiori similis.—Andropogon n. 4, *Hook. f. et T. Thoms.*

North Muneypore, alt. 3500 feet [n. 41961].

A frequent Khasi grass; marked by Munro in herb. Kew as "*Andropogon* (*Gymnandropogon*), sp. nova, mixed up with *A. Bladhii*." The species appears to me more a *Cymbopogon* than a *Gymnandropogon*, and not far off the preceding *A. ascinodis*; but Munro (and Bentham follows) distinguishes the section *Cymbopogon* from *Gymnandropogon* (*Euandropogon*) by the length of the peduncles (in fact by no other character), and not by the peculiar bract-like state of the upper leaves, on which the genus *Cymbopogon* was really founded.

ANDROPOGON PUNCTATUS, *Roxb.*
North Muneypore, alt. 3500 feet.

A. VACHELLII, *Nees.*
Muneypore, alt. 2700 feet.
Described from China; and is common in Khasia &c.

A. PTEROPECHYS, sp. nova. (Plate XXXVIII.)
Culmi cæspitosi, 1–3-pedales, tenuiores; nodi villosi. Folia angusta, fere glabra, summum vix inflatum bracteæforme; ligula longe pilosa. Panicula tenuiter pedunculata, sub-10-spicigera; rami longi, tenues, apicem versus longe patentim pilosi. Spicæ 3–5 pares spicularum gerentes. Gluma inferior mutica, in humeris breviter dense ciliata. Spiculæ cum floribus omnino ut *Euandropogonis*.
Kohima, alt. 5500 feet [n. 41187].
Jakpho, alt. 7500 feet [n. 41896].
I collected this as a new species from the long hairs below (extending some way below) the spikes, and I do not find the grass in the Kew collection, though from the quantity of material here I may have overlooked it.

SORGHUM MUTICUM, *Nees.*
North Muneypore, alt. 3500 feet.

CHRYSOPOGON MONTANUS, *Roxb.*
Kohima, alt. 4750 feet.

ANTHISTIRIA CILIATA, *Retz.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 3500 feet.

STIPA ROYLEI, *Nees.*
Jakpho, alt. 9000 feet.

SPOROBOLUS INDICUS, *R. Br.*
Kohima, alt. 4750 feet.

POLYPOGON MONSPELIENSIS, *Linn.*
Kohima, alt. 5250 feet.

DEYEUXIA SCABRESCENS, *Munro MS. in herb. Kew.* (Plate XXXIX.)
Culmi 2–5-pedales; nodi glabri; folia longa, angusta; ligula conspicua, glabra. Panicula longa 4–10-uncialis, oblonga, densiuscula, pallide roseo-brunnea; pedicelli dense minute piloso-scabri. Glumæ lanceolatæ, læves glabræque, in carina superiore scabræ. Palea inferior late lanceolata, apice breviter bifida, infra apicem e dorso tortim aristata, 3–5-nervis, in nervis minute scabrida. Rudimentum floris superioris parvum lineari-oblongum, longe pilosum.
Jakpho, alt. 9900 feet [n. 41350].
Throughout the Himalaya.

CŒLACHNE PULCHELLA, *R. Br.*
Kohima, alt. 4750 feet.

ELEUSINE INDICA, *Gaertn.*
Kohima, alt. 4750 feet.

ARUNDO DONAX, *Linn.*
Kohima, alt. 5750 feet.

A. REYNAUDIANA, *Kunth.*
Kohima, alt. 4500 feet.
North Muneypore, alt. 3500 feet.
Munro has marked this *A. madagascariensis*, Kunth. *i. e.*, he considers the Madagascar and Assam-Burma species identical. The names appear to be of the same date.

ERAGROSTIS TENUISSIMA, *Schrader.*
Kohima, alt. 4000 feet.

E. NIGRA, *Nees.*
Kohima, alt. 4750 feet.

E. BROWNEI, *Nees.*
Kohima, alt. 4750 feet.

CENTOTHECA LAPPACEA, *Desv.*
West Muneypore, alt. 2000 feet.

BRACHYPODIUM WATTII, sp. nova. (Plate XL.)

Culmi 4-6 pedes longi, vagantes; nodi minutissime glauco-lanati. Folia longa, angusta; ligula conspicua, non fimbriata. Spica 6–10-uncialis; spiculæ superiores subsessiles; spicularum inferiorum pedicelli 0–$\frac{1}{6}$ unciam longi, dense minute pilosi. Spiculæ generis, 6–8-floræ. Glumæ ovatæ, muticæ, dense minute pilosæ, flore imo multo breviores. Palea inferior dense minute pilosa, longe aristata.

Kohima, alt. 5750 feet.

Jakpho, alt. 7500 feet.

The pedicelled lower spiculæ are unlike those of other species of *Brachypodium*, and technically take the species out of that genus.

ARUNDINARIA, sp.

Jakpho, alt. 7500–9950 feet.

Branchlets only; which appear to match *A. spathiflora*, Wall.

ARUNDINARIA, sp.

Kohima, alt. 4000 feet.

Branchlets only, which may be *A. falcata*, Nees.

BAMBUSA VULGARIS, *Wendl.* (?)

West Muneypore, alt. 750 feet.

FILICES.

DIACALPE ASPIDIOIDES, *Blume.*

Kohima, alt. 5000–6000 feet.

HYMENOPHYLLUM EXSERTUM, *Wall.*

Kohima, alt. 6000 feet.

H. POLYANTHOS, *Swartz.*

Jakpho, alt. 9000 feet.

H. JAVANICUM, *Spreng.*

Jakpho, alt. 7500 feet.

DAVALLIA ASSAMICA, *Hook. et Baker.*

North Muneypore, alt. 5500 feet.

Kohima, alt. 4500 feet.

D. MULTIDENTATA, *Hook. et Baker.*

Kohima, alt. 6000 feet.

D. IMMERSA, *Wall.*

North Muneypore, alt. 5500 feet.

DAVALLIA MARGINALIS, *Hook. et Baker.*
North Muneypore, alt. 3000 feet.

D. HIRTA, *Hook. et Baker.*
Kohima, alt. 4750 feet.

D. POLYPODIOIDES, *D. Don.*
West Muneypore, alt. 1000 feet.

D. PLATYPHYLLA, *D. Don.*
North Muneypore, alt. 5500 feet.

LINDSAYA CULTRATA, *Swartz.*
West Muneypore, alt. 1000 feet.

L. ENSIFOLIA, *Swartz.*
Kohima, alt. 1500 feet.
West Muneypore, alt. 3000 feet.

ADIANTUM CAUDATUM, *Linn.*, var. RHIZOPHORA (sp., *Wall.*).
North Muneypore, alt. 5500 feet.

A. CAPILLUS-VENERIS, *Linn.*
Neechoogard, alt. 1000 feet [Naga Hills].

A. FLABELLULATUM, *Linn.*
Piffima, alt. 1500 feet [Naga Hills].

CHEILANTHES ANCEPS, *H. Blanford, Synopsis N.W. Himalayan Silver Ferns.*
Kohima, alt. 4500 feet.

C. FARINOSA, *Kaulf.*
Kohima, alt. 4000–5000 feet.
North Muneypore, alt. 5000 feet.

PTERIS CRETICA, *Linn.*
Kohima, alt. 5500 feet.

P. SEMIPINNATA, *Linn.*
West Muneypore, alt. 500 feet

P. QUADRIAURITA, *Retz.*
Kohima, alt. 6000 feet.
North Muneypore, alt. 5500 feet.

P. AQUILINA, *Linn.*
Kohima, alt. 4750 feet.

PTERIS WALLICHIANA, *Agardh.*
North Muneypore, alt. 3000 feet.

P. LUDENS, *Wall.*
Neechoogard, alt. 750 feet: Naga Hills [n. 40889].

P. INCISA, *Thunb.*
North Muneypore, alt. 3500 feet.

CERATOPTERIS THALICTROIDES, *Brongn.*
North Muneypore, alt. 3000 feet.

LOMARIA GLAUCA, *Blume.*
Jakpho, alt. 8000–9000 feet.

ASPLENIUM SIMONSIANUM, *Hook.*
West Muneypore, alt. 500 feet.

A. UNILATERALE, *Lam.*
West Muneypore, alt. 2000 feet.

A. HETEROCARPUM, *Wall.*
West Muneypore, alt. 2500 feet.

A. PLANICAULE, *Hook.*
Kohima, alt. 5500 feet.
West Muneypore, alt. 5500 feet.

A. NITIDUM, *Swartz.*
West Muneypore, alt. 300 feet.

A. CLARKEI, *W. S. Atkinson.*
Kegwima, alt. 5500 feet [Naga Hills].

A. MACROCARPUM, *Hook.*
North Muneypore, alt. 5500 feet.

A. NIGRIPES, *Mett.*, var. SELENOPTERIS (sp., *Kunze*).
Kohima, alt. 6000 feet.

A. OXYPHYLLUM, *Hook.*
Kohima, alt. 5000 feet.

A. FIMBRIATUM, *Hook.*?
Jakpho, alt. 9000 feet [n. 41239].

Stipites in rhizomate quasi-erecto adgregati basi a squamis multis luteo-brunneis dense intecti. Frons rubescens, 9 uncias longa, oblonga, basi non angustata, 2-pinnata, 3-pinuatifida (fere 3-pinnata). Sori maturi magni, involucris persistentibus, frondis dorsum fere tegentibus.

This plant connects *A. macrocarpum* to *A. fimbriatum*. This (or plants very close to it) is common in the Himalaya, at 9000–13000 feet alt.; not known in Khasia.

ASPLENIUM BANTAMENSE, *Hook. et Baker.*
Kohima, alt. 4500 feet.

A. JAPONICUM, *Thunb.*
West Muneypore, alt. 1000 feet.

A. STOLICZKAI, *C. B. Clarke.*
Kohima, alt. 7000 feet.

A. POLYPODIOIDES, *Mett.*
Kohima, alt. 5500 feet.

A. FINLAYSONIANUM, *Wall.*
West Muneypore, alt. 500–2000 feet.

SCOLOPENDRIUM DELAVAYI, *Franch. in Bull. Bot. Soc. France*, 1885, p. 28. (Plate XLI.)
Mythi Phuni, alt. 3500 feet: North Muneypore [n. 41927].

ASPIDIUM AURICULATUM, *Swartz*, var. CÆSPITOSA (sp., *Mett.*).
North Muneypore, alt. 3500 feet.

A. ACULEATUM, *Swartz.*
Kohima, alt. 6000 feet.

A. ACULEATUM, *Swartz*, var. RUFO-BARBATA (sp., *Wall.*).
Jakpho, alt. 7500 feet.

A. ARISTATUM, *Swartz.*
Kohima, alt. 6000 feet.

A. CADUCUM, *Wall.*
North Muneypore, alt. 4000 feet.

NEPHRODIUM HIRTIPES, *Hook.*
Kohima, alt. 6500 feet.
Jakpho, alt. 7000 feet.

N. HIRTIPES, *Hook.*, var. EXINVOLUCRATA = Polypodium Scottii, *Bedd.*
Kohima, alt. 6000 feet.
In the young fresh fruit I could find no trace of an involucre.

N. GRACILESCENS, *Hook.*, var. *β*. GLANDULIGERA, *Hook. et Baker*, *Syn. Fil.* p. 262.
North Muneypore, alt. 3400 feet.
This fern is abundant in North and East Bengal and in Assam

It is *Aspidium glanduligerum*, Kunze, Analecta, p. 44; Mett. Aspid. p. 86. It is *Asp. gracilescens*, Mett. in herb. Kew, but it is not equal to Hooker's type of *N. gracilescens.* Sir W. J. Hooker founded his description on, and described from, an authentic example of *Aspidium glanduligerum*, Blume, now in the Kew herbarium. In this var. *β. glanduligera* the rhizome is very slender and wide-creeping; the ultimate segments are puberulo-glandulose. Colonel Beddome (Handbook Ferns Brit. India, p. 234) says that his *Lastrea gracilescens* has tufted stipes; and he now tells me that this is *Nephrodium gracilescens*, var. *hirsutipes*, C. B. Clarke, in which the stripes are approximate. Mr. Baker is disposed to regard *Nephrodium gracilescens, N. glanduligerum*, and *N. hirsutipes* as three species.

Nephrodium flaccidum, *Hook.*
Kohima, alt. 4500 feet.
Rhizome short, often slender incurved, with approximate stipes.

N. ciliatum, *C. B. Clarke.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 750 feet.

N. apiciflorum, *Hook.*
Jakpho, alt. 7500 feet.
North Muneypore, alt. 7000 feet.

N. apiciflorum, *Hook.* var. Nidus.
Jakpho, alt. 9000 feet.

N. Filix-Mas, *Rich.*, var. normalis.
Kohima, alt. 4500 feet.

N. Filix-Mas, *Rich.*, var. khasiana.
Kohima, alt. 6000 feet.
This is very large, and not distinguishable from some of the var. *patentissima* (sp., Wall.) from the Central Himalaya. The Khasi examples of var. *patentissima* have a soft thick stipe with pale yellow-brown scales.

N. Filix-Mas, *Rich.*, var. marginata (sp., *Wall.*).
Kohima, alt. 6000 feet.

N. Schimperianum, *Hochst.*
Jakpho, alt. 7000 feet.

Mr. Hope, Mr. Blanford, and Col. Collett all admit this to specific rank; Mr. Baker will not.

NEPHRODIUM COCHLEATUM, *D. Don.*
Kohima, alt. 5000 feet.

N. SPARSUM, *D. Don*? [? n. 41867].
Kegwima Edge, alt. 7500 feet [Naga Hills].
Stipes cum rhachide primaria pallidus, a squamis pallide luteo-brunneis ornato. Frons pedem longa, bipinnata, coriacea. Pinnæ secondariæ $\frac{3}{4}$ unciam longæ, curvatæ, oblongæ, inciso-serratulæ, subspinulosæ. Sori magni involucris lentis persistentibus.

I first named this as "*Filix-Mas*," near var. "*khasiana*," and Mr. Baker thinks that the right place for it.

N. EXTENSUM, *Hook.*
Kohima, alt. 5000 feet.

N. PROCURRENS, *Hook. et Baker.*
Nambre Forest, alt. 400 feet [Naga Hills].

N. ARIDUM, *Hook. et Baker.*
West Muneypore, alt. 1500 feet.

N. AMBOINENSE, *Presl*? [n. 40852].
Neechoogard, alt. 500 feet [Naga Hills].
Col. Beddome has very carefully examined this fern, and has demonstrated that it is equal exactly to a part (the Chittagong portion) of the material collected under *N. pennigerum*, Hook., var. *multilineata* (sp., Wall.), in Trans. Linn. Soc. ser. 2, vol. i. p. 522. Col. Beddome considers that the Wallichian *N. multilineatum* (Wall. Cat. 353) is a mere variety or form of *N. pennigerum* (as reckoned in Trans. Linn. Soc. *l. c.*); but that n. 40852 is the type of a new well-characterized species. Col. Beddome gets rid of *N. amboinense*, *Baker*, altogether by sorting the material to *N. molle* and elsewhere. But Mr. Baker thinks that a Willdenowian name should not be got rid of without necessity, and that my n. 40852 does not differ even as a var. from the Javan specimens of *N. amboinense* named by Mettenius.

N. GLANDULOSUM, *J. Smith*, var. LATE-STRIGOSA, *C. B. Clarke.*
Jirie-Ghat, alt. 300 feet: West Muneypore [n. 42581].
I am indebted to Col. Beddome for the identification of this

fern, which I have issued to some friends as a new species. The arrangement of the sori is V-shaped in the ultimate segments towards the upper part only of the pinnæ; but I am satisfied that it is a mere form of my var. *læte-strigosa,* which again Col. Beddome thinks is only a form of the South-Indian variety of *N. pennigerum.*

NEPHRODIUM CRINIPES, *Hook.*
Neechoogard, alt. 500 feet [Naga Hills].

N. MEMBRANIFOLIUM, *Presl.*
Neechoogard, alt. 500 feet [Naga Hills].

N. MEMBRANIFOLIUM, *Presl,* var. DIMORPHA.
West Muneypore, alt. 400 feet.
Nambre Forest, alt. 400 feet [Naga Hills].

N. LEUZEANUM, *Hook.*
West Muneypore, alt. 1000 feet.

N. VASTUM, *Hook. et Baker.*
Neechoogard, alt. 500 feet [Naga Hills].
West Muneypore, alt. 500–2000 feet.

N. HETEROCARPUM, *Hook. et Baker.*
Neechoogard, alt. 500 feet [Naga Hills].

N. POLYMORPHUM, *Hook. et Baker.*
North Muneypore, alt. 4000 feet.

N. CICUTARIUM, *Hook. et Baker,* var. COADUNATA (sp., *Wall.*).
Kohima, alt. 5000 feet.

NEPHROLEPIS ACUTA, *Presl* [n. 42301].
West Muneypore, alt. 1000 feet.

OLEANDRA WALLICHII, *Presl.*
Kohima, alt. 6000 feet.
North Muneypore, alt. 5500 feet.

O. CUMINGII, *J. Smith.*
West Muneypore, alt. 2300 feet.

POLYPODIUM CHATTAGRAMICUM, *C. B. Clarke.*
Jirie-Ghat, alt. 500 feet [West Muneypore].

This differs from *Nephrodium membranifolium,* Presl, by the absence of an involucre; but it is most easily distinguished by the stipe having few (hardly any) scales, and by the copiously reticulate venation of the barren frond.

POLYPODIUM DAREÆFORME, *Hook.*
Kohima, alt. 6000 feet.

I have been able to put fresh specimens of this in various stages of young fruit under the microscope. The young capsules appear in a cluster at the bottom of hollows in the surface of the frond, without any trace of involucre at any stage of development. The present plant must therefore be called a *Polypodium* so long as we diagnose into distant groups genera of ferns differing by the presence of this minute and fugitive scale *only*; but my friend Mr. H. C. Levinge objects to treating this single character as of such supreme generic importance; *i. e.* he inclines to the views of Mettenius.

P. TRICHOMANOIDES, *Swartz.*
Jakpho, alt. 9000 feet.

P. SUBFALCATUM, *Blume.*
Jakpho, alt. 9000 feet.

P. LACHNOPUS, *Wall.*
North Muneypore, alt. 5500 feet.

P. MICRORRHIZA, *C. B. Clarke.*
Jakpho, alt. 9000 feet.
[Yunan, *Delavay.*]

P. HETERACTIS, *Mett.*
Kohima, alt. 4750 feet.
North Muneypore, alt. 3500 feet.

P. STIGMOSUM, *Swartz.*
West Muneypore, alt. 3500 feet.

P. SUBFURFURACEUM, *Hook.*
North Muneypore, alt. 3500 feet [n. 42074].

P. SUBAURICULATUM, *Blume.*
Kohima, alt. 6000 feet.
North Muneypore, alt. 5500 feet.

This fern is very common in Khasia, and is identical with the Malay examples in herb. Kew. The pinnæ are usually unequally truncate, subcordate, or even definitely auricled at the base, and wider than in the ordinary *P. argutum* of the Himalaya: there is consequently a second row of areoles on each side the midrib more or less completely closed. In the Himalayan *P. argutum*, with (very generally) narrower pinnæ, the second row of areoles is hardly ever complete; and in many examples the veins, except the fruiting areoles, are nearly free: I have not found them quite free in any example. I do not think the character taken from the venation is any advance on the old diagnosis—pinnæ narrowly lanceolate in *P. argutum*, pinnæ (broader) oblong-lanceolate in *P. subauriculatum*. Col. Henderson always doubted whether these should be treated as separate species.

POLYPODIUM NUMMULARIÆFOLIUM, *Mett.*
West Muneypore, alt. 1500–2500 feet.

P. FISSUM, *Hook. et Baker.*
North Muneypore, alt. 5500 feet.

P. FISSUM, *Hook. et Baker*, var. FLOCCIGERA (sp., *Mett.*).
North Muneypore, alt. 5500 feet.

This is plentiful at Moa in North Muneypore, growing with *P. fissum*, type, and there appears an easily distinguishable *species*.—Mr. Baker, after comparison of Mettenius's own specimens of *P. floccigerum*, observes that these Muneypore specimens are much more distinct from *P. fissum* than is *P. floccigerum*, Mett. Mr. Baker further suggests that it might be best to unite *P. floccigerum*, Mett., with *P. fissum*, Hook. et Baker; and then to make this Muneypore (very narrow) plant a variety thereof.

P. WALLICHII, *R. Br.*
West Muneypore, alt. 300–1000 feet.
Fronds here often 12 feet high.

P. PROPINQUUM, *Wall.*
Kohima, alt. 6000 feet.

P. CORONANS, *Wall.*
Kohima, alt. 4500 feet.

P. ROSTRATUM, *Hook.*
Kohima, alt. 5500 feet.

POLYPODIUM LINEARE, *Thunb.*
West Muneypore, alt. 3000 feet.

P. SIMPLEX, *Swartz.*
North Muneypore, alt. 5000 feet.

P. GRIFFITHIANUM, *Hook.*
North Muneypore, alt. 5500 feet.

P. OVATUM, *Wall.*
North Muneypore, alt. 3750 feet.

P. ZIPPELLII, *Blume.*
West Muneypore, alt. 1000 feet.
Polypodium brachylepis, Baker in Gard. Chron. n. s. vol. xiv. p. 494, from China, appears the same.

P. HEMIONITIDEUM, *Wall.*
West Muneypore, alt. 1500 feet.

P. HASTATUM, *Thunb.*, var. OXYLOBA (sp., *Wall.*).
Kohima, alt. 6000 feet.

P. CYRTOLOBUM, *J. Smith.*
Jakpho, alt. 8500 feet.

P. CRENATO-PINNATUM, sp. nova. (Plate XLII.)
Rhizoma tenue, repens, a squamis parvis lanceolatis fusce brunneis densius intectum. Stipites 3–6 uncias longi, tenues, fere nudi. Frondes elongato-triangulares, 3–5 uncias longæ, pinnatifidæ fere pinnatæ, glabræ. Segmenta primaria ludentia, alia crenata, alia fere pinnata; nervi subobscuri, undulato-subparalleli, usque ad marginem producti; sori inter nervos solitarii.
North Muneypore, alt. 3500–4000 feet [n. 41989].
[Yunan, legit *Delavay.*]
I have distributed from Assam this fern named "*Pleopeltis Parishii*, Bedd.," which it is not.

P. WARDII, sp. nova. (Plate XLIII.)
Rhizoma repens, hypogæum, a squamis multis mollibus lanceolatis patentibus luteo-brunneis intectum. Stipes nudus, 6–18 uncias longus. Frons 1–3 pedes longa, 1-pinnata. Pinnæ late lanceolatæ, margine læte hyalino undulato-serrulato, caudatæ;

nervi 30–40 simplices paralleli in altero latere costæ. Sori majusculi, inter duos nervos 1–5, uniseriales.

Kegwima Edge, alt. 7000 feet [Naga Hills]. Bhotan, *Griffith* n. 2725.

Named in honour of W. E. Ward, Chief Commissioner of Assam, to whose appreciation of scientific research I owe the opportunity of my march through the Naga Hills and Muneypore.—This fine fern should stand next *P. venustum*, Wall.

POLYPODIUM JUGLANDIFOLIUM, *D. Don.*
Jakpho, alt. 7500 feet.

P. LEIORRHIZON, *Wall.*
West Muneypore, alt. 3000 feet.

GYMNOGRAMME LANCEOLATA, *Hook.*
Kohima, alt. 6000 feet.

G. INVOLUTA, *Hook.*
North Muneypore, alt. 5500 feet.

G. ELLIPTICA, *Hook. et Baker.*
Kohima, alt. 4500–6000 feet.
North Muneypore, alt. 4500 feet.
Sometimes, as in Khasia, very large.

ANTROPHYUM CORIACEUM, *Wall.*
West Muneypore, alt. 1500 feet.

ACROSTICHUM CONFORME, *Swartz.*
Kohima, alt. 6000 feet.

A. APPENDICULATUM, *Willd.*
Neechoogard, alt. 500 feet [Naga Hills].

A. VARIABILE, *Hook.*
Neechoogard, alt. 500 feet [Naga Hills].

A. COSTATUM, *Wall.*
Neechoogard, alt. 500 feet [Naga Hills].

OSMUNDA REGALIS, *Linn.*
Jakpho, alt. 7000 feet.

LYGODIUM FLEXUOSUM, *Swartz.*
Muneypore, alt. 2700 feet.

LYGODIUM FLEXUOSUM, *Swartz*, var. ALTA ? (Plate XLIV.)

Scandens, ramis pendentibus, 30 pedes longis. Frondes 1-pinnatæ. Pinnæ 8 uncias longæ, $\frac{2}{3}$ unciam latæ, lateribus parallelis, petiolatæ basi truncatæ aut auriculatæ, fertiles (nisi quoad fructus) sterilibus similes.

West Muneypore, alt. 750 feet [n. 42331].

Mr. Baker esteems this a species; but Col. Beddome only a variety.

BOTRYCHIUM VIRGINIANUM, *Swartz.*

North Muneypore, alt. 5500 feet.

EQUISETUM DIFFUSUM, *D. Don.*

Kohima, alt. 5800 feet.

E. DEBILE, *Wall.*

Kohima, alt. 4000 feet.

SELAGINELLA WALLICHII, *Spring.*

Kohima, alt. 4500 feet.

S. PLUMOSA, *Baker.*

Kohima, alt. 6000 feet.

S. PRONIFLORA, *Baker.*

Kohima, alt. 500 feet.

S. SUBEROSA, *Spring.*

Kohima, alt. 4750 feet.

MUSCI.

(Named by Mr. C. H. Wright.)

POGONATUM ALOIDES, *Brid.*

Kohima, alt. 6000 feet.

BRYUM GIGANTEUM, *Hook.*

Kohima, alt. 6000 feet.

Specierum Summatio.

Ordo.	Genera.	Species.	Species antehac indescriptæ.
Ranunculaceæ	5	9	
Dilleniaceæ	1	1	
Magnoliaceæ	2	3	1
Anonaceæ	3	3	
Menispermaceæ	2	2	
Berberideæ	2	3	
Cruciferæ	2	2	
Cappardeæ	3	3	
Violaceæ	1	2	
Polygaleæ	2	7	
Caryophylleæ	4	4	1
Hypericineæ	1	2	
Guttiferæ	2	2	
Ternstrœmiaceæ	5	7	
Malvaceæ	3	3	1
Sterculiaceæ	4	4	
Tiliaceæ	5	5	1
Linaceæ	1	1	
Malpighiaceæ	1	1	
Geraniaceæ	3	10	1
Rutaceæ	6	7	
Simarubeæ	1	1	
Meliaceæ	1	1	
Olacineæ	3	3	
Ilicineæ	1	1	1
Celastrineæ	5	6	2
Rhamnaceæ	3	4	
Ampelideæ	2	10	
Sapindaceæ	2	3	
Sabiaceæ	2	4	
Anacardiaceæ	1	2	
Leguminosæ	31	56	3
Rosaceæ	11	25	2
Saxifragaceæ	3	4	
Crassulaceæ	2	3	1
Hamamelideæ	1	1	
Combretaceæ	2	4	1
Melastomaceæ	5	8	
Lythraceæ	1	2	
Onagraceæ	3	4	
Passifloreæ	2	4	
Cucurbitaceæ	8	12	1
Begoniaceæ	1	12	5
Umbelliferæ	8	12	1
Araliaceæ	7	9	
Cornaceæ	1	1	
Caprifoliaceæ	2	4	
Rubiaceæ	30	51	4
Valerianceæ	2	2	
Dipsacaceæ	1	1	
Compositæ	33	64	8
51	233	395	34

Summatio (*continued*).

Ordo.	Genera.	Species.	Species antehac indescriptæ.
51	233	395	34
Campanulaceæ	6	11	
Vacciniaceæ	1	3	
Ericaceæ	3	9	
Plumbaginaceæ	1	1	
Primulaceæ	1	4	1
Myrsineæ	4	10	
Sapotaceæ	1	1	
Ebenaceæ	1	2	
Styraceæ	2	4	
Oleaceæ	4	6	
Asclepiadeæ	4	6	
Loganiaceæ	4	4	
Gentianaceæ	5	10	1
Boragineæ	3	6	
Convolvulaceæ	5	14	1
Solanaceæ	1	3	
Scrophulariaceæ	14	20	1
Gesneraceæ	8	12	1
Bignoniaceæ	1	1	
Acanthaceæ	15	31	5
Verbenaceæ	6	12	
Labiatæ	16	30	1
Plantagineæ	1	1	
Amarantaceæ	6	7	
Chenopodiaceæ	1	1	
Polygonaceæ	3	11	
Aristolochiaceæ	2	3	
Piperaceæ	2	5	
Chloranthaceæ	1	2	
Myristicaceæ	1	1	
Laurineæ	4	13	2
Elæagnaceæ	1	1	
Loranthaceæ	2	6	
Santalaceæ	2	2	
Thymelaceæ	1	1	
Balanophoreæ	1	1	
Euphorbiaceæ	10	14	1
Celtideæ	1	1	1
Urticaceæ	11	38	9
Juglandeæ	1	1	
Myricaceæ	1	1	5
Cupuliferæ	4	20	
Salicaceæ	1	1	
Coniferæ	2	2	
Orchideæ	23	34	7
Zingiberaceæ	10	14	4
Hæmadoraceæ	2	2	
Taccaceæ	1	1	
Dioscoreaceæ	1	5	
Roxburghiaceæ	2	2	
101	437	786	74

Summatio (*continued*).

Ordo.	Genera.	Species.	Species antehac indescriptæ.
101	437	786	74
Liliaceæ	9	18	1
Commelinaceæ	7	16	
Juncaceæ	2	4	
Palmæ	3	3	
Pandaneæ	1	1	
Typhaceæ	1	1	
Alismaceæ	1	1	
Cyperaceæ	7	30	
Gramina	35	64	10
Filices	22	114	2
Equisetaceæ	2	2	
Lycopodiaceæ	4	4	
Musci	2	2	
114	533	1046	87

EXPLICATIO TABULARUM.

I. *Kadsura Wattii.*—Ramulus fructiger, magn. nat.
a. Carpelli maturi sectio verticalis.
b. Semen.

II. *Silene vagans.*—Ramulus fructifer, magn. nat.
a. Calyx fructifer.
b. Capsula (calyce amota).
c. Semen.

III. *Urena callifera.*—Ramus floriger, magn. nat.
a. Calyx (epicalyx divulsa).

IV. *Uraria paniculata.*—Ramus floriger, ½ magn. nat.
a. Bracteæ caducæ.
b. Pedicellus cum calyce.
c. Ovarium junius.
d. Idem magis evolutum.
e. Fructus in calyce.

V. *Dalbergia Wattii.*—Ramulus fructifer, magn. nat.

VI. *Bauhinia tenuiflora*, Watt.—Ramus floriger, magn. nat.
a. Calyx (corolla amota).
b. Legumen, magn. nat.

VII. *Rubus calophyllus.*—Ramus floriger, magn. nat.

VIII. *Kalanchoe rosea.*—Ramus floriger, magn. nat.
a. Corolla dissecta.
b, c. Pistillum 4-carpellare, cum glandulis hypogynis.

Explicatio Tabularum (*continued*).

IX. *Illigera villosa*.—Ramulus fructiger, magn. nat.

X. *Anplectrum assamicum*, C. B. Clarke.—Ramus floriger, magn. nat.
a. Petalum.
b. Stamen, a latere visum.
c. Stamen, a dorso visum.
d. Stamen, a facie visum.
e. Stylus.

XI. *Begonia Wattii*.—Planta tota, magn. nat.
a. Capsula horizontaliter secta.
b. Diagramma sectionis horizontalis capsulæ.

XII. *Begonia obversa*.—Planta (frutescens) tota, magn. nat.
a. Capsula horizontaliter secta.
b. Diagramma sectionis horizontalis capsulæ.

XIII. *Begonia ascendens*.—Caulis frutescens (folio addito), magn. nat.
a. Capsula horizontaliter secta.
b. Diagramma sectionis horizontalis capsulæ.

XIV. *Pimpinella tenera*, Benth., var. *evoluta*.—Ramus fructiger, magn. nat.; foliis 2 inferioribus additis.

XV. *Pimpinella flaccida*.—Ramus fructiger, magn. nat.; folio inferiore addito.
a. Fructus.

XVI. *Chærophyllum reflexum*, Lindl., var. *orientalis*.—Ramus, magn. nat.
a. Fructus.
b. Diagramma sectionis horizontalis mericarpii.

XVII. *Octotropis* (?) *terminalis*.—Ramulus floriger, magn. nat.
a. Floris sectio verticalis.
b. Ovarii (cum basi floris) sectio verticalis.

XVIII. *Anisopappus chinensis*.—Plantæ apex, magn. nat.
a. Stamen.
b. Achænium, cum squama receptaculi.

XIX. *Senecio Rhabdos*.—*a*. Virgæ apex, ⅓ magn. nat.
b. Rami fragmenta, magn. nat.
c. Stamen.
d. Achænium.

XX. *Senecio Dux*.—*a*. Planta (parva), ⅓ magn. nat.
b. Inflorescentiæ fragmentum, magn. nat.
c. Flos.

XXI. *Swertia Wattii*.—Plantæ apex, magn. nat.
a. Calyx.
b. Corolla.
c. Stamen.
d. Pistillum.

Explicatio Tabularum (*continued*).

XXII. *Ipomœa Wattii.*—Ramus, magn. nat.

XXIII. *Lysionotus pubescens.*—Ramus fructiger, magn. nat.

XXIV. *Strobilanthes recurvus.*—Ramus floriger, magn. nat.
a. Bractea cum 2 bracteolis.
b. Calyx.
c. Capsula junior.

XXV. *Strobilanthes pterygorrhachis.*—Ramuli et spicæ florigeræ fragmenta, magn. nat.

XXVI. *Asystasia pusilla.*—Plantæ apex, magn. nat.
a. Stamen.
b. Capsula matura.

XXVII. *Eranthemum lateriflorum.*—*a.* Ramus, ½ magn. nat.
b. Pedunculus, magn. nat.

XXVIII. *Justicia anfractuosa.*—*a.* Ramus, magn. nat.
b. Stamina.

XXIX. *Liparis distans.*—Planta florigera, magn. nat.

XXX. *Habenaria urceolata.*—Planta (bulbo amoto), magn. nat.
a. Flos.

XXXI. *Hedychium marginatum.* —Plantæ apex, magn. nat.
a. Bractea cum flore.

XXXII. *Campylandra Wattii.*—Planta (frutescens) tota, magn. nat.

XXXIII. *Panicum incisum*, Munro.—Culmi apex, magn. nat.
a. Spicula unica dissecta.

XXXIV. *Erianthus longisetosus*, T. Anders.—Panicula et folium, magn. nat.
a. Rhachillæ nodus unicus cum spiculis duabus, alia sessili, alia pedicellata.
b. Spiculæ fertilis 2 glumæ.

XXXV. *Rottboellia Zea.*—Paniculæ pars superior, magn. nat.
a, *b*, *c*. Spicula unica dissecta, viz. *a*, glume; *b*, flos sterilis; *c*, flos fertilis.
d. Folii basis, cum ligula

XXXVI. *Andropogon ascinodis.*—Paniculæ fragmenta, magn. nat.
a. Rhachillæ nodus unicus (asciformis); cum 2 spiculis, alia sessili, alia pedicellata, dissectis.

XXXVII. *Andropogon Munroi.*—Culmi apex, magn. nat.
a. Rhachillæ nodus unicus; cum 2 spiculis, alia sessili, alia pedicellata, dissectis.

XXXVIII. *Andropogon pteropechys.*—Culmi pars superior, magn. nat.
a. Rhachillæ nodus unicus; cum 2 spiculis, alia sessili, alia pedicellata, dissectis.

Explicatio Tabularum (*continued*).

XXXIX. *Deyeuxia scabrescens*, Munro.—Culmi pars superior, magn. nat.
- *a*. Spicula dissecta.
- *b*. Flos inferior.
- *c*. Floris superioris rudimentum.

XL. *Brachypodium Wattii*.—Culmi pars superior, magn. nat.
- *a*. Pedicellus cum glumis.
- *b*. Paleæ.
- *c*. Caryopsis.

XLI. *Scolopendrium Delavayi*, Franch.—Planta, magn. nat.
- *a*. Frons unica, ampliata.

XLII. *Polypodium crenato-pinnatum*.—Planta, magn. nat.

XLIII. *Polypodium Wardii*.
- *a*. Planta, $\frac{1}{4}$ magn. nat.
- *b*. Pinna unica, magn. nat.

XLIV. *Lygodium flexuosum*, Swartz, var. *alta*.—Caulis fragmentum, cum fronde unica, magn. nat.

J. Allen delt.

KADSURA WATTII

J. N. Fitch imp.

J. Allen delt. J. N. Fitch imp.

SILENE VAGANS

J. Allen delt.

J. N. Fitch imp.

URENA CALLIFERA.

J. Allen delt. J. N. Fitch imp.

URARIA PANICULATA.

J. Allen delt. J. N. Fitch imp.

DALBERGIA WATTII.

J. Allen. delt.

J. N. Fitch imp.

BAUHINIA TENUIFLORA, *Wall.*

J. Allen delt.

J. N. Fitch imp.

RUBUS CALOPHYLLUS

J. Allen delt.

J. N. Fitch, imp.

KALANCHOE ROSEA.

J. Allen delt. J.N. Fitch imp.

ILLIGERA VILLOSA.

J. Allen delt.

N. Fitch imp.

ANPLECTRUM ASSAMICUM.

Allen delt. J. N. Fitch imp.

BEGONIA WATTII

J. Allen delt.

W. Fitch imp.

BEGONIA OBVERSA.

J. Allen delt
J.N.Fitch imp

BEGONIA ASCENDENS

J. Allen delt.

N. Fitch imp.

PIMPINELLA TENERA, *Benth.*
Var. EVOLUTA.

J. Allen delt.

J. N. Fitch imp.

PIMPINELLA FLACCIDA.

J. Allen del.

J.N. Fitch imp.

CHAEROPHYLLUM REFLEXUM, Lindl.
Var, ORIENTALIS.

J. Allen del. J. N. Fitch imp.

OCTOTROPIS (?) TERMINALIS.

C. Allen del.

J.N. Fitch imp.

ANISOPAPPUS CHINENSIS, Hook. & Arn.

J. Allen delt. J. N. Fitch imp.

SENECIO RHABDOS.

J. Allen del. J. N. Fitch imp.

SENECIO DUX.

J. Allen delt. J. N. Fitch imp.

SWERTIA WATTII.

J. Allen del.   [illegible] imp.

IPOMŒA WAITII.

J. Allen del.   J.N. Fitch imp.

LYSIONOTUS PUBESCENS.

J. Allen delt. J. N. Fitch imp.

STROBILANTHES RECURVUS.

J. Allen del. J.N. Fitch imp.

STROBILANTHES PTERYGORRHACHIS.

J. Allen delt. J. N. Fitch imp.

ASYSTASIA PUSILLA.

J. Allen delt.   J.N.Fitch imp

ERANTHEMUM LATERIFLORUM.

J. Allen delt. J. N. Fitch imp.

JUSTICIA ANFRACTUOSA.

C. B. Clarke

J. Allen delt.

J. N. Fitch imp.

LIPARIS DISTANS.

J. Allen delt.

J.N. Fitch imp.

HABENARIA URCEOLATA.

J. Allen delt. J. N. Fitch imp.

HEDYCHIUM MARGINATUM

J. Allen delt.

CAMPYLANDRA WATTII.

J. Allen delt.

J. N. Fitch imp.

PANICUM INCISUM, *Munro.*

J. Allen del.

ERIANTHUS LONGISETOSUS, T. Anders.

J. N. Fitch lith.

J. Allen delt.

J. N. Fitch imp.

ROTTBOELLIA ZEA.

J. Allen delt. J. N. Fitch imp.

ANDROPOGON ASCINODIS.

J. Allen delt. J.N. Fitch imp.

ANDROPOGON MUNROI.

J. Allen delt.

J. N. Fitch imp.

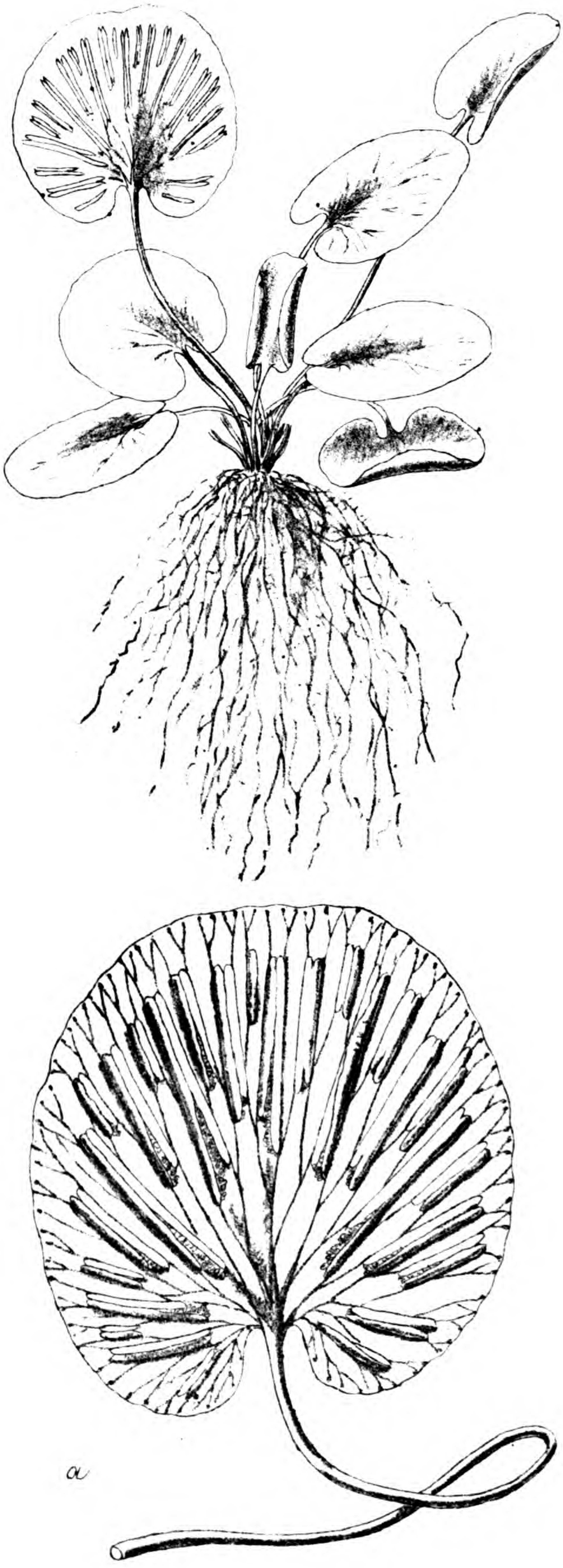
ANDROPOGON PTEROPECHYS.

J. Allen, delt. J. N. Fitch imp.

DEYEUXIA SCABRESCENS, *Munro.*

J. Allen, delt. J. N. Fitch imp.

BRACHYPODIUM WATTII.



J. Allen delt.

J. N. Fitch imp.

SCOLOPENDRIUM DELAVAYI, *Franch.*

J. Allen del.

J. N. Fitch lith.

POLYPODIUM CRENATO-PINNATUM.

J. Allen delt. J. N. Fitch imp.

POLYPODIUM WARDII.

J. Allen delt J.N. Fitch imp.

LYGODIUM FLEXUOSUM, *Swartz.*
Var, ALTA.

Explicatio Tabularum (*continued*).

XXXIX. *Deyeuxia scabrescens*, Munro.—Culmi pars superior, magn. nat.
- *a.* Spicula dissecta.
- *b.* Flos inferior.
- *c.* Floris superioris rudimentum.

XL. *Brachypodium Wattii.*—Culmi pars superior, magn. nat.
- *a.* Pedicellus cum glumis.
- *b.* Paleæ.
- *c.* Caryopsis.

XLI. *Scolopendrium Delavayi*, Franch.—Planta, magn. nat.
- *a.* Frons unica, ampliata.

XLII. *Polypodium crenato-pinnatum.*—Planta, magn. nat.

XLIII. *Polypodium Wardii.*
- *a.* Planta, ¼ magn. nat.
- *b.* Pinna unica, magn. nat.

XLIV. *Lygodium flexuosum*, Sw., var. *alta.*—Caulis fragmentum, cum fronde unica, magn. nat.

A Monograph of the *Thelephoreæ*.—Part I. By George Massee. (Communicated by W. T. Thiselton Dyer, M.A., F.R.S., C.M.G., F.L.S.)

[Read 15th March, 1888.]

(Plates XLV.–XLVII.)

General Introduction.

The group of Fungi known as the Basidiomycetes, characterized by the presence of basidia which abjoint spores acrogenously, is divided into two subgroups, the Gastromycetes and the Hymenomycetes. The latter is characterized as follows by Fries *:— "Hymenio externo subdiscreto, sporophoris apice subtetrasporis, sporis spiculis suffultis," which, from the systematist's point of view, is supposed to define the subgroup, but fails, as is to be expected, at those points where the transition to neighbouring subgroups obliterates the sharpness of the above characteristics. The leading feature is the naked hymenium, which in the simplest order is from the first exposed; whereas in the higher orders the most completely differentiated species of each have the hymenium at first concealed by specialized portions of the sporophore,

* Hym. Eur. p. 1.

becoming exposed only when the spores are ripe for dispersion. The two extremes are connected by transitional forms. In this particular we have shadowed in the Hymenomycetes a feature highly characteristic of the Gastromycetes, in which the hymenium is completely surrounded by a specialized portion of the sporophore until the spores are mature. Here, again, the two subgroups are connected by intermediate stages.

It is not to be inferred that the concealment of the hymenium until maturity implies a higher phase of development in the Gastromycetes. In both subgroups a common idea is aimed at: this is to expose the greatest possible amount of hymenium or spore-bearing surface in the smallest possible space. In the higher Hymenomycetes this is effected by means of closely-packed radiating plates or lamellæ; whereas in the Gastromycetes the same object is attained by the development of a complicated labyrinthiform or cavernous mass, the cavities of which are lined with the hymenium, and the naked or concealed hymenium is the outcome of this twofold arrangement respectively. In the Hymenomycetes the basidia are typically club-shaped terminal branches of hyphæ, each furnished with four slender outgrowths, called sterigmata, at or near the apex; each sterigma produces a spore at its apex (Pl. XLVI. fig. 12). In some of the simpler forms the basidia have only two sterigmata, and, in rare instances, only one*. The spores are simple (unicellular) except in the Tremellineæ, where they are in many species compound, consisting of four cells (triseptate), sausage-shaped and slightly curved.

The fact of a plant producing compound spores is not to be considered as a sign of higher organization than in the case of another producing simple spores; neither is the reverse of this true. Nevertheless, in many instances where the original simple spore becomes broken up by septa into several cells, it suggests to the mind a closer relationship with vegetative structures than

* In Sachs's 'Text-Book of Botany,' Engl. ed. p. 338, in describing *Agaricus campestris*, the following sentence occurs:—"Each basidium produces in this species only two, in other Hymenomycetes usually four spores." This is not correct; the basidia of *Ag. campestris* have four sterigmata, each producing a spore; nevertheless this strange error has been repeated and accompanied by the equally incorrect woodcut in several English works on Botany. Correct figures of the basidia are given by de Seynes, 'Essai d'une Flore Mycologique de la Montpellier,' pl. 4. f. 12; Balfour's 'Class-Book of Botany,' 3rd ed. p. 21, fig. 40, &c. The plant itself is not uncommon.

the more highly differentiated simple spore, and the latter is characteristic of the most highly developed species in all groups.

The Hymenomycetes are arranged by Fries * under six orders:—Agaricineæ, Polyporeæ, Hydneæ, Clavarieæ, Thelephoreæ, Tremellineæ. It must be distinctly understood that no linear arrangement can possibly illustrate completely the relationship of the orders, which approach each other at various points; nevertheless, leaving out of question the Tremellineæ, the above sequence roughly indicates the evolution from the Thelephoreæ, the simplest order, to the Agaricineæ, the most complex.

Professor De Bary, in describing the evolution of the sporophore in the Hymenomycetes from the simplest forms, which are flat expansions attached by the whole of the under surface to the substratum, and producing the hymenium on the free surface, says:—"From these, which are the simplest forms, there is a passage into more highly developed forms, and chiefly in two directions. In the one case the substratum is vertical and the margin of the compound sporophore, which points upwards, raises itself from the substratum, and continues to grow nearly at right angles to it; in this way fan-shaped, mussel-shaped, or horse-shoe-shaped sporophores are formed, bearing the hymenium on the surface which looks towards the ground, and sterile on the opposite side. In the other case the compound sporophore rises in a vertical erect position from the usually, if not always horizontal substratum, and takes the form of the Cap-fungi and club-shaped Hymenomycetes" †.

In reality the two types mentioned by de Bary are not distinct, but pass from the first to the second without a break, as is clearly illustrated in every order of the Hymenomycetes except the Tremellineæ, and in the Thelephoreæ, where there is the greatest amount of latitude in connection with sporophore development, owing to the absence of comparatively rigid inherent laws, acquired and stereotyped during the upward development and usually spoken of as hereditary, which become more exacting as the various orders differentiate. Every type of hymenophore known in the Hymenomycetes is met with in such genera as *Stereum* and *Thelephora*, and in some instances even in the same species.

The following are the most marked phases of sporophore evo-

* Fries, Hym. Eur. p. 1.

† 'Fungi, Bacteria, and Mycetozoa,' Engl. ed. p. 287.

lution as occurring in the Hymenomycetes, illustrated by *Stereum hirsutum*, Fr., one of the Thelephoreæ :—(*a*) The most primitive type, as explained above, is where the sporophore is spread out as a thin layer attached to the substratum by the whole of the under surface, the upper surface being covered with the hymenium (Pl. XLV. fig. 1). In many of the simpler Thelephoreæ this mode of growth is permanent, independent of the direction of the substratum; but in species like *Stereum hirsutum*, which may be described as inclined to 'sport,' or, more correctly, where epinasty, the cause of the (*a*)-type of sporophore, is strongly manifested, the above mode of growth occurs when developing on a broad horizontal substratum. (*b*) When the substratum is vertical, which may be the side of a prostrate trunk, or an erect one, growth commences as in type (*a*), and after extending from a centre for some time, and assuming a more or less circular outline, the uppermost margin becomes free and continues to grow away from the substratum and at right angles to the attached portion. In this type we get the first transition from the superior to the inferior hymenium imperfectly indicated (Pl. XLV. fig. 2); and it is interesting to remember that the first step towards the inversion of the hymenium, itself the most pronounced result of development in the subgroup, is not the outcome of a new initial force, but simply the continuation of epinasty, which kept type (*a*) adpressed to the horizontal substratum. When growing in what may be termed an unnatural position, the dominant directive force, epinasty, directs the plant along the old hereditary lines, and as soon as possible the horizontal position is resumed with the free margin incurved. To prove that this change of direction of growth is due to the position of the substratum, it is only necessary to place a prostrate branch with the plant growing on it, as in the (*a*)-type, in a vertical position, when further development will follow (*b*)-type; and microscopic examination will clearly reveal the epinastic curvatures of the hyphæ in the thallus, as in the section of *Stereum hirsutum* given by De Bary*. The above is a remarkable illustration of the evolution of a new type of structure due entirely to surroundings. (*c*) In type (*b*) three fourths or more of the plant is usually attached to the substratum, and this is more especially the case when growing on the side of a prostrate trunk or large branch, where the side presents, compared to the size of the plant, a practically flat vertical surface, which appears

* 'Fungi, Bacteria, and Mycetozoa,' Engl. ed. p. 53, fig. 23.

in some way to neutralize, to a great extent, the epinasty of the plant; whereas when growing on the side of a small prostrate branch, where the antagonistic flat surface is reduced to a minimum, the plant often becomes free soon after the commencement of growth, the free horizontal portion still continuing to develop in a more or less circular manner, which results in a structure that can be understood by comparing it to a reniform leaf attached by a short flat petiole to the branch, the lamina being free, more or less depressed in the centre, and incurved at the margin (Pl. XLV. fig. 3). This stage illustrates the origin of a central stem and umbrella-shaped pileus, which is perfected in (*d*) by the two lateral lobes becoming united, which results from the plant growing from a point where it is free to expand equally on every side from a short stem-like base (Pl. XLV. fig. 4). In some instances in the (*d*)-type the pileus remains solid and surrounded on all sides with the hymenium, as in *Clavaria*.

It is not to be understood that every *Stereum* will show the sequence sketched above if placed consecutively in the required position. Some plants may be met with illustrating the (*a*)-phase in almost every conceivable direction. The point to be kept in view is the fact that departures from the (*a*)-type are common, and can be seen in all cases to bear a distinct relation to the direction of the substratum, as described above. Passing to the highest order of the Hymenomycetes, the Agaricineæ, we meet with the same sequence of sporophore development. In the genus *Pleurotus*, such simple stemless species as *P. applicatus*, Batsch, illustrate the (*a*)-type, being attached to the substratum by the barren surface with the hymenium uppermost. *P. hypnophilus*, Berk., and *P. chioneus*, Pers., follow the (*b*)-type; *P. ostreatus*, Fr., the various stages of (*c*); while *P. dryinus*, Pers., passes through every condition of (*c*) to the highest condition of (*d*). Here, again, within the range of a single genus, we have a repetition of what has been already described as occurring in the Thelephoreæ, and also the result of similar external influences modifying in various ways the inherent epinastic tendency.

Sporophore evolution, as already described, is not only characteristic ordinal development, but where the orders are further differentiated into tribes, each tribe illustrates the same sequence, and, further, the same idea runs through numerous large genera belonging to the various orders.

The character of primary importance in distinguishing the orders of the Hymenomycetes consists in the arrangement of the hymenium or spore-bearing surface, which may be briefly described as follows:—Agaricineæ: hymenium spread over radiating plates or gills. Polyporeæ: hymenium lining variously shaped pores or depressions. Hydneæ: hymenium covering spine-like or granular projections. Clavarieæ: hymenium continuously covering the greater portion of the clavate or variously branched hymenophore. In the Thelephoreæ we find clearly indicated all the above types of hymenium, which will be fully described under the various genera.

From what has already been stated, it will be seen that the Thelephoreæ constitute the base and also the starting-point in the evolution of the Hymenomycetes, and, further, that from the Thelephoreæ all the other orders have directly originated; which means that some—not all—of the modifications of sporophore and hymenium from the (*a*)-type indicated in the order have by continued differentiation become morphologically so far removed from the fundamental type, although sufficiently connected by intermediate stages as to leave no doubt about the common origin, that they constitute at the present day what are considered as distinct orders. The points of departure of the various orders from the parent stock will be indicated later on.

The Tremellineæ, although undoubtedly closely allied to the Hymenomycetes, present none of the characteristic sequences of development common to all the other orders, and cannot be considered as having been evolved from the Thelephoreæ; but, on the other hand, as pointed out by De Bary *, connect the latter with the tremelloid Uredines, which are clearly shown by the same author to belong to the Ascomycetes. Hence we must consider the Basidiomycetes as having originated from the Ascomycetes at the point indicated. A brief survey of the broad characteristic features of the two main divisions of Fungi, together with the modifications at the point of separation of the Basidiomycetes from the Ascomycetes, will indicate the reasons for the above statement. In the latter the most pronounced feature is the ascocarp, often preceded or accompanied by an asexual or gonidial phase of reproduction, which is, however, always subordinate to the former. The sporophore usually remains small and simple in structure, and in the few exceptional cases assumes forms that are repeated in the Basidiomycetes, where the ascocarp or sexual

* 'Fungi, Bacteria, and Mycetozoa,' Engl. ed. p. 339.

reproductive phase is entirely suppressed, the gonidial stage alone serving for the continuation of the species, and the sporophore attains to a high standard of development and differentiation. It will be observed that the two factors of subordinate importance in the Ascomycetes—the sporophore and gonidial mode of reproduction—entirely constitute the plant in the Basidiomycetes, whereas the ascocarp, so conspicuous in the Ascomycetes, is not represented. It is true that Sautermeister * and others have indicated the presence of ascocarps in the Basidiomycetes, but such statements have not as yet been corroborated, and, even should this be done, it could not be considered as anything very extraordinary if we accept the above explanation as to the origin of the group, which would be strengthened rather than otherwise by such corroboration or discovery.

Towards the base of the Ascomycetes the ascocarp becomes a less conspicuous feature, and in many of the Uredineæ is altogether absent, the teleutospore form being alone developed. If this statement as to the absence of the æcidial state cannot be accepted in its entirety by the advocates of heterœcism, the main argument remains unaffected, as the teleutospore condition is unquestionably most conspicuous and universal in the Uredineæ.

All teleutospores agree in being specially modified terminal cells, and in most instances possess the further peculiarity of remaining firmly attached after maturity to the hypha from which they originated; hence they are often described as pedicellate, and frequently germinate before they break away from the host. During germination all or only the uppermost cells of the compound teleutospore emit a long germ-tube, from the apical region of which, in some species of *Puccinia*, *Æcidium*, *Triphragmium*, *Phragmidium*, and other genera, spores are produced on slender sterigmata. These spores on germination produce either directly or indirectly a plant similar to the one from which they originated. In the genus *Podisoma* the teleutospores with their long supporting hyphæ or pedicels are firmly agglutinated together into a compact mass which is tremelloid when moist, and when the teleutospores are germinating closely resemble in general appearance certain species of the Tremellineæ, and, further, the various structures in the two cases are homologous; but in the last-named order differentiation has proceeded one step further. In the Uredines proper the teleutospore in some genera falls away from its

* Bot. Zeit. 1876, p. 819.

support when mature, and hence comes under the conception of a typical spore; but in *Podisoma*, which may be considered as a connecting-link between the Uredineæ and the Tremellineæ, the teleutospore is permanently fixed in the gelatinous mass, but is yet distinguished by its colour, although such colour is absent from the epispore, the only part usually coloured in typical spores; whereas in the Tremellineæ the teleutospore is less differentiated, devoid of colour, permanently attached to the sporophore, and known as a basidium, each cell of which eventually elongates at its apex into a long tube homologous with the germ-tube (the so-called promycelium) emitted by a typical teleutospore; these threads become attenuated towards the apex, at which point a reproductive cell is produced, and known as a spore in the Hymenomycetes, but which is, in reality, homologous with the spore produced by the germ-tube of the teleutospore in the Uredineæ.

In some of the Tremellineæ the basidia differ from those of typical Hymenomycetes in being compound; the apical cell of a hypha destined to produce a basidium, after enlarging for some time, is segmented by septa into two or four cells exactly as in the formation of typical teleutospores; but even in the Tremellineæ there is a sequence to the simple (unicellular) basidium, the only type met with in the Hymenomycetes where yet further degeneration occurs, due to arrest of the homologues of the germ-tubes of teleutospores, which are reduced to two, or in most cases four minute spicules, henceforth known as sterigmata, each of which bears a spore at its apex.

It may be urged, as telling against the above idea of the conversion of a teleutospore into a basidium, that in the former the septa are, as a rule, transverse to the axis of growth, whereas in the latter, when present, they are always parallel; yet in *Triphragmium* septa are developed in both directions, whereas in *Diorchidium*, a genus belonging to the Uredines, the compound teleutospore consists of two cells separated by a vertical septum, and on germination each cell emits from its apex a long tapering germ-tube, the whole structure closely resembling the basidia met with in the genus *Dacryomyces*, belonging to the Tremellineæ. In some species of *Tremella*, as shown by Tulasne*, the spores on germination produce still smaller spores of a second order; this again has its counterpart in the Uredineæ. Finally, so long as

* Ann. Sci. Nat. sér. V. vol. xv. p. 215.

the teleutospore is typical, on germination the germ-tube is an extension of the endospore, which either ruptures or passes through specialized portions of the exospore, the latter never entering into the composition of the germ-tube; but in the genus *Podisoma* this is not the case, the epispore, in the sense of a specialized protective covering, being altogether absent, and the germ-tube is a direct extension of the outermost portion, in which point it exactly agrees with the origin of sterigmata from basidia in the Hymenomycetes.

THELEPHOREÆ.

Morphology.—Two types of hyphal structure are met with:—(*a*) Having thin walls with little or no tendency to become gelatinous externally, numerous transverse septa, and usually much branched. (*b*) Walls very thick, with a decided tendency to become gelatinous or mucilaginous outside, aseptate. Transitional forms connect the two extremes. In genera of low organization, as *Coniophora*, the entire plant is composed of hyphæ belonging to type (*a*), and the sporophore, even when dry, is felt-like and fibrous in texture, its compactness being due to the relative interweaving of the component hyphæ, and not to their being cemented together by mucilage. In more highly differentiated genera, as *Hypolyssus* and *Skepperia*, hyphæ of the (*b*)-type are alone met with, the entire plant becoming cartilaginous or horny when dry, due to hardening of the gelatinous substance derived from the cell-walls, and in a transverse section presents the structure known as pseudo-parenchyma. In some genera, as *Thelephora*, the two types are present in the same plant; but in one genus only in the order under consideration is there any approach to the marked differentiation I have elsewhere* described as occurring in certain species belonging to the Polyporeæ, where the (*b*)-type of hyphæ are contracted into hollow cylinders or symmetrically arranged radiating fan-shaped ribs of woody consistency for the purpose of mechanical support, and remain as a skeleton after the thin-walled hyphæ of the (*a*)-type, which are more directly concerned with reproduction, have decayed or been eaten by insects.

As a rule, the cell-walls remain for a long time in a *plastic* condition; and in many instances where branches of the same or

* Journ. Roy. Micr. Soc. 1887, p. 205.

adjacent hyphæ meet, absorption of the walls takes place at the point of contact, and open communication is established between the two. In this way a complicated anastomosing network may result; or more frequently two parallel hyphæ are joined by a transverse neck, forming an H-shaped structure, which may in some cases be due to coalescence, as stated by De Bary*; but this is not the only method, as instances are not uncommon where a hypha gives off a branch at right angles to itself, which, after growing for some time, bifurcates, the forks growing in opposite directions and parallel to the first-mentioned hypha. When both ends of one side of the H-shaped figure are free, it certainly cannot be the result of coalescence (Pl. XLVI. fig. 6). The clamp-connections described by De Bary † are present in probably every species having septate hyphæ. They originate as follows:—A protuberance appears on the cell-wall close to a transverse septum, which increases in length in a direction parallel to the hypha from which it springs until it has passed over the septum, when it coalesces with the adjoining cell, and after absorption of the walls at the point of contact provides an open communication between the two adjoining cells; this communication is sometimes eventually interrupted by the appearance of a septum at the point of origin of the clamp, which is usually appressed to the wall of the parent hypha, but sometimes becomes arched to such an extent as to leave an eye-hole between the two points of contact. Every transition from a free branch and the completely adpressed clamp-connection may be met with in *Corticium sanguineum*, Fr. (Pl. XLVI. fig. 6).

So far as I am aware, not even a theory has been propounded as to the meaning of clamp-connections which are characteristic of the Basidiomycetes, without at the same time being absolutely confined to the group, as in *Zygodesmus*, a genus grouped with the Hyphomycetes, very characteristic clamp-connections are invariably present, and constitute an important generic feature. In *Asterostroma*, the genus previously alluded to as illustrating marked differentiation of the sporophore, the mode of development is as follows. The species are entirely resupinate, and the portion immediately attached to the substratum of wood or bark consists of a thin layer of interwoven, thin-walled, septate, colourless

* 'Fungi, Bacteria, and Mycetozoa,' Engl. ed. p. 2. † *Tom. cit.* p. 8.

hyphæ growing parallel to the substratum, and giving origin to numerous erect branches of similar structure, some of which, by further branching, form a corymbose head, each terminal branchlet developing into a clavate basidium producing four spores supported on slender sterigmata. Others of the erect branches at about the level of the base of the basidia develop at the apex a stellate arrangement of branchlets, all situated in one plane parallel to the surface of the hymenium; the number of rays varies from three to seven, five being most frequent, and differ from the supporting hyphæ in being aseptate, with very thick walls which soon become bright brown (Pl. XLVI. figs. 8, 9). When the spores are ripe, the erect hyphæ supporting both stellate threads and basidia, along with the latter, disappear, leaving the coloured star-shaped bodies mixed with spores, resting on the horizontal interwoven basal stratum of the plant. The object of this differentiation is not evident; but it is not the only instance where an apparently useless complex arrangement evolved in simple types, and afterwards suppressed, manifests itself again in more highly organized forms in connection with some important function, as illustrated in the structure of the Polyporeæ already alluded to.

A similar differentiation is met with in *Bovista*, a genus belonging to the Gastromycetes, where a compact external layer forming the peridium is composed of colourless thin-walled septate hyphæ, from one side of which spring numerous branches, some giving origin to basidia, others to variously branched, thick-walled, dark brown, aseptate hyphæ, collectively constituting the capillitium, which, along with the spores, are eventually free, owing to deliquescence of the supporting threads. The only morphological distinction of importance between *Asterostroma* and *Bovista* consists in the former having the basal stratum, from which basidia and coloured hyphæ originate, effused and adnate to the substratum, with the upper free surface everywhere covered with the hymenium; whereas in *Bovista* the corresponding stratum forms a hollow sphere, the outside of which corresponds to that portion in *Asterostroma* attached to the substratum, while the inner surface, which corresponds to the upper surface in *Asterostroma*, gives origin to the spore-producing structures and capillitium, which are consequently concealed. From the above description it will be gathered that the conception of *Bovista* is nothing more than that of a closed-up *Asterostroma*, an idea which I am perfectly aware will be ridiculed by systematists that are supersaturated with what De Bary has happily termed traditional ideas as to affinity; nevertheless, while grateful for the laborious work conscientiously done by the pioneers of mycology, I doubt whether a more solid argument than that of early conceptions—not based on morphology—can be brought to bear against the above statement.

The species included in *Asterostroma* externally agree with the genus *Corticium*, and up to the present have been included in that genus, and in all probability will be retained there by those mycologists who consider analogy as being of more importance than homology. My object in entering into the above details must not be interpreted as suggesting that *Asterostroma* is most nearly allied to *Bovista*; but to show that structures characteristic of the most widely separated groups of the Basidiomycetes are indicated in the Thelephoreæ, which must be considered as the starting-point of the entire group, and at the same time to show that the general morphological relationship between Hymenomycetes and Gastromycetes is nearer than the traditional idea concerning the two groups.

Hymenial appendages other than basidia are more numerous and varied in structure in the order under consideration than in any other included in the Basidiomycetes. In *Veluticeps* the hymenium presents a velvety appearance due to the presence of erect solitary or fasciculate thin-walled septate hairs, not at all differentiated from hyphæ, forming the subiculum, of which they are direct continuations.

Much more highly developed organs are met with in the genus *Peniophora*, where the hymenium is densely setulose, due to the presence of numerous comparatively stout projecting cells called *metuloids* by Cooke*. These cells exactly agree in origin, position, and form with the bodies known as *cystidia*, and will in future be spoken of as such. In shape they are always fusiform; but the widest portion is not always equidistant from the two ends; and when this is the case, is always nearest to the base. Cystidia are always colourless, thin-walled, and vary in size in different, and also to some extent in the same, species, in the latter case depending probably on relative age. In *Peniophora inconspicua* (Pl. XLVII. fig. 14) $120 \times 30\,\mu$ is not

* Grevillea, vol. viii. p. 17.

an unusual size. In some instances they spring from erect hyphæ passing directly from the subiculum, in others terminate lateral projections of the corymbose basidia-bearing branches; both conditions may sometimes be seen in the same section. When quite young, they are perfectly smooth, and remain so for some time after having reached full size and performed their function as organs of transpiration, when the projecting portion becomes incrusted with amorphous masses of oxalate of lime, which renders them very brittle and easily broken off, leaving the hymenium perfectly glabrous. The function stated above is proved by the fact that under certain conditions minute drops of water may be seen to form on them, and also by the formation of external masses of oxalate of lime, which continue to increase in size and number due to escape of water containing this substance in solution.

A third type of hymenial appendage, agreeing in some respects with what has already been described as occurring in *Asterostroma*, is met with in *Hymenochæte* under the form of projecting, thick-walled, brown aseptate hairs which spring from the colourless thin-walled septate hyphæ of the subiculum.

Basidia are terminal cells of short branches usually arranged in a corymbose manner packed close side by side, and form the hymenium. In the simpler forms, as *Coniophora* and *Corticium*, the corymbose branches spring directly from prostrate hyphæ of the dense subiculum; whereas in such genera as *Stereum* the hyphæ growing erect from the subiculum form a complex interlaced weft, known as the *subhymenial* layer, before producing the basidia-bearing branches. In form the basidia are clavate or obovate, and terminated by four more or less elongated filiform spicules or *sterigmata*; each sterigma becomes swollen at the apex. These swellings continue to grow for some time until a definite size and form is reached, being supplied with protoplasm from the basidia which passes along the sterigmata, when they are cut off from their support by transverse septa, and break away as ripe *spores*, which are always simple (unicellular), except in the genus *Heterobasidium*, colourless when young and also at maturity, except in the genera *Coniophora*, *Thelephora*, and *Heterobasidium*, where the epispore is coloured. In *Coniophora* the spores are comparatively large, and before the epispore becomes coloured, reagents demonstrate the presence of a small but well-defined nucleus. Rosenvinge has shown * that nuclei are present in both vegetative and reproductive cells of fungi.

Gonidia are not uncommon. When *Stereum hirsutum* grows in places exposed to constant moisture, the hymenium is not unfrequently more or less covered with small protuberances presenting a velvety appearance under a lens. A section through one of these outgrowths shows it to consist of a compact bundle of delicate septate hyphæ originating from the subhymenial layer, and passing between the elements of the hymenium, where the free apices are branched in an irregularly verticillate manner, each branch bearing a colourless broadly elliptical gonidium at the apex, measuring about $3 \times 2\,\mu$. Judging from the great number of gonidia entangled with the hyphæ of old tufts, several are produced in succession; but I have no direct evidence on this point (Pl. XLVI. fig. 7). In a very dilute alkaline solution the gonidia made feeble attempts at germination, the longest tube emitted being less than half the length of a gonidium. The "glands" on the gills of *Agaricus* (*Pleurotus*) *ostreatus*, var. *glandulosus*, Bull., are gonidia-bearing tufts similar in structure to the above. Numerous true spores are usually mixed with the gonidia in the tufts, and are apt to lead to mistaken ideas when it is only superficially examined. In *Aleurodiscus Oakesii*, in addition to normal tetrasporous basidia, which are rare, there are numerous large elliptical gonidia produced singly on thick gonidiophores; whereas in *Aleurodiscus Micheneri* (= *Artocreas Micheneri*, Berk. & Curt.,=*Michenera Artocreas*, Berk. & Curt.) I have found large coloured gonidia only. Patouillard has also described a *Corticium* (*C. Marchandii*, Pat.†) having numerous large coloured gonidia, solitary and terminal on stout nodulose gonidiophores, mixed with rarely occurring basidia producing small colourless spores on well-developed sterigmata. Gonidia are usually large, with a coloured epispore, and often indistinguishable from the spores of *Coniophora* when free, but differ entirely in origin.

Colouring-matters are confined to the cell-walls, the most usual tints ranging from clear pale yellow, through orange and fulvous, to brown, all being unaffected by a 10-per-cent., or even stronger,

* M. C. Kolderup Rosenvinge, "Sur les Noyaux des Hymenomycetes," Ann. Sci. Nat. sér. 7, vol. v. p. 74, pl. 1.

† Tab. Analyt. Fung. fasc. i. p. 16, f. 25. In this work are numerous illustrations of the occurrence of gonidia in various orders of the Basidiomycetes.

solution of potassic hydrate; but the bright blue colour of *Corticium cæruleum* is at first intensified, and subsequently completely dissolved out of the cell-walls as a bright blue solution, by the above reagent. Dilute ammonic hydrate produces the same effect. The red colour of *Corticium sanguineum* is similarly dissolved. In the two last-named species the colour is usually most intense near the margin; and when portions of young actively growing plants are examined under the microscope, the apices of the marginal radiating hyphæ are seen to be perfectly colourless for a distance of 30–50 μ, followed by a deeply coloured portion of variable length, yet further back the colour is less intense or altogether wanting; and when placed in an alkaline solution, the darkest portion nearest the apex is most resistant, the older parts being bleached at once. It is not unusual to meet with old specimens of the above species quite colourless in the centre, the colouring-matter having been removed by the small amount of alkaline matter dissolved in rain or dew. The dissolved colouring-matter sinks into the substratum, which is frequently deeply stained for some distance beyond the margin of large old plants. These phenomena are more clearly illustrated by such species as *Hypochnus rubrocinctus*, *H. nigromarginatus*, &c., once considered as fungi belonging to the Thelephoreæ, but now known to be ascigerous lichens; nevertheless the colouring is confined to the fungal element.

Laticiferous vessels are present in some species of *Stereum* and *Corticium*, appearing as irregularly branched, aseptate hyphæ filled with hyaline granular contents, and originate as lateral branches from the ordinary septate hyphæ of the subiculum. In *Corticium lactescens* latex is abundant, and remains colourless after escaping from the vessels; but in *Stereum sanguinolentum* and *C. rugosum* it changes to a dull red when exposed to the air. Schönbein has shown* that the change from yellow to deep indigo-blue which occurs in *Boletus luridus* when cut or broken is not due to contact with the air, but to another substance in the fungus which ozonizes the oxygen of the air; and I find that if a perfectly fresh specimen of *Stereum sanguinolentum* is placed for some time in a vessel in which ozone is generated, the entire surface of the hymenium becomes dull red, presenting the same

* Verhandl. d. naturf. Ges. Basel, iii. (1856) p. 339; and in Compt. Rend. July 16, 1860.

appearance as when cut or bruised. If a specimen so treated is afterwards placed in alcohol, sections show the laticiferous vessels filled with dull red colouring-matter. Laticiferous vessels are difficult to trace in specimens that have been dried for any length of time, and equally so in quite fresh specimens, as they become empty at once when cut, and consequently collapse; whereas in fresh specimens that have been kept for a few days in a dry place, the liquid portion of the latex disappears, leaving the granular portion, which enables the observer to follow the vessels in a section much better than in alcohol material. The addition of dilute iodine solution, which stains the latex dark brown, greatly facilitates the examination of laticiferous vessels in fungi generally after the specimens have been prepared by partial desiccation.

With few exceptions, the plants are Saprophytes, growing on wood and bark, or sometimes incrusting decayed vegetable matter.

Few travellers collect fungi, more especially the comparatively inconspicuous resupinate forms; hence it is at present impossible to give more than a general statement as to geographical distribution. In all probability species belonging to the Thelephoreæ are to be found wherever Phanerogams grow, and the present great centres of the group must not be considered as "specific centres," but in reality correspond to those localities where mycologists have resided. *Corticium*, *Coniophora*, *Peniophora*, *Stereum*, and *Thelephora* are, according to the present state of knowledge, characteristic of temperate regions, but not without representatives, generally more highly developed, in the tropics; whereas such genera as *Beccaria*, *Skepperia*, and *Hypolyssus* are confined to warm regions.

The classification of the Thelephoreæ according to the old authors was based entirely on external resemblances; hence it is not suprising that genera were included which have since been shown to belong to the Agaricineæ, Polyporeæ, Tremellineæ, and Pezizeæ respectively. Léveillé * was the first to make use of morphological characters in establishing the genus *Hymenochæte* for the reception of several species previously included in *Stereum*, but distinguished by the presence of numerous spine-like, aseptate, dark brown hyphæ, projecting from the surface of the hymenium, which consequently presents a velvety appearance.

* Ann. Sci. Nat. sér. III. vol. v. p. 150.

The genus *Peniophora*, established by Cooke *, is also characterized by the microscopic structure of the hymenium.

I have not attempted to unravel the synonymy of old writers, which would at best be purely speculative and lead to no good. It is true that there are mycologists at the present day who persuade themselves that they know for a certainty the species intended by Persoon and other early writers, in spite of the very meagre descriptions and absence of authentic specimens; but such knowledge savours of occultism, as it certainly cannot be derived from the source that ordinary mortals would have to depend upon—specific diagnosis. The genus *Corticium*, as hitherto defined, has up to the present been considered as the base of the Hymenomycetes, but in nature, as opposed to book-schemes, there is no sharp line between *Coniophora* (previously included in *Corticium*) and several genera included in the Hyphomycetes; there is the same effused interwoven subiculum with erect spore-bearing branches, the surface eventually becoming powdered with coloured spores, as in *Chromosporium* and *Zygodesmus*.

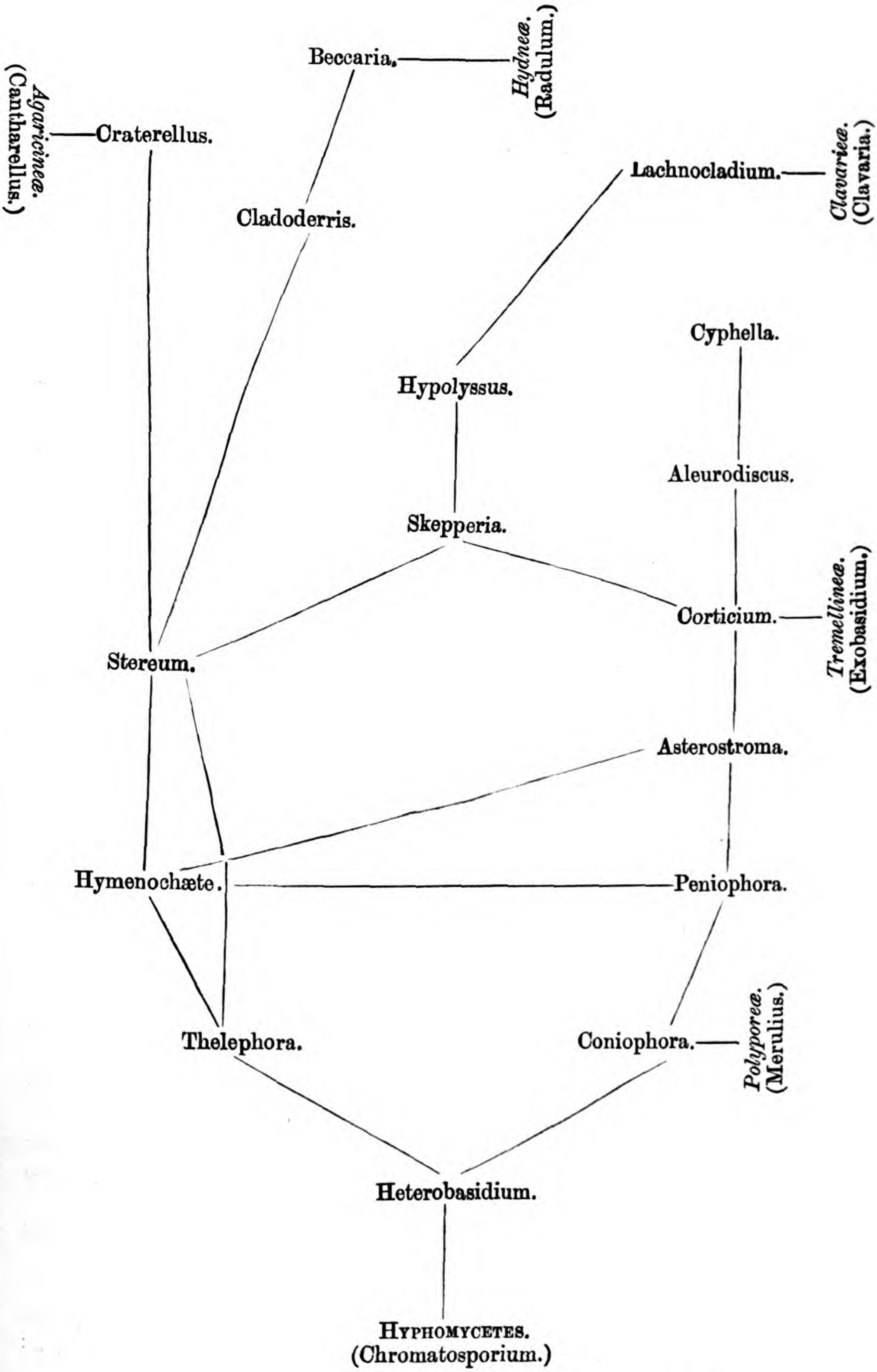
The book student will probably think that the presence or absence of closely packed tetrasporous basidia forming a hymenium should at once indicate the true affinity; but this is not so, otherwise *Aleurodiscus tabacina*, which only produces coloured spores (gonidia) singly on long slender gonidiophores, would belong to the Hyphomycetes; whereas *Aleurodiscus amorpha* and *A. Oakesii* would technically belong to both the Hymenomycetes and the Hyphomycetes, inasmuch as in both species gonidia as defined above and tetrasporous basidia are both present in the hymenium. *Coniophora aurea* (syn. *Hypochnus aureus*), allied in other respects to normal species of *Coniophora*, has only unisporous basidia, in other words gonidia. Gonidia are produced along with basidiospores in several species in addition to those already mentioned. It may be argued that the presence of gonidia in the hymenium of a Hymenomycete does not prove affinity with the Hyphomycetes; but to be convincing it must be shown that the terms gonidium and gonidiophore, as used in the above connection, are in reality something more than mere names, which I incline to believe refer to degraded basidia that have become monosporous, as I have seen gonidiophores and basidia growing from the same hypha in *Aleurodiscus Oakesii*; and in some species of *Corticium*, as *C. arachnoideum* and *C. radians*, it is not unusual to find in the same hymenium normal tetrasporous basidia, others almost

* Grevillea, vol. viii. p. 20.

cylindrical with only two sterigmata, others, again, only slightly or not at all thickened upwards, and bearing at the attenuated apex a single spore (gonidium). Hence the distinction between the Hymenomycetes and the Hyphomycetes, according to the present state of knowledge, depends on the presence or absence of a purely arbitrary and preconceived conception as to what constitutes a basidium. Every other character being equal, as is the case in numerous instances, the presence of the clavate tetrasporous basidium in the hymenium, irrespective of the presence of an equal number of unisporous basidia (gonidiophores), proves the plant to be a Hymenomycete, whereas if the latter are alone present, but not thickened upwards, whether monosporous or polysporous, the plant must be considered as a Hyphomycete. In typical Hymenomycetes the basidia and accompanying structures form a compact, continuous hymenium, but to this rule there are numerous exceptions in the Thelephoreæ.

It is not unusual to meet with specimens of *Corticium arachnoideum* spreading over mosses or decayed vegetable matter as a delicate, white, cobweb-like film not at all felted, the hyphæ giving origin to scattered, erect, spore-bearing branches, the whole structure resembling under a lens such Hyphomycetes as *Dactylium macrocephalum*; but in this instance, although there is no approach to a normal hymenium, the basidia are typical, and the same specimen on passing to a solid substratum of bark or wood may produce a dense subiculum covered with a compact waxy hymenium. The same thing may be met with in *Peniophora velutina*, *Corticium sulphureum*, and other species with a byssoid radiating mycelium; consequently the second leading character of the Hymenomycetes, the compact hymenium, fails at the traditional point of junction with the Hyphomycetes. A third character of importance in distinguishing between the Hymenomycetes and the Hyphomycetes is the presence in the former of a compact hymenophore, which often presents a pseudo-parenchymatous structure in section, due to the closely compacted hyphæ being agglutinated together, whereas in the Hyphomycetes the basal stratum normally remains loosely fibrillose; but there are exceptions in both families.

The diagram on p. 125 illustrates the morphological relationship between the various genera of the Thelephoreæ, and also the points of departure of the remaining orders of the Hymenomycetes, the accompanying bracketed genus being considered as



Beccaria.
Hydneæ. (Radulum.)
Agaricineæ. (Cantharellus.)
Craterellus.
Cladoderris.
Lachnocladium.
Clavarieæ. (Clavaria.)
Cyphella.
Hypolyssus.
Aleurodiscus.
Skepperia.
Corticium.
Tremellineæ. (Exobasidium.)
Stereum.
Asterostroma.
Hymenochæte.
Peniophora.
Thelephora.
Coniophora.
Polyporeæ. (Merulius.)
Heterobasidium.
HYPHOMYCETES. (Chromatosporium.)

the connecting-link. It will be observed that the point of contact with the Ascomycetes through the Tremellineæ is not at the base of the Thelephoreæ, but through *Corticium*, a comparatively highly organized genus, which in the frequent subgelatinous consistency when moist, and large sausage-shaped curved spores of many species, presents affinities with the Tremellineæ through *Exobasidium*. From *Corticium* there is an upward development resulting in the Hymenomycetes, and a downward one passing insensibly into the Hyphomycetes, where the amount of differentiation from the asexual or gonidial states of the ascigerous species is much less than in the Hymenomycetes; in fact numerous so-called genera which are, according to systematists, typical Hyphomycetes, as *Dactylium*, *Sepedonium*, *Trichothecium*, *Mycogone*, &c., have been proved to be asexual phases of well-known ascigerous species, possessing the power, under certain conditions, of reproducing themselves continuously without the intervention of the higher form of reproduction.

DESCRIPTION OF THE PLATES.

Plate XLV.

Fig. 1. *Stereum hirsutum*, Fr., illustrating the (*a*)-type of sporophore: nat. size.

2. *S. hirsutum*, illustrating the (*b*)-type of sporophore; *a*, pileus; *b*, hymenium: nat. size.
3. *S. hirsutum*, illustrating the (*c*)-type of sporophore: nat. size.
4. *S. hirsutum*, illustrating the (*d*)-type of sporophore; *a*, pileus; *b*, hymenium: nat. size.

Plate XLVI.

Fig. 5. *Corticium sanguineum*, Fr., illustrating various stages in the formation of "clamp-connections": × 400.

6. *Peniophora velutina*, Cooke, hypha from the radiating mycelium with H-shaped formations: × 400.
7. *Stereum hirsutum*, vertical section passing through one of the gonidia-bearing tufts *a*, which is seen to originate from the subhymenial layer: × 500.
8. *Asterostroma albido-carneum*, Massee, vertical section showing the position of the coloured stellate hyphæ: × 300.
9. *A. albido-carneum*, coloured stellate hyphæ: × 500.
10. *Aleurodiscus Oakesii*, Massee, illustrating the transition from a typical basidium *a*, with four sterigmata, to so-called gonidiophores, *b*, *c*: × 500.

G. Massee delt.

J. N. Fitch lith et imp.

G. Massee delt. J.N. Fitch lith. et imp.

G. Massee delt.

J. N. Fitch lith et imp.

Fig. 11. *Heterobasidium chlorascens,* Massee, portion of hymenium and densely compacted subiculum: × 500.

12. *Coniophora olivacea,* Massee; basidium, *a*; sterigmata, *b*; spores, *c*; sterile basidium or paraphysis, *d*: × 500.

PLATE XLVII.

Fig. 13. *Coniophora ochracea,* Massee, portion of a cobweb-like radiating margin with sparsely scattered erect basidia-bearing branches, *a*, *b*, not forming a compact hymenium; *c*, prostrate hypha of subiculum: × 500.

14. *Peniophora inconspicua,* Massee, portion of hymenium with cystidium *a*, and basidia *b*: × 500.

15. *P. hydnoides,* Cooke & Massee, portion of hymenium with a fascicle of cystidia *a*: × 500.

16. *P. hydnoides,* cystidia separated to show the basidia-like origin from branched hyphæ: × 500.

17. *P. pezizoides,* Massee, plants: nat. size.

18. *P. pezizoides,* portion of hymenium: × 500.

19. *P. pezizoides,* section of plant: nat. size.

Ordo THELEPHOREÆ, *Fries.*

Hymenium inferum vel amphigenum, ceraceum vel pulverulentum, læve vel effiguratum. Basidia 4–2-sterigmatica, sterigmata acicularia; sporæ albæ vel coloratæ.

The above definition of the Order agrees in most respects with the one given by Fries in his latest work *, the *coriaceous* character of the hymenium being omitted, as the genus *Auricularia,* possessing this character, has been placed in the *Tremellineæ.* In the genus *Beccaria* the tubercles are in some species elongated and large as in *Radulum.*

In the specific descriptions, colour and texture of hymenium or margin refer to the appearance presented by the dried plant; colour of spores as seen by transmitted light; measurements of spores, cystidia, &c. give the average size, and in the present work are considered as only *one* factor of value in the discrimination of species.

HETEROBASIDIUM, *Massee,* nov. gen.

Resupinato-effusum, secernibile; subiculo compacto, arido; basidia bi-monospora; sporæ septatæ, fuscidulæ. (Pl. XLVI. f. 11.)

Intermediate between the Hymenomycetes and the Hypho-

* Hym. Eur. p. 629.

mycetes. The thick, separable, compact subiculum agreeing with the former, whereas the degenerate basidia and coloured compound spores point to an affinity with the latter.

HETEROBASIDIUM CHLORASCENS, *Massee*, n. sp. Late effusum, determinatum; hymenio pallide virente; sporæ elliptico-fusoideæ, triseptatæ, fuscidulæ, $25 \times 5 \times 6\ \mu$. (Type in Herb. Kewens.) * (Pl. XLVI. f. 11.)

On bark of *Carpinus*. Gainsville, Florida (*Ravenal*).

Effused, adnate, but inclined to separate from the matrix; subiculum thick, compact, almost pseudo-parenchymatous in section; hymenium minutely puberulent, dirty white with a tinge of green.

The name *Corticium chlorascens* was first used by Berkeley and Broome (Journ. Linn. Soc. vol. xiv. p. 70) in describing a plant from Ceylon supposed to be a *Corticium*, but which on microscopic examination proves to be an immature byssoid *Nectria*. The plant described above was considered by Berkeley as identical with *C. chlorascens*; hence this name has found its way into the mycologic flora of the United States. Various species of *Corticium* sent by Ellis and others are in the Kew collection as *C. chlorascens*.

CONIOPHORA, *DC.*; *Massee* (emend.).

Resupinato-effusa; hymenio læve pulverulento; sporæ fuscidulæ. (Pl. XLVII. f. 13.)

The word *Coniophora* was first used in a generic sense by De Candolle (Fl. Fr. vi. p. 34), afterwards by Persoon (Myc. Eur. i. p. 153), and later by Fries as a subgenus of *Corticium*; but in neither instance with exactly the same limitation as defined above. Nevertheless it has been considered advisable to retain the old name rather than coin a new one less expressive of the spore-powdered hymenium, which, along with the coloured spores, mark the genus. The basidia are tetrasporous, whereas in *Aleurodiscus* the large coloured gonidia are produced singly on threads, and in most instances accompanied by true spores borne in fours on basidia.

* The *bracketed* reference indicates in every instance the value of the specimen —whether the type or by whom identified, as also the herbarium in which it exists, from which spore-measurements &c. were obtained.

A. Macrosporæ: *sporidiis majoribus* (11–25 μ long.).

Coniophora olivacea, *Cooke.* Membranacea, adnata, ambitu fimbriata albicans; hymenio tenui, obscure olivaceo, pulverulento-tomentoso; sporæ ellipsoideæ, ochraceæ, 14–17 × 10–12 μ. —*Cooke, Grev.* viii. p. 89. Thelephora olivacea, *Fr. Elench.* p. 179; *Berk. Outl.* p. 269. Corticium olivaceum, *Fr. Hym. Eur.* p. 660; *Stev. Brit. Fung.* ii. p. 283; *Winter, Krypt. Fl.* p. 328. Hypochnus olivaceus, *Fr. Obs.* ii. p. 282; *Karst. Myc. Fenn.* (*Basid.*), p. 320. (Specimen from Fries in Herb. Berk. n. 3650.)—*Exs.*: Roum. Fung. Gall. Exs. 2913.

On decaying pine-trunks. Europe.

Broady effused; margin whitish, byssoid, or altogether indeterminate; hymenium pulverulent, ochraceous olive, or brownish olive when dry, sometimes cracked, and covered with minute glistening crystals of line.

Coniophora Ellisii, *Cooke.* Tenuis, papyracea, a matrice separabilis, primum pallida dein centro cinnamomea, margine tenerrimo; sporæ ellipsoideæ, fulvæ, 11–12 × 3–4 μ.—*Cooke, Grev.* viii. p. 89. Hymenochæte Ellisii, *Berk. & Cooke*; *Grev.* iv. p. 162. (Type in Herb. Kew.)—*Exs.*: *Corticium variegatum*, Roumeg., Fung. Sel. Gall. n. 4; Ellis, N. Amer. Fung. n. 328.

On pine boards. New Jersey, U.S.; Europe. Somewhat resembling *C. olivacea*, Cooke.

Coniophora pulverulenta, *Cooke.* Effusa, arida, brunneo-ferruginea, ambitu membranacea, alba; hymenio pulverulento; sporæ ellipsoideæ, flavo-brunneæ, 15 × 10 μ.—*Cooke, Grev.* viii. p. 89. Thelephora pulverulenta, *Lév. Ann. Sci. Nat.* sér. III. v. (1846), p. 149. (Specimen determined by Berkeley in Herb. Berk.)

On wood. France; England.

Coniophora puteana, *Cooke.* Late effusa, carnosa, fragilis, flavescente pallida, demum fusco-olivacea, ambitu mucedinea alba; hymenio pulverulento; sporæ fusco-olivaceæ, 14–16 × 8–9 μ. —*Cooke, Grev.* viii. p. 88. Thelephora puteana, *Schum. Saell.* p. 397; *Fl. Dan.* t. 2035; *Fr. Elench.* i. p. 194; *Berk. Outl.* p. 269. Corticium puteanum, *Stev. Brit. Fung.* p. 281; *Karst. Myc. Fenn.* p. 319; *Wint. Krypt. Fl.* p. 330; *Fr. Hym. Eur.* p. 657. (Specimen from Fries in Herb. Berk. n. 3652.)—*Exs.*;

Cooke, Fung. Brit. 509, ed. 2, n. 11; Sacc. Myc. Ven. 779, and form *cerebella* 1403; Karst. Fung. Fenn. 135; Klotzsch, Herb. Myc. 110.

On bark and wood. Europe; N. America.

Effused, rather thick, and sometimes separable as a thick leathery skin. Hymenium, when well developed, compact, almost waxy, but pulverulent, sometimes cracking and showing the fibrillose substratum.

Coniophora puteana, *Cooke*; var. cellaris, *Sacc.* Sporæ olivaceo-brunneæ, 10–12 × 7–8 μ. (*Sacc. Myc. Ven.* n. 1112.)

On bark, decayed trunks in conservatories &c. Europe.

Coniophora cinnamomea, *Massee.* Effusa, confluendo irregularis, adpressa, cinnamomea, subtus et ambitu fibrilloso-strigosa; hymenio carnoso, molli, concolore, sicco rimoso; sporæ ellipsoideæ, deorsum apiculatæ, dilutissime cinnamomeæ, 12 × 8 μ.—Thelephora cinnamomea, *Pers. Myc. Eur.* i. p. 141; *Fr. Elench.* i. p. 201. Corticium cinnamomeum, *Fr. Epicr.* p. 561; *Hym. Eur.* p. 650; *Quél. Jur. et Vosg.* p. 90; *Stev. Brit. Fung.* ii. p. 276. (From specimen determined by Berkeley in Herb. Berk. n. 3987.)—*Exs.*: The specimens in Kew copies of Lib. Pl. Crypt. Ard. fasc. 2, n. 122, and Fuckel, Fung. Rhen. 2613, under the above name, are both species of *Peniophora*.

On wood and bark of oak, hazel, birch, &c., rare. Europe.

Effused, rather thick, cracked when dry and showing a fibrillose structure. Sometimes darker in colour. Superficially resembling, as Fries says, *P. velutina*, but the spores are coloured and there are no cystidia.

Coniophora viridis, *Cooke.* Effusa, immarginata, tomentoso-mollis, viridis; hymenio granulato; sporæ subglobosæ vel ellipsoideæ, utrinque apiculatæ, atro-brunneæ, 25–30 × 17–20 μ. —*Cooke, Grev.* viii. p. 89. Thelephora viridis, *Berk. Fl. Tasm.* ii. p. 258. (Type in Herb. Berk. Kew. n. 3661.)

On dead wood. New Zealand.

Remarkable for the size and colour of the spores.

Coniophora macra, *P. Karst.* Effusa, membranacea, admodum tenuis, contigua, dense setulosa lævigata, arcte adhærens, indeterminata, fusca, siccitate hinc inde rimose partita, ambitu similaris, concolor, saltem in statu sicco; sporis late ellipsoideis, levibus, flavescentibus, 10–12 × 7–9 μ.—*Symb. Myc. Fenn.* x. p. 65.

On alder-bark. Finland.

CONIOPHORA CENTRIFUGA, *Massee.* Effusa, arida, obscure ferruginea, ambitu pallidior, subtus nigra; hymenio e centro radiato zonatoque, colliculoso, adulto dense pulverulento; sporæ ellipsoideæ, ochraceo-olivaceæ, 15 × 8 μ.—Thelephora centrifuga, *Weinm. Ross.* p. 392. Corticium centrifugum (specimen from Fries in Herb. Kew.).

On pine-wood. Europe.

CONIOPHORA UMBRINA, *Massee.* Effusa, carnoso-mollis, umbrina, subtus villosa, ambitu brevis radians, concolor; hymenio e tuberculoso collabente, ferrugineo-pulverulento; sporæ ellipsoideæ deorsum apiculatæ, dilute umbrinæ, 12–14 × 8–10 μ.—Thelephora umbrina, *Alb. & Schwein.* p. 281 β; *Fr. Elench.* p. 199; *Weinm.* p. 393. Corticium umbrinum, *Fr. Hym. Eur.* p. 658; *Stev. Brit. Fung.* p. 282. (Specimen from Fries in Herb. Berk. n. 3656.)

Effused on wood, branches, twigs, or on the ground; rather thick, crust-like, umber-coloured as well as the fibrillose radiating margin. Europe; N. America.

CONIOPHORA LUTEO-CINCTA, *Cooke.* Effusa; hymenio brunneo, pulverulento, ambitu byssino luteo; sporæ ellipsoideæ, flavo-olivaceæ, 15–18 × 6–8 μ.—*Cooke, Grev.* viii. p. 89. Thelephora luteo-cincta, *Berk. Journ. Linn. Soc.* xiii. p. 168. (Type in Herb. Berk. n. 3642.)

On the ground and on bark. Australia. "Closely allied to *P. puteana*," M. J. Berk.

CONIOPHORA FURVA, *P. Karst.* Longe lateque effusa, membranacea, tenuis, contigua, lævigata, adnata, glabra, badio-fusca, subinde in vinosum leviter vergens, madida obscurior, interdum nigrescens; sporis late ellipsoideis, levibus, flavescentibus, 9–12 × 5–6 μ.—*Symb. Myc. Fenn.* x. p. 65.

On putrid trunks of *Abies.* Finland.

CONIOPHORA LURIDA, *P. Karst.* Effusa, subceracea, membranacea, arcte adnata, tenuis, glabra, lævigata, pallide subfusco-argillacea, passim albo-lutescens, sub lente pulveracea, ambitu vix byssino; sporis sphæroideo-ellipsoideis, fuscidulis, seu flavidis diaphanisque, 9–12 × 6–9 μ.—*Symb. Myc. Fenn.* viii. p. 12.

On pine-wood. Finland. Sometimes rimoso-partite when dry.

CONIOPHORA ATRO-CINEREA, *P. Karst.* Effusa, flocсoso-membranacea, adnata, contigua, lævigata, atro-fumosa, hinc inde in olivaceum vergens, ambitu arachnoidea, canescens seu albicans, sicca cinerea, demum fusco-olivaceo pulverulenta; sporis ovoideis vel ellipsoideis, flavidis diaphanisque, 9–12 × 5–6 μ.—*Symb. Myc. Fenn.* viii. p. 12.

On pine-wood. Finland.

CONIOPHORA INCRUSTANS, *Massee*, n. sp. Effusa, tenuis, indeterminata; hymenio subtomentoso, pallido; sporæ dilutissime ochraceæ, 15–17 × 8–10 μ. (Type in Herb. Berk. along with *Thelephora byssoidea*, which it resembles in habit, but is not so thick and nodulose, and with different spores.)

Running over leaves and twigs, forming a thin film, becoming almost waxy when perfectly developed, but minutely pulverulent. (Apethorpe) England.

CONIOPHORA ARIDA, *Cooke.* Membranacea, effusa, adnata, contigua, ambitu fibrillosa, albicans; hymenio lævi, sulphureo, dein pulverulento, umbrino-ferruginascente; sporæ ellipsoideæ, deorsum apiculatæ, ochraceæ, 12 × 7 μ.—Thelephora arida, *Fr. Elench.* p. 197; *Secretan*, n. 51; *Berk. Outl.* p. 269. Corticium aridum, *Fr. Hym. Eur.* p. 659; *Stev. Brit. Fung.* ii. p. 282. Coniophora arida, *Karst. Myc. Fenn.* p. 319. (Specimen from Fries, in Herb. Berk. Kew. 3654.)—*Exs.*: Berk. Brit. Fung. n. 148.

On pine-wood. Europe.

Thin, altogether adglutinated; margin radiato-byssoid, whitish.

CONIOPHORA SORDULENTA, *Cooke & Massee.* Tenuis, membranacea, olivaceo-ochracea, tuberculata papillatave; hymenio pulverulento; hyphis dichotomi-ramosis; sporis globosis, majusculis, pallide fuscis, 10–12 μ diam.—*Grev.* xvi. p. 1. (Type in Herb. Kew.)

On bark. Missouri, U.S.

CONIOPHORA SULPHUREA, *Massee.* Effusa, fibrilloso-byssina, læte sulphurea; hymenio (perfecto) crasso, fulvo ceraceo-molli, sicco rimoso; sporæ ellipsoideæ vel subglobosæ, flavo-brunneæ, 12 ×9 μ.—Corticium sulphureum, *Fr. Epicr.* p. 561; *Hym. Eur.* p. 650; *Berk. Outl.* p. 274; *Cooke, Handb.* n. 929; *Stev. Brit. Fung.* ii. p. 276; *Karst. Myc. Fenn.* p. 313; *Wint. Krypt. Fl.* p. 336. Thelephora sulphurea, *Fr. Elench.* p. 201. (Specimen from Fries, in Herb. Berk.)—*Exs.*: Cooke, Fung. Brit. n. 607; Fuckel, Fung. Rhen. 2490. Ellis, New Jers. Fung. 3142 is not this species.

On wood, bark, leaves, &c. Europe; Tasmania.

Adnate, effused, often imperfect and spongy, passing into radiating cord-like, branching, sulphur-coloured threads. Hymenium, when perfect, rather thick, smooth, yellowish-fulvous, cracking.

CONIOPHORA SULPHUREA, *Massee*, var. OCHROIDEA. Sporæ ellipsoideæ, deorsum apiculatæ, olivaceæ, 16–18 ×9–10 μ. (Specimen determined by Berkeley in Herb. Berk. n. 3985.)—*Exs.*: Cooke, Fung. Brit. n. 411, ed. 2, n. 9.

On wood and bark. Europe.

CONIOPHORA FUSISPORA, *Cooke*. Effusa, carnosa, mollis, olivaceo-fusca, ambitu mucedinea pallida; hymenio subundulato, pulverulento; sporæ fusoideæ, fulvæ, 20–25 ×6 μ.—*Cooke in Grev.* viii. p. 89. Corticium fusisporum, *Cooke & Ellis in Grev. l. c.* (Type in Herb. Kew.)

Overrunning wood, &c. United States.

A most distinct species, with elongated fusiform spores. Very similar to *C. puteana*, Fr., separating from the matrix readily; thin and soft. (*Cooke.*)

CONIOPHORA SISTOTREMOIDES, *Massee*. Late effusa, primum byssina, olivaceo-brunnea, demum compacta, pulverulenta; sporæ ellipsoideæ, olivaceæ, 12 ×8 μ.—Thelephora sistotremoides, *Schwein. Syn. Car.* 1053; *Syn. N. Amer. Fung.* 674. (Specimen from Schweinitz, in Herb. Berk.)

On bark and wood. United States.

Effused, thin, pulverulent, indeterminate; brown with olive tinge, becoming very powdery, and crumbling away when dry and old.

CONIOPHORA LEUCOTHRIX, *Cooke*. Effusa, tenuis; hymenio (setis candidis vestito) olivaceo, hic illic brunneo tingente, demum rimoso; sporæ ellipsoideæ, deorsum acutæ, olivaceæ, 12 ×7–8 μ.—*Cooke, Grev.* viii. p. 89. Corticium leucothrix, *Berk. & Cooke, in Grev.* ii. p. 4. (Type in Herb. Berk. n. 4055.)

On pine. Carolina.

When old the plant has a tendency to peel off and break away in pieces. Berkeley says "hymenium beset with white bristles," which at the time must have been conspicuous, as suggesting the specific name; but I fail to find any trace of such at present in the type specimen. There is certainly nothing of the nature of cystidia.

Coniophora Karsteni, *Massee.* Effusa, indeterminata; hymenio fusco, pulverulento; sporæ ellipsoideæ, flavo-brunneæ, 12–15 ×6–7 μ.—Coniophora fusca, *Karst. in Ryssl. Hattsvamp.* ii.—*Exs.*: (de Thumen, Myc. Univ. n. 2112, *ex* Karsten). There is a *C. fusca* of prior date.

On prostrate trunk of *Picea vulgaris.* Finland.

Coniophora fulvo-olivacea, *Massee,* n. sp. Effusa, indeterminata, tenuis; hymenio subpulverulento, fulvo-olivaceo; sporæ dilute fusco-olivaceæ, ellipsoideæ, utrinque acutæ, sæpe leviter curvulæ, 10–12 ×5–6 μ.—Coniophora olivacea, *P. Karst. Hym. Fenn.* p. 40.—*Exs.*: (Rabenhorst, Winter Fung. Eur. 2721, *ex* Karsten).

On rotten pine-trunk. Finland.

Much thinner and with smaller spores than *C. olivacea.*

Coniophora indica, *Massee,* n. sp. Effusa, crassa, fibrillosa, determinata; hymenio brunneo, pulverulento; sporæ subglobosæ, deorsum apiculatæ, fulvæ, circa 12 ×10 μ. (Type in Herb. Berk. Kew. n. 3980 *a.*)

On wood. Bombay.

Felt-like, the margin sometimes thin and byssoid; hymenium sometimes tinged with purple.

Coniophora brunneola, *Cooke.* Effusa, inseparabilis, margine albo, byssoideo; hymenio rimoso, brunneolo; sporæ ellipsoideæ, brunneo-olivaceæ, 10–12 ×7–8 μ.—*Cooke, Grev.* viii. p. 88. Corticium brunneolum, *Berk. & Cooke, Grev.* ii. p. 4.—*Exs*: Ellis, Fung. New Jersey, U.S.A., n. 2870. (Type in Herb. Berk. Kew. 4050.)

On wood. Louisiana, United States.

CONIOPHORA AUREA, *Massee.* Effusa, membranacea, aureo-fulva, ambitu araneoso-tomentosa; hymenio pulverulento; sporæ ellipsoideæ utrinque acutæ, aureo-fulvæ, 12 × 6 μ.—Thelephora aurea, *Pers. Myc. Eur.* i. p. 142. Hypochnus aureus, *Fr. Obs.* ii. p. 281; *Syst. Myc.* iii. p. 289. Corticium (Hypochnus) aureum, *Fr. Hym. Eur.* 661. (Specimen in Herb. Berk., from Fries, n. 3894.)

On bark. Europe.

Hyphæ generally thicker than diameter of spores, thick-walled, often forming H-like branches. Basidia subclavate, tapering at the apex into a single sterigma.

CONIOPHORA SUBDEALBATA, *Massee.* Effusa, determinata; hymenio ochraceo-olivaceo, pulverulento; sporæ ellipsoideæ, deorsum apiculatæ, ochraceæ, 12 × 8 μ.—Corticium subdealbatum, *Berk. & Broome in Grevillea.* (Type in Herb. Berk. n. 3891.)

On bark. England; N. America.

Ochraceous olive, broadly effused, thin; surface pulverulent, often with paler barren patches, not cracking (except when it has separated from the matrix, and then torn).

CONIOPHORA SUBMEMBRANACEA, *Cooke.* Late effusa, secernibilis; hymenio fulvo-umbrino e sporis pulverulento; sporæ elliptico-fusoideæ, fulvæ, 10–12 × 5 μ.—*Cooke, Grev.* viii. p. 89. Thelephora submembranacea, *Berk. & Broome in Journ. Linn. Soc.* xiv. p. 64. (Type in Herb. Berk. 3635.)

On bark. Central Province, Ceylon.

CONIOPHORA BERKELEYI, *Massee*, n. sp. Effusa, crassa, determinata; hymenio brunneo demum purpurascente, rimoso, interstitiis sericeis; sporæ ellipsoideæ, deorsum apiculatæ, fulvæ, 12 × 8 μ.—(Type in Herb. Berk. n. 3982 *a*) along with *Corticium lactescens*, Berk., which it superficially resembles. The margin is sometimes minutely byssoid.

On decorticated wood. England.

CONIOPHORA DRYINA, *Massee.* Subiculo vix distincto; hymenio crassiusculo, rhabarbarino-rufo vel cinnamomeo, pulverulento; sporæ ellipsoideæ, cinnamomeæ, 10–12 × 4–5 μ.—Corticium dryinum, *Berk. & Cooke in Grev.* i. p. 179. (Type in Herb. Berk. n. 4507.)

On oak. Alabama; United States.

CONIOPHORA ATROCINEREA, *P. Karst.* Effusa, byssino-membranacea, mollis, adnata, contigua, lævis, atro-fumosa, hinc inde in olivaceum vergens, ambitu arachnoidea, canescens, sicca cinerea, demum fusco-olivaceo pulverulenta; sporæ ovoideæ, flavidæ (sub microscopio), 9–12 μ long., 5–6 μ crass.—*P. Karst. in de Thumen's Myc. Univ. exs.* n. 1806.

On worked pine. Finland.

In the Kew copy of de Thumen's Exs., a miserable fragment of wood, with a few threads and no spores, accompanied the above description. It is much to be regretted that such apologies for specimens should be considered good enough for sale.

B. MICROSPORÆ: *sporidiis minutis* (4–10 μ long.).

CONIOPHORA LICHENOIDES, *Massee*, n. sp. Effusa, ambitu sinuato-lobata; hymenio ochraceo, papillato, pulverulento, demum rimoso; sporæ dilute ochraceæ, ellipsoideæ, 10 × 7 μ.—(Type in Herb. Kew.)

On bark. Zante (*Prof. Balfour*).

Very rigid, resembling in the irregularly lobed margin some species of corticolous lichens.

CONIOPHORA COOKEI, *Massee*, n. sp. Effusa, fibrilloso-membranacea, ambitu byssina, pallida; hymenio olivaceo-ferrugineo, pulverulento; sporæ ellipticæ, ochraceæ, 10 × 6 μ.—(Corticium laxum, *Cooke, Herb. Kew.*)—*Exs.*: Fung. N. Jersey, U.S.A., n. 3425.

On rotting wood. England; United States.

Closely resembling in general appearance *Corticium laxum*, Fr., which however, as proved by a specimen from Fries to Berkeley in Herb. Berk. n. 3655, is a true *Thelephora*.

CONIOPHORA FULVA, *Massee*, n. sp. Late effusa, carnosa, ambitu tenuis, byssoidea; hymenio fulvo-brunneo, areolato-rimoso; sporæ ochraceæ, ellipsoideæ, 10 × 7 μ.—Corticium scutellare, in *Exs.*: Fung. New Jersey, U.S.A., n. 3399.

On Magnolia. Newfield, United States.

CONIOPHORA PEROXYDATA, *Massee*. Resupinata tenuis, immarginata, inæquabilis, lævis, subtiliter pulverulenta, martiana, intus cinnabarina; sporæ ellipsoideæ, brunneo-olivaceæ, 10 × 5 μ.—Corticium peroxydatum, *Berk. & Broome in Journ. Linn. Soc.* xiv. p. 70. (Type in Herb. Berk. Kew. n. 4041.)

Sunk in the wood. Ceylon; Pennsylvania.

Coniophora ochracea, *Massee*, n. sp. Latissime effusa, submembranacea, indeterminata; hymenio pulverulento, ochraceo; sporæ flavidæ, subglobosæ, 8 × 6–7 μ. (Pl. XLVII. f. 13.) (Type in Herb. Kew.)

Spreading continuously over the inside of elm-bark which had become slightly separated from the wood of a prostrate trunk. England (Kew).

In its most perfect state resembling a thin form of *C. sulphurea*, from which it is distinct in the size and form of the spores and absence of a determinate fibrillose margin. The subhymenial hyphæ are very thick and coloured, measuring up to 18 μ diam., from which the erect branches bearing the clustered basidia often arise in opposite pairs. This species is very instructive, as in many instances stout prostrate hyphæ grow beyond the compact mass and produce isolated tufts of erect basidia-bearing branches, which can be readily removed for examination; in this particular it agrees with *Corticium arachnoideum*, Berk.

Coniophora læticolor, *Massee*. Elongato-effusa, confluens, floccoso-grumosa, adglutinata, tenuis, ochracea, ambitu similaris, raro substrigosula; hymenio arido, lævi, contiguo, flocculoso-pulveraceo, concolore; sporis oblongatis, sæpe curvulis, flavescentibus, 6–7 × 2–3 μ.—Xerocarpus læticolor, *Karst. Symb. Myc. Fenn.* ix. p. 52.

On old pine-wood. Finland.

Coniophora crocea, *P. Karst.* Membranacea, arcte adnata, contigua, glabra, crocea, ambitu similaris; hymenio lævi, ochraceo, humectato et tactu subrufo, leviter setuloso-pulveraceo; sporis ellipsoideis, 7–9 × 3–4 μ, flavidis.—*Karst. Symb. Myc.* viii. p. 83.

On pine-wood. Finland.

Coniophora membranacea, *Cooke*. Subrotunda effusave, submembranacea, fragilis, ambitu fibrillosa flavida; hymenio sordide ferrugineo, pulverulento; sporæ ellipticæ, flavo-brunneæ, 10–5 × 5–6 μ.—*Cooke, Grev.* viii. p. 89. Coniophora membranacea, *DC. Pers. Myc. Eur.* i. p. 153; *Fl. Fr.* vi. p. 34. Auricularia pulverulenta, *Sow.* t. 214. (Specimen from Herb. Sow. in Herb. Berk. n. 3653.) Thelephora membranacea, *Berk. in Herb.* n. 3653. Merulius lacrymans, var. pulverulentus, *Fr. Hym. Eur.* p. 592.

Forming thin patches a foot or more in diameter on walls, wood, paper, &c., cracking and peeling off when dry. Europe; India.

CONIOPHORA MURINA, *Massee.* Late effusa, demum frustulosa, immarginata, murina; hymenio subtiliter pruinoso, ferruginascente; sporæ ellipsoideæ, ochraceo-albæ, 10×5 μ.—Corticium murinum, *Berk. & Broome in Journ. Linn. Soc.* xiv. p. 70. (Type in Herb. Berk. n. 4049.)

Ceylon. The spores are almost colourless, but of the *Coniophora* type.

CONIOPHORA STRATALIS, *Massee.* Late effusa, fibrilloso-pannosa, secernibilis; hymenio pulverulente sordide ochraceo vel brunneo; sporæ subglobosæ, olivaceo-fuscæ, circa 6×4 μ.—(Specimen in Herb. Kew. from Herb. Thumen under name of *Hypha stratalis.*)

Forming an elastic felt-like stratum. Loc.?

CONIOPHORA INSINUANS, *Massee.* Late effusa, crassa, pallida, vix separabilis, resupinatim serpens in cavitatibus internis, superficie inæquali; hymenio rugoso, nec tamen tuberculoso, pulverulento; sporæ subglobosæ, olivaceæ, 8–10 μ diam. Intus subtusque fuscescit. Omnino stratoso.—Thelephora insinuans, *Schwein. Syn. N. Amer. Fung.* 666. (Specimen from Schweinitz in Herb. Berk. Kew.)

In hollow trunks. U. States.

Forming broadly effused contorted patches, following the inequalities of the surface. A very distinct species, very compact for a *Coniophora*; readily recognized by the subglobose olive spores, and the olive or brownish substance of the plant, which is composed of very thin, coloured hyphæ. Hymenium becoming dirty ochraceous with age; distinctly pulverulent.

CONIOPHORA OLIVASCENS, *Massee.* Floccosa, subiculo albo, fibrillas hic illic emittente; hymenio pulverulento, olivaceo-luteo; sporæ ellipsoideæ, olivaceæ, 10×5 μ.—Corticium olivascens, *Berk. & Cooke, Grev.* i. p. 179. (Type in Herb. Berk. 4021.)

On bark. Boston, United States.

White mycelial strands often extend from the margin for some distance over the bark.

CONIOPHORA SUFFOCATA, *Massee.* Effusa, indeterminata; subiculo albido v. pallide fulvo, e hyphis intricatis, arachnoideis composito; hymenio fulvo-brunneo, madido glabro, subceraceo, sicco sporis maculato atque plus minus rimoso inter fissuras pallidum subiculum ostendente; sporæ ellipsoideæ, coloratæ, $10 \times 3\ \mu$.—Corticium suffocatum, *Peck*, *40th Report N. York State Mus.* p. 48.

On the under surface of fallen trunks of *Pinus* and *Abies*. U. States.

Coniophora fusca (*Pers.*), *Cooke*. Late effusa, ambitu tenuis, dilutior subtusque tomentosa; hymenio contiguo, subrugoso, nudo; sporæ ellipsoideæ, ochraceæ, 10×7–$8\ \mu$.—*Cooke*, *Grev.* viii. p. 89. Corticium fuscum, *Pers. Obs.* i. p. 38; *Fr. Hym. Eur.* p. 651; *Karst. Myc. Fenn.* p. 314; *Wint. Krypt. Fl.* p. 335. (Specimen in Herb. Kew.)—*Exs.*: Fung. New Jersey, U.S.A., no. 3425.

On bark. Europe; United States.

Closely resembling *Corticium laxum*, Fr., which, as proved by a specimen from Fries in Herb. Kew, is a true *Thelephora*.

Coniophora fumosa, *Massee*. Effusa, determinata, tenuis; hymenio pulverulento, cinereo; sporæ subglobosæ fuscæ, 5–6 μ diam. — Thelephora cærulea, *Pers.*, var. fumosa, *Myc. Eur.* p. 147. Hypochnus fumosus, *Fr.* Tomentella Menieri, *Pat. Tab. Analyt. Fung.* sér. II. p. 32, f. 580.

On wood and bark. Europe.

Coniophora conspersa, *Massee*. Late et indeterminate effusa, membranacea, ambitu byssina, pelliculaque aureis; sporarum acervulis nullis floccis obvolutis nudis, olivaceo-cinereis. —Hypochnus conspersus, *Linn.* v. p. 529; *Epicr.* p. 570.

On bark. Brazil.

Coniophora mustialaënsis, *Massee*. Late effusa, ambitu byssina, albicans. Hymenium tenuissimum, submembranaceum, sporis et floccis laxe intertextis compositum, primo flavidum, dein cærulescens, zona flavida cingente, papillis vel granulis rotundatis, inæqualibus, congestis; sporæ sphæroideæ vel sphæroideo-ellipsoideæ, dilutissime flavidæ vel fuscidulæ, diam. 4 μ.—Hypochnus mustialaënsis, *Karst. Not. Sällsk. pro Faun. et Flor. Förh.* xi. 1871, p. 222. Corticium mustialaënse, *Karst. Myc. Fenn.* (*Basid.*) p. 320; *Fr. Hym. Eur.* p. 705.

On rotten birch. Finland.

Hymenium at length becoming greenish or subolivaceous.

Coniophora conspersa, *Fr.* Late et indeterminate effusa, membranacea, ambitu byssina, pelliculaque aureis; sporarum acervulis nullis floccis obvolutis nudis, olivaceo-cinereis.—Hypochnus conspersa, *Fr. in Linnæa*, v. p. 529; *Epicr.* p. 570.

On bark. Brazil.

Coniophora Broomeiana, *Massee.* Maculiformis, mox confluendo effusa, ambitu fibrilloso-radiata; hymenio subtiliter pulverulento, pallido cinerascente; sporæ cylindrico-ellipsoideæ, dilute olivaceæ, 10×3 μ.—Thelephora Broomeiana, *Berk. in Herb.* (Type in Herb. Berk. n. 3663.)

On bark. Ceylon.

Closely adnate in small patches which soon become confluent.

Peniophora, *Cooke.*

Resupinato-effusa; hymenio setuloso, setulis hyalinis, verruculosis, fusiformibus; sporæ albæ, hyalinæ. (Pl. XLVII. ff. 14–19.)

Established by Cooke (Grevillea, viii. p. 20) for the reception of a number of species previously included in *Corticium*, and characterized by the presence of large spindle-shaped, colourless cystidia (*metuloids* of Cooke) projecting above the surface of the hymenium, and generally rough with amorphous masses of oxalate of lime. The relative number and size of the cystidia vary much in some species, so that while constituting a good generic character, their specific value is but slight; the measurements given refer to the length above the level of the hymenium and width at widest part.

A. *Margine libero, plus minus reflexo.*

Peniophora papyrina, *Cooke.* Tenuissima, coriaceo-papyracea, pileo latissimo effuso reflexo, strigoso-hirsuto, cinereo concentrice sulcato, margine acuto, fulvo; hymenio umbrino-purpurascente, setulis pubescenti-velutino; cystidia fusoidea, circa 80×12 μ; sporæ subglobosæ. 6 μ.—*Cooke, Grev.* viii. p. 20, pl. 124. f. 9. Stereum papyrinum, *Mont. Syll.* p. 178.—*Exs.*: Fungi Cubenses Wrightiani, no. 400. (Specimen from Montagne in Hb. Berk. 3830.)

Cuba, Ceylon, N. America, Pegu, Bahia, S. Africa, Australia, Brazil.

Resembling in habit *Stereum spadiceum.*

PENIOPHORA QUERCINA, *Cooke.* Cartilagineo-membranacea, primo adglutinata, dein centro adfixa, undique soluta et demum involuta, rigida, subtus glabra nigrescens; hymenio carneo; cystidia fusoidea, 50–70 × 15–20 μ; sporæ oblongo-ellipsoideæ, curvulæ, 13–15 × 5 μ.—*Cooke, Grev.* viii. p. 20, pl. 125. f. 13. Corticium quercinum, *Fr. Epicr.* p. 563; *Hym. Eur.* p. 653; *Cooke, Handb.* no. 936; *Stev. Brit. Fung.* ii. p. 278; *Berk. Outl.* p. 275; *Wint. Krypt. Fl.* p. 373; *Grev. Scot. Crypt. Fl.* t. 142. Thelephora quercina, *Pers. Syn.* p. 573; *Fr. Syst. Myc.* i. p. 442; *Elench.* p. 186; *Nees, Syst.* f. 253; *Berk. Eng. Fl.* v. p. 167. Auricularia corticalis, *Bull.* t. 436. f. 1. (Specimen in Herb. Berk. 3993.)—*Exs.*: Thumen, Fung. Aust. 325 and 326; Cooke, Fung. Brit. 2nd ed. n. 8.; Sacc. Myc. Ven. 402; Moug. & Nest. 679; Desm. Cr. Fr. 465; Cooke, Fung. Brit. 222; Lib. Pl. Cr. Ard. fasc. 3, 224; Roum. Fung. Sel. Gal. 103; Klotzsch, Herb. Myc. 214; Roum. Fung. Gall. 2908; Fckl. Fung. Rhen. 1311; Hark. Fung. N. Amer. 1338; Ellis, Fung. N. Jersey, 3489; Rabh. Fung. Eur. 1211.

On oak-branches. Europe; United States.

PENIOPHORA PEZIZOIDES, *Massee,* n. sp. Subcoriacea, e cupulari explanata, centro adfixa, extus pallido-villosa; hymenio ochraceo, velutino, contiguo; cystidia fusoidea, sub apice rotundato-coarctata, basi acuta, 50–60 × 20 μ; sporæ globosæ, 4–5 μ. (Pl. XLVII. ff. 17–19.) (Type in Herb. Kew.)

On branches of horse-chestnut. England (Kew).

Resembling a *Peziza* in habit; sometimes bursting through the bark; from $\frac{1}{4}$–$\frac{1}{2}$ inch across. Allied to *P. quercina.*

PENIOPHORA MORICOLA, *Massee.* Pileo reflexo, postice decurrente pubescente albido; hymenio velutino, fusco; cystidia conico-acuminata, 50–60 × 12–16 μ; sporæ oblongo-pyriformæ, 8 × 5 μ. —Stereum moricola, *Berk. Grev.* i. p. 162. (Type in Herb. Berk. n. 3825.)

On mulberry. Lower Carolina.

Forming semiorbicular patches $\frac{1}{2}$–1 inch across, at first adpressed, but becoming broadly reflexed on one side; hymenium minutely velvety, becoming smooth.

PENIOPHORA ATROCINEREA, *Massee.* Effusa, margine libera, subtus et ambitu fibrillosa; hymenio cinereo, leviter velutino; cystidia elongato-fusoidea, 80–120 × 10–15 μ; sporæ ellipsoideæ,

10×4–$5\ \mu$.—Corticium atrocinereum, *Kalchbr. MS.* (Type in Herb. Kew.)

On bark. Cape of Good Hope.

Peniophora Habgallæ, *Cooke.* Suborbicularis, ceracea, ochroleuca, margine tenui, tomentosa, uno latere elevato; hymenio subtiliter setuloso; cystidia fusoidea, 60–$70 \times 12\ \mu$; sporæ subglobosæ, 5–$6\ \mu$.—*Cooke, Grev.* viii. p. 20, pl. 124. f. 10. Corticium Habgallæ, *Berk. & Broome, in Journ. Linn. Soc.* xiv. p. 72. (Type in Herb. Berk. 3970.)

On dead bark. Habgalla, Ceylon.

Forming more or less elliptical patches about 1 in. long by ½ in. wide, and in every instance with a tendency to become reflexed on one side, thus forming a transition from the truly resupinate to the reflexed species.

Peniophora gigantea, *Massee.* Latissime effusa, madida tumens, ceracea, hyalino-alba, siccitate cartilaginea, papyracea, libera, lactea, ambitu strigoso-radiata; hymenio lævi, contiguo, velutino; cystidia fusoidea, 50–60×20–$30\ \mu$; sporæ ellipsoideæ, 10×5–$6\ \mu$.—Thelephora pergamenea, *Pers. Myc. Eur.* i. n. 99, 100. T. gigantea, *Fr. Obs.* i. p. 152; *Pers. Myc. Eur.* i. p. 150; *Berk. Engl. Fl.* v. p. 170. Corticium giganteum, *Fr. Epicr.* p. 559; *Berk. Outl.* p. 272; *Fr. Elench.* p. 213; *Kickx,* p. 204; *Karst. Myc. Fenn.* p. 311; *Stev. Brit. Fung.* p. 274; *Cooke, Handb.* n. 922; *Winter, Krypt. Fl.* p. 337.—*Exs.*: Thum. Myc. Univ. 909; Moug. & Nest. Stirp. Crypt. 778; Desm. Cr. Fr. Ser. i. 417; Sydow, Myc. March. 501; Roumeg. Fung. Sel. Gal. 205; Rav. Fung. Amer. 452; Karst. Fung. Fenn. 250; Ellis, N. Amer. Fung. 410. (Specimen from Fries in Herb. Berk. 3995.)

Broadly effused, when dry thin and cartilaginous, margin attached or slightly free, and then strigose; hymenium often tinted pale brown or vinous, generally continuous when growing on a smooth surface, sometimes cracked, very rugged when growing over moss or pine-leaves. Cystidia falling away in old specimens.

On firwood, bark, and leaves. Europe; United States; Ceylon.

Peniophora subgigantea, *Massee.* Effusa, rigida, cremicolor, marginem versus subfusca; hymenio e velutino glabro.—*Rav.* no. 1699.—Corticium subgiganteum, *Berk. in Grev.* ii. p. 3.

On *Magnolia glauca*. Sent as a form of *C. giganteum*; but the texture is different. Widely effused; at first cream-coloured, rigid, then acquiring a brownish tint, especially towards the margin; velvety in the younger parts, smooth in the older. (*Berk.*)

I have not been able to find a specimen in Herb. Berk. corresponding to the above name or description, hence can add no further information. This species is evidently a *Peniophora* closely allied to *P. gigantea*.

Peniophora tephra, *Cooke*. Effusa, margine pallide rufa, crenata, libera, tomentosa; hymenio hic illic papillato, gilvo-cinereo, demum rimoso; cystidia fusoidea, $35 \times 15–18\ \mu$; sporæ ellipsoideæ, $12–14 \times 5\ \mu$.—*Cooke, Grev.* viii. p. 20, pl. 123. f. 6. Corticium tephrum, *Berk. & Curt. in Journ. Linn. Soc.* x. p. 336. (Type in Herb. Berk. 4046.)

Resembling some forms of *P. cinerea* in habit. Sometimes the extreme margin is free, in others adnate, and destitute of the rufous tint.

Cuba; Australia.

Peniophora intermedia, *Massee*. Late effusa, mollis, margine breviter reflexo, villosa; hymenio velutino, obscure ferrugineo, contiguo; cystidia cylindraceo-fusoidea, $60 \times 15\ \mu$; sporæ ellipsoideæ, $12 \times 5\ \mu$.—(Stereum papyrinum, *Mont. Rav. Fung. Amer.* 118.)

On oak-branches. Florida.

In addition to cystidia, there are present on the hymenium long tapering coloured hairs, as in the genus *Hymenochæte*, to which this species forms a transition.

Peniophora dissita, *Mass.* Parva pallida, primum orbicularis, margine elevato, tomentoso; hymenio velutino ex albo ochraceo subfuscescente; cystidia conico-acuminato, $40–65 \times 15–20\ \mu$; sporæ ellipsoideæ, $10 \times 5\ \mu$.—Stereum dissitum, *Berk. Grev.* i. p. 164. (Type in Herb. Berk. n. 3842.)

On wood. Texas.

"Forming little orbicular, pallid patches, with an elevated tomentose margin; then at length becoming laterally confluent, with the margin free, but more depressed; hymenium pulverulent, varying from white or ochraceous to a pale-brown tint." (*Berk.*)

Small, thin, adnate, with free upraised strigose margin; hymenium velvety or setulose, pallid.

Peniophora Ellisii, *Massee.* Effusa, tenuis, rigida, margine breviter reflexa, strigosa; hymenio ferrugineo lividove, velutino, siccitate rimoso; cystidia fusoidea, 30–35 × 20 μ; sporæ oblongo-ellipsoideæ, 10 × 5μ.—Peniophora papyrina, *Mont.* (*Exs.*: Fung. New Jersey, U.S.A., no. 3460).

On dead branches. Newfield, N. America.

Peniophora albo-marginata, *Massee.* Latissime confluenti-effusa, rarius breviter reflexa, umbrina, centro velutina, margine albo-tomentosa; cystidia fusoidea, 40–60 × 15–25 μ; sporæ ellipsoideæ, 10 × 5 μ.—Thelephora albo-marginata, *Schwein. ex Berk. in Hook. Lond. Journ.* 1847, p. 324.—*Exs.*: Fung. Cubenses Wrightiani, no. 381. (Type in Herb. Berk. Kew. 3641.)

On bark and wood. N. America; Cuba; New South Wales.

Commencing as minute detached circular patches, which soon become confluent and form irregular broadly effused patches. The margin in some instances is free, but rarely raised. Has a superficial resemblance to thin resupinate forms of *P. papyrina* (M.), Cooke.

Peniophora lilacina, *Cooke.* Effusa, margine albo-tomentoso; hymenio e lilacino-pallescens, demum rimoso; cystidia fusoidea, 60–80 × 12–15 μ; sporæ oblongo-ellipsoideæ, 12 × 5 μ.—*Cooke, Grev.* viii. p. 20, pl. 123. f. 5. Corticium lilacinum, *Berk. & Broome, in Journ. Linn. Soc.* xiv. p. 70. (Type in Herb. Berk. 4035.)

On charred wood. Central Province, Ceylon.

Thick, cracked, flesh-colour or lilac, becoming pallid, minutely velvety. Margin sometimes recurved, and then closely resembling *P. quercina.*

Peniophora Berkeleyi, *Cooke.* Effusa, carnosa, margine crenato vix libero; hymenio pallido hic illic papillato, velutino; cystidia fusoidea, 50 × 20 μ; sporæ 10 × 5 μ.—*Cooke, Grev.* viii. p. 20, pl. 122. f. 4. Corticium aschistum, *Berk. & Curt.* in part. (Type in Herb. Kew.)

On bark. United States; Nicaragua.

Superficially resembling *P. aschista*, differing in the thicker substance and smaller cystidia and spores.

PENIOPHORA SCHWEINITZII, *Massee.* Pileata et resupinato-effusa, coriacea; pileis dimidiatis, confluentibus, strigoso-zonatis, unicoloribus, cinereo-albidis, uncialibus, limbo tenuiore minus strigoso; hymenio setuloso, e cinereo subfuliginoso-purpurascente, siccitate præsertim, ubi resupinatum effusum est, rimoso; cystidia conico-acuminata, asperula, 70 × 150 × 14–20 μ; sporæ ellipsoideæ, 7–8 × 4–5 μ.—Thelephora cinerascens, *Schwein. Syn. N. Amer. Fung.* n. 651. Hymenochæte cinerascens, *Lév. Ann. Sci. Nat.* sér. 3, v. p. 152. (Specimen from Schweinitz in Herb. Berk. Kew. n. 3810.)

On wood. United States.

Brodly effused. Very rigid when dry, thickish margin free and more or less upturned, densely strigose; hymenium coarsely and irregularly tuberculose, bristling with white cystidia; ashy, with slight tinge of purple when dry, much cracked, showing pale fibrous subiculum.

PENIOPHORA CRUSTOSA, *Cooke.* Effusa, crassa, dura, perennis; hymenio irregulari-lobato, pallido, lævi, velutino; margine subelevato; cystidia obclavata, 50–60 × 10–15 μ; sporæ ellipsoideæ, 10 × 3–4 μ.—*Grev.* viii. p. 56. (Type in Herb. Kew.)

On bark. New Zealand (Waitaki).

Resembling in appearance *Stereum annuum*, Berk. & Broome, but with the characteristic bodies on the hymenium.

PENIOPHORA VINOSA, *Massee.* Late effusa, vinosa, ambitu pallidior; hymenio rimoso, interstitiis sericeis; cystidia fusoidea, 60–80 × 15–20 μ; sporæ ellipsoideæ, 10 × 5 μ.—Thelephora vinosa, *Berk. in Hook. Lond. Journ. Bot.* iv. p. 60 (1845.) (Type in Herb. Berk. n. 4043.) Hymenochæte (Veluticeps) vinosa, *Cooke, Grev.* viii. p. 149.

On wood and bark. Australia.

Commencing as isolated round patches, which become confluent and form irregularly lobed widely extending patches. The hymenium varies from vinous to dark brown, the margin paler and brighter, sometimes radiato-fibrillose, and the extreme edge free.

B. *Margine adpresso, sæpe indeterminato.*

PENIOPHORA LIMITATA, *Cooke.* Subrotunda, arcte adnata grumoso-indurata, glabra, lurida, expallens, ambitu nigro-limitata; hymenio subtilissime velutino; cystidia fusoidea, 30–40 × 15–20 μ; sporæ oblongo-ellipsoideæ, leviter curvulæ, deorsum apiculatæ, 20–22 × 6 μ.—Thelephora limitata, *Mont. in Ann. Sci. Nat.* sér. II. v. (1836), p. 338; *Fr. Elench.* p. 222. T. Montagnei, *Balb. Fl. Lyon.* Corticium limitatum, *Fr. Epicr.* p. 565; *Hym. Eur.* p. 656; *Stev. Brit. Fung.* ii. p. 280. (Specimen determined by Berkeley in Herb. Berk. n. 4010.)

On bark and wood. Europe; United States.

Peniophora carbonicola, *Massee.* Effusa, adglutinata, membranacea, ambitu albo-fibrillosa; hymenio brunneo, nigricante; cystidia fusoidea sursum acuminata, circa 25 × 8 μ; sporæ ellipsoideæ, arcuatæ, 5–6 × 2 μ.—Corticium carbonicolum, *Pat. Revue Myc.* 1885, p. 152; *Tab. Analyt. Fung. Patouillard,* fasc. 5, p. 203, f. 461.

On charred wood. France.

The colour is described as reddish brown, which is not shown in the figure. Elongated, with sinuous margin.

Peniophora rosea, *Massee.* Effusa, adnata, rosea, ambitu fimbriata, albicans; hymenio subtiliter velutino, expallente, demum rimoso-corrugato; cystidia fusoidea, 40–60 × 20–30 μ; sporæ oblongo-ellipsoideæ, curvulæ, 13–15 × 4–5 μ.—Thelephora rosea, *Pers. Syn.* p. 375; *Fr. Syst. Myc.* i. 451; *Elench.* i. p. 203; *Berk. Eng. Fl.* v. p. 168. Corticium roseum, *Pers. Disp.* p. 31; *Fries, Epicr.* p. 560; *Hym. Eur.* p. 650; *Berk. Outl.* p. 273; *Cooke, Handb.* n. 926; *Stev. Brit. Fung.* ii. p. 275; *Karst. Myc. Fenn.* p. 313; *Wint. Krypt. Fl.* p. 336. (Specimen in Herb. Berk. n. 3978.)—*Exs.*: Karst. Fung. Fenn. 314; Thum. Myc. Univ. 2012. ("*C. roseum.* Forma: Betulæ (Lignicola), Karst. Fung. Fenn. 315," = *P. velutina.*) Roum. Fung. Gall. 2508; Sacc. Myc. Ven. 800, in the Kew copy gives under this name a fragment without margin, thick, and cracked, no cystidia, and says "sp. 6–7 × 3," whereas the spores on the specimen are 10 × 6.

On wood and bark. Europe; United States; Canada; Venezuela; Tasmania.

Clear rose-pink, with white byssoid margin when fresh, pallid or pale ochraceous, with pink tinge, and margin darker when dry, rather fleshy and broadly effused, adnate, sometimes in small scattered patches. Hymenium minutely velvety.

PENIOPHORA INCARNATA, *Massee.* Subceracea, adglutinata, indeterminata, ambitu radians; hymenio persistenter læte colorato (rubro, aurantio), setulis brevibus velutino; cystidia fusoidea, 25–30 × 15–20 μ; sporæ oblongo-ellipsoideæ, curvulæ, deorsum apiculatæ, 20 × 5–6 μ.—Thelephora incarnata, *Fr. Elench.* p. 219; *Pers. Myc. Eur.* nos. 43, 46, &c.; *Fl. Dan.* t. 2035. f. 2; *Berk. Engl. Fl.* v. p. 171. Corticium incarnatum, *Fr. Epicr.* p. 564; *Hym. Eur.* p. 654; *Wint. Krypt. Fl.* p. 333; *Cooke, Handb.* no. 938; *Stev. Brit. Fung.* ii. p. 227; *Karst. Myc. Fenn.* (*Basid.*), 316; *Gillet, Hym. Fr.* p. 753, and fig. (Specimen in Herb. Berk. no. 3995.)—*Exs.*: Roum. Fung. Gal. 753 & 140; Fckl. Fung. Rhen. 605 & 606; Sacc. Myc. Ven. 493 & 1110; Karst. Fung. Fenn. 815; Thum. Fung. Austr. 1209; Ellis, N. Amer. Fung. 20; Cooke, Fung. Brit. ed. ii. 7; Rav. Fung. Amer. 140; Thum. Myc. Univ. 112.

Often broadly effused, thin, adnate, margin minutely byssoid; hymenium usually not much cracked unless growing on bark; when perfect minutely setulose, due to presence of cystidia, which are much exserted and soon fall away, leaving the hymenium glabrous.

On wood and bark. Europe; N. America; Australia.

PENIOPHORA LILACINA, *Massee.* Effusa, tenuissima, confluens, ambitu alba, subradians; hymenio subtiliter velutino, lilacino; cystidia 20–30 × 5–6 μ; sporæ ellipsoideæ, 8 × 4 μ.—Thelephora lilacina, *Schwein. Syn. N. Amer. Fung.* 680. (Specimen from Schweinitz in Herb. Berk.)

On bark. United States.

Resembling a thin wash of body-colour; margin whitish, byssoid, following the inequalities of the matrix; several small patches often becoming confluent. Much thinner, and with smaller and fewer cystidia than *P. cinerea*, the thinner forms of which it somewhat resembles.

PENIOPHORA SIMILIS, *Massee.* Latissime effusa, coriacea, margine tenui; hymenio sulphureo vel ochraceo, rimoso, subtiliter velutino; cystidea fusoidea, 60 × 30 μ; sporæ oblongo-ellipsoideæ, inæquilaterales, 8–10 × 4 μ.—Corticium simile, *Berk. & Curt. in Journ. Linn. Soc.* x. p. 337. (Type in Herb. Berk. Kew. 4063.)

On bark. Cuba.

"Spreading for several inches. Resembling somewhat resupinate states of *C. læve.* The yellow mycelium is so incorporated with the bark that we hesitate somewhat about its real nature." (*B. & C.*)

PENIOPHORA CINEREA, *Cooke.* E ceraceo rigescens, confluens, cinerea vel lurida, ambitu similaris; hymenio subtiliter velutino; cystidia fusoidea, 30–50×20–25 μ; sporæ globosæ, 5–7 μ.—*Cooke, Grevillea*, viii. p. 20, pl. 123. f. 8. Thelephora cinerea, *Pers. Syn.* p. 579; *Fr. S. M.* i. p. 435; *Elench.* i. p. 221; *Berk. Eng. Fl.* v. p. 172. Thel. Tiliæ, *Pers. Myc. Eur.* i. p. 147; *Grev. Fl. Edinb.* p. 410. Thel. fraxinea, *Pers. Myc. Eur.* i. p. 145; *Grev. Fl. Edinb.* p. 410. Corticium cinereum, *Fr. Epicr.* i. p. 563; *Hym. Eur.* p. 654; *Berk. Outl.* p. 275; *Wint. Kr. Fl.* p. 333; *Karst. Myc. Fenn.* p. 316; *Cooke, Handb.* n. 937; *Stev. Brit. Fung.* ii. p. 279. (From specimen in Herb. Berk. n. 3994.) Corticium rimosissimum, *Pass. et Belt.*—*Exs.*: Crypt. Lusitan. 43; Desm. Cr. Fr. sér. 1, 666; Berk. Brit. Fung. 63–64; Thm. Myc. Univ. 1206, 3011; Sacc. Myc. Ven. 404, 405, 406; Ellis, N. Amer. 610; Fuckel, Fung. Rhen. 1313; Karst. Fung. Fenn. 134; Roum. Fung. Sel. Gall. 105; Rab. Fung. Eur. 20.

Europe. United States.

Often commencing as minute round patches of a brown or ashy colour, which soon become confluent. Sometimes paler, and of a greyish lilac when dry On wood or bark.

PENIOPHORA BAMBUSICOLA, *Massee.* Subrotunda, gilva, scabrida, tenuis, margine subfimbriato concolore; sporis globosis, brunneis, lævis, 11 μ.—Corticium bambusicola, *Berk. & Broome in Trans. Linn. Soc.* ser. 2, *Bot.* vol. xi. p. 64.

On rotting bamboos. Brisbane.

Forms roundish patches of a dull ochraceous or gilvous colour, cracked in drying, and slightly fimbriate at the margin; the substance is composed of loose branched threads closely adhering to the matrix; the surface is rough under the lens, with conical cystidea and brown spherical spores, 0·0004 to 0·00045 inch in diameter (= about 11 μ). It would come under the subgenus *Peniophora* of Cooke. The attachment of the spores has not been seen. (*Berk. & Broome.*)

This anomalous species is intermediate between *Coniophora* and *Peniophora*, agreeing with the former in the large coloured spores, and with the latter in having the hymenium studded with cystidia.

PENIOPHORA LÆVIGATA, *Massee.* Effusa, tenuis, indeterminata, e ferrugineo-cinnamomea; hymenio velutino, sicco rimoso; cystidia sparsa, fusoidea, 50–60 × 15–20 μ; sporæ ellipsoideæ, 12 × 5 μ.—Corticium lævigatum, *Fr. Epicr.* p. 565; *Hym. Eur.* p. 656; *Karst. Myc. Fenn.* p. 318; *Wint. Krypt. Fl.* p. 331. Thelephora lævigata, *Fr. Elench.* p. 224. (Specimen in Herb. Berk. 4052.)

On dead branches of juniper. Europe.

PENIOPHORA INCONSPICUA, *Massee.* Resupinata, effusa, margine crenato-tomentoso; hymenio pallido, setuloso; sporæ oblongo-ellipsoideæ, 10 × 4 μ; cystidia fusoidea, 80–100 × 30–40 μ. (Pl. XLVII. f. 14.)—Corticium inconspicuum, *Berk. & Curt. Journ. Linn. Soc.* x. p. 336. (Type in Herb. Berk. 4069.)

On sticks, Cuba. White when fresh.

Not more than a few lines across, of irregular form, becoming confluent. Remarkable for the very large cystidia, "resembling in some of its characters *C. saccharinum*, but the substance is quite different." (*M. J. Berkeley.*)

PENIOPHORA TENUIS, *Massee.* Effusa, tenuis, indeterminata, alba; hymenio pruina albo-cinerea consperso; cystidia fusoidea, 50–60 × 10–12 μ; sporæ ellipsoideæ, deorsum apiculatæ, 8 × 4–5 μ. —Corticium tenue, *Pat. Rev. Myc.* 1885, p. 152; *Tab. Analyt. Fung. Patouillard*, fasc. v. p. 203, fig. 462.

On wood. France.

PENIOPHORA PUBERA, *Massee.* Late effusa, arcte adnata, indeterminata, alba vel argillacea; hymenio lævi, setulis brevibus velutino, siccitate rimoso; cystidia cylindraceo-fusoidea, 80–120 × 15–20 μ; sporæ oblongo-ellipsoideæ, 10–12 × 4 μ.—Thelephora pubera, *Fr. Elench.* ii. p. 215. Corticium puberum, *Fr. Epicr.* p. 362; *Stev. Brit. Fung.* ii. p. 277; *Wint. Krypt. Fl.* p. 335. (Specimen determined by Berkeley, Herb. Berk. 3980.)

Cystidia very variable in size, some hair-like, but aseptate and colourless. Broadly and irregularly effused over wood or bark. The specimen in the Kew set of "Fung. New Jersey, U.S.A., 3144," under the above name is not a *Peniophora*, and differs from Fries's diagnosis in having the hymenium glabrous, and is possibly an imperfect state of *Corticium calceum.*

Europe.

PENIOPHORA OCHRACEA, *Massee.* Late effusa, ambitu alba, subradians, mox evanida; hymenio e pallido ochraceo, atomis aureo-micantibus conspersis, demum nudo, siccitate rimoso; cystidia fusoidea, 40–50 × 20 μ; sporæ ellipsoideæ, 10 × 5 μ.—Corticium ochraceum, *Fr. Hym. Eur.* p. 652; *Fr. Epicr.* p. 563; *Berk. Outl.* p. 275; *Cooke, Handb.* no. 635; *Karst. Myc. Fenn.* ii. p. 316; *Stev. Brit. Fung.* ii. p. 278; *Wint. Krypt. Fl.* p. 374. Thelephora ochracea, *Fr. Syst. Myc.* i. p. 446; *Fr. Elench.* p. 216; *Berk. Eng. Fl.* v. p. 170; *Pers. Myc. Eur.* i. no. 38; *Weinm. Ross.* p. 396.—*Exs.*: Rav. Fung. Amer. 454; Roum. Fung. Gall. 1408; Rav. Fung. N. Amer. 2863. (Specimen in Herb. Berk. from Fries.)

On bark, wood, &c. Europe; N. America; Cuba.

PENIOPHORA ASCHISTA, *Cooke.* Tenuis, rigida, secernibilis; hymenio pallide cinnamomeo, velutino; cystidia fusoidea, 60–70 × 20 μ; sporæ ellipsoideæ, 10–12 × 6 μ.—*Cooke, Grev.* viii. p. 20, pl. 122. f. 3. Corticium aschistum, *Berk. & Curt. in Grevillea,* ii. p. 3. (Type in Herb. Berk. 4001.)

On the underside of a trunk of *Acer rubrum*, lying on damp soil. Carolina.

PENIOPHORA RAVENELII, *Cooke.* Effusa, carnosa, margine irregulariter lobato; hymenio pallido; cystidia obclavata, 50–60 × 12 μ; sporæ ellipsoideæ, 8 × 5 μ.—*Cooke, Grev.* viii. p. 21, pl. 124. f. 12. (Corticium Auberianum, *Mont. in Rav. Exs.* no. 1369.)

United States. The plant of Montagne is a true *Corticium.*

PENIOPHORA PHYLLOPHILA, *Massee,* n. sp. Late effusa, membranacea, ambitu laxe fibrillosa; hymenio pallido, contiguo; cystidia fusoidea vel cylindraceo-clavata, 60–80 × 20–30 μ; sporæ ellipsoideæ, 12 × 6 μ.—(Corticium epiphyllum, *Pers.*; *Rav. Fung. Amer. Exs.* no. 457.)

On dead leaves. United States.

Superficially resembling *Corticium epiphyllum,* Pers., but a true *Peniophora.* The hyphæ are much branched and very thin, rarely exceeding 3 μ in diam. The close external agreement between the present species and *C. epiphyllum* may possibly have led to some confusion in Ravenel's Exs., which may in some sets contain the true plant of Persoon.

PENIOPHORA AYRESII, *Cooke*. Late effusa, subcarnosa, ambitu laxe fibrillosa; hymenio pallido, velutino; cystidia fusoidea, 100–140 × 40–50 μ; sporæ ellipsoideæ, 10 × 5 μ.—*Cooke, Grev.* viii. p. 22, pl. 122. f. 1. Corticium Ayresii, *Berk. in Herb.*

On bark. Mauritius.

PENIOPHORA FLAVIDO-ALBA, *Cooke*. Effusa, indeterminata, tenuis, flavescenti-pallida; hymenio velutino, sicco rimoso; cystidia cylindraceo-fusoidea, 80–100 × 12–16 μ; sporæ ellipsoideæ, 10–12 × 6 μ.—*Cooke, Grev.* viii. p. 21, pl. 125. f. 14; *Rav. Fung. Exs.* nos. 2529 & 719; *Ellis, N. Amer. Fung. Exs.* no. 1209. (Type in Herb. Cooke, Kew.)

On *Myrica cerifera*, &c. United States.

Thin, pale sulphur-yellow or pallid, often transversely cracked when dry.

PENIOPHORA SPARSA, *Cooke*. Candida, suborbicularis, sparsa, immarginata; hymenio setuloso; cystidia fusoidea, 40–50 × 8 μ; sporæ oblongo-ellipsoideæ, 10 × 5 μ.—*Cooke, Grev.* viii. p. 21, pl. 125. f. 16. Corticium sparsum, *Berk. & Broome in Journ. Linn. Soc.* xiv. p. 72. (Type in Herb. Berk. 4014.)

Forming minute white scattered patches. On bark. Ceylon.

Mixed with the typical cystidia are smooth pointed hair-like processes, similar to those met with in *Hymenochæte*, but colourless.

PENIOPHORA CARNEA, *Cooke*. Late effusa, indeterminata, ochraceo-carnea, ambitu albo-fibrillosa; hymenio rimoso; cystidia fusoidea, 30–40 × 15–20 μ; sporæ ellipsoideæ, 6 × 4 μ.—*Cooke, Grev.* viii. p. 21, pl. 124. f. 11. Corticium carneum, *Berk. & Cooke, Grev.* vii. p. 1. (Type in Herb. Kew.)

On *Pinus contorta*. California; Texas; Australia.

Allied to *P. velutina*.

PENIOPHORA EPHEBIA, *Massee*. Subiculo tomentoso pallido, margine secernibili, velutino; hymenio ex ochroleuco rufulo, setuloso; cystidia sparsa, fusoidea, circa 50 × 20 μ; sporæ oblongo-ellipsoideæ, 10 × 5 μ.—Corticium ephebium, *Berk. & Cooke, Grev.* i. p. 178. (Type in Herb. Berk. 4037.)

On wood. Alabama.

Long, narrow, smooth, colourless hairs are sometimes met with, mixed with the cystidia. Allied to *P. velutina*.

PENIOPHORA GIGASPORA, *Massee*, n. sp. Latissime effusa, ambitu fimbriata albicans; hymenio pallido, velutino, sicco indurato, contiguo; cystidia fusoidea, 80–120 $\times$ 30–40 μ; sporæ oblongo-ellipsoideæ, 18–20 $\times$ 10 μ.

N. Providence, Bahamas.

On decorticated wood, forming thin, continuous, broadly effused patches, somewhat resembling *P. velutina*, but differing in cystidia and spores.

PENIOPHORA SCOTICA, *Massee*, n. sp. Late effusa, margine fibrilloso-radiata; hymenio cinnamomeo, velutino; cystidia subcylindrica, 80–120 $\times$ 15–20 μ; sporæ ellipsoideæ, 8–10 $\times$ 6–7 μ. (Type in Herb. Berk. Kew. 3995 *a*.)

Broadly effused over the inside of bark. Scotland.

Closely related to *P. velutina*, from which it differs in colour, size of cystidia, and absence of thread-like radiating mycelium. The plant is often barren and then loosely fibrillose, but the hymenium, when perfect, is almost waxy and hoary with the numerous cystidia.

PENIOPHORA VIOLACEO-LIVIDA, *Massee*. Effusa, adnata, indurata; hymenio albo-pruinoso; basidia clavata, 4-sterigmatica; cystidia fusoidea; sporæ cylindraceo-ellipsoideæ, curvulæ, circa 5 $\times$ 3 μ.—Corticium violaceo-lividum, *Fr.*, *Patouillard*, *Tabulæ Analyticæ Fungorum*, fasc. i. p. 16, fig. 24.

On dead stem of *Clematis Vitalba*. Lower Pyrenees.

Certainly not *Corticium violaceum-lividum*, Fr., but a true *Peniophora*.

PENIOPHORA VELUTINA, *Cooke*. Late effusa, adnata, carnea, ambitu fibris rectis, divergentibus, concoloribus strigosa; hymenio lævi, setulis densis velutino; cystidia cylindraceo-fusoidea, 60–80 $\times$ 10–15 μ; sporæ ellipsoideæ, deorsum apiculatæ, 10 $\times$ 5 μ. —*Cooke, Grev.* viii. p. 21, pl. 125. f. 15. Corticium velutinum, *Fr. Epicr.* p. 561; *Hym. Eur.* p. 650; *Berk. Outl.* p. 273; *Wint. Krypt. Fl.* p. 336; *Cooke, Handb.* no. 927; *Stev. Brit. Fung.* ii. p. 275. Thelephora velutina, *DC. Fl. Fr.* vi. p. 33; *Fr. Elench.* p. 203. (Specimen in Herb. Berk.)

On wood and bark. When well-developed, of a pale cream-colour tinged with pink, often pallid. The branching thread-like mycelium often spreads for several inches from the margin of the plant. The hymenium is sometimes very much cracked, and the cystidia are more cylindrical and less incrusted than usual.

Europe; N. America.

PENIOPHORA RIMOSA, *Cooke*. Late effusa, adglutinata, indeterminata; hymenio ochraceo, subtiliter velutino, areolato rimoso, interstitiis sericeis; cystidia fusoidea, 70–100 × 15–18 μ; sporæ oblongo-ellipsoideæ, utrinque obtusæ, leviter curvulæ, 15–17 × 6 μ.—*Cooke, Grev.* ix. p. 94. (Type in Herb. Cooke, Kew.)

"Hymenial processes most abundant, often in clusters, hyaline, rough nearly to the apex. Externally it bears so close a resemblance to *Corticium Berkeleyi*, Cooke, that when collected it was believed to be that species, but its substance is thicker and firmer, and it is further distinguished by the presence of the processes characteristic of the genus." (*M. C. Cooke.*)

Closely allied to cracked forms of *P. velutina*, from which it is readily distinguished by its larger spores. The cystidia are usually scattered, but sometimes grouped in clusters.

On bark and wood. England.

PENIOPHORA TERRESTRIS, *Massee*. Effusa, tenuissima, cinerea vel pallide cervina, indeterminata; hymenio velutino; cystidia cylindraceo-fusoidea, 85–90×15–20 μ; sporæ ellipsoideæ, 10× 6–7 μ.—*Massee in Grev.* xv. p. 107. (Type in Herb. Kew.)

On naked soil, and also running over leaves and branches, forming grey or fawn-coloured patches resembling a mould in habit. England.

PENIOPHORA KARSTENI, *Massee*. Latissime effusa, adglutinata, tenuissima, pallescenti-gilva; hymenio leviter velutino; cystidia clavata, interdum apice paulum coarctata, asperula, 80–100 × 10–12 μ; sporæ ellipsoideæ, 5–7 × 4 μ.—Corticium alneum, *P. Karst.*—*Exs.*: Rabenhorst-Winter, Fungi Europæi, 3231. Specimens communicated by Karsten from Finland, growing on bark and wood of *Alnus*, *Betula*, and *Populus*.

Karsten considers that his specimens belong to the *Stereum alneum*, Fries, Epicr. 553, which is said by Fries to resemble *Corticium incarnatum* (=*Peniophora incarnata*, of present work); whereas the specimens of Karsten, so far as the Kew copy of

"Rab. Fung. Eur. 3231" is concerned, consist of the *Peniophora* described above, which is distinct from *P. incarnata* in the cystidia and spores, although the general appearance is the same.

Subgen. SCOPULOIDES: *cystidia fasciculato-aggregata.*

PENIOPHORA HYDNOIDES, *Cooke & Massee*, n. sp. Late effusa, tenuis, subinnata, indeterminata; hymenio cinereo; cystidia cylindraceo-fusoidea, 70–120 × 12–14 μ; sporæ globosæ, 4–5 μ. (Pl. XLVII. ff. 15, 16.) (Type in Herb. Kew.)

On bark. England (Carlisle).

This remarkable species resembles, when examined under a lens, several of the resupinate species of *Hydnum* and *Grandinia*, but is a true *Peniophora* with the cystidia in compact fascicles.

PENIOPHORA AMBIGUA, *Massee*. Late effusa, ochroleuca, margine albo-pulverulento, aculeis minutis dense approximatis; cystidia subfusoidea, apice obtusa, 50–60 ×12–14 μ; sporæ globosæ, circa 4 μ.—Hydnum (Resupinati) ambiguum, *Berk. & Broome in Journ. Linn. Soc.* xiv. p. 60. (Type in Herb. Berk. 3359.)

On dead wood. Ceylon.

The plant presents the appearance of a resupinate *Hydnum*, the fascicles of cystidia closely resembling the spines of the last-mentioned genus.

ASTEROSTROMA, *Massee*, nov. gen.

Resupinato-effusum; subiculo fibrilloso, arido, hyphis stellatis brunneis immixtis. Sporæ albæ, hyalinæ.—(Corticium sp., *Berk.*) (Pl. XLVI. ff. 8, 9.)

Allied to *Corticium*, but readily distinguished by the brown stellate hyphæ present in the subiculum, and the dry, minutely pulverulent, not waxy hymenium. The pulverulent species of *Coniophora* are separated by the coloured spores.

ASTEROSTROMA APALA, *Massee*. Late effusum, margine angustissimo candido; hymenio subtiliter setuloso, isabellino; sporæ fusoideæ, 10 ×3 μ. — Corticium apalum, *Berk. & Broome in Journ. Linn. Soc.* xiv. p. 72. (Type in Herb. Berk. Kew. n. 4038.) Stereum Halei, *B.*

On bark. Central Province, Ceylon.

Broadly effused, extreme margin white and sometimes radiato-byssoid, dirty pale ochraceous, or sometimes with a slight tinge of flesh-colour; primary rays of coloured stellate threads frequently branched.

ASTEROSTROMA CORTICOLA, *Massee*, n. sp. Late effusum; subiculo crasso, cinnamomeo; hymenio cervino demum isabellino; sporæ ellipsoideæ, 8 × 3–4 μ. (Type in Herb. Berk. Kew. n. 4042 *a*.)

On pine-bark. Carolina.

Subiculum thick, spongy; margin sometimes radiato-fibrillose; hymenium at first fawn-colour, becoming dirty ochraceous. Stellate hyphæ bright brown; rays 30–60 μ long, sometimes much longer, often with short irregular branches.

ASTEROSTROMA CERVICOLOR, *Massee*. Effusum, adglutinatum; subiculo delicato byssoideo hymenioque cervinis; sporæ ellipsoideæ, 6 × 4 μ.—Corticium cervicolor, *Berk. & Curt. in Grev.* i. p. 179.—*Exs.*: Rav. Fung. Amer. n. 228. (Type in Herb. Berk. n. 4058.)

Subiculum very delicate, byssoid; spreading over the wood, but scarcely forming a distinct margin; hymenium of the same colour, scarcely pulverulent. (*M. J. Berkeley.*)

Hymenium sometimes with a slight tinge of lilac. Superficially resembling some forms of *Peniophora incarnata.* Stellate bodies variable in size.

ASTEROSTROMA MUSCICOLUM, *Massee*. Latissime effusum; subiculo gilvo tenui subtiliter byssoideo; hymenio concolore, margine angusto demum evanido albo; sporæ subglobosæ, 4 × 3 μ.—Hymenochæte muscicola, *Berk. & Curt. in Journ. Linn. Soc.* x. p. 334. (Type in Herb. Berk. Kew. n. 3713.)

On dead branches of trees covered with moss. Cuba.

Allied to *A. cervicolor*, but readily distinguished by the spores and the very pale brown stellate hyphæ, the primary rays frequently producing more or less perfectly developed secondary whorls.

ASTEROSTROMA ALBIDO-CARNEUM, *Massee*. Late effusum, aridum, margine determinatum; hymenio pallido vel cinnamomeo, subtiliter fibrilloso; sporæ oblongo-ellipsoideæ, 8 × 4 μ.—Thelephora albido-carnea, *Schwein.* Corticium albido-carneum, *Rav.* (*in Rav. Fung. Carol. Exs.* n. 4). (Pl. XLVI. ff. 8, 9.)

On decayed trunks. Carolina.

Spongy, dry, elastic; stellate hyphæ often variously branched; hymenium varying in colour from almost white through pale ochraceous to pale cinnamon.

Contributions to South-African Botany.—Part IV. (With a Revised List of published Species of Extra-tropical South-African Orchids*.) By Harry Bolus, F.L.S.

[Read 21st June, 1888.]

Sphæralcea pannosa, *Bolus*, n. sp. Frutex ramosus erectus, petalis exceptis plus minus stellato-tomentosus. Folia palmatim 3–5-lobata, interdum fere 3–5-partita, lobis oblongis crenatis, supra viridia, subtus incano-tomentosa, stipulis linearibus minimis, petiolis foliorum inferum 9 centim. longis, totum folium cum petiolo 16 centim. longum, superiora minora; flores axillares, pedunculi 2–3-flori, 3 centim. longi, pedicellis gracilibus 1·5–2·5 centim. longis; petala obovata; calycis laciniæ ovatæ vel lanceolatæ acutæ, tubo æquilongæ; epicalyx 3-lobatus, lobis truncatis emarginatis demum reflexis, calyce brevioribus, externe processibus filiformibus stellato-tomentosis, 3–4 millim. longis, dense obtectus; ovarium ovatum truncatum; semina auriculæformia compressa brevissime hispida. (*Ex exempll. plur. exsicc.* No. 475 *ut infra.*)

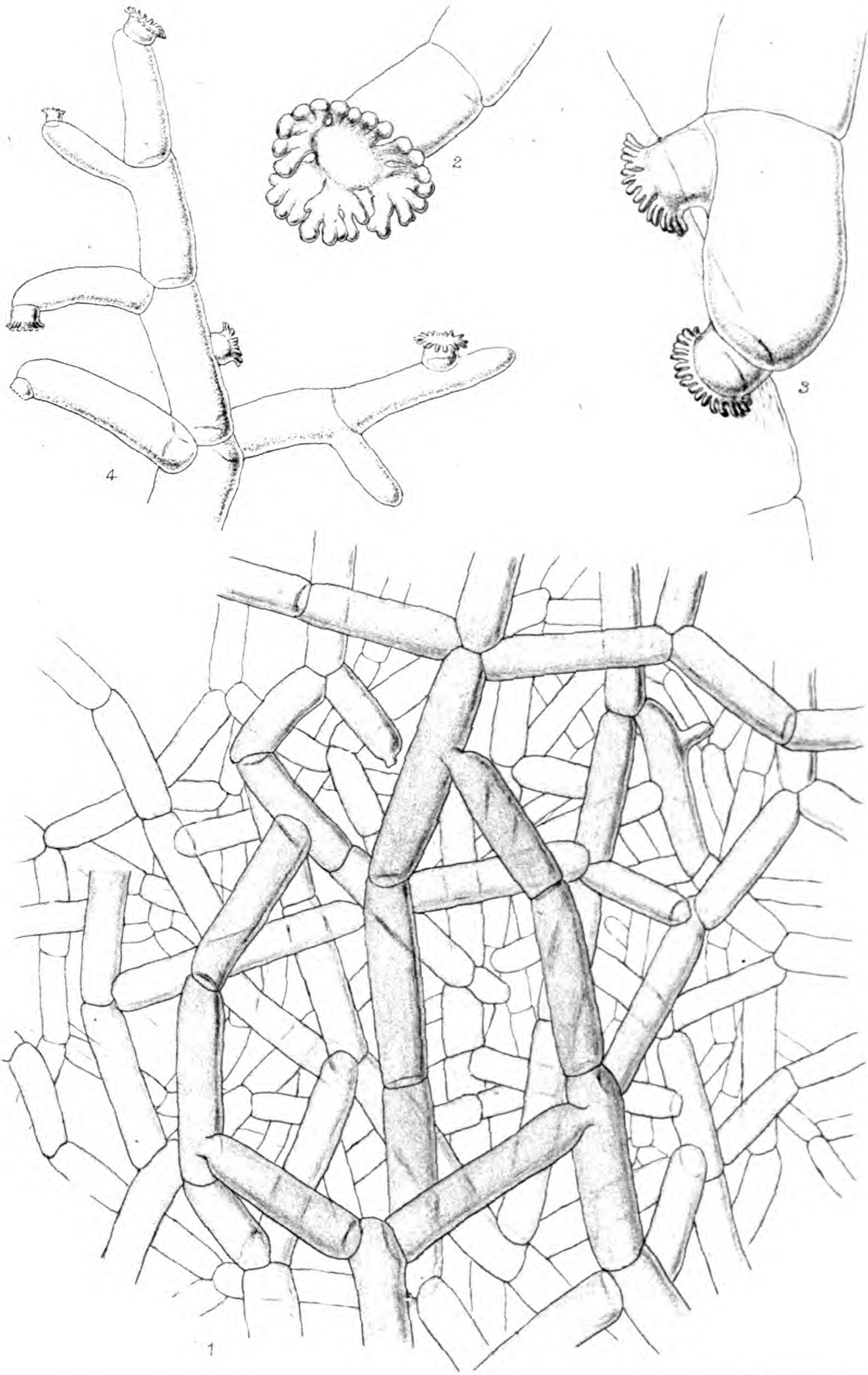
Hab. Ad ripas rivuli in Monte Currie, Griqualand Orientalis, alt. circ. 1760 metr., fl. Febr., legit *W. Tyson* anno 1884; *herb. Norm. Austr.-Afr.* No. 475.

Habit of *Sphæroma Julii*, Harv.; but the side lobes of the leaves are more deeply parted, and the epicalyx is very different both in shape and indument.

Hermannia cristata, *Bolus*, n. sp. Fruticulus basi ramosus, undique petalis exceptis scabrido-pubescens. Rami adscendentes, distanter foliosus; folia oblonga vel lanceolata, acuta, crenulata, basi rotundata vel cuneata, cum petiolis 3–3·5 centim. longa, stipulis lineari-subulatis, acuminatis, 3–5 millim. longis; flores axillares, pedunculis gracilibus unifloris, 2–3 centim. longis, bracteis filiformibus minimis; flores 1·5 centim. longi; calyx campanulatus, lobis triangularibus acutis vel acuminatis, nunc tubo æquilongis nunc longioribus; petala unguiculata, limbo suborbiculari; antheræ acuminatissimæ, petalis fere æquales, filamentis oblanceolatis acutis; capsula ovalis vel subsphærica, 5-alata, anguli processibus filiformibus incurvis tomentosis demum rigidis dense cristati. (*Ex exempll. plur. exsicc. Tyson*, 1689).

Hab. In clivis circa Kokstad, Griqualand Orientalis, alt. 1560

* See preliminary List, Journ. Linn. Soc. (Bot.), vol. xix. pp. 335–347.



Berjeau & Highley del. et lith.

West, Newman imp.

BOODLEA COACTA *G. Murray & De Toni.*

metr., flor. Dec., anno 1883 legit *W. Tyson* No. 1689, *in herb. meo*; tam in monte "Sheba," Transvaalensi, Oct. (1886) legi ipse; "Orange Free State," *Cooper*, 900; Basutoland, *Cooper*, 2001; Natal, *Sutherland*, *Fannin* No. 9, *in herb. Kewensi.*

The flowers I saw were a beautiful crimson. Very distinct by its crested capsule; in Cooper's specimens the crest was longer (4–5 millim.) and the capsule more densely tomentose. It is remarkable that the capsules closely resemble those of the American *H. texana*; while they are very little like those of any Cape species I have seen.

PELARGONIUM LEPTOPODIUM, *Bolus*, n. sp. (§ Ligularia.) Tota, petalis exceptis, plus minus pubescens; caulis debilis, lignosus, decumbens, parce ramosus; rami graciles, interdum pilosi; folia pilis minimis curvatis pubescentia, radicalia plurima longe petiolata pinnati-partita 3·5–7·0 centim. longa, segmentis cuneatis vel linearibus subacutis 0·5–1·2 centim. longis, petiolis laminam longe superantibus, stipulis linearibus acutis basi petiolo adnatis 0·5–1 centim. longis, folia caulina pauciora minora stipulis subliberis; pedunculi graciles, 2- vel rarius 3-flori, demum 5–8 centim. longi, bracteis linearibus; pedicelli gracillimi, 1·5–2 centim. longi, tubo calycis æquilongi; calycis laciniæ lanceolatæ acutæ, 7–9 millim. longæ, tubo gracillimo 2–3plo breviores; petala 5, obovata, circ. 1–1·1 centim. longa. (*Ex exempll. plur. exsicc.* 2604 *et* 7315 *ut infra.*)

Hab. In planitie, tum ad pedes montium, prope pagum Ceres, in Coloniâ Capensi, alt. circ. 460 metr., flor. Oct., anno 1873 legi, No. 2604; in eodem loco, flor. Jan., No. 7315; *in herbb. Kewensi et meo.*

Nearly allied to *P. artemisiæfolium*, DC., of which it has the habit. Differs by the shorter, broader, and fewer segments of its leaves, more copious pubescence, fewer-flowered peduncles, shorter and less acuminate calyx-lobes, and the smaller petals. The latter are usually a bright but dark rose-colour.

PELARGONIUM MACOWANI, *Bolus*, n. sp. Fruticulus ramosus; rami inferne denudati, sursum foliosi nodis incrassatis; folia petiolata bipinnato-partita subcarnosa glauca scabra laciniis linearibus acutis, petiolis 2–2·5 centim. longis cum lamina subæquilonga articulatis, stipulis subulatis acuminatis; pedunculi biflori, recti, 3–3·5 centim. longi, bracteis subulatis acuminatis, pedicellis brevissimis; calycis laciniæ ovatæ acutæ scabræ demum sæpius reflexæ, tubo 1 centim. longo duplo breviores; petala 5 obovata, calycis laciniis duplo longiora. (*Ex exempll. plur. exsicc. MacOwan* 1647 *ut infra.*)—P. biflorum, *Harvey, MS. in herb. Kew., non Willd.*

Hab. In rupestribus in summo monte Boschberg, in Coloniâ Capensi, alt. circ. 1380 metr., flor. Jan., legit *P. MacOwan* No. 1647; *in herbb. Kewensi et meo.*

Belongs to Harvey's section *Glaucophyllum*, and nearly allied to *P. lævigatum*, Willd.; but the leaves are differently cut, with shorter segments, and the calyx-tubes with the pedicel is also much shorter.

PELARGONIUM GRAMINEUM, *Bolus*, n. sp. (§ Hoarea.) Humilis, perennis, 8–20 centim. alta; caules e rhizomate tuberoso graciles simplices vel ramosi brevissimi vix supra solum adscendentes basibus foliorum delapsorum coronati; folia pleraque radicalia plurima linearia gracillima subobtusa ob margines revolutas arcte approximatas quasi filiformia minute pubescentia, 4–10 centim. longa, caulina dum adsint pauca minora, stipulis ovatis, acuminatis, petiolo adnatis; rami gracillimi adscendentes simplices vel semel divisi; pedunculi 1–3-flori, bracteis lanceolatis acuminatis, pedicellis gracillimis 2·5–3 centim. longis; sepala lanceolata acuminata pubescentia 6–8 millim. longa, tubo parum longiora; petala superiora 2 obovato-spathulata, inferiora 3 spathulata vel anguste oblonga basi attenuata crispa multo minora. (*Ex exempll. plur. exsicc.* No. 7314 *ut infra.*)

Hab. In solo arenoso in declivitate montis pone Gydouw, prope pagum Ceres in Coloniâ Capensi, alt. circ. 1050 metr., flor. Jan., anno 1888 legi; No. 7314 *in herbb. Kewensi et meo &c.*

Very distinct from anything which I have been able to find described or in the Kew herbarium, by its slender filiform leaves.

LOTONONIS FILIFOLIA, *Bolus*, n. sp. (§ Aulacinthus.) Tota plus minus sericeo-villosa. Caules e rhizomate perenne, ut videtur, annui, adscendentes, graciles, simplices vel parum ramosi, foliosi, 10–15 centim. alti; foliola linearia acuta, cum petiolis 3 millim. longis, 2·5–3·5 centim. longa, stipulis nullis; racemi laxe 5–6-flori, flori 1–3 centim. longi, pedicelli 1–2 millim. longi, bracteæ filiformis 8 millim. longi, bracteolæ 2 minimæ; calycis laciniæ lanceolatæ acuminatæ subfalcatæ inæquales tubo breviores, tenuiter sericeo-pubescens, totus 7–8 millim. longus; vexillum late ovatum obtusum, basi cuneatum, breviter unguiculatum; alæ spathulatæ obtusæ, carina anguste lanceolata acuta recta subæquilongæ; ovarium multi-ovulatum; legumen oblongum, acutum, rectum, circa 4–6-spermum. (*Ex exempll. plur. exsicc. ut infra.*)

Hab. In monte Sheba, Transvaalensi, alt. circ. 1200 metr., mense Sept., anno 1886, legi; No. 7614 *in herbb. Kewensi et meo.*

Nearest *L. gracilis*, Benth.; differs by its much narrower and longer leaflets, shorter petioles, and much larger flowers.

Lotononis longiflora, *Bolus*, n. sp. Fruticulus humifusus, ramosus, albo-sericeus; ramuli foliosi; folia petiolata 5–7-foliolata, foliolis obovatis obtusis sæpius complicatis 5–8 millim. longis, petioli patentes foliolis longiores sæpe 8–10 millim. longi, stipulis ovatis vel lanceolatis acutis parvis caducis; flores in racemis terminalibus paucifloris (2–3-floris) 2·5 centim. longi, bracteis linearibus pedicellis 2–3 millim. longis brevioribus; calyx sericeus circa 1 centim. longus, lobis duobus lateralibus bifidis, laciniis subulatis acuminatis, intermedio altius fisso lineari-acuminato; vexillum anguste lanceolatum subacutum, dorso sæpe sericeum; alæ oblongæ obtusæ, basi breviter unguiculatæ et auriculatæ, vexillo parum breviores; carina oblanceolata subobtusa, basi auriculata falcato-incurva, alas longe superans; ovarium lineare longe stipitatum 8-ovulatum, stylo exserto. (*Ex exempll. 2 exsicc.* No. 6568 *ut infra.*)

Hab. Namaqualand, legit *W. Dowdle*; No. 6568 *in herbb. Bolus et Kewensi.*

Very distinct by its long narrow flowers and its long-stalked ovary. In the only flower I dissected the stipes was 1·3 centim. in length. The whole plant is a silvery white, and the flowers light yellow.

Lotononis namaquensis, *Bolus*, n. sp. Tota planta, petalis exceptis, sericeo-pubescens. Caulis lignosus, ramis pluribus prostratis alternis 10–15 centim. longis; foliola obovata, intermedio majore, 5–6 millim. longo, folia superiora minora, supra tenuiter subtus dense pubescentia, petiolis 0·6–1·0 centim. longis, stipulis ovatis minimis; flores intra axillas foliorum umbellati, umbellis 2–3-floris; pedunculi 1 millim. vel breviores; pedicelli 2 millim. longi; flores circa 6 millim. longi; calycis laciniæ lineares æquilongæ, tubo parum longiores; vexillum spathulatum v. obovatum, ungue basi dilatato, dorso sericeo-lineatum; alæ oblongæ obtusæ, carina rostrata sæpe acute geniculata breviores; ovarium lanceolatum, 4–6-ovulatum. (*Ex exempll.* 2 *exsicc.* No. 6569 *ut infra.*)

Hab. In arenosis prope Klipfontein in prov. Namaqualand Minor, alt. circ. 900 metr., flor. Sept., legi; No. 6569 *in herbb. Kewensi et meo.*

This has the habit and external appearance of *L. lenticula*, Benth. It differs by its more silky pubescence, by its usually alternate branches, and by its much smaller pod.

ASPALATHUS LEPTOPTERA, *Bolus*, n. sp. Fruticulus rigidus, ramosus, humifusus; ramuli dense foliosi, pubescentes; folia teretia apice acuminato-pungentia glabra vel interdum basi pulvinulis albo-pilosis instructa, 2 millim. longa; flores ad apices ramulorum terminales solitarii subsessili, 7–8 millim. longi, bracteis aculeiformibus; calyx obconicus, basi acutus, sericeo-pubescens, corolla duplo brevior, laciniis lanceolatis in aculeis desinentibus sinibus acutis, tubo parum brevioribus; vexillum ovatum acutum breve unguiculatum, dorso sericeum; alæ oblongæ obtusæ, carina duplo breviore; carina porrecta incurva subobtusa; ovarium 2-ovulatum; legumen ovatum inflatum sericeum, 1-spermum, 4 millim. longum. (*Ex exempll. plur. exsicc.* No. 7313 *ut infra.*)

Hab. In arenosis ad pedes montium prope pagum Ceres, Coloniâ Capensi, alt. circ. 460 metr., flor. Jan., anno 1888 legi; No. 7313 *in herbb. Kewensi, meo, &c.*

Habit and general appearance very like *A. divaricata*, Thunb., but different by its generally solitary flowers and the very short alæ.

ASPALATHUS HUMILIS, *Bolus*, n. sp. Fruticulus humifusus, basi ramosus; ramuli sæpius simplices, villosi, foliosi, prostrati, 6–15 centim. longi; folia fasciculata, carnoso-teretia, acuta, calloso-apiculata, glabra, leviter incurva, 2–3 millim. longa; flores 4–6 in capitulis terminalibus subsphæricis 1–1·3 centim. diametro, pedicellis 1–1·5 millim. longis, bractea lata ovata, bracteolæ anguste oblanceolatæ concavæ calyce breviores bracteam excedentes; calyx campanulatus, laciniis falcato-subulatis, tubo villoso subæquilongis, sinibus angustis acutis; vexillum subrotundum emarginatum, breviter unguiculatum sæpe reflexum; alæ falcato-oblongæ obtusæ, carinam subæquantes; carina apice late rotundata, alis parum longior; ovarium oblongum glabrum, 6-ovulatum. (*Ex exempll. plur. exsicc.* No. 3728 *ut infra.*)

Hab. In saxosis in summo monte Tabulari, alt. circ. 1100 metr., flor. Dec., anno 1877 legi; No. 3728 *in herbb. Kewensi et meo.*

Belongs to Harvey's section *Carnosæ*, but is the only one, so far as I know, with a prostrate habit. The flowers look a little like those of the very rare *A. Priori* (which I have never gathered), but the calyx of that is very peculiar and quite different from this.

ARGYROLOBIUM MARGINATUM, *Bolus*, n. sp. Fruticulus undique rufo-villosus, basi ramosus; rami adscendentes, villosi; folia 3-foliolata petiolata, foliolis ovatis obtuse acutis basi angustatis marginatis nervatis 2–3 centim. longis, petioli 5–6 millim. longi, stipulæ foliis oppositæ bilobæ 1 centim. longæ, lobis subulatis acuminatis; racemi terminales vel axillares ovati, 3–8-flori, bracteæ lanceolatæ, bracteolæ duæ lineares calyce breviores; flores patentes, 1–1·1 centim. longi; calycis labium superius bilobum, lobis lanceolatis acuminatis, inferius longius trifidus, lobis acuminatis carina subæquilongis; vexillum late obovatum vel subrotundum breviter unguiculatum in dorso medio sericeum; alæ oblongæ obovatæ obtusissimæ, carinam incurvam subrostratam parum superantes; ovarium lanceolatum longe hirsutum, 8-ovulatum. (*Ex exempll. plur. exsicc. Tyson* No. 2054 *ut infra.*) Legumina oblonga villosa, circa 3 centim. longa, 6–8-sperma. (*Ex exempll. Cooper* 872.)

Hab. In lat. montis Malowe prope Clydesdale, Griqualand Orientalis, alt. 1230 metr., flor. Febr., legit *W. Tyson* No. 2054; Nelson's Kop, *Cooper*, 872; Natal, *Wood*, 1852.

A very distinct species. Mr. Tyson's specimens only differ in having larger flowers than the others.

LONCHOCARPUS SPECIOSUS, *Bolus*, n sp. Arbor 15-pedalis vel ultra, ramulis foliis junioribus rachidibus calycibusque plus minus sericeo-pubescens; folia petiolata, 3–6-juga, 10–25 centim. longa, foliolis oblique lanceolatis acuminatissimis sub lente minutissime crenulatis reticulato-venosis incurvis, 4·5–7 centim. longis, 1–2 centim. latis, internodos superantibus, petiolulis 2–4 millim. longis, stipulæ subulatæ minimæ; racemi terminales 10–30-flori recurvo-penduli 8–11 centim. longi, pedicelli circa 1·5 centim. longi, bracteolis 3 linearibus caducis; flores fere 2 centim. longi; calyx 8 millim. longus, lobis 2 superioribus latis subfalcatis, inferioribus triangularibus; vexillum orbiculare emarginatum unguiculatum venosum, 1·8 centim. latum; alæ oblongæ obtusæ basi bi-auriculatæ, carina incurva acutiuscula parum breviores; ovarium lineare, 4-ovulatum; legumen oblongum valde compressum glabrum, 3-spermum, 7 centim. longum, 1·1 centim. latum. (*Ex exempll. plur. exsicc.* No. 7615 *ut infra.*)

Hab. In provinciâ Delagoa, haud procul a vado fluminis "Komati River drift" dicto, alt. circ. 160 metr., fl. Sept., anno 1886 legi, No. 7615; Makapansberge, Strydpoort, in Republicâ Transvaalensi, *Rehmann*, 5522; "Gold Fields," *T. Baines.*

A very distinct species, with large and handsome bright blue flowers.

Cliffortia pilifera, *Bolus*, n. sp. Fruticulus gracilis, diffusus, debilis, 1–2-pedalis, erectus vel laxe inter frutices adscendens. Caulis ramique tenues, 1–1·5 millim. crassi, pilis longis mollibus pilosi; foliola solitaria sessilia vel breviter petiolata, cordato-orbicularia vel cordato-ovata, tenuia, pennivenia grosse crenato-dentata, dentibus marginatis longe cuspidatis sed nec rigidis, sinibus incisis, superne glabra, inferne tenuiter pilosa, sæpius 2·5–4 centim. longa, 2–2·5 lata; stipulæ bifidæ, membranaceæ; achænia haud suppetunt. (*Ex exempll. exsicc. plur. sub* No. 4032 *ut infra.*)

Hab. In convalle "Bain's Kloof" dicta, haud procul a ponte "Darling Bridge," in latere orientali montium "Drakensteenbergen," alt. circ. 350 metr., fl. Mart., anno 1879 legi; No. 4032 *in herbb. Kewensi, meo,* &c.

Stems and branches light yellowish-red colour; the thin semitransparent leaves are pale green above, somewhat paler or livid below. Most nearly allied to *C. odorata*, but very distinct by its slender habit and different leaves. It is softer and more herbaceous than anything else in the genus.

Pharnaceum obovatum, *Bolus*, n. sp. Herba annua, glabra, prostrata; caules plurimi sæpe dichotome ramosi, 20–30 centim. longi, circa 1 millim. diametro; folia verticillatim glomerati, glomerulis 8–12-foliatis, obovati sæpius obtusissimi basi angustati, 0·8–1·5 centim. longa, 4–7 millim. lata, internodiis multoties breviores, stipulis semiorbiculatis brevibus laceratis scariosis; cymæ terminales vel axillares multifloræ, pedunculis rectis 2–4 centim. longis, supra ramificationem geniculato-flexuosis pedicellis in fructu 6–8 millim. longis, bracteis minimis; sepala oblonga obtusissima, margine lato membranaceo, demum 4 millim. longa, ad basin fere libera; stamina sepalis breviora, antheris rotundatis;

discus hypogynus tripartitus, segmentis cuneatis crenulatis; capsula sepalis dimidio longior, semina rotundata compressa lævia nigra nitida. (*Ex specim. plur. exsicc.* No. 4830 *ut infra.*)

Hab. In arenosis maritimis ad oras sinus "False Bay" prope Muizenberg in Peninsulâ Capensi, fl. Aug., anno 1882 legi, No. 4830; *herb. Norm. Austr.-Afr.* 622; Simon's Bay, *C. Wright*; Cape, *Harvey*, 243; Cape, *Hooker fil.*, 611.

Comes between *P. serpyllifolium*, Linn. f., and *P. distichum*, Thunb.; distinct from both by its rather large obovate obtuse leaves, besides other characters. In Harvey's fruiting specimen the cyme is several inches long.

MICROLOMA NAMAQUENSE, *Bolus*, n. sp. Frutex gracilis, subscandens. Caulis tenuis, pauci-ramosus, distanter foliosus; folia linearia, breviter petiolata, margine revoluta, nervo medio tenuiter pubescenti, 3–3·5 centim. longa; flores umbellati, pedicelli 5 millim. longi pubescentes, bracteis linearibus 1–2 millim. longis; calycis segmentis lineari-lanceolatis, acutis, subtus pubescentibus, patentibus, 5–6 millim. longis; corolla urceolata, laciniis ovatis subobtusis erectis, 8 millim. longis, a 5 fasciculis pilorum retrorsorum in medio tubi unica serie dispositis intus ornata; folliculi graciles longe rostrati, immaturi 4 centim. longi. (*Ex exempll. plur. exsicc.* No. 5703 *ut infra.*)

Hab. Inter frutices scandens, in terra Austro-Africana "Namaqualand Minor" dicta, fl. Oct., legit *Rev. W. Morris* (No. 5703 *in herbb. Bolus et Kewensi*); in montibus Kaus et Spektakel, terræ ejusdem, alt. 900–1100 metr., fl. Sept., anno 1883 legi ipse, *herb. Norm. Austr.-Afr.* No. 639.

Nearly allied to *M. lineare*, R. Br., but well distinguished by its patent (not erect) calyx-segments; its narrower corolla, with the bundles of hairs in a single (not double) row.

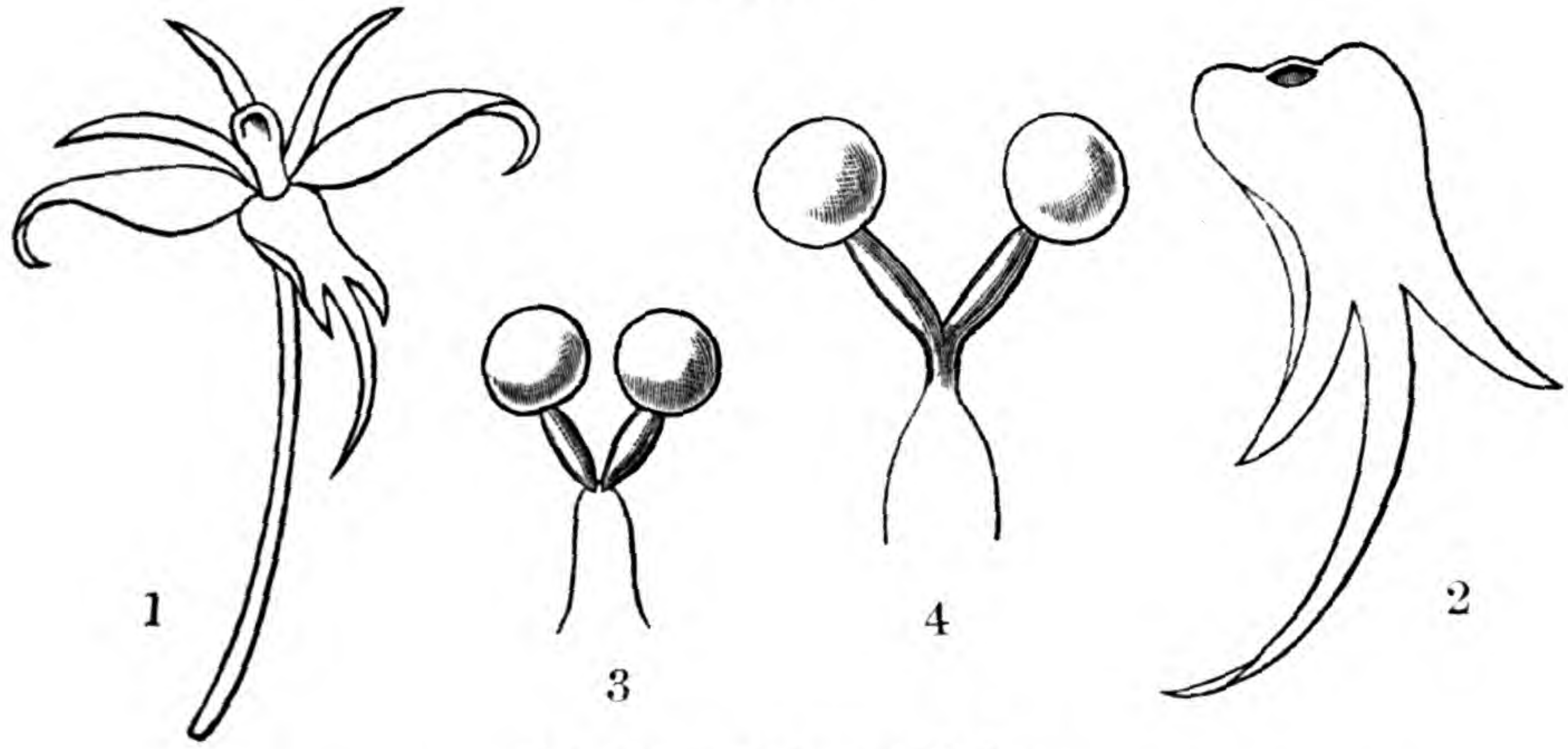
ORCHIDEÆ.

ANGRÆCUM TRICUSPE, *Bolus*, n. sp. (Fig. 1.) Glabra, robusta, 15-20 centim. alta, tuberibus cylindricis 2 millim. crassis; folia ligulata, obtusa, rigida, multinervia, 10–12 centim. longa, 1 centim. lata; racemi adscendentes, substricti, multiflori, foliis parum breviores, bracteæ late ovatæ persistentes, pedicelli 2–3 millim. longi; sepala anguste lanceolata acuta, 6 millim. longa; petala lanceolata acuminata, sepalis latiora, revoluta, 9–10 millim. longa; labellum oblongum, deflexum, petalis æquilongum, supra medium tricuspidatum, cuspide intermedio acuminatissimo, lateralibus 2–3plo longiore, calcare dependente filiformi, laminam 2plo excedenti. (*Ex exempll. exsicc.* 2 *a McKen lectis.*)

Hab. In Natal, *McKen*, 14; *Cooper*, 1398; *Sanderson.*

Habit that of *Angræcum bicaudatum.* Readily distinguished from its congeners by the lip. Sanderson's plant has much

Fig. 1.

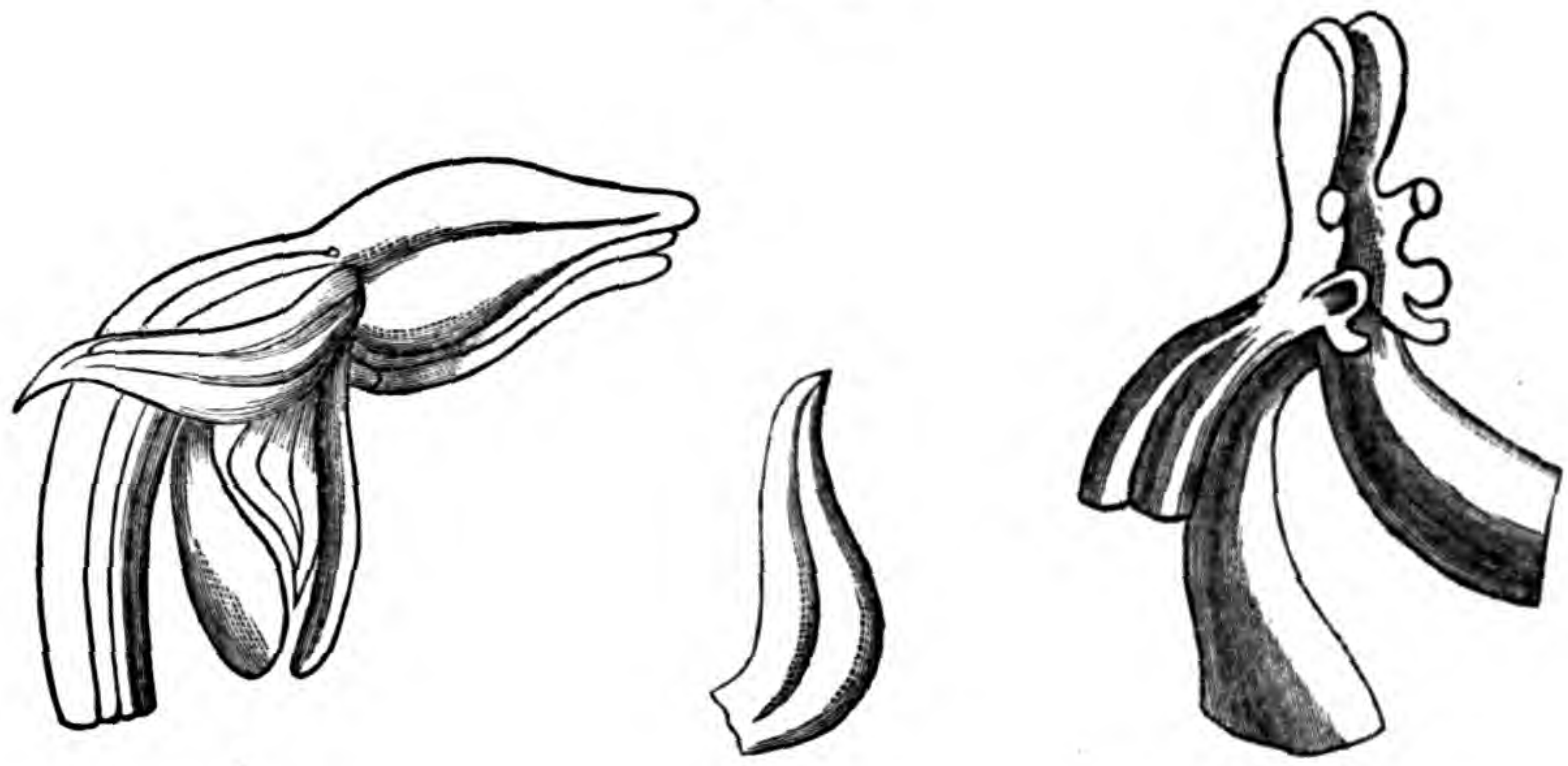


Angræcum tricuspe, Bolus.
1. Flower, front view. 2. Lip. 3. Pollinia, McKen's plant.
4. Pollinia, Cooper's plant?

smaller flowers than McKen's or Cooper's, but otherwise agrees. Bentham and Hooker (Gen. Plant. iii. 583, 584) make the distinction between *Angræcum* and *Mystacidium* to consist in the flat or filiform stipites of the pollinarium, also in the smaller flowers of the latter. In this species they are neither flat nor filiform, but clavate and slightly compressed. The flowers in size are also intermediate between the average of the two genera. Bentham himself made a rough drawing of the pollinarium on the sheet of McKen's No. 14 in the Kew Herb. and marked it "Mystacidium"; yet I cannot see how it differs from that of others included in *Angræcum.* I have a strong suspicion that *Mystacidium* will ultimately have to be merged in *Angræcum*, but the change should be preceded by a knowledge of the greater part of the species of each genus in a living state.

HABENARIA ANGUICEPS, *Bolus*, n. sp. (Fig. 2.) Herba glabra, erecta, 12–18 centim. alta; folia lanceolata, acuminata, nervata, erecta, 2–5 centim. longa, superiora minora, sensim in bracteas conformes floribus longioribus abeuntia; spica cylindrica, multiflora, floribus squarrosis, diametro 2·5 centim.; sepala lateralia oblique lanceolata, acuta, retroflexa, circa 6 millim. longa; sepalum impar cucullatum, acutum, subcompressum, lateralibus æquilongum; petala indivisa oblique lanceolata, acuta, galeæ adhærentia; labellum lineare obtusum, marginibus revolutis, carnosum,

Fig. 2.



1 2 3

Habenaria anguiceps, Bolus.
1. Flower, side view. 2. Petal. 3. Column, oblique side view (ovary, spur, and lip being cut through).

6 millim. longum, calcare inflato, obtuso, limbo parum longiore, præditum. (*Ex exempll. 3 exsicc. ut infra.*)

Hab. In colle argillaceo, prope Brookhuizen's Poort, Grahamstown, in Coloniâ Capensi, alt. circ. 675 metr., flor. Jan., anno 1887 legi, No. 7312 *in herbb. Kewensi et meo*; prope Van Staden's flumen, 25 Dec. 1884, legit *Jos. Mackie.*

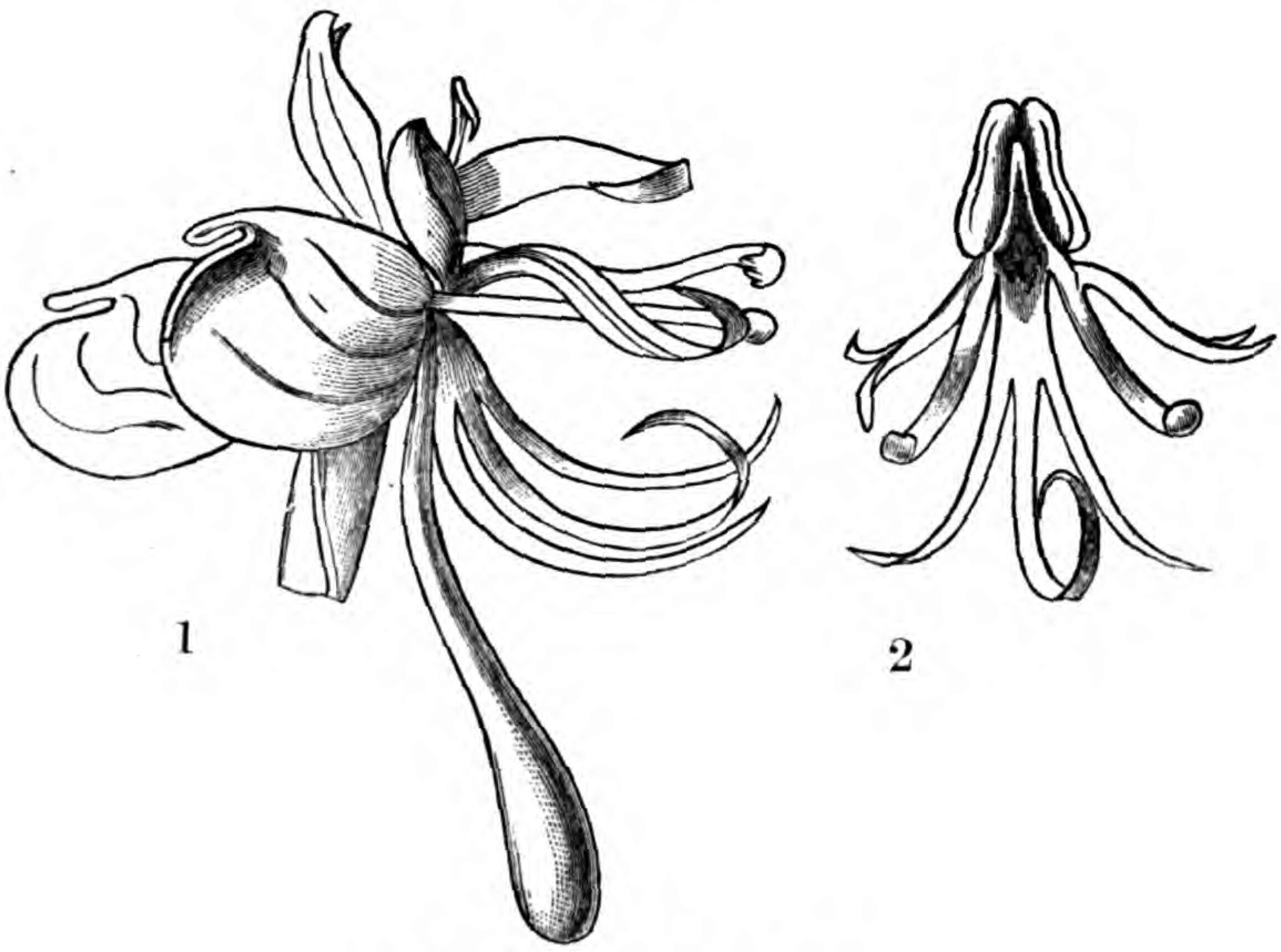
Peculiar by its very short flowers, which somewhat resemble those of *H. lævigata*, Lindl. It appears to be a rare plant.

Habenaria involuta, *Bolus*, n. sp. (Fig. 3.) Herba erecta, glabra, bipedalis vel ultra. Folia 3–4 lineari-lanceolata acuta nervata basi vaginantia, inferum 22 centim. longum, superiora multoties breviora; racemus multiflorus, circa 14 centim. longus, diametro 3 centim., bracteis lanceolatis nervatis ovario cum pedicello æquilongis; sepala lateralia oblique obovata apiculata 3–4-vena recurva, 5 millim. longa; sepalum impar lanceolatum concavum acutum erectum, lateralibus brevius; petala indivisa linearia; labellum tripartitum, segmentis linearibus acutis involutis, intermedio longiore circa 9 millim. longo, calcare dependente inflata 1·2 centim. longo; clinandrium ovatum obtusum emarginatum; antherarum loculi basi in processum linearem productum, brachiis rostelli adnatum eisque æquilongum; rostellum medio triangulari-dilatatum erectum, brachiis linearibus acuminatis planis porrectis, processibus clavatis stigmatiferis subæquilongis; ovarium cum pedicello gracillimum, 1·5–2 centim. longum. (*Ex exempl. unico exsicc. Sanderson in herb. meo.*)

Hab. Natal, *J. Sanderson*, No. 833.

Habit and appearance of *H. dives*, Reichb. f., and of *H. Kilimanjari*, Reichb. f., but the flowers are different from either. The arms of the rostellum do not appear to be channelled, as usual, to carry the caudicles, but these are probably covered under the special process running from the base of the anther-cell to the extremity of the rostellary arm.

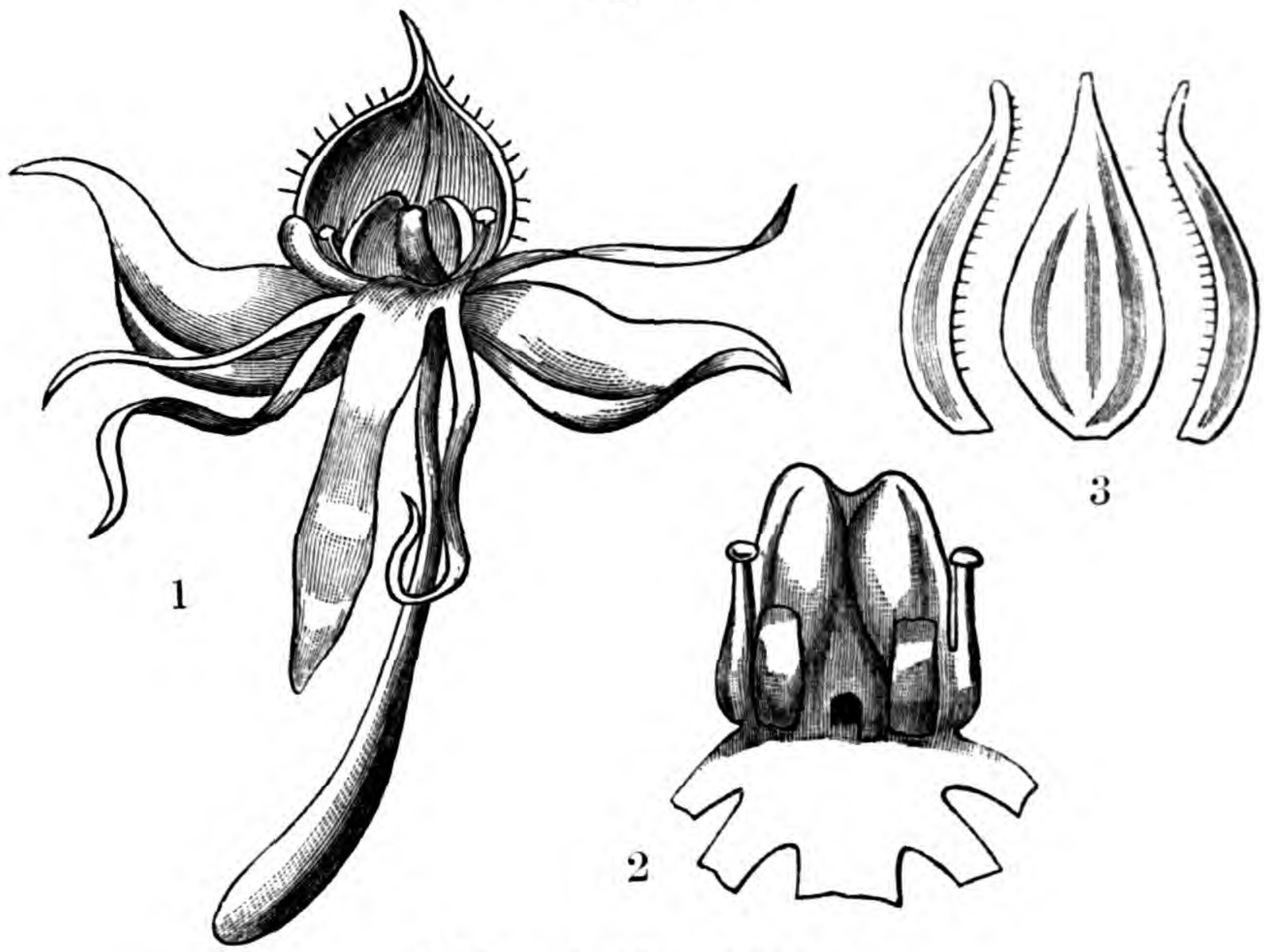
Fig. 3.



Habenaria involuta, Bolus.
1. Flower, side view. 2. Column, petals, and lip.

Habenaria Tysoni, *Bolus*, n. sp. (Fig. 4.) Herba gracilis, glabra, erecta, spithamæa vel pedalis. Folia duo radicalia humistrata, inferum reniforme acutata 3–6 centim. latum, superum minus ovatum evidentius petiolatum acutum; caulis bracteis lineari-lanceolatis acuminatis, apice setiformibus erectis vestitus; racemus laxe 10–18-florus, bracteæ florales conformes floribus nutantibus parum breviores; sepala lateralia ovata acuminatissima concava patentia, 7 millim. longa; sepalum impar ovatum acuminatum concavum, 5 millim. longum; petala bipartita, segmentis linearibus, posticis sepalo impari adhærentibus eoque æquilongis ciliatis, anticis patentibus 8–9 millim. longis; labellum tripartitum deflexum circa 1 centim. longum, segmentis lateralibus linearibus acuminatis, intermedio latiore linguæformi parum breviore, calcare dependente inflato 1·2 centim. longo; clinandrium obtusissimum emarginatum; rostelli brachia caudiculifera brevia incurvo-erecta, processibus stigmatiferis oblongis obtusis fere

Fig. 4.



Habenaria Tysoni, Bolus.
1. Flower, front view. 2. Column. 3. Back sepal and posterior segments of the petals.

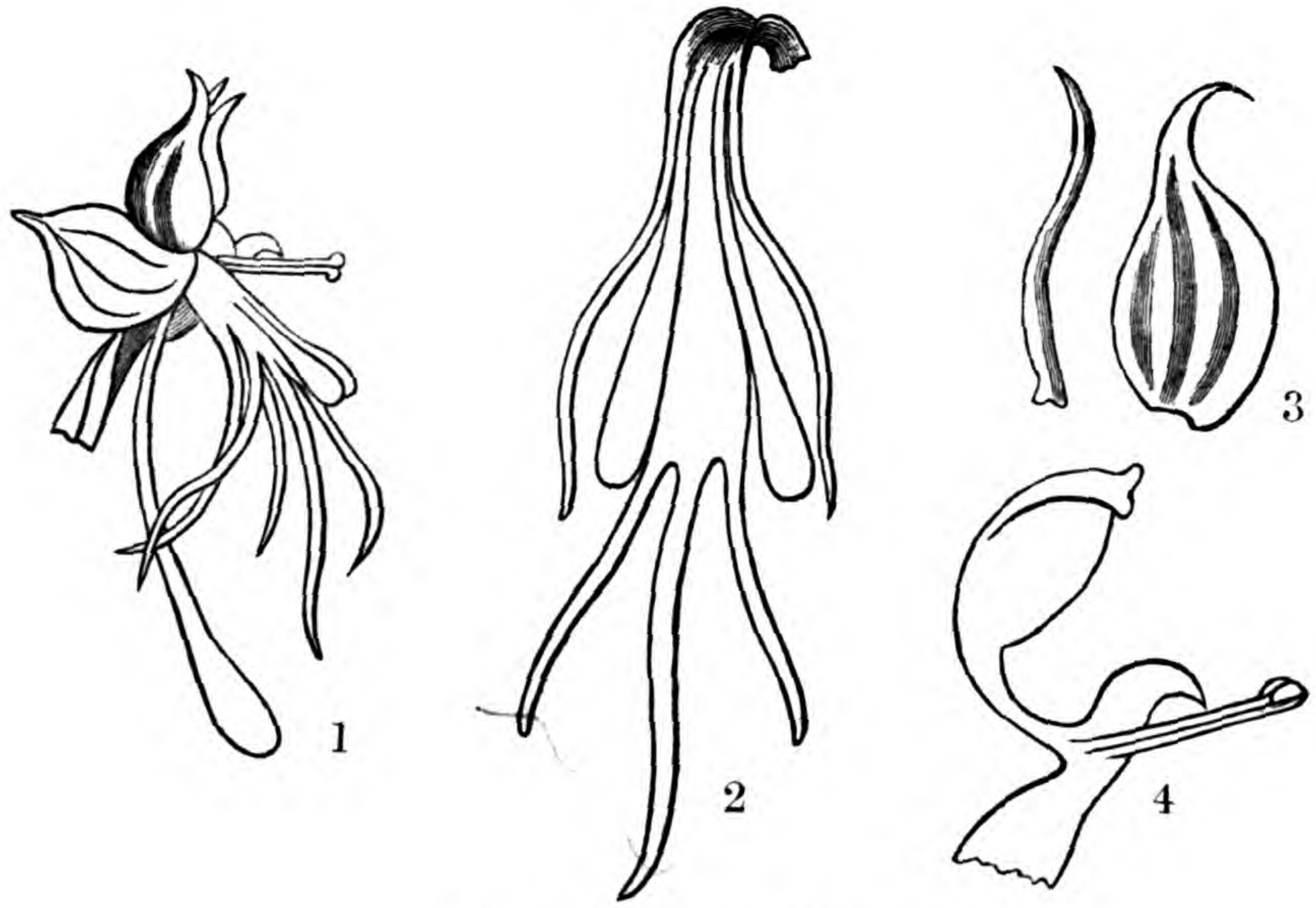
æquilonga; ovarium gracile, apice decurvum, circa 1·3 centim. longum. (*Ex exempll.* 3 *exsicc. Tyson* 1068 *et Sanderson* No. 2 *ut infrà.*)

Hab. In lat. graminosis montis Currie, prope Kokstad, Griqualand Orientalis, alt. circ. 1850 metr., fl. Febr., legit *W. Tyson*, *in herbb. Kew., Bolus, &c.*; Natal, *Sanderson*, No. 2.

Leaves and stem like those of *H. Dregeanum*, Lindl., but the raceme is much laxer and fewer-flowered, the flowers larger and quite differently shaped.

Habenaria porrecta, *Bolus*, n. sp. (Fig. 5.) Herba glabra, erecta, robusta, bipedalis vel ultra. Caulis laxe foliosus, 6–7 millim. crassus; folia lanceolato-ovata subobtusa, basi vaginantia, laxe patentia, 7–8 centim. longa, 2·5 centim. lata, superiora sensim in bracteas lanceolatas acuminatas submembranaceas nervatas abeuntia; racemus dense multiflorus subsecundus bracteis ovario brevioribus; sepala lateralia oblique ovata cuspidata venosa recurva, 1 centim. longa; sepalum impar ovatum concavum acumine recurvo; petala bipartita segmentis linearibus, posticis sepalo impari adhærentibus, anticis multo longioribus patento-deflexis; labellum basi cuneato-oblongum deflexum medio trilobum 2·6 centim. longum, lobis linearibus acuminatis, basi appendice carunculæformi deflexo præditum, calcare dependente subporrecto in-

Fig. 5.



Habenaria porrecta, Bolus.
1. Flower, side view. 2. Column and lip. 3. Petals. 4. Column and lip, side view.

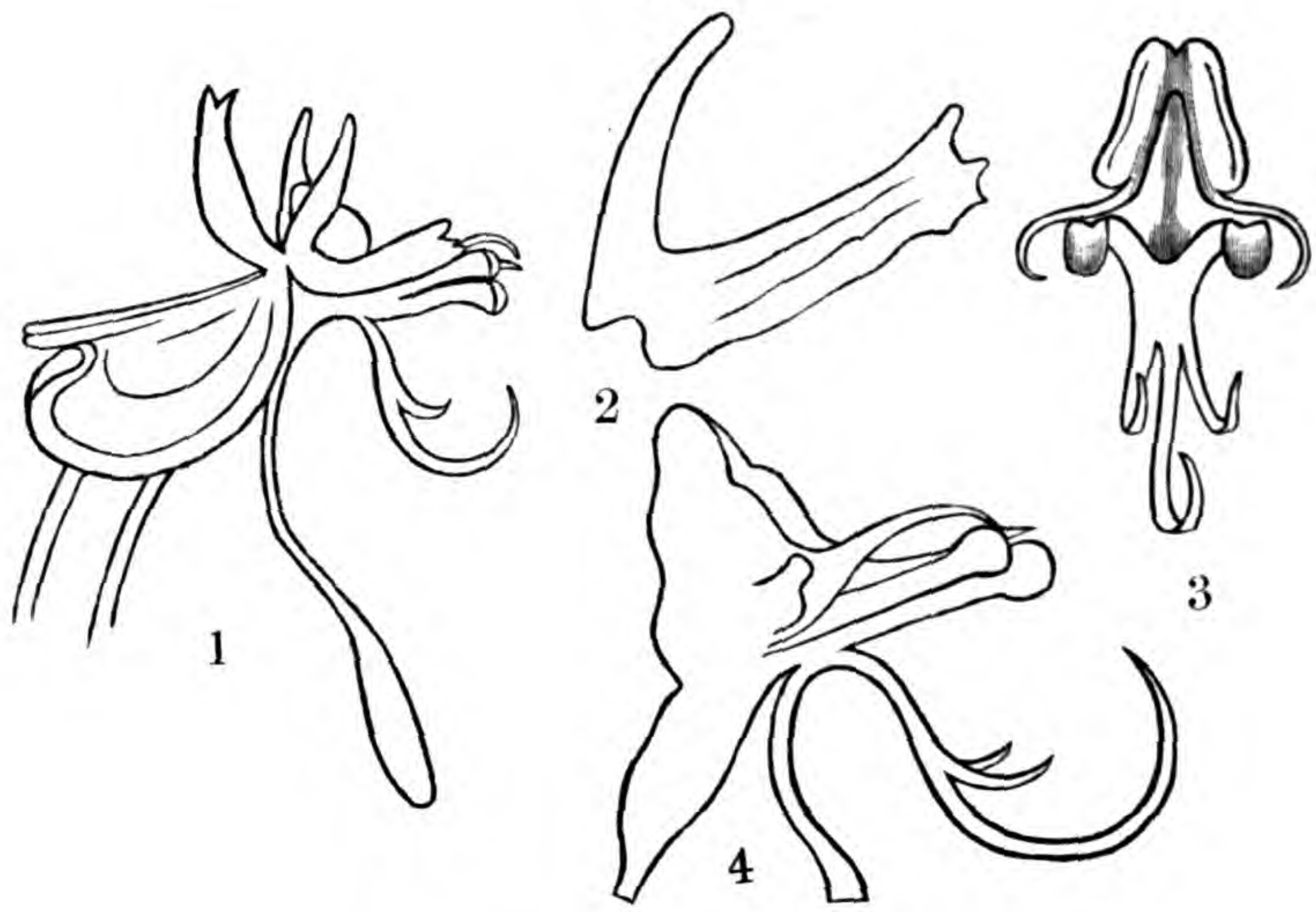
flato circa 3 centim. longo; clinandrium antice incurvum, basi attenuatum; rostelli brachia caudiculifera recta elongata porrecta; processus stigmatiferi clavati deflexi, segmentis anticis petalorum subæquilongi; ovarium cum pedicello fere 3 centim. longum. (*Ex exempll. plur. exsicc. ut infra.*)

Hab. Natal, *McKen*, No. 11; *Plant*, 52; *Sanderson*, *Gueinzius* in herb. Kew.; *Pappe* 77 in herb. Lindley.

All the specimens are imperfect as to leaves. The habit appears to be between that of *H. Bonatea*, Reichb. f., and *H. cassidea*, Reichb. f. Gueinzius's plants are more slender than those of McKen or Pappe. In structure the flowers must be similar to those of *H. densiflora*, Sond., judging from a drawing in Herb. Lindley, but the sepals of that are much narrower and more acuminate and the column very different.

HABENARIA REHMANNI, *Bolus*, n. sp. (Fig. 6.) Herba glabra (subglauca ?), erecta, stricta, 40 centim. alta. Caulis foliosus, 3–4 millim. crassus; folia circa 4, lineari-lanceolata acuminata nervata basi vaginantia erecta vel parum patentia, inferiora 9–10 centim. longa, superiora sensim minora in bracteas conformes abeuntia; racemus laxe 14-florus, bracteis lanceolatis membranaceis acumi-

Fig. 6.



Habenaria Rehmanni, Bolus.
1. Flower, side view. 2. Petal. 3. Column and lip, front view.
4. Column and lip, side view.

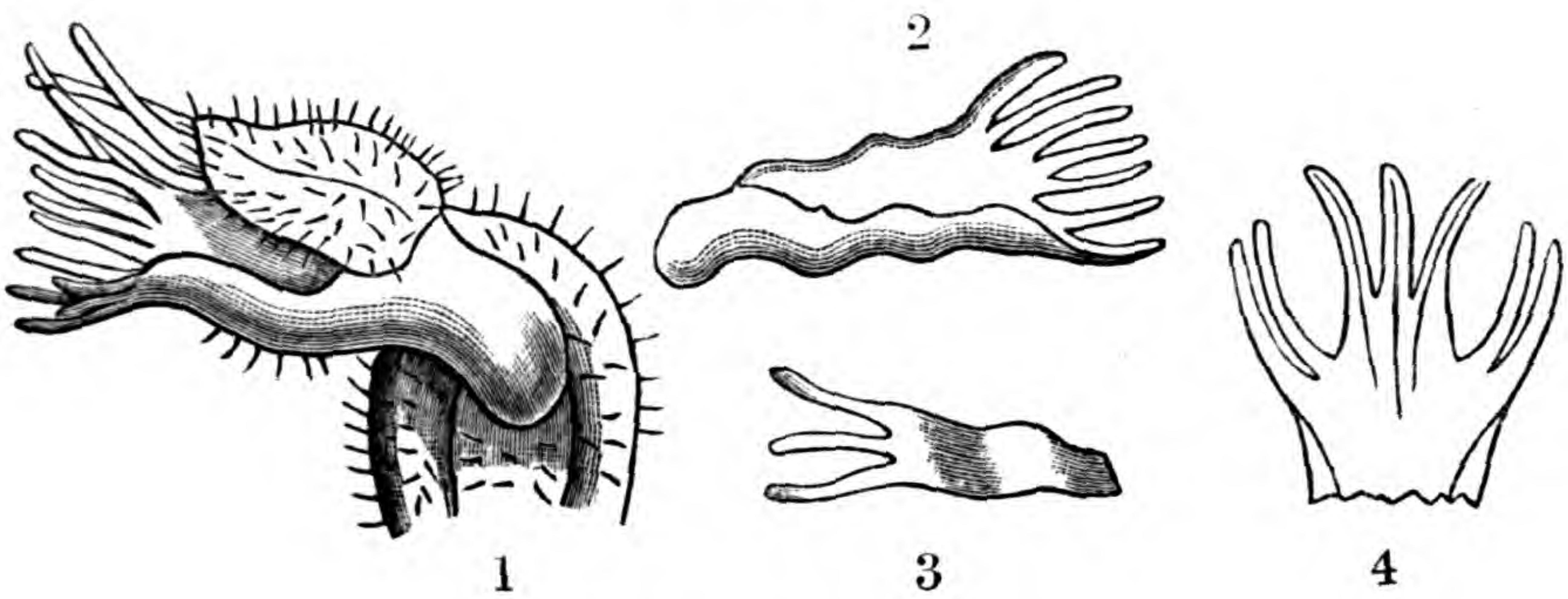
natis ovario (cum pedicello 7 millim. longo) brevioribus; sepala lateralia oblique ovata, margine superiore recto apiculato, concava, 3-nervia reflexa, circa 8 millim. longa; sepalum impar multo minus lanceolatum valde concavum acutum, dorso apiculatum erectum vel parum reflexum; petala bipartita, lacinia postica linearis erecta sepalo impari fere æquilonga, antica parum longior porrecta oblonga apice dentata 2-nervia; labellum trilobum deflexum, laciniis linearibus acutis incurvis lateralibus brevioribus intermedio longiore, calcare dependente apice inflato acutiusculo, 1·5 centim. longo; rostellum medio triangulari-dilatatum, brachia caudiculifera linearia acuta porrecta, processibus stigmatiferis clavatis porrectis subæquilonga; clinandrium emarginatum crassum, basi auriculatum; ovarium valde decurvum. (*Ex exempl. unico exsicc. Rehmann ut infra.*)

Hab. Houtbosch, in Republicâ Transvaalensi [extratropica], legit *Dr. A. Rehmann*, No. 5780 *in herb. Kewensi.*

Very little like any other species with which I am acquainted.

HOLOTHRIX MULTISECTA, *Bolus*, n. sp. (Fig. 7.) Scapus erectus, strictus, pilosus, 30–35 centim. altus; folia sæpius 2, radicalia, humistrata orbicularia basi vaginantia ciliata, superne pilosa, inferne glabra; spica dense multiflora, subsecunda, bracteis ovatis acutis longe ciliatis; sepala late ovata, subobtusa, setis longis pilosa; petala erecta basi oblonga supra medium 3-loba, lobis

Fig. 7.



Holothrix multisecta, Bolus.
1. Flower, side view. 2. Lip. 3. Petal. 4. Apex of lip.

linearibus subobtusis; labellum horizontale 3-lobum, lobis lateralibus bipartitis segmentis linearibus, intermedio longiore 3-lobulato segmentis linearibus, basi calcare brevi obtuso subinflato auctum. (*Ex exempll. plur. exsicc. Scully* 391 *ut infra.*)

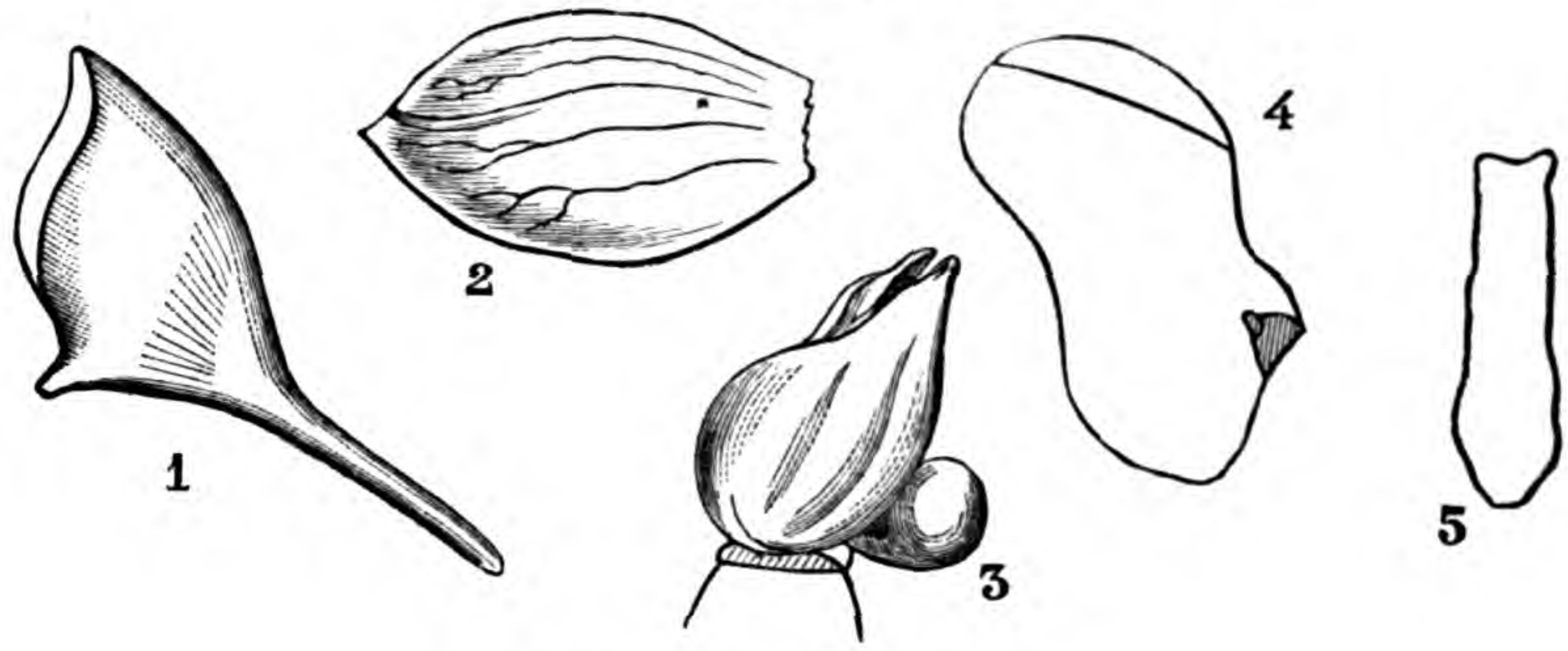
Hab. In summo monte Elandsberg, prope Stockenstrom, in Coloniâ Capensi, alt. circa 1850 metr., fl. Jan., anno 1886 legit *W. Scully, in herbb. Kewensi et meo*; Umnyola prope Bazija, Kaffraria, 1050 metr., fl. Oct., *R. Baur*, No. 737; Natal, *Mrs. Fannin.*

With the habit and general appearance of *H. Burchellii*, Reichb. f. (*Scopularia Burchellii*, Lindl.), this has very different flowers. In size the latter are about equal to those of *H. condensata*, Sond.

DISA OREOPHILA, *Bolus*, n. sp. (§ Eudisa.) (Fig. 8.) Herba glabra, gracilis, erecta vel subdecumbens, 10–24 decim. alta. Scapus tenuis, subrectus vel flexuosus, sparse foliatus; folia graminoidea, acuta, nervata, rigidula, basi vaginantia, patentia, scapo breviora, in bracteas conformes abeuntia; racemus laxe 3–15-florus, bracteæ lanceolatæ, acuminatæ, membranaceæ, nervatæ, inferiores flores superantes, superiores floribus breviores;

flores sub lente minute papillosi; sepala lateralia ovalia, obtusissima, venosa, mucrone minuto sub apice aucta, circa 5 millim. longa; sepalum impar posticum, galeatum, obtusum, calcare gracili attenuato, horizontali vel deflexo, 5–8 millim. longo, præditum; petala oblique oblonga, obtusissima, antice rotundata,

Fig. 8.



Disa oreophila, Bolus.
1. Dorsal sepal, side view. 2. Side sepal. 3. Column and petals, side view. 4. Petal. 5. Lip. All enlarged.

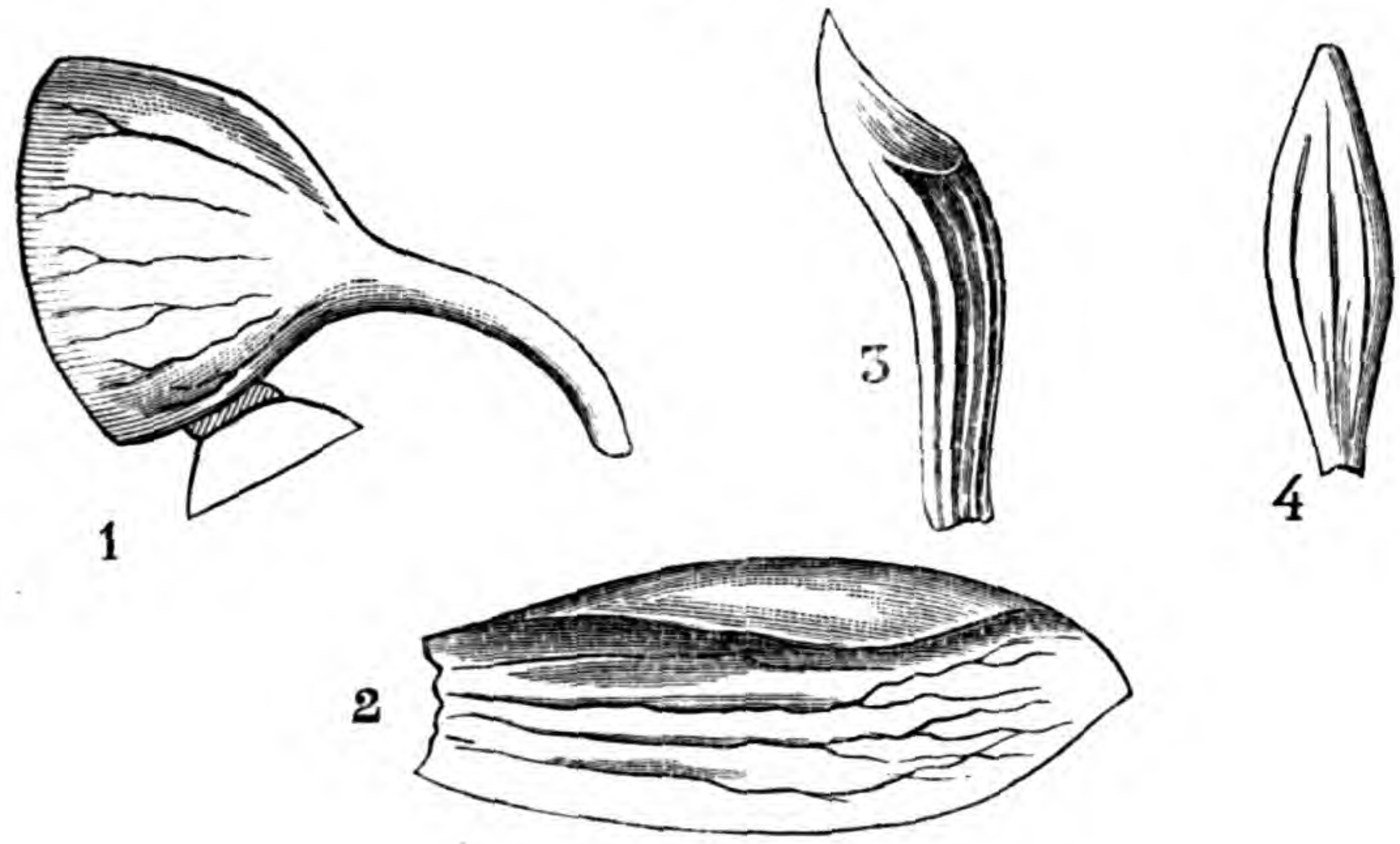
columnæ basi adnata; labellum ligulato-oblongum, apice parum latius, obtusum, subundulatum, circa 4 millim. longum; ovarium rectum, gracillimum, 1 centim. longum. (*Ex exempll. plur. exsicc.* 1073 *Tyson ut infra.*)

Hab. In saxosis summo monte Currie, Griqualand Orientalis, alt. 2300 metr., fl. Feb., anno 1883, legit *W. Tyson* No. 1073; Natal, Oliver's Hoek Pass, *J. M. Wood*, No. 3413; *in herbb. Kewensi et meo.*

Flowers, according to Mr. Wood, pink. Very distinct amongst its allies by its subremote flowers and long slender ovaries. Leaves somewhat like those of *D. stricta*, but neither so broad nor so straight. The slender graceful flowers are somewhat like those of the section *Schizodium*.

Disa caffra, *Bolus*, n. sp. (§ Eudisa.) (Fig. 9.) Herba glabra, erecta, circa 2 decim. alta. Scapus subgracilis, strictus, vaginis foliaceis subinflatis vestitus; folia 1–2, lanceolata, acuta, mucronata, 3-nervia, erecta, 6–8 centim. longa, in bracteas abeuntia; spica ovata vel lanceolata, subdensiflora, bracteis ovato-lanceolatis acuminatis, floribus parum longioribus; sepala lateralia ovalia, concava, subobtusa, venosa, 9 millim. longa; sepalum impar posticum, galeatum, inflato-hemisphæricum, obtusum, venosum, in calcar dependentem e basi conica filiformem, circa 8 millim. longum, productum; petala oblongo-lanceolata, acuta, supra medium geniculato-inflexa, apice margineque membranacea, carnoso-carinata, columnæ adnata, 6 millim. longa;

Fig. 9.



Disa caffra, Bolus.
1. Dorsal sepal, side view. 2. Side sepal. 3. Petal. 4. Lip.
All enlarged.

labellum lanceolatum, acutum, carnoso-carinatum, 5 millim. longum; rostelli brachia discreta, subelongata, acutangula; ovarium 1–1·2 centim. longum. (*Ex exempll. plur. exsicc. Tyson* 2611 *ut infra.*)

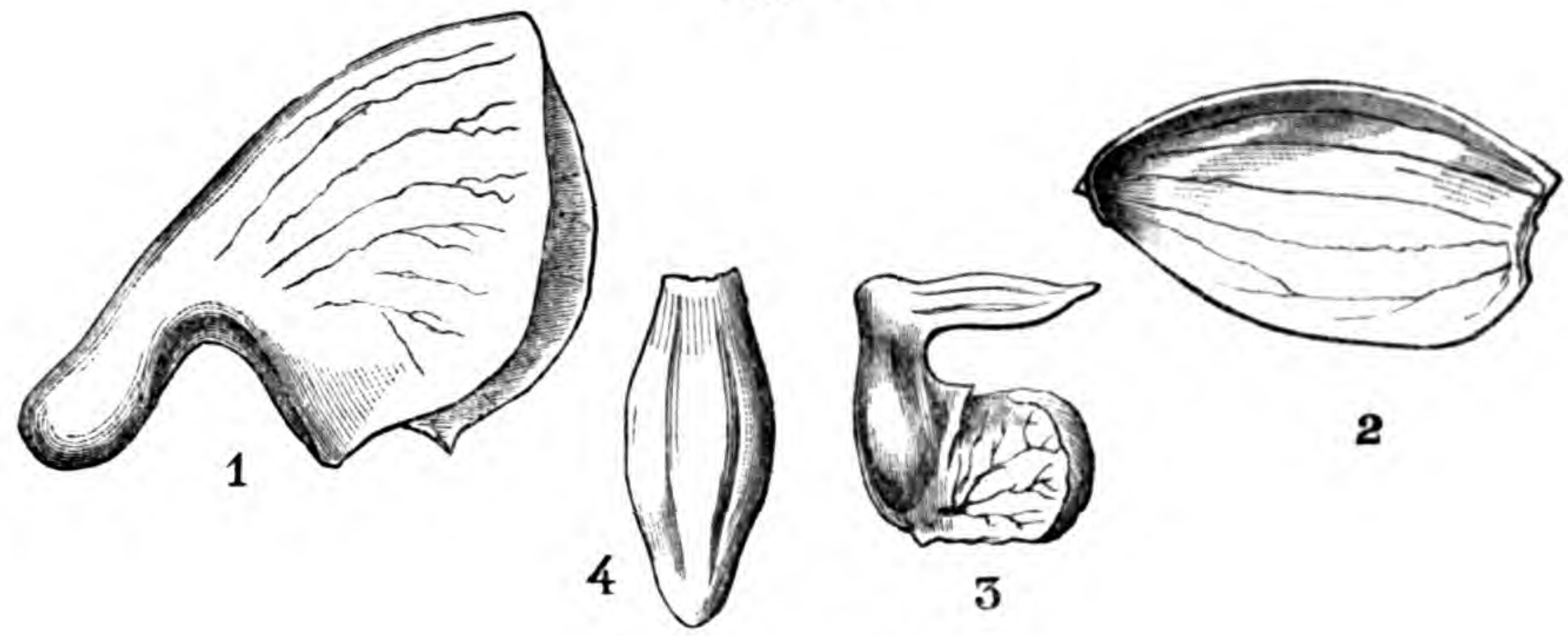
Hab. In graminosis udis prope flumen Umkwani, Pondoland, Africæ australis, alt. 60 metr., fl. Oct., legit *W. Tyson* (anno 1885) No. 2611; *in herbb. Kewensi et meo.*

"Flowers purple," according to the collector's ticket. The habit is that of the section *Monadenia.* The plant dries a dark reddish brown.

Disa Tysoni, *Bolus*, n. sp. (§ Eudisa.) (Fig. 10.) Herba glabra, erecta, robusta, pedalis. Scapus validus, foliatus; folia lanceolata, acuta, basi vaginantia, erecta, 10–12 centim. longa; racemus multiflorus, bracteæ inferiores floribus longiores, superiores breviores; sepala lateralia ovalia, acuta, venosa, apiculo extrorso, 9 millim. longa; sepalum impar posticum galeatum inflatum, æquilongum, venosum, calcare oblongo vel ovato, obtuso, inflato, 3–4 millim. longo, præditum; petala basi columnæ adnata, rotundata, concava, sursum lanceolata, abrupte geniculato-inflexa, acuta. (*Ex exempl. unico exsicc. ut infra.*)

Hab. In clivis graminosis supra Beeste Kraal prope Kokstad, Griqualand Orientalis, alt. 1600 metr., fl. Nov.-Dec., legit *W. Tyson* No. 1609 (*in herb. meo*).

Fig. 10.

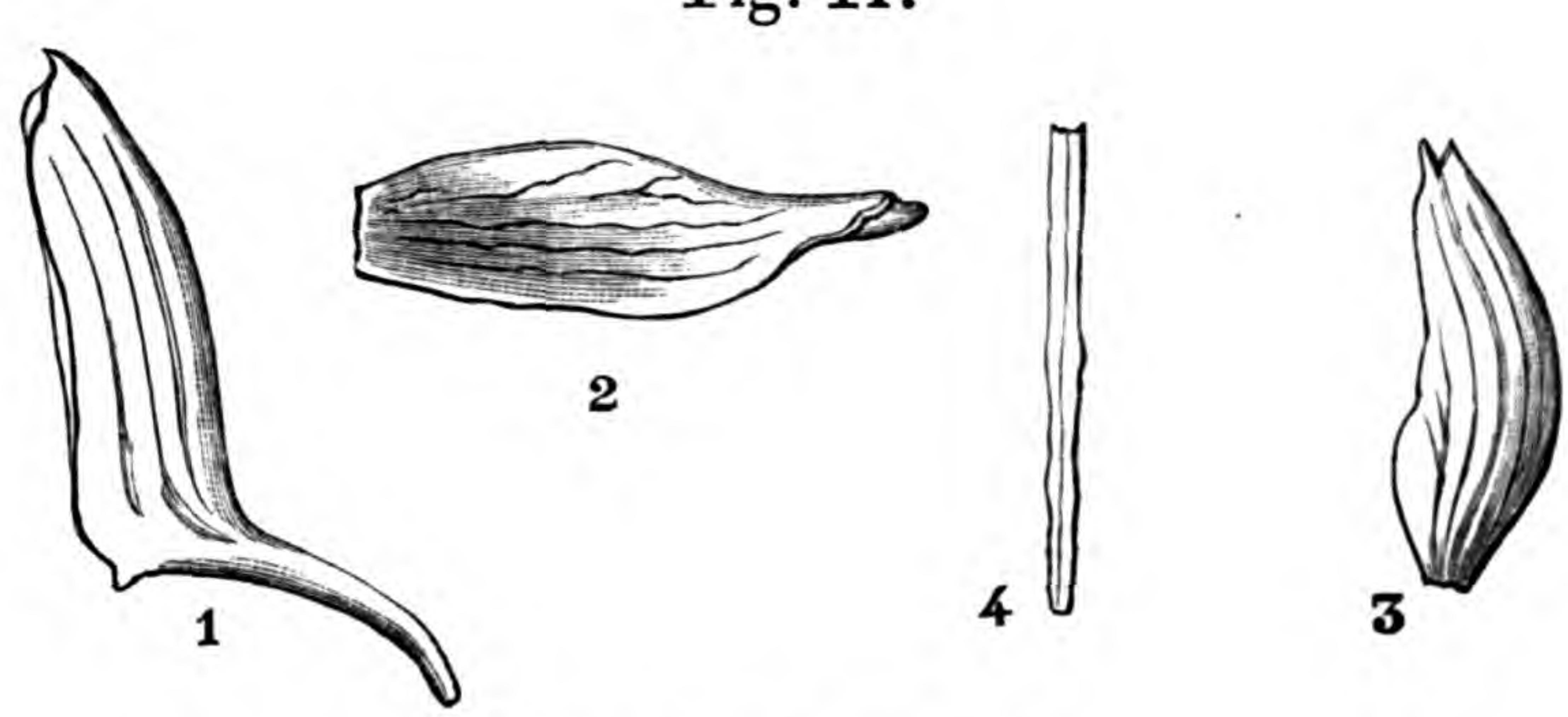


Disa Tysoni, Bolus.
1. Dorsal sepal, side view. 2. Side sepal. 3. Petal. 4. Lip.
All enlarged 3 diameters.

The spur is flattened on its inner surface, and resembles those of *D. longifolia* and *D. uncinata.*

Disa stenoglossa, *Bolus,* n. sp. (§ Eudisa ?) (Fig. 11.) Herba glabra, erecta, 20 centim. alta. Scapus subgracilis, foliis obtectus ; folia lanceolata, acuta, basi vaginantia, erecto-patentia, inferiora præsertim multinervia, 5–9 centim. longa ; racemus multiflorus, bracteis lanceolatis, acuminatis, reticulato-venosis, flores

Fig. 11.



Disa stenoglossa, Bolus.
1. Dorsal sepal, side view. 2. Side sepal. 3. Petal. 4. Lip.
All enlarged 3 diameters.

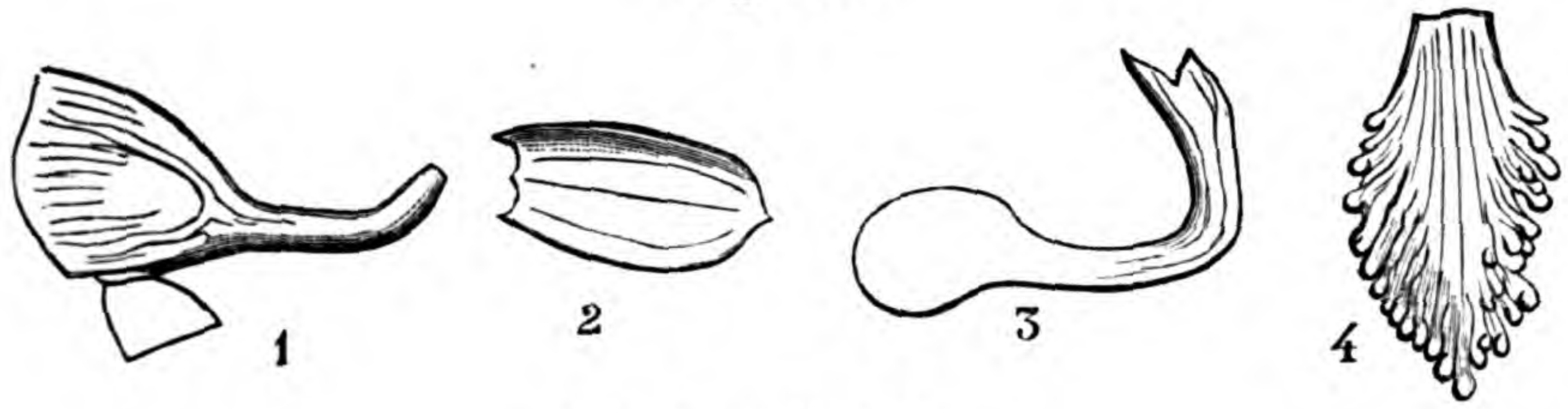
subæquantibus ; sepala lateralia lanceolata, acuta, concava, venosa, apiculo extrorso aucta, 9 millim. longa ; sepalum impar posticum oblongum, fornicatum, erectum, retusum, mucronatum, calcare e basi conico filiformi, attenuato, deflexo, 5 millim. longo, præditum ; petala oblique lanceolata, mucronulata, venosa ; labellum lineari-filiforme, obtusum, subcarnosum, vena media percursum, 9 millim. longum; ovarium rectum, gracile, 1·5 centim. longum. (*Ex exempl. unico exsicc. ut infra.*)

Hab. Natal, a *Mrs. Saunders* missa; *in herb. meo.*

The flowers appear to be reddish in colour, with purple spots. Distinct by its arched, not galeate odd sepal, and its remarkably slender lip.

DISA BAURII, *Bolus*, n. sp. (§ Herschelia.) (Fig. 12.) Folia desunt. Scapus gracilis, striatus, 5 decim. altus, vaginis membranaceis nervatis cuspidatis distanter vestitus; racemus laxe 8–9-florus, bracteis obovatis longe cuspidatis, nervatis, ovaria subæquantibus; sepalum impar posticum galeatum obtusum vel retusum, erectum, calcare flexuoso primum horizontali deinde (post anthesin) adscendenti, 1 centim. longo; sepala lateralia ovalia obtusa, mucrone minuto sub apice aucta; labellum ovatum, multi-laceratum, lacinulis linearibus, simplicibus vel divisis, papillosis, interdum apice dilatatis, 1 centim. longum; petala bilobata, sub galea abscondita, lobo posteriore recurvo, falcato, lineari, subtruncato, apice denticulato, lobo anteriore breviore rotundato. (*Ex exempl. unico exsicc. ut infra.*)

Fig. 12.



Disa Baurii, Bolus.
1. Dorsal sepal, side view. 2. Side sepal. 3. Petal. 4. Lip.
Magnified 2 diameters.

Hab. In monte Bazija Kaffrariæ, alt. 925 metr., fl. Febr., legit *Rev. R. Baur*, No. 814 (*in herb. Kewensi*).

Very distinct in this section by its long spurs. The rostellum is clearly trilobate. A *Disa* of this section (No. 1537 *W. Tyson*, Mt. Currie, Griqualand Orientalis, 1570 metr., fl. Oct.) appears to be very similar; but the spurs are half the length, and the flowering season so different that I doubt its being any form of the present species.

DISA MACOWANI, *Reichb. f.*, *Otia Bot. Hamb.* 106.

Hab. In summo monte Boschberg, prope Somerset East, alt.

circ. 1500 metr., fl. Febr., *P. MacOwan* No. 1123; in summo monte et ad latera montis Bazijæ, Kaffraria, fl. Jan., *R. Baur* No. 592; in Republicâ "Orange Free State" dicta, *T. Cooper* No. 1095; prope Lambonjwa flumen, ditione Klip River, Natal, fl. Jan., *J. M. Wood* No. 3421; in graminosis pr. Fort Macdonald, Griqualand Orientalis, fl. Jan., alt. circ. 1530 metr., *W. Tyson* No. 1598.

Disa porrecta, *Sw.* (§ Oregura.) There has long been a confusion between this species and *D. ferruginea*, S. Both were first published under those names in the 'Kongl. Vetenskaps Academiens Nya Handlingar,' vol. xxi. (1800), pp. 210–211, the last-named being based upon *Satyrium ferrugineum*, Thunb., and the first upon a plant collected by Sparrman. In Thunberg's herbarium are two sheets of different species both marked *D. ferruginea*. One of these, according to Mr. N. E. Brown, who examined them, agrees with the description of the plant well known under that name, and which grows commonly on Table Mountain close to Cape Town. It was figured by Ker in the 'Journal of Science and the Arts,' vol. v. (London, 1818), t. 1. f. 1, under the name of *D. porrecta*, and by Harvey in Hooker's 'Icones Plantarum' (1840), tab. 214, as "*D. ferruginea*?, Thunb." Subsequently, in a paper in Hooker's 'London Journal of Botany,' vol. i. 1842, p. 15, Harvey stated his belief that *D. porrecta* was a synonym for the same species. In 1838 Lindley, in 'Genera and Species of Orchids,' p. 352, described *D. porrecta* afresh, but quoted under that name Ker's figure above named, and Burchell's specimens No. 8199, both of which are unmistakably *D. ferruginea*; while he enumerated *D. ferruginea* amongst the species unknown to him.

The specimens on the other sheet marked *D. ferruginea* in Thunberg's herbarium were identified by Mr. Brown as *D. Zeyheri*, Sond., in 'Linnæa,' vol. xix. (1847), p. 95, a species founded on a plant of Ecklon and Zeyher's from Eland's River Mountains, Uitenhage district.

There were no sheets or specimens in Thunberg's herb. marked *D. porrecta*.

Prof. Reichenbach, who also examined the Orchids of Thunberg's herb. and published an account of them in 'Flora' for 1883, reported:—"14. *Disa ferruginea*, Thunb.=*Zeyheri*, Sond." (p. 461). From this we may infer that Prof. Reichenbach saw only one of the sheets in Thunberg's herb., namely the one containing the specimens also lately identified as *D. Zeyheri*, Sonder, by Mr. Brown.

In November 1888 * Prof. Wittrock of Stockholm kindly sent over to the Kew herbarium the two sheets of type-specimens of *D. porrecta* in the Swartzian herbarium. An examination of these showed them to be identical with *D. Zeyheri*, Sonder. The flowers are indeed smaller than the usual size of those of *D. Zeyheri*, but in structure they agree. Sonder's name will therefore be reduced to a synonym of *D. porrecta*, Swartz.

So far as is known at present *D. ferruginea* is an exclusively western plant, the easternmost recorded limit being Swellendam, *Kennedy* 31; while *D. porrecta* is an eastern plant, the westernmost recorded limit being Long Kloof, near Groote River, *Burchell* 5014. The readiest character of difference is to be found in the spur, which in *D. ferruginea* tapers rapidly to a fine hair-like point, but in *D. porrecta* is longer and thicker and equally thick to nearly the apex. In the first the petals are acuminate, in the second obtuse and sometimes bidentate.

It may be useful to quote the following numbers occurring in the Kew Herbarium :—

D. ferruginea, Sw.: Burchell, 8199; Kennedy, 31; also the following, all distributed under the erroneous name *D. porrecta*— MacOwan, 2419; Bolus, 4764; Herb. Norm. Austr.-Afr., 165.

D. porrecta, Sw.: Burchell, 4693, 5014; MacOwan, 1478 and 1532; Bolus, 1298.

DISA MACRANTHA, *Sw. in Kongl. Vet. Acad. Handl.* vol. xxi. (1800), p. 210.

DISA BRACTEATA, *Sw. l. c.* p. 211.

DISA LACERA, *Sw. l. c.* p. 212.

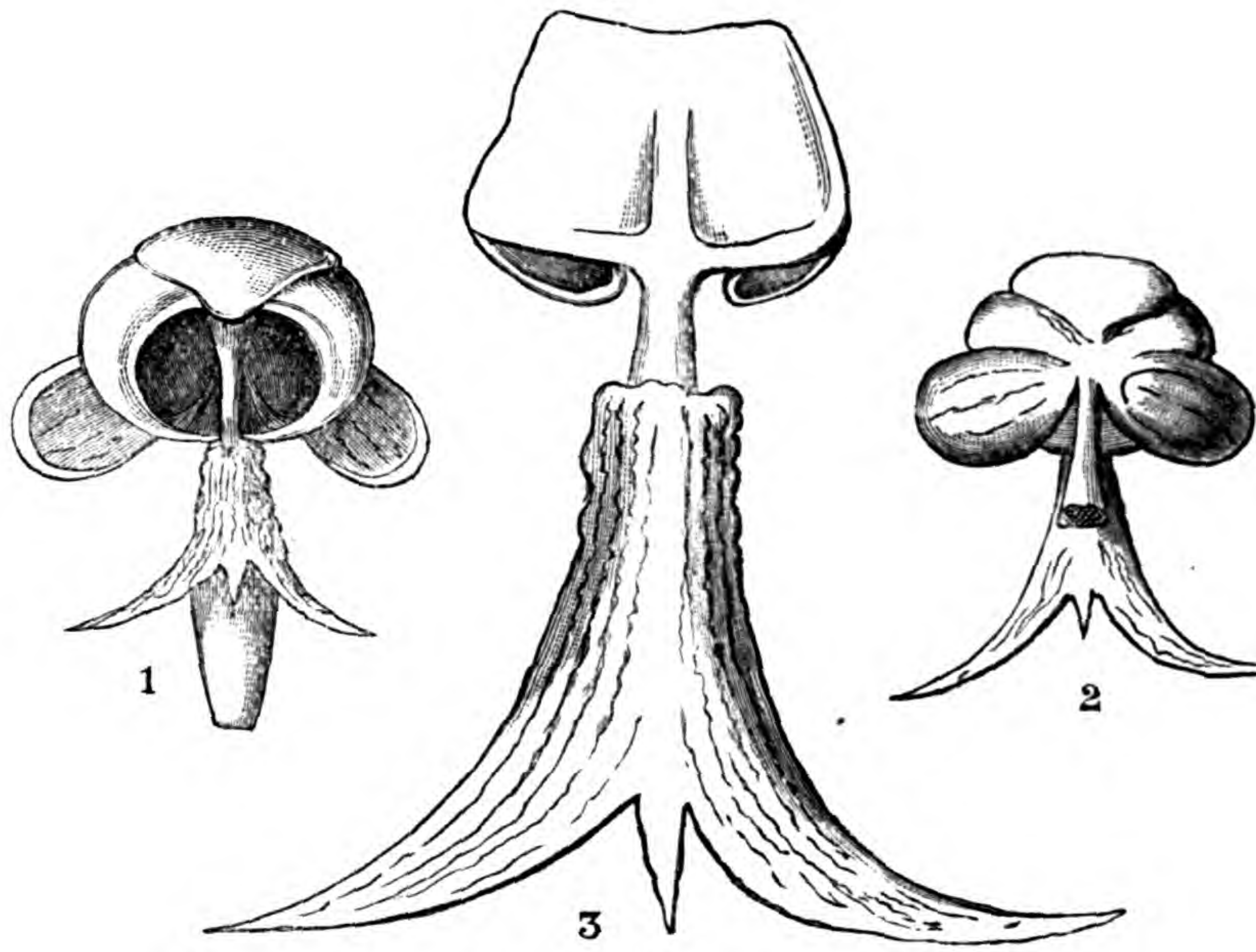
It is desirable to place upon record that, according to inquiries kindly answered by Prof. Wittrock of Stockholm, types of these plants do not exist in the herbarium of Swartz. As they are also absent in Thunberg's herbarium, it is to be feared that the means of certain identification no longer exist.

CORYCIUM TRICUSPIDATUM, *Bolus*, n. sp. (Fig. 13.) Herba glabra, erecta, 3·5 decim. alta, floribus exceptis siccitatione nigricans; caulis foliosus; folia plura, linearia, acuminata, laxa, ner-

* After my note on this subject in 'The Orchids of the Cape Peninsula' (1888), p. 173, had already been printed.

vata, 4–8 centim. longa; spica dense multiflora, bracteis lanceolatis acuminatissimis flores duplo superantibus; sepalum impar ovale, concavum, obtusum, subcarnosum; sepala lateralia parum majora, ovalia vel suborbicularia, valde concava, membranacea,

Fig. 13.



Corycium tricuspidatum, Bolus.
1. Flower, front view, magnified. 2. Flower viewed from behind, magnified.
3. Column and lip, front view, magnified 5 diameters.

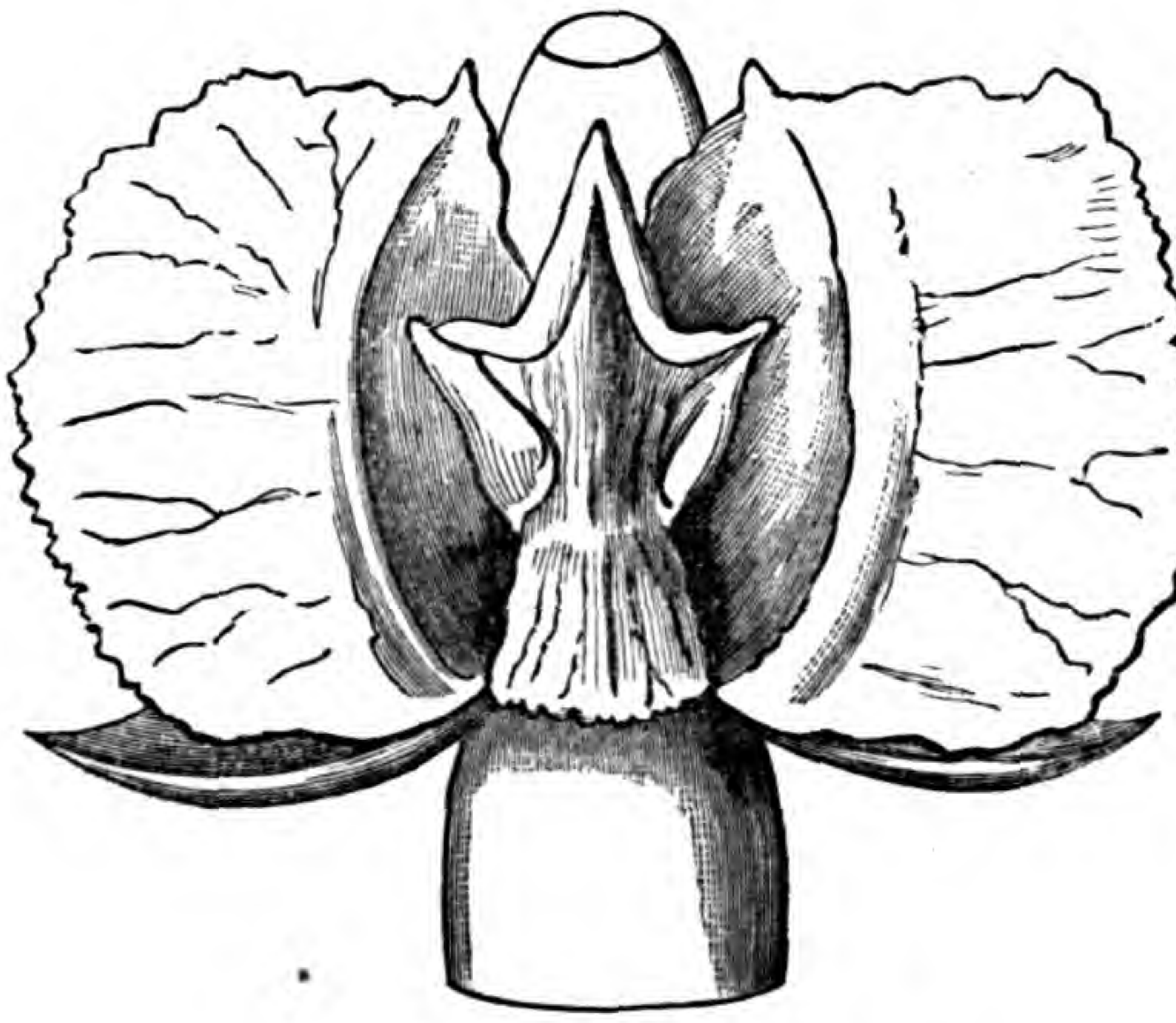
circa 3 millim. longa; petala oblique ovata, acuta, submembranacea; labellum e basi cuneata trilobatum, lobis lateribus longioribus gracilibus divaricato-curvatis, in cuspidas attenuatis, medio minore recto interjecto; appendice subnullo vel vix perspicuo. (*Ex exempl. unico exsicc. in herb. Kewensi.*)

Hab. In Coloniâ Capensi, ad Cradock, legit *T. Cooper* (anno 1861) No. 1321, *in herb. Kewensi.*

Very distinct by the shape of its lip, which is large for the genus and resembles no other species. The habit is somewhat like that of *C. nigrescens*, Sonder, but the flowers do not turn black in drying.

Pterygodium hastatum, *Bolus*, n. sp. (Fig. 14.) Herba glabra, erecta, gracilis, 15–30 centim. alta, facie *P. cruciferi*. Scapus debilis, subflexuosus; folia duo, inferum oblanceolatum, acutum, multinervatum, basi angustatum, erecto-patens, 5–10 centim. longum, 2–3 centim. latum, superum multoties minus; racemus laxe 6–8-florus, bracteis lanceolatis acuminatis ovaria æquantibus; flores expansi, circa 1·5 centim. lati; sepalum impar posticum, erectum, lanceolatum, concavum, obtusum, lateralia subconformia, acuminata, patentia, petala vix excedentia; petala subquadrato-rotundata concava, venosa, margine exteriore crenulato; labellum oblongum basi modice angustatum crenulatum

Fig. 14.



Pterygodium hastatum, Bolus.
Flower, front view, magnified 3 diameters.

venosum, circa 3 millim. longum, 2·5 millim. latum, appendice duplo majore cuneato apice hastato, carnoso, antice sacculis duobus transversis plicatis prædito; ovarium gracile, cum pedicello circa 1 centim. longum. (*Ex exempll. 3 exsicc. ut infra.*)

Hab. In Republicâ Austro-Africana "Orange Free State" dicta, leg. *T. Cooper* (anno 1862) No. 1090, *in herb. Kew.*

In habit and appearance this comes near *P. cruciferum* and *P. acutifolium*; but the structure of the lip and petals is different from either.

PTERYGODIUM RUBIGINOSUM, *Sonder, ex Drège in Linnæa*, xx. (1847), p. 220 (nomen); *Bolus, in Journ. Linn. Soc.* (*Bot.*) xx. p. 486.—In descriptione error gravis corrigendus est:—Labellum triangulari-hastatum, nec "semiorbiculare hastatum," ut monuit amiciss. N. E. Brown, in notula adjuncta (*loc. cit.*).

This species being rare, I take the opportunity of adding a locality recently discovered:—

Hab. In clivis humidis, Jonkershoek, prope Stellenbosch, alt. metr. 1250, Jan. (anno 1888), legit *Dr. R. Marloth*, No. 1853, *in herb. meo.*—The collector describes the flowers as "purpureo-cœrulei."

Revised List of published Species of Orchideæ indigenous in Extra-tropical South Africa.

The following list is a revision, with additions and alterations, of that which the Society did me the honour to publish in its Journal for 1882, vol. xix. pp. 335–347.

Our knowledge of South-African Orchids has been considerably extended in the interval which has elapsed; and many new species, besides additional genera, have been added to the Flora of the Region here treated of.

The extrication of the synonymy, owing to the many old species in the herbaria of Thunberg and Swartz, has been a difficult task. For aid in this I am greatly indebted to Mr. N. E. Brown, A.L.S., of the staff of the Royal Herbarium, Kew, the results of whose scrupulously careful comparison of Thunberg's Orchids (not yet published) have been most generously placed at my disposal, and without which this part of my work could not have been completed. A few doubtful points, owing to the non-existence of types in the herbaria named, are still unavoidably left.

In the present list I have made an attempt to add, roughly, the distribution of the species as a contribution to phyto-geography, and an aid and guide to South-African students and collectors. The results are tabulated in the subjoined summary (Table, p. 210).

These show that the South-Western is inferior to the South-Eastern Region in respect of number of species, having 168 and 182 respectively; while the Karroo Region has only 3.

The tribes, however, are divided in very different proportions: the Epidendreæ, Vandeæ, and Neottieæ largely predominating in the east, while the Ophrydeæ are in excess in the west. Taking the first three tribes together, there are 17 species in the south-west against 64 in the south-east, 5 species being common to both. Of the Ophrydeæ there are recorded 151 species in the south-west against 118 in the south-east, 25 species being common to both. These figures confirm the known affinity of the Flora of the South-Eastern Region with that of Tropical Africa and India, and agree with the marked separation of the South-Western Flora in so many other elements from its neighbouring Region. The great Orchid centre of the latter is now known with tolerable certainty to be the Cape Peninsula, the extreme south-western corner of the continent, where, in a little tract of country 197 square miles in extent, 102 species of Orchideæ, all terrestrial, have been recorded*.

The paucity of Orchids in the excessively arid Karroo Region is not surprising. Of the three species recorded, *Habenaria arenaria* extends also to the South-Eastern Region; while *Holothrix parviflora* and *Corycium bicuspidatum* are, so far as is yet known, confined to the Karroo Region. On the mountains near Graaff Reinet at 4600 feet, *Holothrix villosa* has indeed been found; and on the Kaus Mountains of Namaqualand, *Satyrium erectum*, *Disperis purpurata*, and *Pterygodium Volucris* (besides a *Holothrix* undetermined). But these stations, though situate in or near the Karroo Region, are rather, by reason of their altitude and different climate, outliers from the neighbouring Regions; and it would be misleading to regard them as belonging to the Karroo.

The species are arranged in each genus, and in each section of a genus (where the genera are so divided), in the chronological order of their publication.

A note of interrogation placed before the number signifies doubt as to the existence of the species within our limits. A similar note placed after the number and before the name, signifies doubt as to the location of a species in the section of a genus where it is placed.

The terms Western, South-Western, South, and South-Eastern districts signify those districts of the Cape Colony proper, and refer chiefly to the coast country within 100 miles (and for the most part within 50 miles) of the sea.

Tribe EPIDENDREÆ.

Subtribe LIPARIDEÆ.

I. LIPARIS, *L. C. Rich.*, *in Mém. Mus. Hist. Nat.* iv. (1818), 52; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 495. (Sturmia, *Reichb. f.*)

1. L. CAPENSIS, *Lindl.*, *in Ann. Nat. Hist.* ii. (1840), 314; *Bolus, Orch. Cape Penins.* (1888), 103, tab. 22. f. 1–3, anal. —Western districts.

Sturmia capensis, *Sond.*, *in Linnæa*, xix. (1847), 71.

* *Cf.* "Orchids of the Cape Peninsula," by the writer, in the 'Transactions of the South-African Philosophical Society,' vol. v. part 1 (1888).

2. LIPARIS BOWKERI, *Harv., Thesaur. Cap.* ii. (1863), 6, t. 109. —Natal.

3. L. GERRARDI, *Reichb. f., in Flora* (1867), 118.—Natal.

?4. L. POLYCARDIA, *Reichb. f., in Flora* (1885), 543.—"S.E. Africa."

Subtribe DENDROBIEÆ.

II. BULBOPHYLLUM, *Thouars, Orchid. Iles Afriques* (1822), tab. syst. 3, et ic. t. 93–97, 99–110; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 501.

(Bolbophyllum, *Spreng., Syst. Veg.* iii. (1826), 681; Gersinia, *Neraud, in Gaud. Bot. Freycin. Voy.* (1826), 27; Diphyes, *Blume, Bijdr.* (1826), 310, t. 66; Tribrachium, *Lindl., Collect. Bot.* (1821), t. 41; Anisopetalon, *Hook., Exot. Fl.* (1825), t. 149; Megaclinium, *Lindl., in Bot. Reg.* (1826), t. 989; *Gen. Sp. Orch.* (1830), 47.)

1. B. SANDERSONI, *Reichb. f., in Flora* (1878), 78.—Natal.
Megaclinium Sandersoni, *Oliver, in Bot. Mag.* (1871), sub t. 5936 (name only).

2. B. SCABERULUM, *Bolus*.—Pondoland.
Megaclinium scaberulum, *Rolfe, in Gard. Chron.* ser. 3, iv. (1888), 6.

Subtribe CŒLOGYNEÆ.

III. CALANTHE, *R. Br., in Bot. Reg.* (1821), sub t. 578; *Benth. & Hook. f., in Gen. Plant.* iii. (1883), 520.

1. C. NATALENSIS, *Reichb. f., in Bonplandia* (1856), 322; *Bolus, in Journ. Linn. Soc. Bot.* xxii. (1885), 65.—Brit. Kaffraria to Natal.
C. sylvatica, *Lindl.*, var. natalensis, *Reichb. f., in Linnæa*, xix. (1847), 374.

Tribe VANDEÆ.

Subtribe EULOPHIEÆ.

IV. EULOPHIA, *R. Br., in Bot. Reg.* vii. (1821), sub t. 573; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 535.

(Orthochilus, *Hochst.*; Lissochilus, *R. Br.*; Cyrtopera, *Lindl.*)

1. E. TRISTIS, *Spreng., Syst. Veg.* iii. (1826), 720.—Cape to Grahamstown.

Satyrium triste, *Linn. f.*, *Suppl.* (1781), 402.
Limodorum triste, *Thunb.*, *Prodr. Plant. Cap.* (1794), 4.

2. Eulophia barbata, *Spreng.*, *Syst. Veg.* iii. (1826), 720.—Southern districts.

Serapias capensis, *Linn.*, *Mant.* (1771), 293.
Limodorum barbatum, *Thunb.*, *Prodr. Pl. Cap.* (1794), 4.
E. ovalis, *Lindl.*, *Comp. Bot. Mag.* ii. (1836), 202.

3. E. aculeata, *Spreng.*, *Syst. Veg.* iii. (1826), 720.—Western districts.

Satyrium capense, *Linn.*, *Amœn. Acad.* vi. (1763), 110; *Sp. Plant.* 1339.
Satyrium aculeatum, *Linn. f.*, *Suppl.* (1781), 402.
S. pedicellatum, *Linn. f.*, *Suppl.* (1781), 402.
Serapias aculeata, *Thunb.*, *Prodr.* (1794), 3.
Serapias pedicellata, *Thunb.*, *Prodr.* (1794), 3.
Cymbidium aculeatum, *Sw.*, *in Schrad. Journ.* ii. (1799), 225.
C. pedicellatum, *Sw.*, *l. c.* 224.
Cyrtopera pedicellata, *Lindl.*, *Gen. & Sp. Orch.* (1833), 190.
Cymbidium plicatum, *Harv.*, *in Comp. Bot. Mag.* ii. (1836), 203; *Hook. Icon. Plant.* t. 104.
Eulophia odontoglossa, *Reichb. f.*, *in Linnæa*, xix. (1847), 373, xx. 684; (ex *Reichb. f.*, *in Flora* (1883), 463).
Eulophia plicata, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xix. (1882), 336 (excl. syn. in part).

4. E. hians, *Spreng.*, *Syst. Veg.* iii. (1826), 720.—S.-Eastern to Natal.

Limodorum hians, *Thunb.*, *Prodr. Plant. Cap.* (1794), 3; *Flor. Cap.* (1823), 30.

(*Satyrium hians*, Linn. f., Suppl. 401, quoted by Swartz (in Kongl. Vet. Acad. Handl. 243) as a synonym of the last named, is, according to the specimen in the Linnean herbarium, a species of *Disa*, perhaps *D. lacera*, Sw., as Lindley thought (Gen. & Sp. Orch. 354). But it does not follow that *E. hians* of Sprengel should be expunged from the system (as Lindley maintained in Comp. Bot. Mag. ii. (1836), 202), since Sprengel based his description on Thunberg's plant, and not on Linnæus's; and, on the authority of Mr. N. E. Brown, it undoubtedly agrees with *Limodorum hians* in Thunberg's herbarium, and is a *Eulophia*.)

E. clavicornis, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 202.
E. emarginata, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 202.

5. EULOPHIA STREPTOPETALA, *Lindl.*, *Bot. Reg.* xii. (1826), t. 1002; *Bot. Mag.* t. 2931.—Uitenhage, Somerset, &c.
Lissochilus streptopetalus, *Lindl.*, *Gen. & Sp. Orch.* (1833), 191.
L. parviflorus, *Lindl.*, *Gen. & Sp. Orch.* (1833), 191.

6. E. ENSATA, *Lindl.*, *Bot. Reg.* (1828), t. 1147.—South-Eastern.

7. E. LAMELLATA, *Lindl.*, *Gen. & Sp. Orch.* (1833), 184; *Bolus, Orch. Cape Penins.* (1888), tab. 22. figs. 4–7, anal.—South-Western.

8. E. MICRANTHA, *Lindl.*, *Gen. & Sp. Orch.* (1833), 184.—South-Eastern.

9. E. PARVILABRIS, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 201.—Kaffraria.

10. E. COCHLEARIS, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 202, not of *Steudel.*—South-Western.

11. E. DREGEANA, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 202.—South-Eastern.

12. E. PLATYPETALA, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 202.—Swellendam and Uitenhage.

13. E. LISSOCHILOIDES, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 203.—Swellendam.

14. E. FOLIOSA, *Bolus, in Journ. Linn. Soc., Bot.* xix. (1882), 337.—Kaffraria.
Cyrtopera foliosa, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 204.

15. E. SPHÆROCARPA, *Sond.*, *in Linnæa*, xix. (1847), 73.—Cape Town to Saldanha Bay.

16. E. ZEYHERIANA, *Sond.*, *in Linnæa*, xix. (1847), 73.—South-Eastern and Orange Free State.

17. E. COMOSA, *Sond.*, *in Linnæa*, xix. (1847), 72.—Caledon.

18. E. NUTANS, *Sond.*, *in Linnæa*, xix. (1847), 73.—Uitenhage to Katberg.

19. E. TENELLA, *Reichb. f.*, *in Linnæa*, xx. (1847), 681.—"Kleinfontein."

20. E. RUPESTRIS, *Reichb. f.*, *in Linnæa*, xx. (1847), 682.—"Paardekop."

21. E. MELEAGRIS, *Reichb. f.*, *in Linnæa*, xx. (1847), 683.—Kaga and Katberg.

22. E. VIOLACEA, *Reichb. f.*, *in Linnæa*, xx. (1847), 683.—"Douw Kamma."

23. EULOPHIA BICOLOR, *Reichb. f.*, *in Flora* (1865), 186.—Magaliesbergen?

24. E. CAFFRA, *Reichb. f.*, *in Flora* (1865), 186.—Zululand.

25. E. NATALENSIS, *Reichb. f.*, *in Flora* (1865), 186.—Natal.

26. E. LEONTOGLOSSA, *Reichb. f.*, *in Flora* (1881), 329.—Transvaal.

27. E. CARUNCULIFERA, *Reichb. f.*, *in Flora* (1881), 329.—Natal.

28. E. COOPERI, *Reichb. f.*, *in Flora* (1881), 330.—Orange Free State.

? 29. E. SCLEROPHYLLA, *Reichb. f.*, *in Flora* (1885), 542.—"S.E. Africa."

? 30. E. ALISMATOPHYLLA, *Reichb. f.*, *in Flora* (1885), 543.—"S.E. Africa."

31. E. TABULARIS, *Bolus* [*Orch. Cape Penins.* (1888), 108, tab. 1].—Western districts.
   Satyrium tabulare, *Linn. f.*, *Suppl.* (1781), 402.
   Serapias tabularis, *Thunb.*, *Prodr. Plant. Cap.* (1794), 3.
   Cymbidium tabulare, *Sw.*, *in Schrad. Journ.* (1799), 224; *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xx. (1884), 471.

32. E. USTULATA, *Bolus* [*Orch. Cape Penins.* (1888), 110, tab. 2].—Muizenberg Mt.
   Cymbidium ustulatum, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xx. (1884), 469.

33. E. SPECIOSA, *Bolus*.—South-Eastern districts.
   Satyrium giganteum, *Linn. f.*, *Suppl.* (1781), 402; *Murr. Syst. Veg.* ed. xiv. (1784), 1811.
   Limodorum giganteum, *Thunb. Prodr. Pl. Cap.* (1794), 4.
   Cymbidium giganteum, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 288; *Willd. Sp. Plant.* iv. (1805), 107; *Thunb. Flor. Cap.* 28.
   Lissochilus speciosus, *R. Br.*, *in Lindley Coll. Bot.* (1821), t. 31.

34. E. ÆQUALIS, *Bolus*.—Eastern districts.
   Lissochilus æqualis, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 204.

35. E. TUBERCULATA, *Bolus*.—Zuurbergen.
   Lissochilus platypetalus, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 204.

36. E. CLITELLIFER, *Bolus*.—S.-Eastern to Transvaal.
   Lissochilus clitellifer, *Reichb. f.*, *in Linnæa*, xx. (1847), 687.

37. Eulophia Krebsii, *Bolus*.—Natal, Transvaal.
Lissochilus Krebsii, *Reichb. f.*, *in Linnæa*, xx. (1847), 685; *Bot. Mag.* t. 5861.
Var. purpurata, *Bolus*. Lissochilus Krebsii, *Ridley*, *in Gard. Chron.* xxiv. (1885), 102; *Williams's Orchid Album*, vi. (1887), t. 259.

38. E. arenaria, *Bolus*.—Natal.
Lissochilus arenarius, *Lindl.*, *in Journ. Linn. Soc.* vi. (1862), 133.

39. E. porphyroglossa, *Bolus*.—Natal.
Lissochilus porphyroglossus, *Reichb. f.*, *Otia Bot. Hamb.* (1878), 61.
L. Sandersoni, *Reichb. f.*, *Otia Bot. Hamb.* (1878), 62.

40. E. Buchanani, *Bolus*.—Natal.
Lissochilus Buchanani, *Reichb. f.*, *Otia Bot. Hamb.* (1878), 64.

41. E. Oliveriana, *Bolus*.—Natal.
Cyrtopera Oliveriana, *Reichb. f.*, *in Flora* (1881), 329.

42. E. Reichenbachiana, *Bolus*.—Natal.
Cymbidium Buchanani, *Reichb. f.*, *in Flora* (1881), 329.

V. Ansellia, *Lindl.*, *Bot. Register*, 1844, sub t. 12, (1846) t. 30; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 537.

1. A. gigantea, *Reichb. f.*, *in Linnæa*, xx. (1847), 673.—Natal, Delagoa Bay.
A. africana, *Lindl.*, var. natalensis, *Hook. Bot. Mag.* t. 4965. fig. 3.
Cymbidium Sandersoni, *Harv.*, *Gen. S. Afr. Plants*, ed. 2 (1868), 360.
Var. citrina, *Reichb. f.* *in Wilson*, *Ref. Bot.* ii. t. 136.

VI. Grammangis, *Reichb. f.*, *Xenia Orchidacea*, ii. (1873), 17; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 537.

?1. G. pardalina, *Reichb. f.*, *in Flora* (1885), 541.—"S.E. Africa."

?2. G. falcigera, *Reichb. f.*, *in Flora* (1885), 541.—"S.E. Africa."

Subtribe Cymbidieæ.

VII. Polystachya, *Hook.*, *Exotic Flora*, ii. (1825), 103; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 540.

(Encyclia, *Poepp. & Endl. Nov. Gen. & Sp.* ii. 10; Epiphora, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 201.)

1. POLYSTACHYA GRANDIFLORA, *Lindl., Bot. Mag.* (1839), t.3707. —Natal.

Limodorum cucullatum, *Afzel., in Pers. Syn.* ii. (1807), 521; *Lindl., Gen. & Sp. Orch.* 185.

2. P. OTTONIANA, *Reichb. f., in Hamburger Garten-Zeitung*, xi. (1855), 249.—Uitenhage to Natal.

P. capensis, *Sond., in Harv. Thes. Cap.* ii. (1863), 51, t. 179.

3. P. PUBESCENS, *Reichb. f., in Walp. Ann.* vi. (1861), 643; *Bot. Mag.* t. 5586.—Uitenhage to Delagoa Bay.

Epiphora pubescens, *Lindl., in Comp. Bot. Mag.* ii. (1836), 101.

P. Lindleyana, *Harv., Thes. Cap.* ii. (1863), 50, t. 178.

4. P. GERRARDI, *Harv., Thes. Cap.* ii. (1863), 49, t. 176.—Natal.

5. P. SANDERSONI, *Harv., Thes. Cap.* ii. (1863), 49, t. 177.—Natal.

6. P. TRICRURIS, *Reichb. f., in Flora* (1867), 118.—Natal.

7. P. RIGIDULA, *Reichb. f., in Flora* (1867), 117.—Natal.

8. P. SIMILIS, *Reichb. f., Otia Bot. Hamb.* (1881), 112.—Natal.

VIII. ANGRÆCUM, *Thouars, Orchid. Iles Afriques* (1822), tab. syst. 2, *pro parte*; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 583.

1. A. ARCUATUM, *Lindl., in Comp. Bot. Mag.* ii. (1836), 204; *Harv., Thes. Cap.* (1863), t. 107.—Uitenhage to Natal.

2. A. BICAUDATUM, *Lindl., in Comp. Bot. Mag.* ii. (1836), 205; *Harv., Thes. Cap.* (1863), t. 108.—Uitenhage, Albany.

3. A. CONCHIFERUM, *Lindl., in Comp. Bot. Mag.* ii. (1836), 205. —George to Natal.

4. A. SACCIFERUM, *Lindl., in Comp. Bot. Mag.* ii. (1836), 205. —George, &c.

5. A. PUSILLUM, *Lindl., in Comp. Bot. Mag.* ii. (1836), 205.— George.

6. A. CHILOSCHISTÆ, *Reichb. f., in Linnæa*, xx. (1847), 678.— Natal.

7. A. MYSTACIDII, *Reichb. f., in Linnæa*, xx. (1847), 677.—Natal.

8. A. TRIDENTATUM, *Harv., Thes. Cap.* ii. (1863), 6.—Natal (*Sanderson*, 562).

9. A. BURCHELLII, *Reichb. f., in Flora* (1867), 117.—George (*Burchell*, 5841).

10. A. SAUNDERSIÆ, *Bolus, in Hook. Icones Plant.* (1888), t. 1728. —Natal.

11. A. TRICUSPE, *Bolus, suprà*, p. 163.—Natal.

IX. Mystacidium, *Lindl., in Comp. Bot. Mag.* ii. (1836), 205; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 584.

(Aeranthus, *Reichb. f., in Walp. Ann.* vi. (1861), 899, *pro parte, nec Lindley.*)

1. M. filicorne, *Lindl., in Comp. Bot. Mag.* ii. (1836), 206· *Harv. Thes. Cap.* t. 175.—Knysna to Natal.

Epidendrum capense, *Linn. f., Suppl.* (1781), 407.

Limodorum longicornu, *Thunb., Prodr. Pl. Cap.* (1794), 3; *Flor. Cap.* (1823), 28.

Eulophia longicornis, *Spreng., Syst. Veg.* iii. (1826), 720.

Angræcum capense, *Lindl., Gen. & Sp. Orch.* (1833), 248.

Aeranthus filicornis, *Reichb. f., Walp. Ann.* vi. (1861), 900.

2. M. pusillum, *Harv., Thes. Cap.* ii. (1863), 47, t. 173.—Natal.

Aeranthus pusillus, *Reichb. f., in Flora* (1867), 117.

3. M. gracile, *Harv., Thes. Cap.* ii. (1863), t. 174.—Queenstown to Natal.

Aeranthus gracilis, *Reichb. f., in Flora* (1867), 117.

4. M. Gerrardi, *Bolus.*—Natal.

Aeranthus Gerrardi, *Reichb. f., in Flora* (1867), 117.

?5. M. Meirax, *Bolus.*—"S.-Eastern Africa."

Aeranthus Meirax, *Reichb. f., in Flora* (1885), 540.

Tribe NEOTTIEÆ.

Subtribe Spirantheæ.

X. Platylepis, *A. Rich., Monogr. Orch. Iles de France et de Bourbon* (1828), 39, t. 6. f. 4.

(Notiophrys, *Lindl., in Journ. Linn. Soc.* i. (1857), 189, vi. (1862), 138; Diplogastra, *Reichb. f., in Flora* (1865), 183.)

1. P. glandulosa, *Reichb. f., in Linnæa*, xli. (1877), 62.—Natal.

Subtribe Arethuseæ.

XI. Pogonia, *Juss., Gen. Plant.* (1789), 65; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 615.

1. P. purpurata, *Reichb. f., in Flora* (1865), 184.—Transvaal (*Zeyher*, 1584).

Tribe OPHRYDEÆ.

Subtribe Habenarieæ.

XII. Herminium, *Linn., Gen. Plant.* ed. 1 (1737), 271; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 622.

1. HERMINIUM NATALENSE, *Reichb. f.*, *Otia Bot. Hamb.* fasc. 2 (1881), 108.—Natal.

XIII. STENOGLOTTIS, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 209; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 622.

1. S. FIMBRIATA, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 210; *Harv.*, *Thes. Cap.* i. (1869), t. 56.—Albany to Natal.

XIV. BARTHOLINA, *R. Br.*, *in Ait. Hort. Kew.* ed. 2, v. (1813), 194; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 623. (Lathrisia, *Sw.*, *Adnot. Bot.* (1829), 49.)

1. B. PECTINATA, *R. Br.*, *in Ait. Hort. Kew.* ed. 2, v. (1813), 194; *Bot. Reg.* xx. (1835), t. 1653; *Endl. Icon. Genera Plant.* (1838), t. 40.—Capetown to Grahamstown.

Orchis Burmanniana, *Linn.*, *Spec. Plant.* ed. 2 (1763), 1334.
Arethusa ciliaris, *Linn. f.*, *Suppl.* (1781), 405.
Orchis pectinata, *Thunb.*, *Prodr. Plant. Cap.* (1794), 4.
B. Burmanniana, *Ker*, *in Journ. Sci. R. Inst. Lond.* iv. (1818), 204, t. 5.

2. B. ETHELÆ, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xx. (1884), 472; [*Orch. Cape Penins.* (1888), 112, tab. 3].—Cape Peninsula.

XV. HUTTONÆA, *Harv.*, *Thes. Cap.* ii. (1863), 1, t. 101; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 623.

(Hallackia, *Harv.*, *Thes. Cap.* ii. (1863), 2, t. 102.)

1. H. PULCHRA, *Harv.*, *Thes. Cap.* ii. (1863), 1, t. 101; *Reichb. f.*, *in Flora* (1867), 115.—Eastern districts to Natal.

2. H. FIMBRIATA, *Reichb. f.*, *in Flora* (1867), 116.—Eastern districts to Natal.

Hallackia fimbriata, *Harv.*, *Thes. Cap.* ii. (1863), 2, t. 102.
Huttonæa Hallackii, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xix. (1882), 339.

XVI. HOLOTHRIX, *L. C. Rich.*, *in Mém. Mus. Hist. Nat.* iv. (1818), 55 (nomen); *Lindl.*, *Gen. & Sp. Orch.* (1835), 283; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 623.

(Saccidium, Monotris, Scopularia, Tryphia, *Lindl.*, *Gen. Sp. Orch.* (1835), pp. 301, 303, 333; Bucculina, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 209.)

1. H. PARVIFOLIA, *Lindl.*, *Gen. & Sp. Orch.* (1835), 283; *not of*

Hooker's, Icon. Plant. t. 103 B; [*Bolus, Orch. Cape Penins.* (1888), 115, tab. 24].—Cape Peninsula.

Habenaria hispida, *A. Spreng., Tentamen Supplementi ad Syst. Veg. Linn.* (1828), p. 27.

2. HOLOTHRIX EXILIS, *Lindl., Gen. & Sp. Orch.* (1835), 283.—Riversdale district.

3. H. SQUAMULOSA, *Lindl., in Comp. Bot. Mag.* ii. (1836), 206; [*Bolus, Orch. Cape Penins.* (1888), 114, tab. 23].—Western districts.

H. Harveiana, *Lindl., in Comp. Bot. Mag.* ii. (1836), 206; *Hook. Icon. Plant.* ii. (1837), t. 103 A.

4. H. VILLOSA, *Lindl., in Comp. Bot. Mag.* ii. (1836), 207.—Western districts.

5. H. GRACILIS, *Lindl., in Comp. Bot. Mag.* ii. (1836), 207.—Table Mountain.

6. H. INCURVA, *Lindl., in Comp. Bot. Mag.* ii. (1836), 207.—Katberg.

7. H. BRACHYLABRIS, *Sond., in Linnæa,* xix. (1847), 78.—Uitenhage, &c.

8. H. CONDENSATA, *Sond., in Linnæa,* xix. (1847), 76; [*Bolus, Orch. Cape Penins.* (1888), 115, tab. 22. figs. 8–11, analysis].—Western districts.

9. H. MUNDTII, *Sond., in Linnæa,* xix. (1847), 77.—Western districts.

10. H. SECUNDA, *Reichb. f., Otia Bot. Hamb.* fasc. 2 (1881), 119.—Clanwilliam.

Orchis secunda, *Thunb., Prodr. Plant. Cap.* (1794), 4.

Tryphia major, *Sond., in Linnæa,* xix. (1847), 82.

11. H. BURCHELLII, *Reichb. f., Otia Bot. Hamb.* (1881), 119.—South, S.E., and Midland districts.

Scopularia Burchellii, *Lindl., Gen. & Sp. Orch.* (1835), 303.

12. H. MONOTRIS, *Reichb. f., Otia Bot. Hamb.* (1881), 119.—Mossel Bay district.

Monotris secunda, *Lindl., Gen. & Sp. Orch.* (1835), 303.

13. H. PILOSA, *Reichb. f., Otia Bot. Hamb.* (1881), 119.—Swellendam (*Burchell*, 7483).

Saccidium pilosum, *Lindl., Gen. & Sp. Orch.* (1835), 301.

14. Holothrix Scopularia, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 119.—Witbergen.

Scopularia secunda, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 207.

15. H. aspera, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 119.—Western districts.

Bucculina aspera, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 209.

16. H. Lindleyana, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 119.—Uitenhage, &c.

Tryphia secunda, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 209; *Harvey*, *Thes. Cap.* ii. (1863), t. 105.

17. H. parviflora, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 119.—Zwanepoelspoort (Karroo).

Tryphia parviflora, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 209.

18. H. grandiflora, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 119.—Uitenhage.

Scopularia grandiflora, *Sond.*, *in Linnæa*, xix. (1847), 79.

19. H. orthoceras, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 119.—Uitenhage to Natal.

Tryphia orthoceras, *Harv.*, *Thes. Cap.* ii. (1863), 4, t. 105.

20. H. MacOwaniana, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 108.—Katberg.

21. H. multisecta, *Bolus*, *suprà*, p. 170.—S.-Eastern districts to Natal.

XVII. Habenaria, *Willd.*, *Spec. Plant.* iv. (1805), 44; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 624.

(Sieberia, *Spreng.*, *Anleit. Kenntn. Gew.* ii. (1802), 282.)

1. H. arenaria, *Lindl.*, *Gen. & Sp. Orch.* (1835), 317.—Graaff Reinet to Kaffraria.

Bonatea micrantha, *Lindl.*, *Gen. & Sp. Orch.* (1835), 329.

H. micrantha, *Reichb. f.*, *Flora* (1865), 180.

2. H. cornuta, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 208.—Kaffr., Natal, Transvaal.

3. H. tridens, *Lindl.*, *in Comp. Bot. Mag.* ii. (1836), 208.—Natal.

H. Gerrardi, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 97.

4. H. Dregeana, *Lindl.*, *in Ann. Nat. Hist.* iv. (1840), 314.—Kaffr. to Natal.

5. H. ciliosa, *Lindl.*, *in Ann. Nat. Hist.* iv. (1840), 314.—Natal.

6. H. lævigata, *Lindl.*, *in Ann. Nat. Hist.* iv. (1840), 315.—"Ruytersbosch" to Kaffraria.

H. ornithopoda, *Reichb. f.*, *in Linnæa*, xx. (1847), 696.

7. HABENARIA CASSIDEA, *Reichb. f., in Walp. Ann. Bot.* i. (1849), 797.—Somerset to Natal.

Bonatea cassidea, *Sond., in Linnæa*, xix. (1847), 81.

B. Darwinii, *Weale, in Journ. Linn. Soc.* x. (1869), 470.

8. H. DENSIFLORA, *Reichb. f., in Walp. Ann. Bot.* i. (1849), 797. —Kat River, &c.

Bonatea densiflora, *Sond., in Linnæa*, xix. (1847), 80.

9. H. BOLTONI, *Harv., Thes. Cap.* i. (1859), t. 88.—Kaffraria to Natal.

10. H. SAUNDERSIÆ, *Harv., Thes. Cap.* ii. (1863), t. 147.—Natal.

11. H. TETRAPETALA, *Reichb. f., in Flora* (1865), 180.—Knysna to Natal.

Bilabrella falcicornis, *Lindl., in Bot. Reg.* (1835), sub t. 1701.

Bonatea bilabrella, *Lindl., Gen. & Sp. Orch.* (1835), 328.

Bonatea tetrapetala, *Lindl., in Comp. Bot. Mag.* ii. (1836), 208.

H. falciformis, *Bolus, in Journ. Linn. Soc., Bot.* xix. (1882), 340.

H. tetramera, *Bolus, in Journ. Linn. Soc., Bot.* xix. (1882), 340.

12. H. CLAVATA, *Reichb. f., in Flora* (1865), 180.—Kaffraria to Natal.

Bonatea clavata, *Lindl., in Comp. Bot. Mag.* ii. (1836), 208.

13. H. FOLIOSA, *Reichb. f., in Flora* (1865), 180.—Uitenhage to Natal.

Orchis foliosa, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 206.

Bonatea foliosa, *Lindl., Gen. & Sp. Orch.* (1835), 329.

14. H. DIVES, *Reichb. f., in Flora* (1867), 117.—Kaffraria to Natal.

15. H. NATALENSIS, *Reichb. f., Otia Bot. Hamb.* (1881), 97.—Natal.

16. H. POLYPODANTHA, *Reichb. f., Otia Bot. Hamb.* (1881), 97. —Natal.

17. H. MALACOPHYLLA, *Reichb. f., Otia Bot. Hamb.* (1881), 97. —Kaffraria.

18. H. ORANGANA, *Reichb. f., Otia Bot. Hamb.* (1881), 101.—Orange Free State.

19. H. BONATEA, *Reichb. f., Otia Bot. Hamb.* (1881), 101, in description of *H. Steudneri*.—Mossel Bay to Natal.

Orchis speciosa, *Linn. f.*, *Suppl.* (1781), 401; *Thunb.*, *Flor. Cap.* (1823), 27.

Bonatea speciosa, *Willd.*, *Spec. Plant.* iv. (1805), 43: *Bot. Mag.* t. 2926; *Lodd. Cab.* t. 284.

H. robusta, *N. E. Brown, in Gard. Chron.* xxiv. (1885), 307.

20. HABENARIA TENUIOR, *N. E. Br., in Gard. Chron.* xxiv. (1885), 307.—Natal and Transvaal.

Brachycorythis tenuior, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 104.

21. H. MACOWANIANA, *N. E. Br., in Gard. Chron.* 1889, vol. v. p. 168.—Grahamstown.

Brachycorythis MacOwaniana, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 104.

22. H. ANGUICEPS, *Bolus, suprà*, p. 164.—Van Studen's River to Grahamstown.

23. H. INVOLUTA, *Bolus, suprà*, p. 165.—Natal.

24. H. TYSONI, *Bolus, suprà*, p. 166.—Griqualand East to Natal.

25. H. PORRECTA, *Bolus, suprà*, p. 167.—Natal.

26. H. REHMANNI, *Bolus, suprà*, p. 169.—Transvaal (extra-tropical).

XVIII. CYNORCHIS, *Thouars, Orch. Iles Afr.* in tab. synopt. et tab. 13.

(A species of this genus was detected in Natal by the late Mr. John Sanderson, and drawn by him, but has not yet been published.)

Subtribe DISEÆ.

XIX. SATYRIUM, *Sw., in Kongl. Vet. Acad. Nya Handl.* xxi. (1800), 214, *nec Linn.*; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 629.

(Diplecthrum, *Pers.*, *Syn. Plant.* ii. (1807), 508; Satyridium, *Lindl.*, *Gen. & Sp. Orch.* (1838), 345; Aviceps, *Lindl.*, *Gen. & Sp. Orch.* (1838), 345.)

Subgenus 1. EUSATYRIUM.

§ 1. *Calcaratæ.*

* Humistratæ.

1. S. BICORNE, *Thunb.*, *Prodr. Capens.* (1794), 6.—Capetown to Caledon.

Orchis lutea, *Buxbaum, Cent.* iii. (1729), 6, t. 8.
O. bicornis, *Linn., Amœn. Acad.* vi. (1764), 109.
S. cucullatum, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 216; *Thunb., Flor. Cap.* (1823), 17; *Bot. Reg.* t. 416; *Andrews, Bot. Repos.* t. 315.

2. SATYRIUM MEMBRANACEUM, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 216.—Port Elizabeth to Kaffraria.

3. S. ERECTUM, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1880), 216, *nec Lindl.*—Stellenbosch to Namaqualand.
S. pustulatum, *Lindl., Bot. Reg.* (1840), t. 18.
S. papillosum, *Lindl., Gen. & Sp. Orch.* (1838), 341.

4. S. CARNEUM, *R. Br., in Ait. Hort. Kew.* ed. 2, v. (1813), 196; *Bot. Mag.* t. 1512 (poor figure).—Cape Peninsula.

5. S. MACULATUM, *Burch., in Lindl. Gen. & Sp. Orch.* (1838), 337.—Stellenbosch to Uitenhage.
S. longicolle, *Lindl., Gen. & Sp. Orch.* (1838), 335.

6. S. ACUMINATUM, *Lindl., Gen. & Sp. Orch.* (1838), 339.—Swellendam to Amatola Mts.

7. S. HUMILE, *Lindl., Gen. & Sp. Orch.* (1838), 339.—Du Toit's Kloof.

8. S. OCHROLEUCUM, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 66; [*Orch. Cape Penins.* (1888), 123, tab. 26].—S.-Western districts.
Orchis bicornis, *Jacq., Hort. Schönbr.* ii. (1797), t. 179, *non Linn.*

9. S. EMARCIDUM, *Bolus, in Journ. Linn. Soc.* xxii. (1885), 67; *Orch. Cape Penins.* (1888), 121, tab. 27.—Cape Peninsula.

10. S. PRINCEPS, *Bolus, in Hook. Icones Plant.* xviii. (1888), t. 1729.—Port Elizabeth.

** Adscendentes.

11. S. CORIIFOLIUM, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 216; *Bot. Mag.* t. 2172; *Bot. Reg.* t. 703.—Capetown to Knysna.
Orchis lutea, *Buxbaum, Cent.* iii. (1729), 7, t. 10.
O. bicornis, *Linn., Spec. Plant.* ed. 2 (1763), 1330, *non Jacq.*
S. cucullatum, *Lindl., in Lodd. Bot. Cab.* (1818), t. 104.
S. erectum, *Lindl., Gen. & Sp. Orch.* (1838), 340, *non Sw.*
S. chrysostachyum, *Herschel, in Bot. Reg.* (1838), sub t. 154.

12. SATYRIUM PARVIFLORUM, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 216.—Paarl, Knysna, &c.
 S. densiflorum, *Lindl., Gen. & Sp. Orch.* (1838), 340.
 S. cassideum, *Lindl., Gen. & Sp. Orch.* (1838), 341.

13. S. FOLIOSUM, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 216; *Thunb., Flor. Cap.* ed. *Schult.* (1823), 18, *non Lindl.* —Table Mt.

14. S. STENOPETALUM, *Lindl., in Gen. & Sp. Orch.* (1838), 336. —Riversdale distr.

15. S. SPHÆROCARPUM, *Lindl., Gen. & Sp. Orch.* (1838), 337.—Natal and Delagoa Bay.
 S. militare, *Lindl., Gen. & Sp. Orch.* (1838), 342.

16. S. LONGICAUDA, *Lindl., Gen. & Sp. Orch.* (1838), 337.—Katberg, &c.

17. S. MACROPHYLLUM, *Lindl., Gen. & Sp. Orch.* (1838), 338.—Kaffraria to Natal.

18. S. LUPULINUM, *Lindl., Gen. & Sp. Orch.* (1838), 338.—Capetown to Port Elizabeth.

19. S. CANDIDUM, *Lindl., Bot. Reg.* (1838), *Misc.* No. 153.—Western and S.W. districts.
 S. utriculatum, *Sond., in Linnæa*, xix. (1847), 84.

20. S. LIGULATUM, *Lindl., Gen. & Sp. Orch.* (1838), 342; [*Bolus, Orch. Cape Penins.* (1888), 122, tab. 28].—Capetown to Grahamstown.

21. S. ERIOSTOMUM, *Lindl., Gen. & Sp. Orch.* (1838), 342.—S.-East. districts to Natal and Transvaal.
 S. lydenburgense, *Reichb. f., in Flora* (1881), 328.

22. S. CRISTATUM, *Sond., in Linnæa*, xix. (1847), 84.—Katberg, Kaffraria, &c.

23. S. ODORUM, *Sond., in Linnæa*, xix. (1847), 86.—Cape Peninsula.

24. S. ATHERSTONEI, *Reichb. f., in Flora* (1881), 328.—Transvaal.

25. S. MARGINATUM, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 476.—S.-West. distr.

26. S. HALLACKII, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 476; *Orch. Cape Penins.* (1888), 128, tab. 29.—C. Peninsula to Port Elizabeth.
 S. foliosum, *Lindl., Gen. & Sp. Orch.* (1838), 336, *not of Swartz.*

§ 2. *Saccatæ.*

27. SATYRIUM PUMILUM, *Thunb., Prodr. Plant. Cap.* (1794), 6.—Piquetberg and Worcester.

Aviceps pumila, *Lindl., Gen. & Sp. Orch.* (1838), 346.

28. S. STRIATUM, *Thunb., Prodr. Plant. Cap.* (1794), 6; [*Bolus, Orch. Cape Penins.* (1888), 132, tab. 33].—C. Peninsula to Piquetberg.

29. S. BICALLOSUM, *Thunb., Prodr. Plant. Cap.* (1794), 6; *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 216; [*Bolus, Orch. Cape Penins.* (1888), 128, tab. 31].—S.-West. districts.

30 S. BRACTEATUM, *Thunb., Prodr. Plant. Cap.* (1794), 6; *Flor. Cap.* ed. *Schult.* (1823), 18, *non Lindl.*; [*Bolus, Orch. Cape Penins.* (1888), 130, tab. 32].—S.-West. districts.

Ophrys bracteata, *Linn. f., Suppl.* (1781), 403.

S. lineatum, *Lindl., Gen. & Sp. Orch.* (1838), 343.

S. striatum, *Ker, in Journ. Sci. R. Inst. Lond.* viii. (1820), 221, t. 3. f. 3, *non Thunb.*

S. pictum, *Lindl., Gen. & Sp. Orch.* (1838), 344.

31. S. RETUSUM, *Lindl., Gen. & Sp. Orch.* (1838), 343.—Knysna, Port Elizabeth, &c.

32. S. CORDIFOLIUM, *Lindl., Gen. & Sp. Orch.* (1838), 344.—Katberg, Kaffraria, &c.

33. S. MUTICUM, *Lindl., Gen. & Sp. Orch.* (1838), 344.—Riversdale distr.

34. S. PYGMÆUM, *Sond., in Linnæa*, xix. (1847), 86.—Tulbagh distr.

35. S. SAXICOLUM, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 474; [*Orch. Cape Penins.* (1888), 131, tab. 4].—Cape Peninsula.

36. S. LINDLEYANUM, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 474; [*Orch. Cape Penins.* (1888), 130, tab. 30].—S.-Western distr.

37. S. DEBILE, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 67.—Tulbagh district.

Subgenus 2. SATYRIDIUM, *Lindley, Gen. & Sp. Orch.* (1838), 345 (genus).

38. S. RHYNCHANTHUM, *Bolus, in Journ. Linn. Soc., Bot.* xix. (1882), 342; [*Orch. Cape Penins.* (1888), 133, tab. 25].—S.-Western districts.

Satyridium rostratum, *Lindl., Gen. & Sp. Orch.* (1838), 345; *Harv., Thes. Cap.* i. (1859), 55, t. 87.

XX. PACHITES, *Lindl., Gen. & Sp. Orch.* (1838), 301 ; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 629.

1. P. APPRESSA, *Lindl., Gen. & Sp. Orch.* (1838), 301.—Summit of Swellendam Mt. (15 January, 1815, *Burchell*, 7356).

XXI. DISA, *Berg., Descr. Plant. Cap. B. Spei* (1767), 348 ; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 630.

(Monadenia, *Lindl., Gen. & Sp. Orch.* (1838), 356 ; Schizodium, *ib.*, 358 ; Penthea, *pro parte, ib.*, 360 ; Herschelia, *ib.*, 362.)

§ 1. *Monadenia*, Lindl. (genus).

1. D. RUFESCENS, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 210.—Cape Peninsula.
Monadenia macrocera, *Lindl., Gen. & Sp. Orch.* (1838), 358.
M. leptostachya, *Sond., in Linnæa*, xix. (1847), 101.

2. D. CERNUA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 211. S.-West. and S. districts.
D. prasinata, *Ker, Bot. Reg.* iii. (1817), t. 210.
Monadenia prasinata, *Lindl., Gen. & Sp. Orch.* (1838), 358.
M. inflata, *Sond., in Linnæa*, xix. (1847), 102.

3. ? D. BRACTEATA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 211.—Western districts? (Station unknown.) [Cf. *Bolus, Orch. Cape Penins.* (1888), p. 154.]

4. D. RETICULATA, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1884), 73; [*Orch. Cape Penins.* (1888), 143, tab. 16].—Cape Peninsula.

5. D. AFFINIS, *N. E. Brown, in Gard. Chron.* xxiv. (1885), 402. —S.-Western distr.
Monadenia rufescens, *Lindl., Gen. & Sp. Orch.* (1838), 356, excluding synonyms.
M. comosa, *Reichb. f., in Linnæa*, xx. (1847), 687.

6. D. PYGMÆA, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 72 ; [*Orch. Cape Penins.* (1888), 140, tab. 17].—Cape Peninsula.

7. D. OPHRYDEA, *Bolus.*—S.-Western districts.
Monadenia ophrydea, *Lindl., Gen. & Sp. Orch.* (1838), 358.
M. lancifolia, *Sond., in Linnæa*, xix. (1847), 100.

8. D. MICRANTHA, *Bolus.*—Western distr. to Port Elizabeth.
Monadenia micrantha, *Lindl., Gen. & Sp. Orch.* (1838), 357.

9. D. BREVICORNIS, *Bolus.*—S.-East. distr. to Natal.
Monadenia brevicornis, *Lindl., Gen. & Sp. Orch.* (1838), 357.

10. D. MULTIFLORA, *Bolus.*—Cape Peninsula.
Monadenia multiflora, *Sond., in Linnæa*, xix. (1847), 101.

11. DISA DENSIFLORA, *Bolus*.—Paarl, &c.
Monadenia densiflora, *Lindl.*, *Gen. & Sp. Orch.* (1838), 357.

12. D. MACROSTACHYA, *Bolus*.—Khamiesbergen.
Monadenia macrostachya, *Lindl.*, *Gen. & Sp. Orch.* (1838), 357.

§ 2. *Eudisa*, Bolus [in Orch. Cape Penins. 1888, p. 137].

13. D. UNIFLORA, *Berg.*, *Descr. Plant. Cap. B. Spei* (1767), 348, t. 4. fig. 7.—Cape Peninsula; Cold Bokkeveld; Cederbergen.
D. grandiflora, *Linn. f.*, *Suppl.* (1781), 406; *Thunb.*, *Flor. Cap.* (ed. 1823), 7; *Ker*, *in Journ. Sci. R. Inst. Lond.* iv. (1818), t. 5. f. 1; *Bot. Reg.* (1825), t. 926; *Lindl.*, *Sertum Orchid.* (1838), t. 49; *Bot. Mag.* t. 4073; *Flore des Serres*, ii. t. 160; *R. Trimen*, *in Journ. Linn. Soc.* vii. (1863), 144.

14. D. LONGICORNU, *Linn. f.*, *Suppl.* (1781), 406; *Lam. Encycl.* t. 727. f. 2 (bad figure); [*Bolus*, *Orch. Cape Penins.* (1888), 145, tab. 6].—Table Mt.

15. D. MACULATA, *Linn. f.*, *Suppl.* (1781), 407; *Bolus*, *in Journ. Linn. Soc.* xx. (1884), 478; [*id.*, *Orch. Cape Penins.* (1888), 146, tab. 7].—S.-West. districts.
Schizodium maculatum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 360.

16. D. CORNUTA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 210; *Bot. Mag.* t. 4091.—Capetown to Grahamstown.
Orchis cornuta, *Linn.*, *Spec. Plant.* ed. 2 (1763), 1330.
Satyrium cornutum, *Thunb.*, *Prodr. Plant. Cap.* (1794), 5.

17. D. PHYSODES, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 211.—Malmesbury, &c.
Monadenia physodes, *Reichb. f.*, *in Flora* (1883), 461.

18. D. CHRYSOSTACHYA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 211.—George to Albany.
D. gracilis, *Lindl.*, *Gen. & Sp. Orch.* (1838), 348.

19. D. TENELLA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 212.—S.-Western districts.
Orchis tenella, *Linn. f.*, *Suppl.* (1781), 400.
Satyrium tenellum, *Thunb.*, *Prodr. Plant. Cap.* (1794), 5.

20. D. CYLINDRICA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 213.—Cape Peninsula.
Satyrium cylindricum, *Thunb.*, *Prodr. Plant. Cap.* (1794), 5.

21. Disa crassicornis, *Lindl.*, *Gen. & Sp. Orch.* (1838), 348.—Witbergen and Natal.

D. megaceras, *Hook. f.*, *Bot. Mag.* t. 6529.

22. D. polygonoides, *Lindl.*, *Gen. & Sp. Orch.* (1838), 349; *Bot. Mag.* t. 6532.—Uitenhage to Natal.

D. natalensis, *Lindl.*, *in Hook. Lond. Journ. Bot.* i. (1842), 16.

23. D. longifolia, *Lindl.*, *Gen. & Sp. Orch.* (1838), 349; Piquetberg, Hex River, &c.

24. D. caulescens, *Lindl.*, *Gen. & Sp. Orch.* (1838), 351.—S. and S.W. districts.

25. D. brachyceras, *Lindl.*, *Gen. & Sp. Orch.* (1838), 355.—Caledon.

26. D. obtusa, *Lindl.*, *Gen. & Sp. Orch.* (1838), 355; [*Bolus, Orch. Cape Penins.* (1888), 153, tab. 34].—S.W. districts.

27. D. montana, *Sond.*, *in Linnæa*, xix. (1847), 90.—Winterberg, &c.

28. D. stricta, *Sond.*, *in Linnæa*, xix. (1847), 91.—S.E. distr. and Kaffraria.

29. D. aconitoides, *Sond.*, *in Linnæa*, xix. (1847), 91; *Harv.*, *Thes. Cap.* t. 41.—Uitenhage to Natal.

30. D. sanguinea, *Sond.*, *in Linnæa*, xix. (1847), 97.—S.E. distr. and Kaffraria.

D. Huttonii, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 105.

31. D. tabularis, *Sond.*, *in Linnæa*, xix. (1847), 99; [*Bolus, Orch. Cape Penins.* (1888), 152, tab. 15].—Table Mt., Cape.

32. D. picta, *Sond.*, *in Linnæa*, xix. (1847), 99.—Caledon and Swellendam.

33. D. neglecta, *Sond.*, *in Linnæa*, xix. (1847), 100.—Tulbagh.

34. D. Cooperi, *Reichb. f.*, *in Flora* (1881), 328.—Kaffr., Natal, and Orange Free State.

35. D. extinctoria, *Reichb. f.*, *in Flora* (1881), 328.—Lydenburg.

36. D. stachyoides, *Reichb. f.*, *in Flora* (1881), 328.—Kaffraria, Natal.

D. hemisphærophora, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 106.

37. D. MacOwani, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 106.—S.E. distr., Kaffr., Natal.

38. D. cephalotes, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 106.—Somerset E. to Natal.

39. D. læta, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 106.—Natal.

40. DISA OCELLATA, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 477; [*Orch. Cape Penins.* (1888), 148, tab. 5].—Table Mt., Cape.

D. maculata, *Harv., in Hook. Lond. Journ. Bot.* i. (1842), 15, *not of Linnæus f.*

41. D. UNCINATA, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 478.—Tulbagh distr.

42. D. ÆMULA, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 69.—Cape and Malmesbury distr.

43. D. TENUICORNIS, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 68; [*Orch. Cape Penins.* (1888), 151, tab. 14].—Table Mt., Cape.

44. D. SCULLYI, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 70. —Katberg to Kaffraria.

45. D. LINEATA, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 74; [*Orch. Cape Penins.* (1888), 154, tab. 18].—Cape Peninsula.

46. D. OLIVERIANA, *Reichb. f., in Flora* (1886), 547.—Station not recorded.

47. D. TRIPETALOIDES, *N. E. Br., in Gard. Chron.* ser. III. v. (1889), 360.—Stellenbosch distr. to Natal.

Orchis tripetaloides, *Linn. f., Suppl.* (1781), 398.

(Disa excelsa, *sheets β, δ, and ε of Thunberg's Herb.*)

D. venosa, *Lindl., Gen. & Sp. Orch.* (1838), 351, *not of Swartz.*

(=*Burchell* 6123, 7409! *Zeyher* 3916! *MacOwan* 1095! *Bolus* 4209! *J. M. Wood* 1981!)

48. D. OREOPHILA, *Bolus, suprà*, p. 170.—Griqualand East to Natal.

49. D. CAFFRA, *Bolus, suprà*, p. 171.—Pondoland.

50. D. TYSONI, *Bolus, suprà*, p. 172.—Griqualand East.

51. ? D. STENOGLOSSA, *Bolus, suprà*, p. 173.—Natal.

§ 3. *Vexillata*, Bolus, in Journ. Linn. Soc., Bot. xx. (1884), 479.

52. D. RACEMOSA, *Linn. f., Suppl.* (1781), 406; *Bot. Mag.* t. 7021. —Capetown to Grahamstown.

Satyrium secundum, *Thunb., Prodr. Pl. Cap.* (1794), 4.

D. secunda, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 210.

53. D. VENOSA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 213, *not of Lindley.*—Capetown to Port Elizabeth.

54. D. TENUIFOLIA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 214.—Capetown to Swellendam.

Ophrys patens, *Linn. f.*, *Suppl.* (1781), 404.
Serapias patens, *Thunb.*, *Prodr. Plant. Cap.* (1794), 3.
Disa patens, *Thunb.*, *Flor. Cap.* (1823), 16, *not of Swartz.*
Penthea patens, *Lindl.*, *Gen. & Sp. Orch.* (1838), 362.

55. DISA PATENS, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 214, *not of Thunberg.*—Capetown to George distr.
Orchis filicornis, *Linn. f.*, *Suppl.* (1781), 400.
D. filicornis, *Thunb.*, *Flor. Cap.* (1823), 17.
Penthea filicornis, *Lindl.*, *Gen. & Sp. Orch.* (1838), 361.
Penthea reflexa, *Lindl.*, *Gen. & Sp. Orch.* (1838), 361.
D. reflexa, *Reichb. f.*, *in Flora* (1865), 182.

56. D. ELEGANS, *Reichb. f.*, *in Flora* (1865), 182.—River Zondereinde at Appel's Kraal.
Penthea elegans, *Sond.*, *in Linnæa*, xx. (1847), 220 (nomen).

§ 4. *Coryphæa*, Lindl., partim.

57. D. DRACONIS, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 210.—West. and S.W. districts.
Orchis Draconis, *Linn. f.*, *Suppl.* (1781), 400.
Satyrium Draconis, *Thunb.*, *Prodr. Pl. Cap.* (1794), 5.

58. D. SAGITTALIS, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 212.—George to Albany.
Orchis sagittalis, *Linn. f.*, *Suppl.* (1781), 399.
Satyrium sagittale, *Thunb.*, *Prodr. Pl. Cap.* (1794), 5.

59. D. ATTENUATA, *Lindl.*, *Gen. & Sp. Orch.* (1838), 351.—Knysna.

60. D. TRILOBA, *Lindl.*, *Gen. & Sp. Orch.* (1838), 351.—"Breede River."

61. D. GLANDULOSA, *Burch.*, *in Lindl. Gen. & Sp. Orch.* (1838), 351; [*Bolus, Orch. Cape Penins.* (1888), 158, tab. 35].—Capetown to Swellendam.

62. D. NERVOSA, *Lindl.*, *Gen. & Sp. Orch.* (1838), 352.—Kaffraria.

63. ? D. GLADIOLIFLORA, *Burch.*, *in Lindl. Gen. & Sp. Orch.* (1838), 352.—Knysna distr.
D. capricornis, *Reichb.*, *in Linnæa*, xx. (1847), 689.

64. D. HARVEIANA, *Lindl.*, *in Hook. Lond. Journ. Bot.* i. (1842), 15.—Cape Peninsula.

65. D. VAGINATA, *Harv.*, *in Hook. Lond. Journ. Bot.* i. (1842), 15.—Capetown to Caledon.
D. modesta, *Reichb. f.*, *Linnæa*, xix. (1847), 690.

66. D. OVALIFOLIA, *Sond.*, *in Linnæa*, xix. (1847), 93.—Clanwilliam.

67. Disa pulchra, *Sond.*, *in Linnæa*, xix. (1847), 94.—Winterberg, Katberg, &c.

68. D. patula, *Sond.*, *in Linnæa*, xix. (1847), 94.—Albany to Transvaal.

§ 5. *Schizodium*, Lindl. (genus), Gen. & Sp. Orch. (1838), 358.

69. D. torta, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 211. —S.-Western districts.

Orchis biflora, *Linn.*, *Spec. Plant.* ed. 2 (1763), 1330.
Satyrium tortum, *Thunb.*, *Prodr. Pl. Cap.* (1794), 5.
Schizodium arcuatum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 359.

70. D. bifida, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 212. —Capetown to Port Elizabeth.

Satyrium bifidum, *Thunb.*, *Prodr. Pl. Cap.* (1794), 5.
Schizodium rigidum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 360.
S. bifidum, *Reichb. f.*, *in Flora* (1883), 460.

71. D. flexuosa, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 212.—S.-Western districts.

Orchis flexuosa, *Linn.*, *Spec. Plant.* ed. 3 (1764), 1331.
Satyrium flexuosum, *Thunb.*, *Prodr. Pl. Cap.* (1794), 5.
Schizodium flexuosum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 359.

72. D. longipetala, *Bolus.*—Paarlberg.

Schizodium longipetalum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 359.

73. D. obliqua, *Bolus.*—S.-Western districts.

Schizodium obliquum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 359.
S. obtusatum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 359.

74. D. clavigera, *Bolus.*—S.-Western districts.

Schizodium clavigerum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 360.

75. D. inflexa, *Mundt, in herb. Lehm.*, *ex Lindl.*, *Gen. & Sp. Orch.* (1838), 360; [*Bolus*, *Orch. Cape Penins.* (1888), 162, tab. 22. figs. 12–14, anal.].—S.-Western districts.

Schizodium inflexum, *Lindl.*, *Gen. & Sp. Orch.* (1838), 360.

76. D. Gueinzii, *Bolus.*—Station not recorded.

Schizodium Gueinzii, *Reichb. f.*, *in Linnæa*, xx. (1847), 694.

§ 6. *Orthocarpa*, Bolus, in Journ. Linn. Soc., Bot. xx. (1884), 480.

77. D. melaleuca, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 213; *Harv.*, *Thes. Cap.* i. (1859), 53, t. 84.—Western and South-Western districts.

Ophrys bivalvata, *Linn. f.*, *Suppl.* (1781), 403.
Serapias melaleuca, *Thunb.*, *Prodr. Pl. Cap.* (1794), 3.

78. DISA ROSEA, *Lindl.*, *Gen. & Sp. Orch.* (1838), 350.—S.-Western districts.

79. D. RICHARDIANA, *Lehm.*, *ex Lindl.*, *Gen. & Sp. Orch.* (1838), 361.—Table Mt., Cape.

Penthea obtusa, *Lindl.*, *Gen. & Sp. Orch.* (1838), 361.

80. ? D. SCHIZODIOIDES, *Sond.*, *in Linnæa*, xix. (1847), 92.—Swellendam (*Burchell*, 7323).

81. D. MINOR, *Reichb f.*, *in Flora* (1865), 182.—Winterhoeksberg, Tulbagh.

Penthea minor, *Sond.*, *in Linnæa*, xix. (1847), 104.

82. D. OLIGANTHA, *Reichb. f.*, *in Flora* (1865), 182.—Hex River.

Penthea triloba, *Sond.*, *in Linnæa*, xix. (1847), 104.

D. parvilabris, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xix. (1882), 344.

83. D. ATRICAPILLA, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xix. (1882), 344; [*Orch. Cape Penins.* (1888), 166, tab. 10].—S.-Western districts.

Penthea atricapilla, *Harv.*, *in Hook. Lond. Journ. Bot.* i. (1842), 17.

84. D. BODKINI, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xxii. (1885), 74; [*Orch. Cape Penins.* (1888), 165, tab. 13].—Table Mt., Cape.

§ 7. *Vaginaria*, Lindl., Gen. & Sp. Orch. 350.

85. D. FASCIATA, *Lindl.*, *Gen. & Sp. Orch.* (1838), 350; *Harv.*, *Thes. Cap.* i. (1859), 54, t. 85; [*Bolus*, *Orch. Cape Penins.* (1888), 167, tab. 36].—Cape Peninsula to Houw Hoek.

§ 8. *Herschelia*, Lindl. (genus), Gen. & Sp. Orch. 362.

86. D. BARBATA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 212; [*Bolus*, *Orch. Cape Penins.* (1888), 170, tab. 8].—Cape Peninsula.

Orchis barbata, *Linn. f.*, *Suppl.* (1781), 399.

Herschelia barbata, *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xix. (1882), 236.

87. D. LACERA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 212.—S. and S.-East. districts.

(The synonymy quoted by Lindley, Gen. & Sp. Orch. 354, for this species, viz. *Eulophia hians*, Spreng., &c., is erroneous. He had in the previous part of the same work (p. 183) upheld the last-named as a good species, and the quotation on p. 354, without remark, was probably an oversight.)

88. DISA EXCELSA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 213, excluding synonyms.—Station not recorded.
(=Sheet γ of Thunberg's Herbarium, *fide* N. E. Brown.)

88. D. SPATHULATA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 213; *Bauer, Illustr. Orch. Gen.* t. xiv.; *Harv., Thes. Cap.* i. (1859), t. 86.—S.-Western districts.
Orchis spathulata, *Linn. f., Suppl.* (1781), 398.
Satyrium spathulatum, *Thunb., Prodr. Pl. Cap.* (1794), 5.

90. D. GRAMINIFOLIA, *Ker, in Journ. Sci. R. Inst. London*, vi. (1819), 44, t. 1; *Reichb. f., in Orchid. Europeæ*, t. 2. f. 18–20, anal.; *Bolus, in Journ. Linn. Soc., Bot.* xix. (1882), 234, anal.—Capetown to Genadendal.
Herschelia cœlestis, *Lindl., Gen. & Sp. Orch.* (1838), 362.

91. D. TRIPARTITA, *Lindl., Gen. & Sp. Orch.* (1838), 353.—Albany.

92. D. MULTIFIDA, *Lindl., Gen. & Sp. Orch.* (1838), 353.—Cederbergen.

93. D. PROPINQUA, *Sond., in Linnæa*, xix. (1847), 95.—Clanwilliam.

94. D. ATROPURPUREA, *Sond., in Linnæa*, xix. (1847), 95; *Bot. Mag.* (1886), t. 6891.—Tulbagh.

95. D. CHARPENTIERIANA, *Reichb. f., in Linnæa*, xx. (1847), 688; *Ic. Fl. Germ.* xxiii. (1850), t. 353. f. 21–23.—Caledon district.
D. macroglottis, *Sond., ex Drège in Linnæa*, xx. (1847), 219 (nomen).

96. D. VENUSTA, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 482; [*Orch. Cape Penins.* (1888), 170, tab. 9].—S.-Western and (?) S.-Eastern districts.

97. D. PURPURASCENS, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 482.—Cape Peninsula.

98. D. LUGENS, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 483. —Capetown to Grahamstown.

99. D. BAURII, *Bolus, suprà*, p. 174.—Kaffraria.

§ 9. *Oregura*, Lindl., Gen. Sp. Orch. (1838), 352.

100. D. FERRUGINEA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 210; *Ker, in Journ. Sci. R. Inst. Lond.* v. (1818), t. 1. f. 1; *Hook. Icon. Plant.* (1840), t. 214 (where the petals are erroneously drawn as exterior to the galea!).—S.-Western districts.

101. DISA PORRECTA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 211; *Bolus, suprà*, p. 175.—Station unknown. (Coll. Sparrman.)

D. Zeyheri, *Sond., in Linnæa*, xix. (1847), 95.—Uitenhage, Somerset East, &c.

§ 10. *Aristaria*, Reichb. f., in Linnæa, xx. (1847), 689.

102. D. TELIPOGONIS, *Reichb. f., in Linnæa*, xx. (1847), 689.—"Cape," *Mund, Bergius.*

§ 11. *Amphigena* *, Bolus, Orch. Cape Penins. (1888), p. 139.

103. D. TENUIS, *Lindl., Gen. & Sp. Orch.* (1838), 354; *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 484.—Capetown to Houw Hoek.

D. leptostachys, *Sond., in Linnæa*, xix. (1847), 98.

XXII. BROWNLEEA, *Lind., in Hook. Lond. Journ. Bot.* i. (1842), 16; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 631.

1. B. CÆRULEA, *Harv., in Hook. Lond. Journ. Bot.* i. (1842), 16; *Harv., Thes. Cap.* ii. (1863), 2, t. 103.—S.E. districts and Natal.

B. macroceras, *Sond., in Linnæa*, xix. (1847), 106.

Disa cærulea, *Reichb. f., Otia Bot. Hamb.* (1881), 119.

D. macroceras, *Reichb. f., Otia Bot. Hamb.* (1881), 119.

2. B. PARVIFLORA, *Harv., in Hook. Lond. Journ. Bot.* i. (1842), 16.—S.E. districts and Natal.

Disa parviflora, *Reichb., Otia Bot. Hamb.* (1881), 119.

3. B. RECURVATA, *Sond., in Linnæa*, xix. (1847), 107; *Harv., Thes. Cap.* ii. (1863), 3, t. 104.—S.-Eastern districts and Natal.

Disa recurvata, *Reichb. f., Otia Bot. Hamb.* (1881), 119.

* The section *Amphigena* may prove to be identical with the previous section *Aristaria*. The latter is only known to me from a drawing of *D. Telipogonis* in Herb. Kew, made from a type specimen in the Schönberg Herbarium. It shows a small plant similar in many parts of its floral structure, and especially in the aristæ of the sepals, to *D. tenuis*. But the spur is dependent and the leaves synanthous, different in shape, and apparently wanting the peculiar sheath of *D. tenuis*; as, moreover, there were no means of determining the nature of the pollinary gland or glands, or the character of the tuber, I have thought it better for the present to keep the sections distinct.

XXIII. FORFICARIA, *Lindl., Gen. Sp. Orch.* (1838), 362; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 632.

1. F. GRAMINIFOLIA, *Lindl., Gen. & Sp. Orch.* (1838), 362.—Du Toit's Kloof.

XXIV. BRACHYCORYTHIS, *Lindl., Gen. & Sp. Orch.* (1838), 363; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 632.

1. B. OVATA, *Lindl., Gen. & Sp. Orch.* (1838), 363; *Harv., Thes. Cap.* i. (1859), 34, t. 53.—Natal and Transvaal.

2. B. PUBESCENS, *Harv., Thes. Cap.* i. (1859), 35, t. 54.—Kaffraria to Transvaal.

3. B. TYSONI, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 485.—Bedford, Kaffraria, and Transvaal.

XXV. SCHIZOCHILUS, *Sond., in Linnæa,* xix. (1847), 78; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 632.

1. S. ZEYHERI, *Sond., in Linnæa,* xix. (1847), 78.—Kaffraria, Natal, Transvaal.

Brachycorythis Zeyheri, *Reichb. f., in Flora* (1867), 117.

2. S. BULBINELLA, *Bolus.*—S.-Eastern distr., Natal, Transvaal.

Brachycorythis Bulbinella, *Reichb. f., in Flora* (1867), 116.

3. S. GERRARDI, *Bolus.*

Brachycorythis Gerrardi, *Reichb. f., in Flora* (1867), 116.

Subtribe CORYCIEÆ.

XXVI. DISPERIS, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 218; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 633.

(Dryopeia, *Thouars, Orch. Iles Afr.* (1822), t. 1–3; Dipera, *Spreng., Syst. Veg.* iii. (1826), 676.)

1. D. CAPENSIS, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 220, t. iii. fig. F; *Ker, in Journ. Sci. R. Inst. Lond.* v. (1818), t. i. f. 2.—Capetown to Port Elizabeth.

Arethusa capensis, *Linn. f., Suppl.* (1781), 405.

Dipera capensis, *Spreng., Syst. Veg.* iii. (1826), 696.

D. tenera, *Spreng., Syst. Veg.* iii. (1826), 696.

2. D. VILLOSA, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 220; *Ker, in Journ. Sci. R. Inst. Lond.* vi. (1819), t. 1. f. 5.—S.-Western districts.

Arethusa villosa, *Linn. f., Suppl.* (1781), 403.

3. DISPERIS CUCULLATA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 220; *Ker, in Journ. Sci. R. Inst. Lond.* vi. (1819), t. 1. f. 4.—S.-Western districts.

4. D. SECUNDA, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 220; *Ker, in Journ. Sci. R. Inst. Lond.* v. (1818), t. 1. f. 3; *Buxbaum, Cent.* iii. (1729), 8, t. 13; [*Bolus, Orch. Cape Penins.* (1888), 177, tab. 11].—S.-Western districts.
   Ophrys circumflexa, *Linn.*, *Spec. Plant.* ed. 2 (1763), 1344.
   Arethusa secunda, *Thunb.*, *Prodr. Pl. Cap.* (1794), 3.

5. D. MICRANTHA, *Lindl.*, *Gen. & Sp. Orch.* (1838), 370.—Zuurbergen, Kagaberg, &c.

6. D. PALUDOSA, *Harv.*, *in Hook. Lond. Journ. Bot.* i. (1842), 14; *Harv.*, *Thes. Cap.* ii. (1863), 30, t. 148; [*Bolus, Orch. Cape Penins.* (1888), 176, tab. 19].—Cape Peninsula, French Hoek.

7. D. CARDIOPHORA, *Harv.*, *Thes. Cap.* ii. (1863), 4, t. 106.—S.-Eastern districts and Natal.

8. D. FANNINIÆ, *Harv.*, *Thes. Cap.* ii. (1863), 46, t. 171.—Natal, Transvaal.

9. D. COOPERI, *Harv.*, *Thes. Cap.* ii. (1863), 47, t. 172.—Natal, Orange Free State.

10. D. LINDLEYANA, *Reichb. f.*, *in Flora* (1865), 181.—"C.B.S., Krebs," probably about Bedford.

11. D. PURPURATA, *Reichb. f.*, *in Linnæa*, xli. (1877), 55.—Hantam, Calvinia.
    D. Namaquensis, *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 486.
    Var. parviflora, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 79.

12. D. STENOPLECTRON, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 102.—S.-Eastern districts.

13. D. WEALII, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 103.—Kagaberg, Bedford.

14. D. ANTHOCEROS, *Reichb. f.*, *Otia Bot. Hamb.* (1881), 103.—Natal.

15. D. OXYGLOSSA, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 76, t. 1. f. 6–12.—Kaffraria to Natal.

16. D. MACOWANI, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), 77, t. 1. f. 13–17.—Somerset East.

17. Disperis Woodii, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), t. 1. f. 18–22.—Natal.

18. D. Tysoni, *Bolus, in Journ. Linn. Soc., Bot.* xxii. (1885), t. 1. f. 28–33.—Griqualand East.

XXVII. Corycium, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 220; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 633.

1. C. orobanchoides, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 222; *Ker, in Journ. Sci. R. Inst. Lond.* viii. (1820), t. 3. f. 3!; *Lindl., Bot. Reg.* xxiv. (1838), t. 45.—S.-Western districts.

 Satyrium orobanchoides, *Linn. f., Suppl.* (1781), 402.

2. C. crispum, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 222; *Ker, in Journ. Sci. R. Inst. Lond.* vi. (1819), t. 1. f. 1. —S.-Western districts.

 Orchis coccinea, *Buxbaum, Cent.* iii. (1729), 7, t. 11.

 Arethusa crispa, *Thunb., Prodr. Pl. Cap.* (1794), 3.

3. C. vestitum, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 222.—Piquetberg and Verlooren Vley. (Only in Thunberg's coll.)

 Ophrys volucris, *Thunb., Prodr. Plant. Cap.* (1794), 2, *non Linn. f.*

4. C. bicolorum, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 222; *Bauer, Ill. Orch., Gen.* t. 15.—S.-Western districts.

 Ophrys bicolor, *Thunb., Prodr. Plant. Cap.* (1794), 2.

5. C. excisum, *Lindl., Gen. & Sp. Orch.* (1839), 368; [*Bolus, Orch. Cape Penins.* (1888), 182, tab. 20].—West. and South-West. districts.

6. C. microglossum, *Lindl., Gen. & Sp. Orch.* (1839), 369.—Paarlberg.

7. C. nigrescens, *Sond., in Linnæa,* xix. (1847), 110.—Albany to Natal.

8. C. bifidum, *Sond., in Linnæa,* xix. (1847), 111.—Cape Peninsula.

 C. ligulatum, *Reichb. f., in Linnæa,* xix. (1847), 375; *Walp. Annales,* i. (1849), 805.

9. C. tricuspidatum, *Bolus, suprà,* p. 176.—Near Cradock.

XXVIII. PTERYGODIUM, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 217, t. 3. fig. E; *Benth. & Hook. f.*, *Gen. Plant.* iii. (1883), 632. (Ommatodium, *Lindl.*, *Gen. & Sp. Orch.* (1838), 365.)

§ 1. *Eupterygodium.*

1. P. ALATUM, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 218; *Ker*, *in Journ. Sci. R. Inst. Lond.* viii. (1820), t. 3. f. 2.—West. and S.-West. districts.

Ophrys alata, *Thunb.*, *Prodr. Plant. Cap.* (1794), 2.

2. P. CATHOLICUM, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 218; *Ker*, *in Journ. Sci. R. Inst. Lond.* vi. (1819), t. 1. f. 3. —Capetown to Port Elizabeth.

Orchidi affinis &c., *Buxbaum*, *Cent.* iii. (1729), 12, t. 21.
Ophrys catholica, *Linn.*, *Sp. Plant.* ed. 2 (1763), 1344.
Ophrys alaris, *Linn. f.*, *Suppl.* (1781), 404.

3. P. CAFFRUM, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 218.—S.-Western districts.

Ophrys caffra, *Linn.*, *Sp. Plant.* ed. 2 (1763), 1344.

4. P. INVERSUM, *Sw.*, *in Kongl. Vet. Acad. Handl.* xxi. (1800), 218; *Ker*, *in Journ. Sci. R. Inst. Lond.* ix. (1820), t. 4. f. 1. —West. and S.-West. districts.

Ophrys inversa, *Thunb.*, *Prodr. Plant. Cap.* (1794), 2.

5. P. PLATYPETALUM, *Lindl.*, *Gen. & Sp. Orch.* (1838), 366.—S.-Western districts.

6. P. ACUTIFOLIUM, *Lindl.*, *Gen. & Sp. Orch.* (1838), 366.—S.-Western districts.

7. P. VENOSUM, *Lindl.*, *Gen. & Sp. Orch.* (1839), 367.—Caledon, Palmiet R., &c.

8. P. CRUCIFERUM, *Sond.*, *in Linnæa*, xix. (1847), 109; [*Bolus*, *Orch. Cape Penins.* (1888), 186, tab. 22. figs. 18–21, anal.]. —Capetown and Uitenhage.

9. P. RUBIGINOSUM, *Sond.*, *in Linnæa*, xx. (1847), 220 (nomen); *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xx. (1884), 486.—Caledon (*Zeyher* 3946).

10. P. MAGNUM, *Reichb. f.*, *in Flora* (1867), 117; *Bolus*, *in Journ. Linn. Soc.*, *Bot.* xxii. (1885), 75.—Kagaberg to Natal.

11. P. HASTATUM, *Bolus*, *suprà*, p. 177.—Orange Free State.

§ 2. *Ommatodium*, Lindl. (genus.)

12. Pterygodium Volucris, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 218; *Ker, in Journ. Sci. R. Inst. Lond.* ix. (1820), t. 4. f. 1.—West. and S.-West. districts.
   Ophrys Volucris, *Linn. f., Suppl.* (1781), 403.
   O. triphylla, *Thunb., Prodr. Plant. Cap.* (1794), 2.

§ 3. *Micranthum.*

13. P. carnosum, *Lindl., Gen. & Sp. Orch.* (1839), 367; [*Bolus, Orch. Cape Penins.* (1888), 189, tab. 12].—Capetown to Stellenbosch.

XXIX. Ceratandra, *Ecklon, ex Lindl., Gen. & Sp. Orch.* (1838), 363; *Benth. & Hook. f., Gen. Plant.* iii. (1883), 634.

1. C. chloroleuca, *Ecklon, ex Lindl., Gen. & Sp. Orch.* (1838), 364; *Bauer, Illustr. Orch. Genera*, t. 16.—S.-Western districts.
   Ophrys atrata, *Linn., Mant.* (1767), 121.
   Pterygodium atratum, *Sw., in Kongl. Vet. Acad. Handl.* xxi. (1800), 218.
   C. auriculata, *Lindl., Gen. & Sp. Orch.* (1838), 364.
2. C. globosa, *Lindl., Gen. & Sp. Orch.* (1838), 364.—West. and S.-West. districts.
3. C. parviflora, *Lindl., Gen. & Sp. Orch.* (1838), 364.—Capetown to Swellendam.
4. C. grandiflora, *Lindl., Gen. & Sp. Orch.* (1838), 364.—Van Stadensberg to Grahamstown.
5. C. Harveyana, *Lindl., Gen. & Sp. Orch.* (1838), 365.—Table Mt., Cape.
6. C. affinis, *Sond., in Linnæa*, xix. (1847), 108.—Hex River.
7. C. bicolor, *Sond., ex Drège in Linnæa*, xx. (1847), 220, name only; *Bolus, in Journ. Linn. Soc., Bot.* xx. (1884), 487; [*ib., Orch. Cape Penins.* (1888), 190, tab. 21].—Cape Peninsula and Tulbagh.

[Note.—Since this paper was presented to the Society, a few references have been added in square brackets.—Sec. L. S.]

	Total Species of each Tribe.	Total Species of each Genus.	South-Western Region.	S.E. or Subtropical Region.	Common to S.W. and S.E. Regions.	Karroo Region.	Station unknown.
EPIDENDREÆ	7						
1. Liparis	......	4	1	3			
2. Bulbophyllum	......	2	......	2			
3. Calanthe	......	1	......	1			
VANDEÆ	70						
4. Eulophia	......	42	11	32	3	......	3
5. Ansellia	......	1	......	1			
6. Grammangis	......	2	......	2			
7. Polystachya	......	8	......	8			
8. Angræcum	......	11	4	8	1		
9. Mystacidium	......	5	1	5	1		
NEOTTIEÆ	2						
10. Platylepis	......	1	......	1			
11. Pogonia	......	1	......	1			
OPHRYDEÆ	252						
12. Herminium	......	1	......	1			
13. Stenoglottis	......	1	......	1			
14. Bartholina	......	2	2	1	1		
15. Huttonæa	......	2	......	2			
16. Holothrix	......	21	12	9	1	1†	
17. Habenaria	......	26	2	26	2	1‡	
18. Cynorchis *	......						
19. Satyrium	......	38	29	15	6		
20. Pachites	......	1	1				
21. Disa	......	103	74	36	12	......	6
22. Brownleea	......	3	......	3			
23. Forficaria	......	1	1				
24. Brachycorythis	......	3	......	3			
25. Schizochilus	......	2	......	2			
26. Disperis	......	18	6	13	1	1†	
27. Corycium	......	9	7	1			
28. Pterygodium	......	13	11	4	2		
29. Ceratandra	......	7	6	1			
Totals	331	331	168	182	30	3	9

* See note in the foregoing List, p. 192. † Peculiar to the Karroo Region. ‡ Common to the Karroo and S.-Eastern Regions.

A Morphological and Systematic Review of the *Apostasieæ*. By R. ALLEN ROLFE, A.L.S., Assistant in the Herbarium of the Royal Gardens, Kew.

[Read 21st June, 1888.]

(PLATE XLVIII.)

THE *Apostasieæ* form a highly interesting little group, placed at the very end of the large order Orchideæ, and as no general revision has ever been published, and the literature relating to the subject is extremely scattered, I have attempted to remedy the deficiency in the following paper. I have also discussed somewhat fully the morphology, affinities, and geographical distribution of the group. The annexed Plate I have prepared to illustrate the more important points of structural detail.

HISTORICAL INTRODUCTION.

The genus *Apostasia* was founded in 1825 by Blume *, for a plant discovered by him in Western Java, and which he termed *Apostasia odorata*. It was considered simply a genus of Orchideæ, for Blume divided the Order into three tribes, viz. *Cereaceæ*, *Granulosæ*, and *Pulvereæ*, the latter tribe being again subdivided into *Monantheræ* and *Diantheræ*, the last-named division comprising only the genus *Apostasia*. *Cypripedium* is not mentioned in the text, but is bracketed with *Apostasia* in a separate table of genera. Blume's description of the genus is sufficiently correct, except as to the pollen, which he describes as "Massæ pollinis pulverulentæ;" while of the tribe he remarks, "Pollinis massæ in pulverem facile solvenda." So far as *Apostasia* is concerned, it is incorrect to speak of pollen-masses, for the grains are quite free, not aggregated in masses at all. The three-celled ovary and axile placentation he appears to have quite overlooked, for he makes no mention of them whatever.

In 1830 two other species, which had been sent from India by Wallich, were described by Robert Brown †. All the structural details were accurately described by Brown, the position of the stamens with regard to the perianth-segments clearly set forth, the affinities ably discussed, and the genus raised to the rank of a distinct, though somewhat anomalous, tribe of Orchideæ, bearing

* Bijdr. Fl. Nederl. Ind. p. 423, t. i. fig. 5.

† Wall. Pl. Asiat. Rar. i. pp. 74–76, tt. 84, 85.

a certain analogy in the staminal arrangement, and perhaps in the economy of fertilization, to *Cypripedium*. Both the species are admirably illustrated.

In 1833 * Lindley raised Apostasieæ to the rank of a distinct natural order, another group of Orchideæ being also so separated under the name *Vanillaceæ*. This latter group was abandoned in a later work †, though *Apostasieæ* was retained, on account of the three-celled ovary and the style being free for the greater part of its length. Here Lindley remarks, "the Order seems as if connecting Orchids with Hypoxids."

Between 1830 and 1838 Bauer's 'Illustrations of Orchidaceous Plants' appeared, in which *Apostasia* is admirably figured ‡, with the single exception of the pollen. That of *Apostasia nuda* is here represented as cohering in tetrads, a point in which no subsequent author agrees, and which is quite at variance with my own observations.

Attention was called to this very point by Griffith § in describing *Apostasia Brunonis*, in the following note :—" With respect to the pollen, in this species at least, it has no affinity with that of Orchideæ ; Mr. Bauer, however, has figured that of *A. nuda*, which has a manifest and close resemblance to that of Orchideæ." He then describes the pollen from his own observations as "pulvereous" and differing "only from the common form of pollen in having but one tegument. It appears to be lanceolate-ovate, with one or three elevated lines of a whiter colour than the remaining part. Immersed in water, the lines generally disappear, and it appears like an oval or roundish vesicle, very transparent, containing very minute granules and a viscid fluid. There is no ternary or quaternary cohesion." But on examining Griffith's specimens I find them to be identical with *A. nuda*, R. Br., so that the error must be simply one of observation, and perhaps arose from Bauer not clearly seeing all the details and trying to make the pollen fit with that of other Orchideous genera.

In 1834 a second genus of *Apostasieæ* was described by Blume ‖, under the name *Neuwiedia*, differing from *Apostasia* in its sub-

* Nixus Plantarum, p. 188.

† Veg. Kingd., ed. 1 (1847), p. 184.

‡ Fructification, t. 15.

§ Posthumous Papers ; Notulæ ad Plantas Asiaticas, iii. p. 243, Icones, t. 282 (published in 1851).

‖ Ann. Sc. Nat. sér. 2, ii. p. 93.

ringent perianth, three perfect stamens, and other minor characters, which were all very accurately set forth. This plant, also from Java, was called *Neuwiedia veratrifolia*. Here Blume also ranked the group as a distinct natural order, closely allied to Orchideæ.

A third genus was afterwards doubtfully added to the *Apostasieæ* by Lindley. In his 'Vegetable Kingdom'* "? *Rhynchanthera*, Blume"†, is enumerated under this Order, with the following remark :—"If *Rhynchanthera* is correctly represented by Blume, its 3-locular ovary will refer it here, while the structure of its column would keep it in Orchids. The essential character [*i. e.* of *Apostasieæ*] is, however, framed without reference to it."

In 1837 Endlicher ‡ (who also retained *Apostasieæ* as a distinct Order) divided *Apostasia* into two sections—*Mesodactylus*, with the rudimentary third stamen present, and the anthers unequal at the base, and *Adactylus*, with no vestige whatever of a third stamen, and the anthers equal at the base—characters which had been pointed out by Robert Brown.

In 1846 Lindley described *Uropedium* §, remarking, "Omnia *Cypripedii*, sed labellum planum et petala longissime caudata. Anthera sterilis trilobo-hastata." No mention is made of the structure of the ovary.

Three years later, the plant meantime having flowered in cultivation, Brongniart published an elaborate memoir on *Uropedium Lindenii*, Lindl. ||, illustrated with a plate, showing, among other

* Ed. 1, p. 184.

† This genus is at present a mystery to me. Blume himself (Coll. des Orch. Archip. Ind. (1858) p. 125) cites "*Rhynchanthera*, Bl. *Bydr.* (1825–1826), fig. lxxviii," as a synonym of *Corymborchis*, Thouars ; and on the following page he cites "*Rhynchanthera paniculata*, Bl. *Bydr.* fig. lxviii," as a synonym of *Corymborchis veratrifolia*, Blume ; and yet no such figure appears in either of the two sets of plates at Kew. Figure 73 is the highest number on tab. 15, which, according to Pritzel, is the number issued with the work. Neither in plates, text, nor index, can I find any trace of the name or the figure in question ; and yet, from Lindley's remark, it is clear he had seen this figure. I can only surmise that some copies of the work may have been issued incomplete, yet this would not account for its absence in the index, and hardly in the text. With regard to the other question, I have examined the ovary of a species of *Corymborchis*, which is synonymous according to Blume, and find it one-celled with parietal placentation, as in the rest of the *Monandræ*. Other authors appear to have found, or assumed, the same.

‡ Gen. Plant. i. p. 221.

§ Orch. Linden. p. 28.

|| Ann. Sc. Nat. sér. 3, vol. xiii. p. 113, t. 2. figs. 1–8.

things, that it differed from *Cypripedium* in having a trilocular ovary and three perfect stamens, in addition to a barren one or staminode; and that, while in characters it more nearly approached the small family *Apostasieæ*, still it might possibly prove to be a monstrous state of the plant then known as *Cypripedium caudatum*, Lindl., now *Selenipedium caudatum*, Reichb. f.

In 1854 Prof. Reichenbach described *Selenipedium* *, basing it on the Tropical-American species then called *Cypripedium*, but differing in having a trilocular ovary (a point previously apparently unsuspected). He remarks of it, "Omnia *Cypripedii*, sed ovarium *Apostasieæ Uropediique*," and briefly adds, "*Apostasieæ sunt Orchideæ*."

A little later the same author figured and described *Uropedium Lindenii*, Lindl. †, contending that as the three stamens of the inner whorl were all perfect, *Uropedium* should be regarded as a good genus and not a monstrous condition of something else. Notwithstanding this, it is now certain that the plant is simply a pelorioid state of *Selenipedium caudatum*, in which this peculiar character has become fixed or permanent. Excepting in the altered parts, no difference whatever can be detected between the two,—colour, texture, and similar characters are as absolutely identical as if the two kinds of flower were produced by the same plant; and Dr. Masters has recorded an instance where a plant of the normal character produced a flower with all the stamens of the inner whorl perfect, and the lip quite intermediate between the normal condition of that organ and an ordinary petal (or the lip of *Uropedium*) ‡.

Dr. Pfitzer also retains *Uropedium* § (spelling it "*Uropedilum*"), adding, however, a "?"; he also defines his group *Cypripedilinæ* as sometimes having all the stamens of the inner whorl perfect, a character obviously drawn from *Uropedium*.

In 1867–8 Baron Ferdinand von Müller described *Niemeyera* ‖ as a new genus of *Hypoxidaceæ*, but it has proved to be simply an Australian species of *Apostasia*.

In 1881 Bentham published his "Notes on *Orchideæ*," in which he united *Apostasieæ* with *Cypripedieæ* ¶ under the latter

* Seemann's Bonplandia, ii. p. 116.

† Xen. Orch. i. p. 32, t. 15.

‡ Gard. Chron. n. s. xxvi. p. 268, fig. 54; also Journ. Linn. Soc. xxii. p. 419, t. 20.

§ Nat. Anordn. Orch. (1887) p. 95.

‖ Fragm. Phyt. Austral. vi. p. 96.

¶ Journ. Linn. Soc. xviii. p. 358.

name. He remarks:—"The four genera constituting this tribe differ so strikingly from the rest of the Order in their andrœcium, that they have been proposed as forming one or two distinct natural orders. Now, however, that they are better known, they are found to be too closely connected together not to be united in a single tribe; and the importance of the single character which separates them from Orchideæ generally has fallen so much in estimated value, that they have by common consent been re-united with that order as a distinct tribe only." This arrangement was also adopted in the 'Genera Plantarum.'

In 1886 Ridley *, in describing a new species of *Neuwiedia* from New Guinea, again placed *Apostasieæ* as a distinct natural order.

Lastly comes Dr. Pfitzer's arrangement of the group †, which is as follows:—

Ordo ARRHIZOGONÆ (Gynandræ).

Fam. BURMANNIACEÆ.

Fam. ORCHIDACEÆ.

A. DIANDRÆ.

1. Apostasiinæ.

Gen. *Apostasia*, *Neuwiedia*.

2. Cypripedilinæ.

Gen. *Cypripedilum*, *Selenipedilum*, *Paphiopedilum* ‡, *Uropedilum* ? §.

B. MONANDRÆ.

(Including the remainder of the Orchideæ.)

In the present paper I have treated *Apostasieæ* as forming a distinct tribe of Orchideæ allied to *Cypripedieæ*, but differing

* Journ. of Bot. 1886, p. 355. † Nat. Anordn. Orch. p. 95.

‡ Pfitzer, Morph. Stud. Orchideenbl. p. 11. This so-called genus is based on Reichenbach's section *Acaulia Coriifolia* of *Selenipedium* (Xen. Orch. i. p. 3), and the section *Coriaceæ* of *Cypripedium* (Benth. and Hook. f. Gen. Plant. iii. p. 634), the character relied on being the connivent leaves. It is a strictly artificial group, as there is nothing in floral structure to separate it; moreover, it contains species with a three-celled, and others with a one-celled ovary, beyond which there is nothing to keep these two genera, *Cypripedium* and *Selenipedium*, apart. The species of *Paphiopedilum* are tropical, and the difference in leaf-character is probably due to the evergreen habit, most of the other species being temperate and deciduous.

§ *Uropedium* has already been shown to be simply a monster of *Selenipedium caudatum*, and not a genus. And surely in this, as in other cases above given, there is no sufficient reason for the (orthographical) change of name.

therefrom in several important points. These two tribes I have regarded as forming one diverging branch of the Order, not very far removed in structure from what may be considered the ancestral Orchideous prototype, and worthy to be looked upon as a distinct suborder,—*Diandræ*. The other diverging branch comprises the remainder of the Order, the suborder *Monandræ*, more highly specialized than the *Diandræ*, and divisible into several distinct tribes; too intimately connected, however, to be considered Suborders. Certain it is that there is no other gap anywhere in the Order of anything like such importance as that which separates *Monandræ* from *Diandræ*. Lastly, I do not think *Apostasieæ* can be maintained as even a Suborder (much less a distinct Order) apart from *Cypripedieæ*. On the other hand, I think these two groups are too distinct to be merged together in a single homogeneous tribe, and far better regarded as forming two distinct tribes of the Suborder *Diandræ*.

Morphology.

General habit.—The species of *Apostasieæ* are terrestrial plants, from about one to three feet in height, generally growing in shady woods and thickets. They produce underground creeping rhizomes, shortly jointed, and clothed with numerous sheathing bracts. These appear to push out for some distance, and then throw up an erect leafy shoot, from near the base of which is produced a tuft of several thickish, hard, wiry roots. These stems in *Apostasia* are nearly, and in some cases over, a foot high, clothed with numerous, more or less recurved, narrow, grass-like leaves, and bearing at the apex a more or less spreading or recurved, simple or branched raceme of small yellow flowers. In *Neuwiedia* the leaf-bearing portion of the stem is generally shorter, and thus the tuft of leaves is formed near the ground. The leaves are fewer and larger, suberect, and somewhat like those of *Curculigo* or *Veratrum* in appearance. On reaching the flowering stage the stems lengthen above the leaves, sometimes but little, at others very considerably, the apex of the raceme of *N. Lindleyi* apparently being at least three feet from the ground. The flowering portion of the stem bears a number of much smaller leaves, which pass gradually into the bracts, the inflorescence itself being a strictly erect, spike-like, many-flowered raceme of medium-sized flowers, also yellow in colour.

The Stem.—In all the species the stem is erect and simple, produced, as already remarked, from an underground creeping rhizome. Thus it is probably herbaceous and of annual duration, dying down after maturing the seeds.

Leaves.—The leaves differ somewhat in the two genera, but are remarkably uniform through the different species of each genus. In *Neuwiedia* they are narrowly or broadly lanceolate, varying from half a foot to about two feet long; few in number, suberect, and strongly plicate. In *Apostasia* they are narrowly lanceolate-linear, about half as long as in *Neuwiedia*, much more numerous, generally somewhat recurved, and less strongly plicate.

Inflorescence.—In *Neuwiedia* the inflorescence is an erect, spike-like, many-flowered raceme, varying from about three or four inches to occasionally over a foot in length, as in *N. Lindleyi*. In *Apostasia* it consists of a more or less recurved, subsessile raceme, occasionally simple, but more frequently branched, and measuring from two to about four inches in length, or as much as six inches when in fruit.

Bracts.—The bracts are lanceolate or subulate-linear, invariably acute; much shorter than the ovary in *Apostasia*, generally longer in *Neuwiedia*, in which genus they gradually pass, at the base of the racemes, into the reduced leaves of the flowering-stem.

Flowers.—The flowers are generally shortly pedicelled or subsessile, in the axils of the bracts, and apparently always yellow; very small in *Apostasia* (Pl. XLVIII. fig. 15), but larger in *Neuwiedia* (figs. 2, 3, and 10). The segments in *Apostasia* range from about $1\frac{1}{2}$ lines in the section *Adactylus* to about $2\frac{1}{2}$ lines in *A. Wallichii*, or, according to Blume, a little larger still in *A. odorata*, the other species of the section *Mesodactylus*. In *Neuwiedia* the same organs range from about 3 lines in *N. Griffithii* (figs. 2 to 6) to 6 lines in *N. Curtisii*, or even 9 lines in *N. Lindleyi* (fig. 10). They are more or less widely spreading in *Apostasia*, but subconnivent in *Neuwiedia* (fig. 3).

Ovary.—The ovary in *Neuwiedia* (figs. 2, 3, and 13) is ovoid-oblong, tapering into the short pedicel, narrowed above, strongly triquetrous and grooved down each face opposite the dissepiment, and from two lines long in *N. Griffithii* (figs. 2 and 3) to quite four lines in *N. Lindleyi*. In *Apostasia* (fig. 15) it is narrowly linear, less distinctly triquetrous, with more rounded angles, and measures from three to six lines long in the different species. In both genera it is trilocular, with three, polyspermous, axile placentas, running throughout the length of each cell. It is nearly or quite glabrous in *Apostasia* (fig. 15) and *Neuwiedia Zollingeri*, but more or less puberulous in other species of the latter genus.

Perianth-segments.—The perianth-segments in both genera are lanceolate or lanceolate-linear, and more or less distinctly cuspidate (see numerous figures); in *Apostasia* (fig. 15), also in *Neuwiedia Zollingeri*, nearly or quite glabrous; but in other species of *Neuwiedia* (see figs. 2 and 3) the three outer segments, or sepals, as well as the central keel of the three inner ones (the only part exterior in the bud), are puberulous or shortly pubescent. In *Apostasia* the six segments are subsimilar and subequal, no real difference in the petals and no differentiation of the median one into a lip being perceptible. All the segments are strongly, but obtusely, keeled, and shortly cuspidate. In *Neuwiedia*, however, the petals are a little broader than the sepals, very slightly oblique, while the lip, in other respects similar to the petals, is a little broader, quite equal-sided, and with a slightly thickened, linear, fleshy keel inside, in addition to the outer one, both of course being simply thickenings of the central nerve (see figs. 4 to 6, also 10). The sepals are also keeled, perhaps not quite so strongly as are those of the inner segments, especially in *N. Griffithii* (fig. 4); and all the segments are shortly cuspidate. The margins of the petals and lip, which are interior in the bud, are glabrous.

Column.—The column, which is altogether homologous with that of other Orchids, is extremely short in *Apostasia* (figs. 18, 21, 23, and 28), and in *Neuwiedia Griffithii* (fig. 7), but half a line long and sometimes over in other species of the genus (see fig. 11). It is flattened from front to back, the angles being somewhat acute.

Stamens.—Three perfect stamens are present in *Neuwiedia* (figs. 7, 10, 11, and 13), but only two in *Apostasia* (figs. 17, 21, 23, and 28); the third one, homologous with the staminode of *Cypripedium*, is present in the section *Mesodactylus* as a barren filament-like organ, always more or less adnate to the back of the style (figs. 23 and 28), while in the section *Adactylus* it is entirely absent (figs. 17, 18, and 21). Two of these stamens are opposite the petals, being the lateral stamens of the inner staminal whorl (see fig. 1), while the third one is opposite the dorsal sepal, and is the median or dorsal stamen of the exterior staminal whorl (see fig. 1). The lateral stamens of the outer whorl and the median one of the inner whorl are entirely wanting, while in the section *Adactylus* the whole outer series is altogether suppressed (figs. 18 and 21). The free portions of the filaments about equal the column in *Apostasia* (figs. 18, 21, 23, and 28) and in *Neuwiedia Griffithii* (fig. 7); but in other species of the latter genus they somewhat exceed it, sometimes reaching double this length (see fig. 11).

The anthers are linear or oblong in *Neuwiedia* (figs. 7 and 11), ovate or linear-oblong in *Apostasia* (figs. 19, 21, 24, &c.); in both genera the base being more or less distinctly cordate. In *Neuwiedia* the insertion of the filament is distinctly versatile (see fig. 11), also in the *Mesodactylus* section of *Apostasia* (see fig. 24), though, from the erect position of the anther, it is not so perceptible unless carefully examined. In the section *Adactylus*, however, the stamens appear to be truly basifixed (see figs. 19 and 21). In this section, too, the two cells are quite equal at the base, and narrowing upwards to an acute point; while in *Mesodactylus* (see fig. 24) one cell is distinctly longer than the other, making the anther unequal at the base. In this section the anthers are not so perceptibly narrowed above and the apex less acute. These differences are evidently correlated with the presence or absence of the staminode, and make the division of the genus into two sections a most marked and absolute character. In *A. stylidioides*, where the character was supposed to break down, I have shown, under that species, that this is not the case, the supposition arising from an error of observation (see fig. 28).

The anther-cells are quite parallel in *Neuwiedia* (see fig. 11), and nearly so in *Apostasia* (see figs. 19, 21, and 24), the difference alone arising from the shape of the anther in the latter genus, and more especially in the section *Adactylus* (figs. 19 and 21). The dehiscence is introrse by a pair of longitudinal grooves (see figs. 11, 19, and 24). In the section *Adactylus*, more especially in *A. Lobbii*, the anthers are strongly connate by their margins round the style (fig. 17); but I am not sure whether they remain so after the flowers open. Expanded flowers are wanting to settle this point.

Staminode.—The staminode is only present in *Apostasia*, section *Mesodactylus*. It is continuous with the back of the column, and adnate to the style except at the extreme apex. In *A. Wallichii* (fig. 23) it is distinctly broader below, the lateral angles acute, narrowing upwards to an acute point, the minute apex alone being free. Here it is shorter than the style. In *A. stylidioides* it is a little narrower at the extreme base, and perhaps a little longer relatively to the style, but otherwise very similar (fig. 28).

Pollen.—The pollen-grains are ellipsoidal in shape, invariably simple, dry, and quite free from each other (figs. 14 and 25). Griffith speaks of that of *Apostasia* as grooved; but I was unable to satisfy myself on this point, although I examined *A. Wallichii* under a $\frac{1}{5}$ objective both dry and in water. Fig. 25 represents approximately the shape. The pollen of *Neuwiedia Curtisii* was examined in the same way (fig. 14), and beyond a slight tendency to be more acute at the ends, I could not observe much difference between the two.

Style and Stigma.—The free portion of the style is invariably slender, arising from the apex of the column between the filaments. In *Neuwiedia* it is slightly flattened laterally, distinctly grooved along the face, and terminated by a somewhat enlarged, rounded, but distinctly oblique and somewhat bilateral stigma (see fig. 11). In *Apostasia* the bilaterality is also distinctly marked (figs. 21 and 23); and although it is invariably described as very minutely three-lobed at the apex, I am inclined to think it bilobed, as in *Neuwiedia*. This is the result of my observations; but I have not had time to make sections of this minute organ to settle the point.

Capsule.—The capsule corresponds very closely to the characters given of the ovary. In *Neuwiedia Griffithii* it is strongly triquetrous-ovoid, strongly keeled along the back of the carpels, but grooved along the face opposite each dissepiment (fig. 8). The surface is strongly hispidulous. This is the only species of which I have seen mature capsules; but the somewhat immature ones of *N. Lindleyi* are more strongly triquetrous, longer, and nearly glabrous. In *Apostasia* the capsule is narrowly linear, subterete, with three strong rounded keels. The texture is stouter, the walls and dissepiments much stouter than in *Neuwiedia* (see fig. 26). In both genera the capsule is narrowed above, and crowned with the remains of the withered perianth-segments; but in *Neuwiedia* it is more distinctly rostrate (fig. 8). It is three-celled, with axile placentas and numerous minute seeds (figs. 8 and 26).

Seeds.—The seeds are minute, with reticulated testa, corresponding in structure to those of the order generally. In *Neuwiedia Griffithii* they are narrowly oblong in shape, almost truncate at the ends, the roundish embryo, by reason of its darker colour, showing very prominently through the thin testa (fig. 9). The reticulations of the testa are small and very numerous. In *Apostasia Wallichii* the shape is more nearly ellipsoidal, or rhomboid-ellipsoidal, the embryo apparently filling the entire testa, except a small narrow portion at the base, which is of a paler colour than the rest. The reticulations of the testa are also much fewer and larger (fig. 27). Other species of *Apostasia* seem substantially identical in this respect.

Fertilization.—Notwithstanding the comparatively simple structure as compared with other Orchids, and the dry simple pollen, the group is certainly entomophilous, both the genera showing decided adaptations for insect-fertilization. Whether they secrete nectar it is impossible, from dried specimens, to say; but, according to Wallich, *Apostasia* exhales a fragrant perfume. In *Neuwiedia* the segments are subconnivent (fig. 3), and therefore an insect must enter from the mouth of the flower. It would alight on the lip and, on crawling into the flower, its back would invariably come into contact with the three versatile anthers, and thus become dusted with the pollen. On subsequently visiting another flower it would as surely brush against the oblique slightly down-curved stigma and leave some of the pollen behind. In *Apostasia* the arrangement is quite different; the segments are spreading or recurved, and the anthers stand suberect in the centre of the flower. It seems equally certain that the genus is insect-fertilized, though in what way does not seem so clear as in the preceding case. The differences between the two sections of the genus seem to be in some way connected with the fertilization; though the use of the staminode seems an obscure point, unless it be to prevent the insect from alighting on that side of the flower towards the back of the anthers. This and other points yet remain to be settled—whether the anthers are mature before the stigma, whether any nectar is secreted, also some points of structural detail which I have found it impossible to determine from dried specimens or from the scanty materials at command. I regret that none of the species are in cultivation, a fact probably arising from their not being sufficiently showy for introduction as garden plants.

Affinities.

This comparatively simple organization is highly instructive, and stands in the strongest contrast with that of so many of our familiar garden Orchids. It is here that the affinities of the Orchideæ can best be traced, because here ancestral characters are less masked by later adaptations. In discussing the affinities of any group there is one very important point to be carefully borne in mind, viz. the necessity of distinguishing between truly ancestral characters (which alone afford evidences of consanguinity or real affinity) and adaptive or developmental characters (which may present strong analogies in groups very far separated by lineal descent).

Two extreme cases may be mentioned to illustrate this point. *Ranunculaceæ* presents a number of the strongest analogies with *Alismaceæ*, and yet the two groups might be traced backwards through their various ramifications to the point of divergence of the two great branches of the Angiospermeæ—Monocotyledones and Dicotyledones—before the point of contact was reached; and this alone represents the degree of affinity between the two. In the same way *Asclepiadeæ* and *Orchideæ* present certain similarities in their economy of fertilization, yet their affinities are equally remote. It is therefore clear that organisms, or groups of organisms, standing far apart by ties of consanguinity may yet tend to approach each other in their adaptive or developmental characters if placed for sufficiently long periods under substantially similar conditions. Thus adaptations for securing plants against long periods of drought take the form of succulence; or adaptations for securing the visits of insects frequently take the form of irregularity or unequal suppression or development of parts of the flower; both producing analogies of structure in very diverse groups, *i. e.* groups far separated by ties of consanguinity. These points are here emphasized because they have not been sufficiently recognized by some systematic botanists in discussing affinities, and until quite recently were scarcely recognized at all.

A difficulty may be here supposed to present itself, as to what are ancestral and what adaptive characters; but as the two have been shown to be so essentially distinct, it is sufficient to establish the general principle, premising, however, that, from the very nature of the case, no general rule can possibly ever be applied to it. Ancestral characters will sometimes be of one kind, sometimes of another, but always easily recognized as those extending with the greatest uniformity throughout a group and subject to the smallest amount of variability. Moreover, they are invariably most apparent in embryonic structures, becoming most masked or obscured in those stages where the greatest amount of specialization is developed. Adaptive characters may (and do) become ancestral ones if sufficiently beneficial to give rise to a dominant group of organisms, the adaptive characters being handed down to all the descendants in common. But when once a group becomes dominant, and therefore widely diffused, some of its members invariably come under new conditions of environment; still newer adaptations arise; the group begins again to diverge in various directions; and the non-variable characters are now easily recognized as the ancestral ones.

We now proceed to apply these principles in discussing the affinities of the *Apostasieæ*, and by the aid of the two accompanying diagrams (figs. 1 and 2, page 224) to show their relationship with surrounding groups.

It is very probable that the ancestral Monocotyledonous prototype was an apocarpous plant of very simple structure, destitute of perianth, and probably more nearly allied to *Pandanaceæ* than to any other existing order—a conclusion based upon structural grounds and supported by palæontological evidence. Commencing from this common starting-point, the broad features of the evolution of existing Monocotyledones may be pretty closely traced; though the exact point of divergence of many of the branches from the primary Monocotyledonous stem, and from each other, is a point on which much difference of opinion exists, and the real affinities of a few Orders are not yet at all conclusively settled. At the base of the series occurs the *Nudifloræ*, a comparatively simple group which has not departed far in its essential characteristics from the primary Monocotyledonous type, and which, together with the *Apocarpæ* and the natural orders they comprise, probably represent diverging ramifications of the same early branch. From a point somewhere near the angle of divergence of the previous group may be traced another branch which afterwards separated into three ramifications, the *Glumales* on the one hand, the *Calycinæ* and *Coronarieæ* on the other. The passage between these groups, and their subsequent ramifications into Orders, is, for the most part, so gradual that it seems tolerably clear they had one common origin, afterwards diverging in various directions. Lastly may be mentioned the *Epigynæ*, though it is doubtful if this group had one common origin. The *Amaryllidæ* and Bromeliads at least appear to have arisen from the same branch which produced the *Liliaceæ*; and it seems probable

Fig. 1.

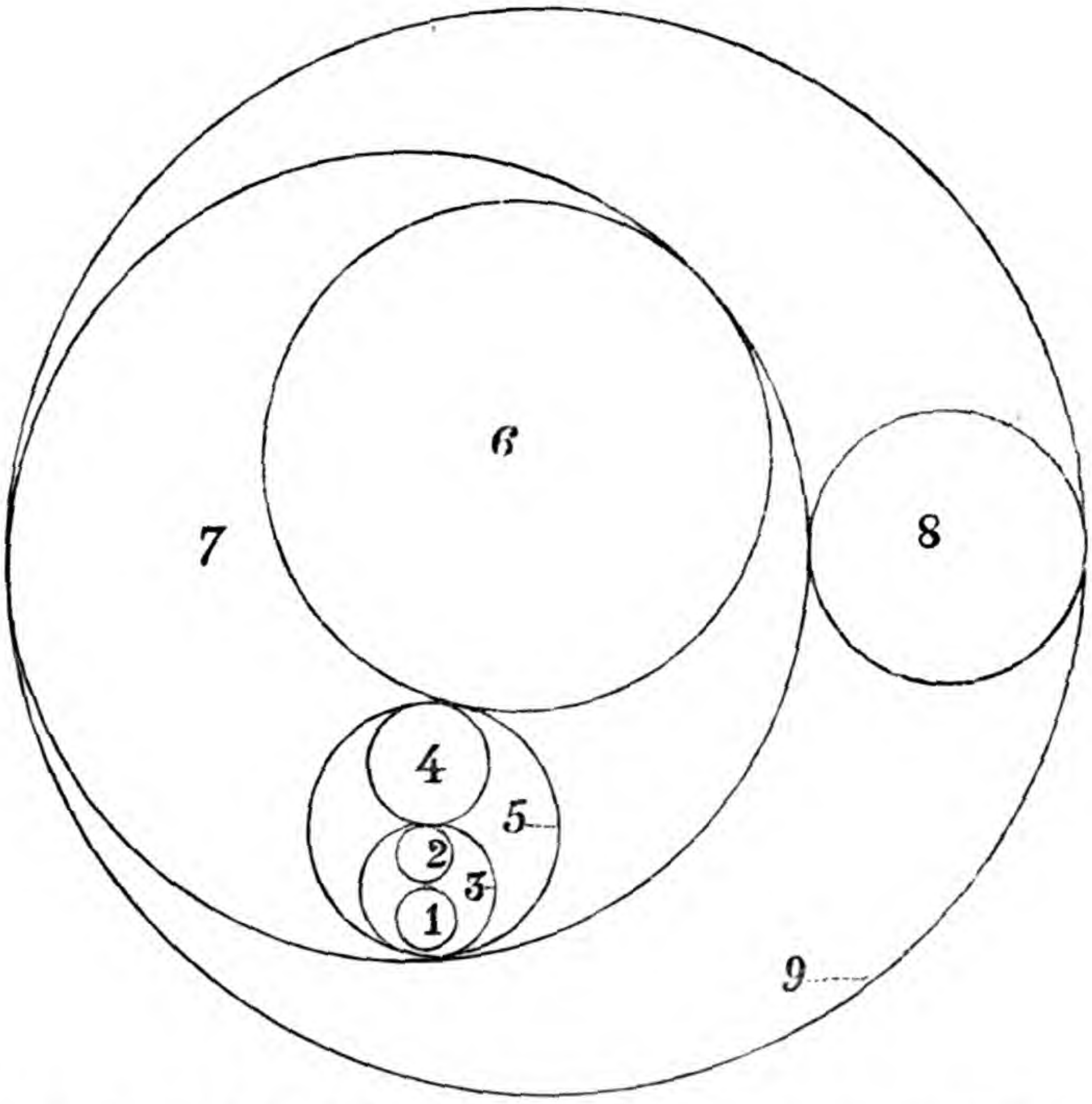


Diagram to show the affinities of *Apostasieæ* with surrounding groups (Plan.) Numbers as in Fig. 2.

Fig. 2.

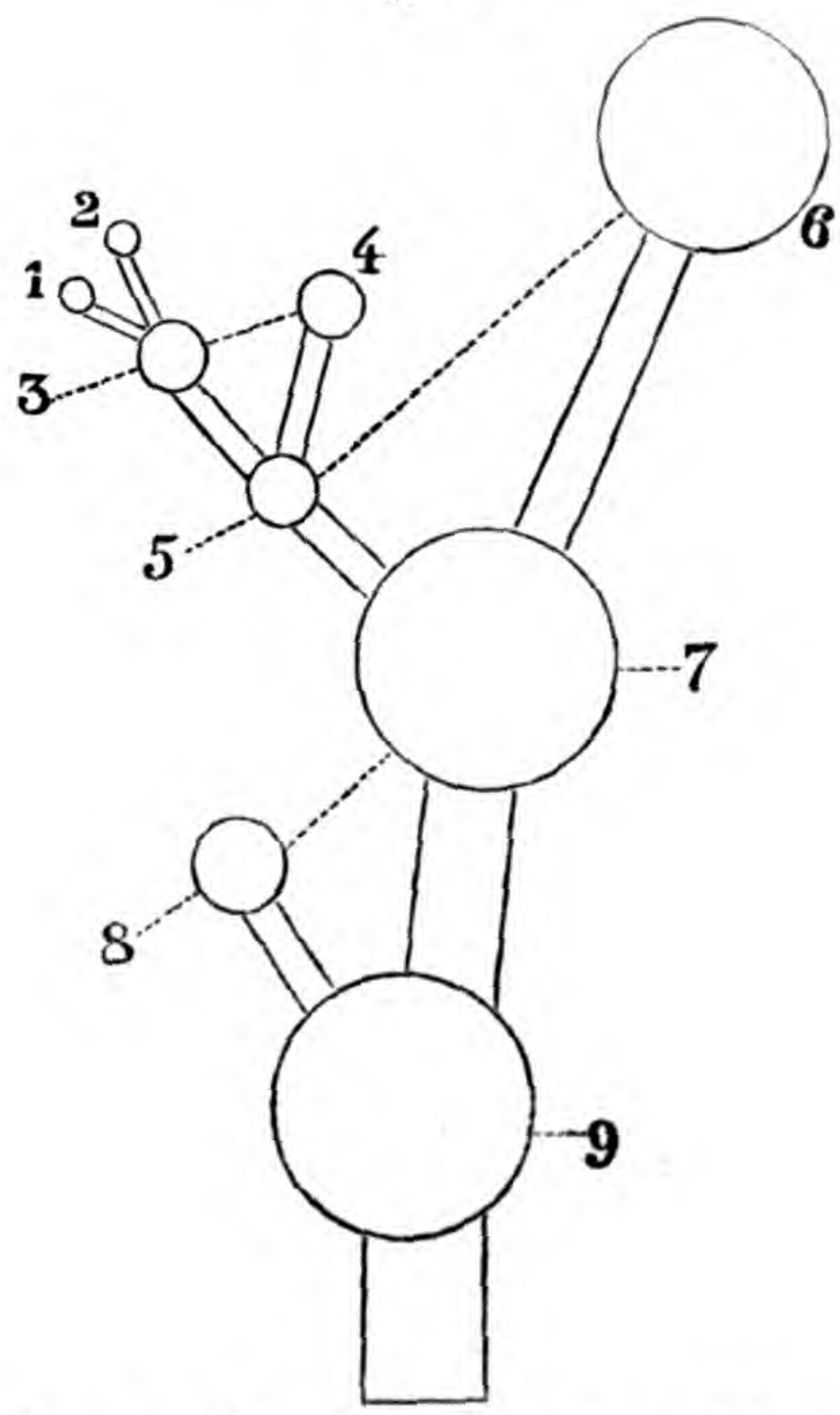


Diagram to show the affinities of *Apostasieæ* with surrounding groups. (See also Fig. 1.)

1. Neuwiedia, 2. Apostasia, 3. Apostasieæ, 4. Cypripedieæ, 5. Diandræ, 6. Monandræ, 7. Orchideæ, 8. Burmanniaceæ, and 9. Arrhizogoneæ.

that most of the epigynal alliance arose from some point along the branch which produced the *Coronarieæ*, and that at some point of the Epigynal branch the *Arrhizogoneæ* (n. 9, figs. 1 and 2) were developed.

The *Arrhizogoneæ* *, in which the culminating point of development of the Monocotyledones is reached, is separated from the remainder of the *Epigynæ* by the minute exalbuminous seeds, with reticulated testa and apparently homogeneous embryo. *Hydrocharideæ* has been artificially grouped together with the two Orders which the above group comprises, on account of its minute exalbuminous seeds; but in other respects it presents so many important differences, that it is tolerably certain its affinities are more remote.

The Arrhizogonal branch now bifurcates, giving rise, on the one hand to *Burmanniaceæ* (n. 8), on the other to *Orchideæ* (n. 7)—the former with the andrœcium quite regular, adnate to the perianth, and free from the gynæcium; the latter with the andrœcium highly irregular, adnate to the gynæcium but free from the perianth.

The Orchideous branch now bifurcates into *Diandræ* (n. 5) and *Monandræ* (n. 6)—the former with the two lateral stamens of the inner whorl perfect, the median stamen of the outer whorl either perfect or modified into a barren staminode, or occasionally quite absent, and the pollen-grains simple; the latter with the median stamen of the outer whorl alone developed, and the pollen-grains either united in tetrads, or still further aggregated in masses.

The Diandrous branch bifurcates into *Apostasieæ* (n. 3) and *Cypripedieæ* (n. 4)—the former with the perianth nearly regular, the column very short, being equalled or exceeded by the free portions of the filaments, the anthers always distinctly elongated, generally versatile, the pollen dry, and the style very slender and much elongated; the latter with the perianth highly irregular, the column more elongated, the anthers very short and basifixed, the pollen-grains connected together by a viscid fluid exudation, and the style short and terminated by an enlarged stigma.

The *Apostasieæ* diverge into two genera, *Neuwiedia* (n. 1) and *Apostasia* (n. 2); the former with three perfect anthers, the

* Pfitzer, Nat. Anordn. Orch. p. 95.

latter with but two, together with other important differences pointed out elsewhere. *Neuwiedia* at once breaks up into about half a dozen species; but *Apostasia* first bifurcates into two marked sections:—*Mesodactylus*, with the third stamen represented as a narrow staminode, adnate to the back of the style, and the anthers versatile, with their bases unequal; and *Adactylus*, with the third stamen entirely suppressed, the anthers basifixed, with their bases quite equal. These groups then break up; the former into three, the latter into two (known) species. Notwithstanding the marked difference between the two sections of *Apostasia*, still in habit and general appearance they are so thoroughly identical, that I do not think it advisable to consider them as genera; though they are at least as distinct as some others so separated, and had each given rise to a large number of species, they might perhaps have been so distinguished. The one negative character correlated with the floral differences above mentioned is, that in both the known species of the section *Adactylus* the peduncle is a little elongated and covered with a series of lanceolate imbricating bracts, which are not present on the more sessile one of the other section.

Returning now to the *Apostasieæ*, the point in dispute with the different botanists who have treated of the group is not so much their characters (though some of these have been somewhat misunderstood), as the particular rank in the system of classification to which those characters entitle them. Those who treat the group as a distinct Order, at the same time uniting *Cypripedieæ* with *Orchideæ*, take a view which, in my opinion, is wholly at variance with the structural peculiarities of the respective groups; while, on the other hand, to regard both as distinct Orders would at least render a similar subdivision of the *Monandræ* necessary. In fact the difference between *Apostasieæ* and *Cypripedieæ* is simply a developmental one, the latter group being a more highly specialized form, or development, of the same structural plan. Nor do I think *Diandræ* and *Monandræ* should be considered as more than distinct Suborders, for the amount of agreement between them is far closer than that between *Orchideæ* and *Burmanniaceæ*, the latter itself by no means a homogeneous group, though not so markedly subdivided as is the Orchideæ *.

* In *Burmanniaceæ* the perianth-segments are united at their bases into a tube, the upper part being free and divided into six segments. The inner whorl of three is generally smaller than the outer (or rarely quite suppressed), both

The *Diandræ* and *Monandræ* evidently represent the two great diverging branches along which the Order has been evolved, the more ancestral *Diandræ* having developed but two marked tribes, while the highly specialized *Monandræ* has multiplied enormously, and given rise to several well-marked tribes and a large number of genera; all connected together by a very strong thread of affinity, and many of them separated from each other by very slight differences.

With regard to the *Cypripedieæ*, a very curious point presents itself. The genus *Selenipedium* has retained the ovarian characters of the more ancestral *Apostasieæ*, while *Cypripedium* has a unilocular ovary with parietal placentation as in the *Monandræ*. This cannot of course be held to constitute any affinity with the *Monandræ*, as *Cypripedium* clearly represents the culminating point of development of the *Diandræ*. The trilocular ovary with axile placentation obviously represents the ancestral condition of the Order, and the development of a unilocular ovary with parietal placentation in each of the two diverging branches may possibly be an adaptation for saving room to accommodate the enormous number of seeds produced. In floral characters *Selenipedium* so clearly agrees with *Cypripedium*, that horticulturists generally treat the two as constituting a single genus, though from the above-named important difference, correlated with a few minor ones, I am convinced that *Selenipedium* should be regarded as a sufficiently distinct genus*.

Affinities with *Hypoxideæ* have been pointed out in the *Apostasieæ*; but these are nothing but developmental analogies, for

being regular, except that in the tribe *Corsieæ* the median segment of the outer whorl (not the inner one, the lip, as in Orchids) is larger than the rest. The stamens are situated on the perianth-tube, six in number, both whorls being present, or the outer whorl suppressed in the tribe *Euburmannieæ*, when the stamens are but three, opposite the inner perianth-segments. The ovary is unilocular with parietal placentation, except in two genera of *Euburmannieæ*, where it is trilocular with axile placentation. In this respect the Order is in a transition state; for in some genera the placentæ intrude considerably, the ovary being three-celled at the extreme base, but only one-celled above. So that here a considerable range of variation is seen.

* There are other genera which, neglecting some constant and important character, are equally difficult to separate. For instance *Eria* and *Dendrobium*, the one with eight, the other with but four pollen-masses; also *Octomeria* and *Pleurothallis*, the one with eight, the other with but two, cannot be absolutely separated without reference to these highly important characters; yet every one considers these as good and sufficiently distinct genera.

the structure of the seeds is quite different. Even the supposed analogies are not very close; for the andrœcium in *Hypoxideæ* is regular. In fact this group so thoroughly agrees with *Amaryllidaceæ*, that it is clearly only a tribe of that order. The similarities in certain characters between *Orchideæ* and *Scitamineæ*, which have been pointed out as tending to justify the ordinal separation of *Apostasieæ*, are in a like manner simply developmental analogies; for the seeds are altogether different, and the line of ancestry of *Scitamineæ* would have to be traced back to the diverging-point of at least one or two other Orders before the point of contact or common ancestry with *Orchideæ* was reached. In short, the lines of bifurcation, if rightly interpreted, are as (in ideal) shown in the annexed diagram (fig. 2, p. 224, shown in plan in fig. 1), and all other affinities are necessarily more remote, and therefore outside the scope of the present paper. The exact point of contact of the *Arrhizogoneæ* with its parent branch, I believe, yet remains to be solved.

Geographical Distribution.

The (known) geographical distribution of the *Apostasieæ* is set forth in the following table; but I believe on this point very much yet remains to be done, and I can only hope that those

			Indo-Malaya.							
	India.	Ceylon.	Malacca.	Penang.	Java.	Sumatra.	Borneo.	Philippines.	New Guinea.	Queensland.
Neuwiedia										
veratrifolia	...	...	...	...	×	...	...	?		
Lindleyi	...	...	...	×	...	...	×			
calanthoides	...	...	..	...	...	...	...	...	×	
Curtisii	...	...	...	×	...	×				
Zollingeri	...	...	...	...	×	...	...	?		
Griffithii	...	...	×							
Apostasia										
§ Mesodactylus										
odorata	...	...	...	...	×	...	..	?		
Wallichii	×	×	...	×	?	...	...	...	×	
stylidioides	...	...	...	...	...	...	...	...	...	×
§ Adactylus										
Lobbii	...	...	...	...	...	...	×			
nuda	×	...	×	×						

who have the opportunity will turn their attention to it and collect more materials.

There are one or two points of interest about the distribution of the group, though in the present imperfect state of our knowledge they cannot be particularly emphasized. Thus, *Neuwiedia* is not represented in India proper or in Ceylon, but only in Indo-Malaya, including the Peninsula, with a single species in New Guinea. Two species occur in the little island of Penang; and as two Apostasias also occur there, it is clear that this island has been better worked than many others. Again, *Neuwiedia Lindleyi* being common to Penang and Borneo, and *N. Curtisii* to Penang and Sumatra, both should also occur elsewhere if looked for. The Philippine species of *Neuwiedia*, also the *Apostasia* so marked, are reported in the "Novissima Appendix" of the third edition of Blanco's 'Flora de Filipinas,' but I have not seen specimens; and the species may not prove identical with the Javan ones with which they have been identified. If correct, however, each is common to Java and the Philippines, and therefore should also occur elsewhere. *Apostasia Wallichii* occurs in Ceylon, in a limited district in India proper (*vide infrà*), in Penang, doubtfully in Java, and apparently again in New Guinea; so that here also much yet remains to be done. *A. Lobbii* is only known from Borneo (here also another undetermined species occurs, *vide infrà*); while *A. stylidioides* is interesting as occurring beyond the range of any other species of the group, namely in Tropical Australia.

Enumeration of Species.

Subordo I. DIANDRÆ*.—Stamina 2 vel 3, antheræ laterales semper perfectæ, anthera postica (in Subordine *Monandra* solum perfecta) sæpius sterilis, varie difformis, rarius perfecta lateralibus similis, rarissime omnino deficiens. Pollen semper simplex, siccum vel viscosum. Ovarium 3-loculare placentis axilibus, vel, in *Cypripedii*, 1-loculare placentis parietalibus.

* Although in *Neuwiedia* three perfect stamens are present, it seems best to retain the old nomenclature, which represents at once one of the earliest and best characters for naturally subdividing the Orchideæ. The terms *Monandræ* and *Diandræ* appear to have been first used by Salisbury, in 1796, in his 'Prodromus Stirpium in horto ad Chapel Allerton vigentium,' though of course in a far more restricted sense than at the present time.

In the Suborder *Monandræ* the median stamen of the outer whorl is alone normally perfect (though others are occasionally developed in monstrous flowers); and the pollen-grains are united together in tetrads, or variously aggregated in masses *. And correlated with this greater complexity in the staminal characters is very frequently a high degree of specialization in the other parts of the flower.

Tribus 1. Apostasieæ, *R. Br. in Wall. Pl. Asiat. Rar.* i. (1830), p. 74.—Ovarium perfecte triloculare placentis axilibus. Perianthium subregulare. Columna brevissima. Antheræ breviter vel plus minus stipitatæ, lineares vel angusti-oblongæ; pollen siccum. Stylus plus minus elongatus.

In the remaining tribe, the *Cypripedieæ*, the perianth is very irregular; the lateral sepals, with one solitary exception (*Cypripedium arietinum*, Ait.), being united into one body, which is thus placed exactly opposite the dorsal sepal, and behind the median petal or lip. This latter organ is modified into a pouch or slipper-like organ, quite different from the lateral petals, which again are always more or less dissimilar to the sepals. The column is more elongated and curved; the two perfect anthers globose, while the third is invariably transformed into a shield-shaped staminode, which partially closes the mouth of the lip. The pollen-grains are held together by a glutinous fluid exudation, which causes it to adhere to the bodies of insects, by which means it is carried from flower to flower. Lastly, the free portion of the style is very short, and terminated by the enlarged oblique stigma. The two genera agree in these respects; but while the Tropical American *Selenipedium* has retained the ovarian characters of the *Apostasieæ*, the remaining genus, *Cypripedium*, agrees with the *Monandræ* in possessing a one-celled ovary with parietal placentation.

Conspectus Generum.

Perianthium subconnivens. Stamina 3, omnia perfecta. Racemi erecti, simplices. Flores mediocres . . 1. *Neuwiedia*, Blume.

* To this *Cephalanthera* forms a solitary exception, having single pollen-grains; but as the genus is obviously a degraded representative of the *Neottieæ*, with which in every other respect it entirely corresponds, it cannot be held to invalidate the general correctness of the above classification.

Perianthium patens vel recurvum. Stamina 2 laterales solum perfecta, staminum posticum castratum vel omnino deficiens. Racemi patentes vel recurvi, sæpe ramosi. Flores parvi.
2. *Apostasia*, Blume.

1. NEUWIEDIA, *Blume*.

NEUWIEDIA, *Blume in Ann. Sc. Nat.* sér. 2, ii. (1834), p. 93. —Perianthium subconnivens, segmentis subæqualibus. Sepala lanceolata. Petala extus carinata, cæterum sepalis similis. Labellum petalis paullo latius, cæterum simile. Columna brevis. Antheræ perfectæ 3, stipitatæ, angustæ, versatiles, loculis parallelis contiguis, 2 ad latera styli, tertium posticum; pollen granulosum. Stylus ad apice columnæ erectus, elongatus, apice in discum parvum antrorsum obliquum stigmatosum dilatatum. Ovarium perfecte 3-loculare. Capsula ovoideo-triquetra, breviter rostrata.—Herbæ terrestres rhizomati brevi, caule erecto simplici foliato. Folia longa in petiolum contracta, venis elevatis percursa. Racemus terminalis, densus, simplex, sæpe elongatus. Flores mediocres, breviter pedicellati. Bracteæ angustæ, flores interdum superantes.—*Blume in Hoev. et De Vr. Tijdschr.* i. (1834), 140*; *Schnizl. Iconogr.* i. t. 67. figs. 15–18; *Benth. in Journ. Linn. Soc.* xviii. 360; *Benth. & Hook. f. Gen. Plant.* iii. 635.

Species 6, ranging from Penang and Malacca through the Malayan Archipelago to the Philippines and New Guinea.

1. N. VERATRIFOLIA, *Blume in Ann. Sc. Nat.* sér. 2, ii. (1834), 94.—"Planta caule simplici inferne radicante, omnino habitus ejusdem ac quædam *Calanthe*, foliis lato-lanceolatis nervoso plicatis, racemo terminali puberulenti, floribus breviter pedicellatis unibracteatis flavescentibus."—*Blume.* "Racemo elongato sparsifloro, bracteis herbaceis acutis, ovariis fusiformibus velutinis, labello ligulato per axin linea carnoso carinato."—*Reichb. f.* —*Blume in Hoev. et De Vr. Tijdschr.* i. (1834), 142; *Reichb. f. in Bonpl.* v. 58; *Miq. Fl. Ind. Bat.* iii. 748.

Hab. Java: "in sylvis montorum altiorum Javæ occidentalis, licet rarissime; ego certe semel tantum mense Julio plantam

* The paper here cited is the same as the one at the head of the genus. Both appeared in the same year, but I am not certain which of them has priority. The same remark also applies to *N. veratrifolia*, Blume.

florentem et alteram eodem tempore fructiferam indagavi" (*Blume*).

This, the original species of the genus, I have not seen; and have therefore reproduced Blume's short description, adding also that of Prof. Reichenbach, who has seen Blume's specimen.

2. N. LINDLEYI, n. sp.—Folia anguste lanceolata, acuminata, petiolata. Scapus bipedalis v. altior. Racemus elongatus, puberulis, multiflorus. Bracteæ anguste lanceolatæ, puberulæ. Ovarium puberulum, triquetro-oblongum. Sepala lineari-lanceolata, minute puberula, cum petalis et labellum cuspidatis. Petala sublatiora, extus carinata. Labellum petalis subsimile, callo medio lineare paullo incrassato. Filamenta ultra dimidium libera. Capsula ovoideo-oblonga, triquetra, subglabra.

Hab. Borneo; *Low*! Island of Penang; *Curtis*, n. 469!

A tall plant, reaching to 3 or $3\frac{1}{2}$ feet high. Leaves 1–2 feet long by $1\frac{1}{2}$–2 in. broad. Racemes 10–15 in. long, with numerous flowers. Bracts $\frac{3}{4}$–$2\frac{1}{2}$ in. long by $1\frac{1}{2}$–3 lin. broad. Pedicels 1–2 lin. long. Ovary 4–5 lin. long. Segments 7–9 lin. long. Column 1 lin., free portion of filaments $1\frac{1}{2}$ lin. long, anthers $3\frac{1}{2}$ lin. long. Free portion of style 3 lin. long. Capsule $\frac{1}{2}$ in. long.

Evidently allied to the preceding, but with narrower leaves, less pubescence, and other differences. Lindley appears to have considered it identical with *N. Zollingeri*, but, as I think, quite wrongly. Likewise Reichenbach, who (*Bonpl.* v. p. 58) remarks:—"In herbario Lindleyano adest planta quæ omnino *N. Zollingeri* bene evoluta. Inflorescentia prope *Cœliæ macrostachyæ* seu *Calanthidis* cujusdam. Ovarium abrupte turbinatum; apice recurrens in rostrum. Sepala linearia, elongata (ovario incluso callo longiora) apicibus apiculata, apiculis in carinulus exeuntibus. Tepala subbreviora. Labellum prope ejusdem rationis, convexum, pagina inferiori carinatum.—Sepala oblique inserta. Stylus apice retusus; filamenta lateralia extus decurrentia. Antheræ lineares apice obtuse acutæ basi cordatæ; versatiles. Borneo, *Lowe*." But the sheet referred to in Lindley's Herbarium contains a single specimen of *N. Zollingeri*, Reichb. f. (collected by Zollinger himself, in Java), and an enlarged drawing of a single flower, labelled by Lindley himself—"Borneo, Lowe, in Hb. Hooker." This drawing, so fully described by Reichenbach, is from the very specimen now described by me as *N. Lindleyi*, a quite distinct plant from *N. Zollingeri*, Reichb. f., as remarks under that species will show. The Penang plant seems identical in every respect with the Bornean one; and being in much more perfect condition, I have made use of it in drawing up the description wherever the other was insufficient.

3. N. CALANTHOIDES, *Ridley*! *in Brit. Journ. of Bot.* 1886, 355, t. 271.—Folia anguste lineari-lanceolata, acuminata, petiolata. Scapus pubescens, vaginis dissitis tectus, validulus, bipedalis. Racemus multiflorus, comosus. Bracteæ virides, pubescentes. Flores majores, carnosuli, ochraceo-flavi. Ovarium pubescens, breviter rostratum. Sepala angusta, lanceolato-linearia, pubescentia. Petala latiora, lanceolata, extus carina depressa pubescente, cum sepalis cuspidata. Labellum angustum, lanceolatum, medio incrassato subtus pubescente, marginibus tenuibus glabris. Antheræ angustæ, lineares, brunneæ. Filamenta complanata, ultra dimidio libera. Stylus cylindricus, filiformis, versus apicem attenuatus, antheris brevior. Stigma parvum, rotundatum.

Hab. New Guinea; Mt. Meroka, at 2000 feet elevation, under shade; flowers yellow; *H. O. Forbes*, n. 777!

A little smaller than the preceding. Leaves 2 ft. long by 1½ in. broad. Racemes 8 in. or more long. Bracts, the lower ones 1½ in. long, decreasing upwards. Sepals ½ in. long, petals and lip a little broader than sepals. Ovary ½ in. long.

I have seen the type specimen in the British Museum; but the description is, for the most part, drawn up from that of Mr. Ridley. The flowers are a little smaller than in *N. Lindleyi*, also more pubescent, and the leaves a little narrower.

4. N. CURTISII, n. sp.—Folia lanceolata, acuminata, petiolata. Scapus brevis. Racemus brevis, multiflorus, pubescens. Bracteæ anguste lanceolatæ, pubescentes. Ovarium pubescens, triquetrum, ovoideum. Sepala lineari-lanceolata, pubescens, cum petalis et labellum cuspidatis. Petala paullo latiora, extus carinata. Labellum petalis subsimile, callo medio lineare paullo incrassato.

Hab. Sumatra; *Curtis*, n 55! Island of Penang; West Hill, at 2000 ft. elevation; *Curtis*, n. 1185!

Leaves 8–18 in. long by $1\frac{1}{2}$–$2\frac{3}{4}$ in. broad. Scape much shorter than the leaves. Racemes 4–5 in. long. Bracts 9–12 lin. long by $1\frac{1}{2}$–$2\frac{3}{4}$ lin. broad. Pedicels 2 lin. long. Ovary $2\frac{1}{2}$ lin. long. Segments 5–6 lin. long. Column and free portion of filaments each about 1 lin. long. Style 2 lin. long.

The leaves are broader and the racemes shorter than in any of the preceding species, while the pubescence is also very marked. The Penang plant seems quite identical with the Sumatran one. In this latter two or three of the flowers I have examined are monstrous, while others are in the normal condition. In one the two lateral sepals and the lip occur in their normal position, the dorsal sepal and the two petals being carried at least a line higher by a pedicel-like growth formed of their united bases together with the column. After elongating for another line the style becomes free, while the filaments remain further united for over half a line more, when they branch in the ordinary way, the central filament being, as usual, a little longer than the lateral ones. This condition is represented on Pl. XLVIII. fig. 13. It appears to result from a remarkable lengthening of the floral axis. All the organs appear to be quite perfect. In a second flower, however, the petals are united to the lateral sepals, while the filaments are wholly connate. In other respects the flower is unaltered.

5. N. Zollingeri, *Reichb. f.* ! *in Seem. Bonpl.* v. (1857), 58.—Folia lanceolata, acuminata, petiolata. Scapus brevis. Racemus brevis, multiflorus, minutissime puberulis. Bracteæ anguste lanceolatæ, subglabræ. Ovarium glabrum, triquetrum, ovoideum. Sepala lineari-lanceolata, subglabra, cum petalis et labellum cuspidatis. Petala paullo latiora, extus carinata. Labellum petalis subsimile, callo medio lineare paullo incrassato.—*Reichb. f. Xen. Orch.* ii. 13, t. 106.

Hab. Java; Mt. Idjeng, 2000–4000 ft. alt., in bambusetis; *Zollinger*, n. 2808!

Leaves 8–18 in. long by $1\frac{3}{4}$–$2\frac{1}{2}$ in. broad. Scapes much shorter than the leaves. Racemes 4–6 in. long. Bracts 6–12 lin. long by 1–2 lin. broad. Ovary 2 lin. long. Sepals 4–5 lin. long. Filaments $1\frac{1}{4}$ lin. long; anthers 2 lin. long. Style a little exceeding the stamens.

Readily distinguished from all the preceding species by its nearly, if not quite, glabrous ovary, sepals, and bracts. *N. Lind-*

leyi, with which it has been confounded, is quite distinct, as pointed out under that species. The only specimen of *N. Zollingeri* I have seen is in Lindley's Herbarium, the lower flowers of the raceme only being expanded.

6. N. Griffithii, *Reichb. f.*! *Xen. Orch.* ii. (1874), 215.—Folia lanceolata, acuminata, petiolata. Scapus brevis. Racemus brevis, multiflorus, hispidus. Bracteæ anguste lanceolatæ, hispido-pubescentes. Ovarium hispidum, triquetrum, ovoideum. Sepala lanceolata, hispido-pubescentes, cum petalis et labellum breviter cuspidatis. Petala subsimiles, extus carinata. Labellum petalis subsimile, callo medio lineare paullo incrassato. Filamenta brevis; antheræ oblongæ. Capsula triquetro-ovoidea, rostrata, hispida.

Hab. Malacca; *Griffith*! *Maingay*, n. 1682!

Leaves 4–10 in. long by 1–1½ in. broad. Scapes shorter than the leaves. Racemes 3–4 in. long. Bracts 6–9 lin. long by 1 lin. broad. Ovary 2 lin. long. Sepals 3 lin. long. Filaments shorter than column; anthers 1 lin. long. Style exceeding anthers. Capsule, including the beak, 4 lin. long.

Much smaller in all its parts than any other species; also readily distinguished by the very hispid pubescence. This is the only species of which I have seen quite mature capsules.

Doubtful Species.

F. Villar, in *Blanco, Fl. Filip.* ed. 3, *Nov. App.* 251, enumerates the following:—

N. veratrifolia, Blume, from San Mateo, Island of Luzon.

N. Zollingeri, Reichb. f., from the same locality.

These determinations may be correct; but as I have not seen specimens, and as these species with the above exceptions have only been recorded from Java, I prefer to consider the determinations as requiring confirmation. I should feel extremely obliged to any one who would forward specimens, not only from this locality, but also from any other. A good series of the genus is much wanted, for, with the exception of the last species, the material is not sufficient for complete description. The best characters for determination of the species appear to rest in the relative size of the flowers, the nature of the pubescence, and, I am inclined to think, in the character of the mature capsule.

In the leaves and general habit there is a considerable amount of uniformity between the species.

2. Apostasia, *Blume.*

Apostasia, *Blume, Bijdr.* (1825). 423, t. 1. fig. 5.—Perianthii segmenta consimilia, æqualia, libera, patentia v. recurva. Columna brevis. Antheræ perfectæ 2, ad latera styli brevissime stipitatæ, erectæ, versatiles v. basifixæ, angustæ, loculis subparallelis contiguis; pollen granulosum. Stylus ad apicem columnæ erectum, elongatum, apice in discum parvum stigmatosum integrum v. 3-dentatum dilatatum. Ovarium perfecte 3-loculare. Capsula anguste linearis.—Herbæ terrestres rhizomate brevi, caule erecto simplici undique foliato. Folia angusta, venis prominentibus percursa. Racemi in apice caulis sessiles, simplices vel ramosæ, sæpissimæ patentes vel recurvæ. Flores parvi, brevissime pedicellati. Bracteæ angustæ, acutæ.—*R. Br. in Wall. Pl. Asiat. Rar.* i. 74; *Bauer, Ill. Orch. Pl., Fruct.* t. 15; *Schnizl. Iconogr.* i. t. 67. figs. 1–14; *Griff. Notul.* iii. 243, *Icones*, t. 282; *Blume in Ann. Sc. Nat.* sér. 2, ii. 93; *Endl. Gen. Pl.* i. 221; *Benth. in Journ. Linn. Soc.* xviii. 360; *Benth. & Hook. f. Gen. Pl.* iii. 635.

Niemeyera, *F. Muell. Fragm. Phyt. Austral.* vi. (1867–8), 96.

Species 5 or 6, ranging from subtropical India, at low elevations, to Ceylon, and through the Malayan Archipelago to the Philippines and Tropical Australia.

Sect. 1. Mesodactylus, *Wall. ex Endl. Gen. Plant.* i. 221.—Staminis tertii filamentum anantherum. Antheræ versatiles; antherarum loculi basi inæquales.

1. A. odorata, *Blume, Bijdr.* (1825), 423, t. 1. fig. 5.—"Foliis lineari-lanceolatis, racemis deflexis antherarum loculis basi inæqualibus, filamento tertio castrato."—*Blume in Ann. Sc. Nat.* sér. 2, ii. 93; *id. in Hoev. et De Vr. Tijdschr.* i. 139; *Miq. Fl. Ind. Bat.* iii. 748.

Hab. Java; in sylvis primævis montis Salak; *Blume.*

This, the original species of the genus, I have not seen, and have therefore reproduced Blume's very short description. It has, however, larger flowers than *A. Wallichii*, R. Br., for in the Ann. Sc. Nat., above cited, Blume under that species remarks:—"Iterata *A. odoratæ* inspectis me docuit, antherarum structuram esse eamdem atque in *A. Wallichii*, R. Br. Facile autem ambæ interse dignoscuntur indicata foliaturæ diversitate: hujus etiam flores sunt minores ac filamenta breviore quam in specie priore."

2. A. Wallichii, *R. Br. in Wall. Pl. Asiat. Rar.* i. (1830), 75, t. 84 ("*A. odorata*" on plate).—Folia ensiformi-lanceolata, in acumen gracillimum attenuata, recurvato-patentia. Racemus ramosus, decurvato-nutantis, multifloris. Flores parvi, flavi, admodum fragrantes. Bracteæ lanceolatæ, subcarinatæ. Perianthii segmenta lanceolato-lineares, cuspidata, subsimilia, apice patentia. Filamenta brevissima; antheræ oblongæ, basi inæquales. Staminodium styli supra medium adnatum. Stylus staminodio longior.—*Blume in Ann. Sc. Nat.* sér. 2, ii. 93; *Miq. Fl. Ind. Bat.* iii. 748; *Wall. Cat.* n. 4448; *Thwaites, Enum. Ceyl. Pl.* 315.

Mesodactylus deflexa, *Wall. ex R. Br. in Wall. Pl. Asiat. Rar.* i. (1830), 74, in nota.

Hab. India; in valle Napaliæ minore Noakote; *Wallich*! Assam; *Griffith*, n. 5603! Khasia Mts., in the tropical region; *Hooker & Thomson*, n. 2398! Penang, at 2500 ft. elevation; *Curtis*, n. 925! Ceylon, banks of streams in the Saffragan district, at no great elevation; *Thwaites*, n. 2744! N. Guinea, in the south-eastern district; *Rev. J. Chalmers*!—Blume also mentions a fruiting specimen from New Guinea, and a specimen from Java without flowers.

Plant 1–2 ft. high. Leaves 6–10 in. long by 3–5 lin. broad. Racemes 2–3 in. long, somewhat longer in fruit. Ovary 6–8 lin. long. Perianth-segments 2½ lin. long. Capsules 1 in. long.

Distinguished from the preceding, according to Blume, by the smaller flowers. The New-Guinea plant cited is in the British Museum. The leaves are a little narrower than usual, still it appears to belong to the same species. The Javan locality requires confirmation.

3. A. stylidioides, *Reichb. f. in Flora*, v. (1872), 278, in nota.—Planta humilis. Folia lanceolato-linearia, acuminata, suberectes. Racemus ramosus, laxiflorus. Bracteæ lanceolati-triangulares, acutæ. Perianthii segmenta lanceolato-linearia, cuspidata. Filamenta brevis; antheræ basi inæquales. Staminodium fere omnino adnatum.—*Reichb. f. Xen. Orch.* ii. 215, t. 196. fig. 1; *Benth. Fl. Austral.* vi. 396.

Nieymera stylidioides, *F. Muell. Fragm. Phyt. Austral.* vi. (1867–8), 96.

Hab. N.E. Australia: Rockingham Bay; *F. Mueller*!

Plant 6–8 in. high. Leaves 3–6 in. long by 1½–3 lin. broad. Racemes 1–2 in. long. Bracts 1–2 lin. long. Ovary 4 lin. long, elongating somewhat in fruit. Perianth-segments 1½ lin. long.

A much smaller plant than the preceding, with shorter and narrower leaves and smaller and narrower perianth-segments.

Both Reichenbach and Bentham, while describing the anther-bases as unequal, say that the staminode is absent, the former also so figuring it. Bentham, however, while saying that it agrees with *A. nuda* in the absence of the barren stamen, adds, "except that in some flowers I find the style abortive, or nearly so, and replaced, as it were, by a staminode." My observations, however, do not agree with those of these two authors, and, as all worked with the same materials, there should be no discrepancy on this point. I have very carefully examined four flowers, one, at least, having probably been examined by Bentham, as it was placed in a small capsule. In all four the staminode was undoubtedly present, but almost entirely adnate to the style, and hence perhaps previously overlooked. The apex, however, is free, or like a minute tooth, and down either side between the staminode and the style is a most distinct groove; while at the base the insertion of the staminode is precisely as in *A. Wallichii*, R. Br. (see Pl. XLVIII. fig. 23). Nor did I observe any difference in the flowers examined, all seemed quite normal, and unmistakably those of the section *Mesodactylus*.

Sect. 2. ADACTYLUS, *Endl. Gen. Plant.* i. 221.—Staminis tertii vestigium nullum. Antheræ basifixæ; antherarum loculi basi æquales.

4. A. LOBBII, *Reichb. f. in Flora*, lv. (1872), 278.—Folia lineari-lanceolata, acuminata, subpatentia. Racemus breve pedunculatus, basi multibracteatus, ramosus, recurvo-nutantis. Bracteæ subulato-lineares, acutæ. Ovarium sessile. Perianthii segmenta linearis, cuspidata. Filamenta brevia; antheræ sagittato-lineares, acutæ, vulgo cohærentiæ.

Hab. Borneo; *Lobb* (ex *Reichb. f.*); Forests of Labuan; *Lobb* (in Herb. Kew)! Bangarmassing, Borneo; *Motley*, n. 840!

Plant 1½ ft. high. Racemes 2½ in. long, elongating in fruit.

Ovary 4 lin. long. Perianth-segments $1\frac{1}{2}$ lin. long. Capsule $\frac{3}{4}$ in. long.

Readily distinguished from the following species by its broader leaves and more robust habit, also by the more linear perianth-segments and narrower anthers. The ovary is more sessile than in any other species.

5. A. NUDA, *R. Br. in Wall. Pl. Asiat. Rar.* i. (1830), 76, t. 85. —Folia erecto-patentia, linearia, attenuato-acuminata. Racemus breve pedunculatus, recurvato-patentis, basi multibracteatus. Bracteæ lineari-lanceolatæ, acuminatæ. Flores minimi, flavi. Perianthii segmenta lanceolata, breve cuspidata. Filamenta brevia; antheræ lineari-subcordatæ, acutæ.—*Blume in Ann. Sc. Nat.* sér. 2, ii. 93; *Miq. Fl. Ind. Bat.* iii. 748; *Wall. Cat.* n. 4449.

A. Brunonis, *Griff.*! *Notul.* iii. (1851), 243; *Icones*, t. 282.

Hab. India; in montosis Penang; *Wallich*! Khasia Mts., in the tropical region, *Hooker & Thomson*! Chittagong, below 1000 ft. elevation, *Hooker & Thomson*, n. 444! Mergui; *Griffith*, n. 5604! Malacca, *Maingay*, n. 1680! Singapore, *Lobb*! Without locality, *Falconer*!

Plant 2–3 ft. high. Racemes 2 in. long, elongating in fruit. Ovary 4 lin. long. Perianth-segments $1\frac{1}{4}$ lin. long. Capsule $\frac{1}{2}$ in. long.

A more slender plant than the preceding, with narrower leaves, more lanceolate perianth-segments, and broader anthers. In fruit it may be readily distinguished from *A. Wallichii*, R. Br., by the narrower leaves, and racemes with numerous imbricating bracts at the base.

Doubtful Species.

F. Villar, in *Blanco, Fl. Filip.* ed. 3, *Nov. App.* p. 251, enumerates:—

A. odorata, Blume, from San Mateo, Island of Luzon; but as I have seen no specimen, and as the species is otherwise only recorded from Java, I prefer to consider the determination as requiring confirmation.

A., sp.—A plant in the Kew Herbarium, from "Deep shady jungle, Labuan, *Motley*, n. 95," very closely resembles *A. stylidioides*, Reichb. f., in general appearance, though I believe it to be a distinct species. It is, however, just passing out of flower, and much too imperfect for description. The material is not sufficient to show even to which section it belongs.

A good series, especially of flowering specimens, of this genus is much wanted, many of those which I have seen being very imperfect in this respect. Of all the specimens of *A. Wallichii* cited only one bears examinable flowers. I should be extremely obliged to any one who would send specimens, especially from localities not here enumerated, for it is clear that the range of the species is at present very imperfectly known.

DESCRIPTION OF PLATE XLVIII.

Fig. 1. Diagram showing the arrangement of the flower in *Apostasieæ*.
2. A bud of *Neuwiedia Griffithii*, Reichb. f., × 2 diam.
3. Expanded flower
4. Lateral sepal
5. Petal
6. Lip
7. Column, with stamens and style,
8. Capsule, and in section,
} of same, × 2 diam.
9. Seed of same, highly magnified.
10. Flower of *N. Lindleyi*, Rolfe, all the segments, except the dorsal sepal, being thrown back to show the position of the stamens and style, × 2 diam.
11. Column with stamens and style of same, the anther on the right bent down to show its versatile insertion, × 3 diam.
12. Section of ovary of same, showing axile placentation, × 3 diam.
13. Monstrous flower of *N. Curtisii*, Rolfe (fully described on page 234), showing abnormal elongation of the floral axis, the parts being carried up out of their normal position, × 2 diam. Note the union of the filaments, the darker central nerves, and the insertion of the style, which is only an exaggerated development of their normal arrangement.
14. Pollen of same, highly magnified.
15. Bud of *Apostasia Lobbii*, Reichb. f., × 2 diam.
16. Segment
17. Column with stamens (back view) and style
18. Ditto (side view, one stamen removed)
19. Stamen (front view), showing introrse dehiscence,
} of same, × 4 diam.
20. Segment of *A. nuda*, R. Br., × 4 diam.
21. Column with stamens (back view on right hand, front view on left) and style of same, showing the equal basifixed anthers, as in *A. Lobbii*, × 4 diam.
22. Segment of *A. Wallichii*, R. Br., × 4 diam.
23. Column with stamens (back view) and style of same, showing the staminode adnate to the back of the style, × 4 diam.
24. A stamen of same removed (front view), showing the versatile arrangement, the unequal base of the anther, and the longitudinal dehiscence, × 4 diam.

R.A.Rolfe delt.

J.N. Fitch lith et imp.

Fig. 25. Pollen of same, highly magnified.
26. Capsule, with section, of same, the former × 2, the latter 4 diam.
27. Seed of same, highly magnified.
28. Column, with staminode, style, and anthers, of *A. stylidioides*, Reichb.f., showing that it really belongs to the section *Mesodactylus* (see remarks on page 238), × 4 diam.

Supplementary Note.

Since the foregoing was written some additional materials have come into my hands, which it seems desirable to append as a supplementary note. These are :—(1) specimens received at Kew in the ordinary way, and (2) Blume's types of the two genera *Neuwiedia* and *Apostasia*, together with other specimens for determination, kindly lent by the authorities of the Botanic Garden at Leyden. These are distinguished by the words "*Hb. Kew.*," or "*Hb. Lugd. Batav.*," respectively.

1. Neuwiedia veratrifolia, *Blume*.—The type specimen received is in fruit, and has the raceme a little more compact than in *N. Lindleyi*, Rolfe, the bracts proportionately broader, and the young fruits are more pubescent. A second specimen has two or three narrower bracts, but no flowers, the upper portion of the raceme being missing. An erect portion of the rhizome, six inches long and supported by stout aerial roots, has the nodes half an inch distant, each marked by a very prominent annular scar. The two species are not strictly comparable without better material of the former; but I should not be surprised if *N. Lindleyi* yet proves specifically identical with Blume's plant.

2. N. Lindleyi, *Rolfe*.—(Probably; there being no flowers.) Borneo; Coll. —— ? *Hb. Lugd. Batav.*

4. N. Curtisii, *Rolfe*.—A specimen in young fruit. Sumatra; Coll. —— ? *Hb. Lugd. Batav.*

6. N. Griffithii, *Reichb. f.*—Perak, in dense old jungle at 400 to 600 feet elevation, "rare, flower very white, hanging downwards, bell-shaped;" *King*, n. 10128. *Hb. Kew.*

1. Apostasia odorata, *Blume*.—The type specimen is a little over a foot high, the leaves 3–5 in. long by 4–5 lin. broad, the

raceme unbranched, and the segments 3–3½ lin. long. The short lanceolate leaves readily distinguish it.

2. A. Wallichii, *R. Br.*—Perak, in dense bamboo-forest, at 400–600 ft. elevation; *King*, n. 10629; *Scortechini*, n. 714. *Hb. Kew.* Sumatra, *Prætorius. Hb. Lugd. Batav.*

3 *a.* A. (§ Mesodactylus) gracilis, *Rolfe*, n. sp.—Planta 6–9 poll. alta. Folia linearia, attenuata, 3–6 poll. longa, 2–3 lin. lata. Racemus ramosus, diffusus, 2–2½ poll. longus. Bracteæ lanceolatæ, acutæ, 1½–2 lin. longæ. Ovarium 6–7 lin. longum. Perianthii segmenta angustissima, 1½–2 poll. longa. Antheræ lineares, obliquæ, basi inæqualibus. Staminodium ut in sectione.

Hab. Borneo; Coll. ——? *Herb. Lugd. Batav.*

Differs from *A. stylidioides*, Reichb. f., of which it has much of the general appearance, in its more diffuse panicle, with more slender branches, its more slender ovaries and narrower segments. The stamens, staminode, and style are very similar in the two species.

Motley's Bornean specimens, mentioned at p. 239 as probably belonging to an undescribed species (which I have since discovered in his MSS. to have flowers "white"), is remarkably similar in general appearance; but as the fruits are only two thirds as long as the undeveloped ovaries of *A. gracilis*, I hardly think they can belong to the same species.

4. A. Lobbii, *Reichb. f.*—Borneo; Coll. ——? *Hb. Lugd. Batav.*

5. A. nuda, *R. Br.*—Perak; *Wray*, n. 1114, "flowers white;" also n. 866. Malacca, top of Mt. Ophir; *Hullett*, n. 866. *Hb. Kew.* Sumatra; *Korthals*; *Prætorius.* Java; Coll. ——? *Hb. Lugd. Batav.* Wray's specimen, marked "flower white," seems quite identical with yellow-flowered ones in other respects.

6. A. (§ Adactylus) latifolia, *Rolfe*, n. sp.—Planta 1½–3 ped. alta. Folia lanceolata, acuta, petiolata, 3–6 poll. longa, 1 poll. lata. Racemi ramosi, nutantes, 3–5 poll. longi. Bracteæ subulato-lanceolatæ, subcarinatæ, 2 lin. longæ. Ovarium sessile, angustum, 3 lin. longum. Perianthii segmenta lineari-oblonga, cuspidata, 1 lin. longa. Antheræ lineari-cordatæ, obtusæ, basi æqualibus. Staminodium nullum. Stylus gracilis, antheras æqualis. Fructus 6 lin. longus.

Hab. Perak, at Ulu Batang Padang; *Wray*, n. 1605; *Scortechini*, n. 868. *Hb. Kew.*

A most distinct species. The leaves are much broader than in any other, also fewer and more distant, while the bracts at the base of the inflorescence are not so distinctly developed. Wray notes the plant as "3 ft. high," but his specimen (with roots attached) is but little over half this height. His specimen is in fruit only, but Scortechini's has both flowers and fruit.

On *Boodlea*, a new Genus of Siphonocladaceæ.

By GEORGE MURRAY, F.L.S.

[Read 21st February, 1889.]

(PLATE XLIX.)

A FEW weeks ago Dr. G. B. De Toni, on receiving a paper on *Struvea* recently published by Mr. Boodle and myself ('Annals of Botany,' vol. ii.), suggested to me in a letter that a species of *Cladophora* collected by the 'Challenger' Expedition on the coast of Japan, and described in our Journal (vol. xv. p. 451) by Professor Dickie as a new species, viz. *C. coacta*, Dickie, would be worth examination, since, so far as he could judge from the reference to "anastomosing filaments" in the description, it appeared to be a *Struvea*. The type is in the British Museum—both Prof. Dickie's own specimens and the distributed 'Challenger' series. It was therefore hardly likely that it could have escaped us in our recent work at the genus; but the allusion to its "anastomosing" filaments certainly excited curiosity. The specimens had not been long under examination when it appeared that the so-called "anastomosing" was in a double sense like that of *Struvea*—first, it was not true anastomosis, but adhesion without open communication; and, secondly, this adhesion was effected by tenacula remarkably like those of *Struvea* (compare 'Annals of Botany,' vol. ii. pl. xvi. figs. 1 *f*, 3 *d*, 3 *e*, 3 *f*, with figs. 2 and 3 of the Plate accompanying this paper). At the same time it became apparent that this alga possessed no regular frond or stalk like a *Struvea*, but resembled *Microdictyon* more strongly in this respect. The tenacula, however, are very different from those of *Microdictyon*, and, more important still, the branching also. In *Microdictyon* the filaments spread out in one plane and form a definite net; in this organism they run in all directions (Pl. XLIX. fig. 1), and are united by apical tenacula into a body which (when allowed to swell up in water) has a pulpy spongy texture, and *is net-like in whatever section it may be viewed.* No genus has been described which would serve for the reception of such an organism; and I therefore establish one, and, at the happy suggestion of Dr. De Toni, name it in honour of my friend Mr. Leonard Boodle, F.L.S., who has been my fellow-worker in three recent researches on the group to which it belongs, viz. on *Spongocladia*, on *Struvea*, and on *Avrainvillea*.

The discovery of this form led me to look more closely into the forms of *Microdictyon* in the British Museum Herbarium; and I was at once struck with the appearance of specimens labelled *M. Montagnei* by Prof. Dickie, from the Island of Mangaia in the South Pacific, and published as such in our Journal (vol. xv. p. 33). Examination of it very speedily revealed the fact that it was even a finer specimen of *Boodlea*. It exhibited tenacula in great abundance and in perfect preservation. The accompanying figures have been drawn from this material.

The apical tenacula adhere to whatever portion of the adjoining filaments they may come in contact with; and since the branching is by no means regular, either as to the number of filaments given off at a particular point or as to the degree of their divergence, a very irregular maze of joined and jointed filaments is the result. As a rule, however, either one or two branches are given off at the same place. The configuration of the meshes is further rendered irregular by the occurrence of tenacula, though rarely, at indefinite points on the walls of filaments, where no doubt they have been produced in response to the stimulus of contact with neighbouring branches. The ordinary tenacula which occur at the ends of branches are commonly single, but sometimes in pairs, an arrangement which holds good for *Struvea* as well.

The filaments and their septation are very like those of *Cladophora*; and since they also resemble *Microdictyon*, one is by no means astonished that Prof. Dickie has at different times placed this alga in both genera. The contents of the cells, so far as can be judged with safety from the dried material, agree very well with what Schmitz has described as typical of *Siphonocladaceæ*. The chlorophyll grains are flat with polygonal outline and central clear spot—the pyrenoid—and occur in denser mass towards the free ends of the filaments.

As regards the systematic position of *Boodlea* there need be no hesitation in assigning it. If we start from *Cladophora* in the direction of *Spongocladia*, if I may so express myself, we find in the latter genus occasional tenacula, which, however, do not serve to unite the filaments into any definite reticulate frond, but are more probably of use in binding them together in strands. *Spongocladia* is at once very like *Cladophora*; and, as regards its long filaments, which are septate only in the basal region, not unlike *Vaucheria*, for example. Let us take *Boodlea* next. It retains the resemblance to *Cladophora* in its jointed filaments; but the tenacula are very abundant and unite the filaments in the fashion just described. In *Microdictyon* we have a further approach to the formation of a frond, since the adhesion of the filaments lying in one plane constitutes a true reticulum. In *Struvea* there is not only a definite and very beautiful frond (the adhesion still being by means of tenacula), but a stalk, the structure of which indicates relationship with *Valonia*. Before coming to *Valonia*, however, we have two genera, *Apjohnia* and *Chamædoris*, with the *Valonia*-like stalk-structure, but with fronds which are no longer held together by tenacula, but wave free in the water. From these to *Valonia* it is but a step. I may therefore claim for *Boodlea* that it forms a very important link in establishing a connexion between the Siphoneæ (*sensû* Agardh) and the jointed green Algæ. It thus strengthens the cohesion of the group of *Siphonocladaceæ*, or, at all events, of that portion of the group which everybody accepts.

BOODLEA, nov. gen., *G. Murr. et De Toni.*

Alga viridis, marina, spongiosa, aspectû frondis defecta, ex filis confervoideis regulariter articulatis, iterum atque iterum ramosis, quocunque vergentibus, inter se per tenacula adhærentibus composita.

B. COACTA, n. sp. Pusilla, coacta, cellulis cylindricis diametro 2–10plo longioribus; ramulis aut singulis aut binis, hinc illinc inter se per tenacula adhærentibus.

Syn. *Cladophora coacta*, Dickie (Journ. Linn. Soc., Bot. xv. p. 451).

Hab. Ad Osima Harbour, Nippon, Japan, '*Challenger*'! et ad ins. Mangaia, in oceano Pacifico lat. 21° 57′ S., long. 158° W., *Gill*! (sub nomine *Microdictyi Montagnei*, Harv., in Dickie, "Algæ from Mangaia," Journn. Linn. Soc., Bot. xv. p. 33).

The Flora of Madagascar.

By the Rev. RICHARD BARON, F.L.S., F.G.S.

[Read 1st November, 1888.]

(With MAP.)

IT may now be said with perfect truth that the vegetable productions of Madagascar have been, though not thoroughly, very extensively explored, and that the majority of the plants inhabiting the island are known to science. The country has been traversed by botanists in many different directions, its highest mountains have been ascended, its lakes and marshes crossed, its forests penetrated, and large collections of plants have been made from time to time, which have been examined and described in various publications. Our knowledge of the flora of Madagascar is due, in the first instance, to the labours of Flacourt, Dupetit Thouars, Commerson, Chapelier, Bernier, Lantz, Boivin, Pervillé, De Lastelle, Richard, Grevé, Hilsenberg, Bojer, Goudot, Bréon, Vesco, Grandidier, Thompson, Lyall, Ellis, and others, most of whom collected plants chiefly in the east, north, and north-west parts of the island. M. Grevé, however, gathered many, if not all, of his specimens on the south-west coast; while Messrs. Hilsenberg, Bojer, Lyall, and Ellis explored the botanical treasures of the eastern forests and the central highlands.

Within the last few years our knowledge of the flora of the island has been very materially increased ; so that, whereas until recently less than 2000 species of plants were known, there are now [1889] named and described about 4100, though many of these will doubtless prove repetitions when they are properly compared and worked out. Dr. Rutenberg, who, in the year 1878, was probably murdered in Western Madagascar, and Dr. Hildebrandt, who died in Antananarivo in 1881, made extensive botanical collections, chiefly in the north-west and central parts of the country. Mr. Borgen, of the Norwegian Missionary Society, gathered, a few years ago, a valuable series of mosses, chiefly, if not entirely, on Ankaratra Mountain in Imerina. Miss Gilpin, of the Friends' Foreign Mission Association, and Mrs. Pool, of the London Missionary Society, have largely added to our knowledge of the fern-flora of the interior, especially of the forests ; and Dr. Fox, of the Friends' Foreign Mission Association, has materially increased our knowledge of the orchids of Imerina. M. Humblot has recently explored the large forest in the north-east of the island. Mr. Langley Kitching, Dr. Parker, and Mr. Cowan have discovered a considerable number of novelties in the Imerina and Betsileo provinces, and I myself have sent to Kew several cases of plants collected in various parts of the island. The greater number of the plants gathered by these various collectors in different localities have been examined by Mr. J. G. Baker, F.R.S., of Kew, and the novelties have been described by him in the Linnean Society's 'Journal' and the 'Journal of Botany.' Mr. Ridley has, however, described the new orchids and a few other plants. The French collections have been chiefly taken in hand by M. Baillon, and the German collections by Vatke, Freyn, Buchenau, Körnicke, Radlkofer, O. Hoffmann, and others.

Botanizing in Madagascar, as those who have travelled in wild and uncivilized regions in other parts of the world will easily believe, is a totally different experience from botanizing in England. Your collecting materials are carried by a native, who may be honest or not, in which latter case the drying paper will begin gradually and mysteriously to disappear, and the leather straps with which the presses are tightened will, one by one, be quietly appropriated. For a Malagasy bearer has a special weakness for leather straps, they being largely used for belts; so that both for the sake of your own comfort and the honesty of the men, the sooner you dispense with them the better. As for the dried plants themselves, they are secure from all pilfering; for of what possible use or value they can be, it puzzles the natives to conceive. You might leave your collection in a village for a whole month, and you would find on your return that it was still intact. If, after the day's journey, you sit down in a hut to change the sheets of paper containing the specimens, the villagers will be sure to come in and, standing round in a circle, gaze at you in mute astonishment turning over the plants so well known to them. After a few minutes' silent gaze, there will perhaps be a sudden outburst of amused laughter, or it may be a little whispering, which, if it were audible, would be something to this effect:—"Whatever in the world is the man doing?" or, "What strange creatures these white men are!" Some of the people doubtless think that you are a kind of sorcerer. For these dried plants—whatever can you do with them? You cannot eat them. You cannot make them into broth. You cannot plant them, for they are dead. You cannot form them into bouquets or wreaths, for they are brown and withered. Is it surprising, then, if some of the natives think that you are dabbling in the black art, and that your plants, in the form of some strange and mysterious decoction, are to supply, it may be, a potent rain-medicine or a love-philter, or a disease-preventing physic? For among the natives themselves there are many herbal quacks, who, for a consideration, are able, not only to prescribe for the cure, and even prevention, of disease, but also to furnish charms against fire or tempest, locusts or lightning, leprosy or lunacy, ghosts, crocodiles or witches. The explanation which I have most frequently heard given, however, by the more intelligent of the natives as to the use of the dried plants is that the leaves are intended to be employed for patterns in weaving.

It is not, then, the natives that you have to fear in regard to your collections of plants, it is the weather—it is those heavy showers that, unless protected with extreme care by waterproof coverings, succeed in soaking your specimens and your drying paper, so that you have occasionally to spend half the night in some dirty hovel in doing what you can, by the aid of a large fire, to save your collection from destruction.

There are many discomforts, too, connected with botanizing in Madagascar, which it is not necessary to mention here. Suffice it to say that all the difficulties and discomforts are far more than outweighed by the pleasure you gain in the exercise—a pleasure which is enhanced by the consciousness that you are probably the first that has ever plucked the flowers from Nature's bosom in that particular locality, and that a large number of the specimens will probably prove to be new to science.

The fullest liberty to gather plants is allowed to the botanist. There are no laws which forbid his roaming at will amid the extensive forests, or which prevent him from breaking off whole branches of trees, or, if need be, even felling the trees themselves. In the open country, too, he may wander to the right hand or to the left, or in any direction he pleases, without having the uncomfortable feelings and apprehensions of a trespasser. The traveller may occasionally be prevented from collecting mineral specimens, but he is never prevented from gathering plants.

In Madagascar a considerable area is covered by primeval forest. On the eastern side of the island (that is, the part eastward of the highest range of mountains which forms the chief watershed) there is a forest which extends probably 800 miles from north to south, almost, if not entirely, without a break, and which, if what is frequently stated be true, continues round the island, forming a complete, or almost complete, belt some distance from the sea. Whether the forest does thus actually encircle the island is somewhat questionable. There can, however, be no doubt that in the western part of Madagascar there are forests, mostly, I believe, narrow, which run for long distances in a northerly and southerly direction, but how far these are continuous is not yet known. In regard to the large eastern forest, it attains its greatest dimensions in the north-east part of the country. Here it reaches, in many places, from the mountains of the interior right down to the sea, and is probably 60 (in North Antsihanaka perhaps 80) miles in width. If we take its average width on the eastern side of the island at 30 miles and its length at 800, we get an area of 24,000 square miles of forest-clad country, not reckoning the innumerable patches of wood on the lower slopes. If we include these, probably two fifths, if not one half, of the eastern side of the island is clothed with trees. In the whole of Madagascar, if one may be allowed to make a rough estimate, there will not unlikely be an area of 30,000 square miles of forest-covered country; and if we reckon the area of the island at 228,000 square miles, about one eighth part of it may be said to be so covered.

It is grievous to relate, however, that the forests of Madagascar are being destroyed in the most ruthless and wholesale manner by the natives. Every year thousands of acres of country are cleared, the trees being burned to the ground, and that for no other purpose than to provide ashes as manure for a mere handful or two of beans, or a few cobs of Indian corn, or a little rice to be grown in the clearing. Moreover, all the towns and villages with Hova Governors are surrounded by palisades, frequently in a double series, made of the trunks of young trees, six or eight inches in diameter, fixed in the ground and placed in contact with each other. I once counted the trees that had been thus used in a certain village, and found that there were about 10,000. These trees, moreover, in many of these places are renewed every eight or ten years. When we remember the great number of villages thus provided with these palisades, we see that many hundreds of thousands of trees must be thus foolishly destroyed within a comparatively few years! Even where stone and lime or other suitable materials are abundant and close at hand, the people prefer, or are obliged, to make these timber barricades, though the forest may be miles away, and though the trees have to be dragged along the ground or carried on men's shoulders, involving indescribable labour, hardship, and loss of time, and forming a much ess impregnable and permanent barricade when finished than would be the case if the other materials were employed. All this seems to a European the very essence of waste and folly. But as though the timber was absolutely of no value, I once saw a road which had been cut through the forest for a long distance, for no other purpose than to allow passage for the dragging of a tombstone which had been quarried in the neighbourhood. To make this road no fewer than 25,000 trees had been cut down! Again, in getting planks for building purposes from the forests, there is most extravagant waste of timber. A tree is felled, and the native woodmen, not having saws, set to work with their hatchets on each side of it until the timber is reduced to the required thickness, and thus each tree, however large, supplies but a single plank. It is truly lamentable to see how the forests, containing, as they do, fine valuable timber, are, in these and other ways, being consigned to destruction. The laws of the country forbid the people to burn or otherwise destroy them; but these laws have been hitherto practically a dead letter, and consequently the area covered by trees is being rapidly reduced year by year. Happily there seems to be now, on the part of the Malagasy Government, a growing consciousness of the immense value of the extensive forests of the island, and, let us hope, a growing determination also to stop the fearful havoc at present going on.

There are now known in Madagascar, as has been already stated, about 4100 species of plants, and although there is still a considerable number of novelties in every fresh collection sent from the island, the percentage of such is rapidly diminishing, and I think it may with certainty be said that the great bulk of Madagascarian plants have already been gathered*, so that we

* In the Kew 'Bulletin of Miscellaneous Information' for May, 1888, it is stated that "the flora of the lowlands of Madagascar is very imperfectly known at present........ Mr. J. G. Baker, Principal Assistant in the Kew Herbarium, has for many years devoted attention to the flora of the mountainous parts of Madagascar." This is only partially true. I am convinced that nearly all the vegetable forms found on the east coast of the island, and, at any rate, the majority of those found on the west coast, are now known to science. The flora of

now have sufficient data to enable us to draw a few general conclusions as to the character and distribution of this very interesting and remarkable flora.

The following figures will show at a glance the number of Natural Orders and genera of flowering plants represented in Madagascar as compared with those known throughout the world, according to Bentham and Hooker's 'Genera Plantarum':—

Total known in the World:	Orders	200,	Genera	7569.
„ „ Madagascar:	„	144,	„	970.

The number of genera here given comprises those only that are indigenous to the island. If we include the numerous plants that have at one time or other been introduced, the total number of the genera would be raised probably to about 1050.

Of the 4100 indigenous plants at present known in Madagascar, about 3000 (or three fourths of the total flora) are, remarkable to say, endemic. Even of the Gramineæ and Cyperaceæ about two fifths of the plants in each Order are peculiar to the island. There is but one Natural Order confined to Madagascar, the Chlænaceæ, with 24 species, which, however, M. Baillon places under Ternstrœmiaceæ. Of Ferns more than a third are endemic, and of Orchids as much as five sixths, facts which in themselves are sufficient to give a very marked individuality to the character of the flora.

Of the 4100 known plants, there are:—

Dicotyledons	3492
Monocotyledons	248
Acotyledons *	360
	4100

the lowlands of the southern part of the country is least known of all. The plants, moreover, which Mr. Baker has examined are by no means only those "of the mountainous parts of Madagascar." They have been gathered in the lowlands as well as in the higher parts of the island, though not, perhaps, to so great an extent.

* This includes only the Filices, Equisetaceæ, Lycopodiaceæ, and Selaginellaceæ. The remaining Acotyledonous Orders are as yet very imperfectly known. Of Mosses about 250 have been described, and of Rhizophoreæ 5.

The following list shows the number of species in the Orders most largely represented, and their percentage of the total flora (*i.e.* of the 4100 plants mentioned above):—

	No.	Per cent.
Leguminosæ	346	8·4
Filices	318	7·8
Compositæ	281	6·9
Euphorbiaceæ	228	5·6
Orchideæ	170	4·1
Cyperaceæ	160	3·9
Rubiaceæ	147	3·6
Acanthaceæ	131	3·2
Gramineæ	130	3·2

The Palms and Asclepiads are as yet imperfectly known. Of the former only 18 are described, although the island undoubtedly possesses a large number. Many Asclepiadaceous plants have been collected, but the majority of them are still lying unnamed in various European herbaria.

Since Mr. Baker read his paper on "The Natural History of Madagascar" at the meeting of the British Association at York, in 1881, a goodly number of new genera of plants from the island have been described, so that the list he there gives needs many additions, so many in fact as to justify its revision. The number of endemic genera then known was about 80, it now reaches about 148. The following is a list of the endemic genera with the number of species as at present known:—

MENISPERMACEÆ	Rhaptonema (1), Spirospermum (1), Burasaia (4), Strychnopsis (1), Orthogynium (1), Gamopoda (1).
BIXINEÆ	Tisonia (3), Prockiopsis (1).
PORTULACEÆ	Talinella (1).
GUTTIFERÆ	Sphærosepalum (1), Leioclusia (1).
CHLÆNACEÆ	Sarcolæna (4), Leptolæna (5), Xerochlamys (4), Eremolæna (1), Rhodolæna (4), Schizolæna (5), Sclerolæna (1).
STERCULIACEÆ	Cheirolæna (1), Speirostyla (1).
TILIACEÆ	Ropalocarpus (4).
LINEÆ	Rhodoclada (1).
MALPIGHIACEÆ	Microsteira (1).
GERANIACEÆ	Trimorphopetalum (1).
OLACINEÆ	Tridianisia (1), Petrusia (1).

Celastrineæ	Ptelidium (1), Polycardia (5), Macrorhamnus (1).
Sapindaceæ	Macphersonia (4), Eriandrostachys (1), Pseudopteris (1) Tina (9).
Anacardiaceæ	Micronychia (1).
Leguminosæ	Chadsia (8), Baukea (1), Colvillea (1), Neobaronia (2), Xanthocercis (1), Aprevalia (1), Baudouinia (2), Brandzeia (1).
Saxifragaceæ	Grevea (1).
Hamamelideæ	Dicoryphe (14).
Rhizophoreæ	Macarisia (2).
Combretaceæ	Calopyxis (8).
Melastomaceæ	Dichætanthera (7), Veprecella (4), Rousseauxia (1), Gravesia (3), Rhodosepala (1), Amphoracalyx (1), Phornothamnus (1).
Lythraceæ	Rotantha (1).
Samydaceæ	Calantica (2), Nisa (7), Asteropeia (3), Franchetia (1).
Turneraceæ	Hyalocalyx (1).
Passifloreæ	Deidamia (5), Physena (2), Hounea (1).
Cucurbitaceæ	Delognæa (1), Trochomeriopsis (1).
Umbelliferæ	Phellolophium (1), Anisopoda (1).
Araliaceæ	Cuphocarpus (2).
Cornaceæ	Melanophylla (2), Kaliphora (1).
Rubiaceæ	Breonia (1), Carphalia (4), Paracephaelis (1), Tamatavia (1), Chapelieria (1), Nematostylis (1), Leiochilus (1), Saldinia (2), Schismatoclada (4), Holocarpa (1), Gomphocalyx (1), Payera (1), Solenixora (1), Canephora (1).
Compositæ	Centauropsis (3), Rochonia (3), Glycideras (1), Henricia (1), Synchodendron (2), Syncephalum (1), Sphacophyllum (1), Micractis (1), Epallage (6), Apodocephala (1), Astephanocarpa (1), Temnolepi (1), Brachyachenium (1).
Campanulaceæ	Dialypetalum (1).
Myrsineæ	Oncostemon (20).
Ebenaceæ	Tetraclis (1).
Oleaceæ	Noronhia (1).
Apocynaceæ	Craspidospermum (1), Plectaneia (1), Mascarenhaisia (12).
Asclepiadeæ	Harpanema (1), Pycnoneurum (1), Decanema (1), Pervillæa (1), Vohemaria (1).
Loganiaceæ	Hymenocnemis (1), Adenoplea (2).
Gentianaceæ	Tachiadenus (6).
Convolvulaceæ	Bonamia (1), Humbertia (1), Cardiochlamys (1).
Scrophulariaceæ	Hydrotriche (1), Rhaphispermum (1), Tetraspidium (1).
Acanthaceæ	Periblema (1), Brachystephanus (3), Lasiocladus (2), Forsythiopsis (1), Pseudocalyx (1), Monachochlamys (1).

VERBENACEÆ	Adelosa (1), Acharitea (1).
LABIATÆ	Tetradenia (1).
AMARANTACEÆ	Henonia (1).
PHYTOLACCACEÆ	Barbenia (1).
MONIMIACEÆ	Ephippiandra (1).
LAURINEÆ	Ravensara (6), Potameia (2), Bernieria (1).
PROTEACEÆ	Dilobeia (1).
BALANOPHOREÆ	Cephalophyton (1).
EUPHORBIACEÆ	Leptonema (1), Cometia (2), Tannodia (1), Sphærostylis (1), Didierea (1).
URTICACEÆ	Pachytrophe (1), Ampalis (1).
ORCHIDEÆ	Bicornella (3).
LILIACEÆ	Rhodocodon (1).
PALMACEÆ	Dypsis (7), Bismarckia (1), Chrysalidocarpus (1).
CYPERACEÆ	Acriulus (1).
GRAMINEÆ	Pœcilostachys (2).

A few words regarding some of these endemic genera may not be out of place. The Chlænaceæ are shrubs or trees, of which there are at present known 24 species comprised under 7 genera. The majority of the plants are found in Eastern Madagascar, all the *Rhodolæna* entirely so. The only species of *Sclerolæna* (*S. Richardi*) is found in the north and north-west, and the four species of *Xerochlamys* in the central, parts of the island. *X. pilosa* and *X. pubescens* are low wiry shrubs found on some of the hills and mountains of the interior, and are used by the natives in the manufacture of rum, but are said to cause vomiting of blood if used incautiously. They are known as "Hatsikana." Four of the species of *Leptolæna* occur in the large eastern forest, though *L. multiflora* is found also in the north-west part of the island, where *L. cuspidata* finds its home. *Leptolæna pauciflora* is a hard-wooded tree, from the trunk and branches of which, at a certain season of the year, there is a ceaseless dropping of water, sufficient indeed to keep the ground quite damp. This is caused by a number of hemipterous insects crowding together in a slimy liquid. May this afford an explanation of the similar well-known phenomenon exhibited by the Tamai-caspi, or Rain-tree, of the Eastern Peruvian Andes? The various species of *Rhodolæna*, which, with the exception of *R. altivola*, a semi-scandent shrub, are large trees, have handsome bright purple flowers about 2 inches in diameter; and *Sarcolæna grandiflora*, a tree found on the east, and probably also on the north-west, coast, possesses a white flower, also about 2 inches in diameter. *Cheirolæna linearis* "is a close ally of the nearly extinct blackwood and redwood of St. Helena." *Rhodoclada* is a doubtful member of the Order Linaceæ. *Trimorphopetalum* is an insignificant monotypic herb, nearly allied to *Impatiens*, inhabiting the streams in the forest on the eastern confines of Imerina. *Colvillea* is a plant possessing a long raceme of large handsome red flowers and somewhat sensitive leaflets. The two species of *Neobaronia*, noticed later on, are amongst the most remarkable trees in the whole island. The *Dichætantheræ* are forest trees, which are very beautiful when in full bloom. *Schismatoclada*, of which four species have been described, are shrubs or trees closely allied to *Cinchona*. The bark may possibly be worth analysis. *Pycnoneurum*, of which there is but one species, is an insignificant herb growing in the open country. The species of *Tachiadenus* are herbs with white or blue, crateriform, very long-tubed, corollas. *T. longiflorus* is said to possess purgative properties. *Dilobeia* is a large tree with leaves doubly bifid when young, and singly bifid when mature. It possesses diœcious inconspicuous flowers and a hard indehiscent oblong fruit about $1\frac{1}{4}$ in. long.

I have long been convinced that the flora of Madagascar may be divided into three Regions, and the data given below will, I think, justify the conviction. These Regions run in a longitudinal direction, following approximately the longer axis of the island. I propose to call them Eastern, Central, and Western. The Central Region includes the elevated plateau of the interior, that is to say, the territory bounded on the east by the western edge of the great forest, on the west by the high land, from which there is generally a more or less distinct descent into the western lowlands, on the north by Lat. 14°, and on the south by the tropic of Capricorn. Its limits may be more definitely traced thus:—From the tropic of Capricorn and Long. 46° 50′ the line runs about 15 miles east of Ihosy, thence to Ikalamavony, passes a few miles to the east of Ankavandra, turns north-east to Malatsy and Antongodrahoja, on to Isomboana, follows the range of mountains in the province of Befandriana, then up to a point halfway across the island in Lat. 14°; coming south, it skirts the great forest until it reaches the mountain of Ambiniviny, it then takes a direction a little west of south until it again reaches the forest to the west of Ambatondrazaka (thus shutting out the great Antsihanaka province), which it skirts until it meets the tropic of Capricorn. By connecting the northern point with Port Lonky (or Loquez), and the southern point with the mouth of


45°
50°
Comoro Islands
Cape Amber
Diego Suarez
Nosibe I.
NORTHERN REGION
15°
R. Sofia
Mandritsara
Mojanga
Antongil B.
Trabonjy
R. Betsiboka
R. Ikopa
St. Marie I.
Alaotra L.
Ambatondrazaka
Tamatave
ANTANANARIVO
R. Manambolo
L. Itasy
R. Mahajilo
CENTRAL REGION
20°
R. Mania
WESTERN REGION
EASTERN REGION
Mananjara R.
Fianarantsoa
R. Mangoky
St. Augustine's B.
R. Onilahy
25°
Fort Dauphin
English Miles
0 50 100 150
Cape St. Mary
45° E. of Greenwich
50°
Stanford's Geog! Estab!, London.

the River Andrahona, the divisions will be complete. All the territory to the west of the limits thus defined, with the island of Nosibé and all others near the mainland, constitute the Western Region, and that to the east the Eastern. Of course it is not pretended that these Regions can be defined with great accuracy, the divisions in the extreme north and south of the island between the Eastern and Western Regions, where they come in contact, being almost arbitrary. To what points north and south the Central Region should extend is also somewhat uncertain. The limits, however, of the three divisions as thus defined may be accepted as substantially correct. Inasmuch as these Regions range through about thirteen degrees of latitude (the Eastern and Western Regions being chiefly, and the Central entirely within the tropics), there must necessarily be considerable variation in the character of the vegetation in a northerly and southerly direction, but the variation is gradual and by no means so marked or distinct as it is in an easterly and westerly direction.

A few general figures (particulars will be given further on) will show that this division into Eastern, Central, and Western Regions is fair and natural. Of the 3178 *species* of plants whose localities I have been able to determine, there are:—

Common to the three Regions	100
" " Eastern and Central Regions	190
" " Western and Central "	74
" " Eastern and Western "	128
Peculiar to the Eastern Region	1108
Not peculiar to E. Region, but occurring in it	418
Total in the Eastern Region	1526
Peculiar to the Central Region	872
Not peculiar to C. Region, but occurring in it	364
Total in the Central Region	1236
Peculiar to the Western Region	706
Not peculiar to W. Region, but occurring in it	302
Total in the Western Region	1008

In regard to the *genera* whose distribution I have been able to determine, there are :—

Common to the three Regions	184
„ „ Eastern and Central Regions	131
„ „ Western and Central „	32
„ „ Eastern and Western „	119
Peculiar to the Eastern Region	153
Not peculiar to E. Region, but occurring in it	434
Total in the Eastern Region	587
Peculiar to the Central Region	130
Not peculiar to C. Region, but occurring in it....	347
Total in the Central Region	477
Peculiar to the Western Region................	115
Not peculiar to W. Region, but occurring in it....	335
Total in the Western Region....	450

There are, as shown by one of the preceding tables, 3178 species of plants whose distribution in the island I have been able to make out. There remain to be determined about 1000. Some of these occur in the extreme north of the island, both on its eastern and western sides, and therefore belong to both the Eastern and Western Regions; but as the boundary line between the two in this part of the country is more or less arbitrary, I have not taken them into account. The names of the parts of the island where other plants have been found are sometimes given in publications, but, owing to inaccuracy on the part of the collectors, or blunders in copying, I have been frequently unable to locate them, as, for instance, "Anànlsinàhina bozaba." What part of the island is meant by such a blundering combination of letters it is impossible to say. "Chasak mountains" is also given in one publication. Possibly this is meant for Ankaratra mountains! These localities, when quite unrecognizable, I have also omitted.

Although the figures in the above and the following tables will doubtless require alteration when we become acquainted with the localities of the remaining plants, and though some of those which at present are only known to occur in one of the three Regions will probably in the future be found in one or both of the others, the proportion of the plants peculiar to the respective Regions will not, I am convinced, be seriously disturbed, or the floras be shown to be even approximately identical.

In regard to the Orders, there are several which appear to be absolutely confined, and more which are nearly confined, to one or other of the three Regions, but these will be noticed further on.

The table on the next page shows the Orders most largely represented, and their percentage of the total flora, in the respective Regions. In this table the following facts are prominent:—In the Eastern Region the two most abundantly represented Orders are Filices and Compositæ; but the former are more than double the latter in the number of species, forming respectively 13·1 and 6 per cent. of the flora of this Region. It will be noticed that Filices do not appear in the second or third column at all, the reason being that I have not sufficient data for determining their relative positions. Possibly they might occupy the third or fourth place. In the Western Region the Leguminosæ stand at the head of the list, and these are followed by Euphorbiaceæ; but the difference between the two is very great the proportion being about 5 to 2. The table shows that 18·8 per cent. of the flora of the Western Region consists of Leguminosæ. The Compositæ appear to be poorly represented, forming only 3·2 per cent. of the flora. In the Central Region, on the other hand, the Compositæ are at the head of the list, with a percentage of 13. Rubiaceæ, again, which one might expect to be largely represented in the Western Region, only form 3·2 per cent. of the flora. The Eastern, Central, and Western Regions therefore might, if we take the most largely represented Orders into account, be fairly called the Fern Region, the Composite Region, and the Leguminous Region respectively.

Turning to the table showing the distribution of the species, we see that 190 are common to the Eastern and Central Regions, and 74 to the Western and Central. But the majority of these may be reckoned as intruders which do not far exceed the boundaries of one or other of the two Regions to which they more properly belong.

Eastern Region.			Central Region.			Western Region.		
	No. of species.	Per cent.		No. of species.	Per cent.		No. of species.	Per cent.
Filices	200	13·1	Compositæ	160	13·0	Leguminosæ	190	18·8
Compositæ	91	6·0	Leguminosæ	104	8·4	Euphorbiaceæ	78	7·7
Leguminosæ	80	5·2	Cyperaceæ	82	6·7	Tiliaceæ	36	3·6
Rubiaceæ	74	4·9	Orchideæ	70	5·7	Compositæ	32	3·2
Orchideæ	73	4·8	Gramineæ	45	3·6	Rubiaceæ	32	3·2
Euphorbiaceæ	57	3·7	Labiatæ	40	3·2	Sterculiaceæ	31	3·1
Acanthaceæ	50	3·3	Euphorbiaceæ	37	3·0	Acanthaceæ	29	2·9
Gramineæ	39	2·6	Acanthaceæ	36	2·9	Malvaceæ	29	2·9
Urticaceæ	38	2·5	Rubiaceæ	36	2·9	Convolvulaceæ	28	2·8
Myrsineæ	33	2·2	Crassulaceæ	30	2·4	Cyperaceæ	27	2·7
Cyperaceæ	31	2·1	Geraniaceæ	25	2·0	Gramineæ	26	2·6
Tiliaceæ	27	1·8	Malvaceæ	17	1·4	Anonaceæ	14	1·4
Total of the above	793			682			552	
Total in the Region	1526			1236			1008	

There are only 100 plants common to the three Regions. A list of these may be here given:—(*a*) ENDEMIC: *Gomphia deltoidea, Piptadenia chrysostachys, Dichrostachys tenuifolia, Mimosa latispinosa, Combretum coccineum, Calantica cerasifolia, Vernonia grandis, Pterocaulon Bojeri, Emilia citrina, Ficus megapoda, Lagarosiphon madagascariensis, Cynorchis flexuosa, Dioscorea heteropoda, Raphia Ruffia, Arundo madagascariensis.* (*b*) MASCARENE: *Aphloia theæformis, Gouania tiliæfolia, Tristemma virusanum, Phyllanthus casticum.* (*c*) CHIEFLY TROPICAL AND WIDELY SPREAD: *Cissampelos Pareira, Nymphæa stellata, Polycarpæa corymbosa, Portulaca oleracea, Haronga madagascariensis, Sida rhombifolia, Urena lobata, Melochia corchorifolia, Waltheria americana, Triumfetta rhomboidea, Desmostachys Planchonianus, Cardiospermum Halicacabum, Paullinia pinnata, Crotalaria retusa, C. striata, Indigofera hirsuta, Sesbania punctata, Æschynomene sensitiva, Desmodium paleaceum, D. salicifolium, D. mauritianum, Abrus precatorius, Dolichos axillaris, Eriosema cajanoides, Cassia occidentalis, C. mimosoides, C. Tora, Mimosa asperata, Albizzia fastigiata, Ammannia senegalensis, Woodfordia floribunda, Jussiæa repens, J. erecta, Ludwigia jussæoides, Melothria tridactyla, Ageratum conyzoides, Psiadia dodonææfolia, Blumea lacera, Gnaphalium luteo-album, Eclipta erecta, Gynura cernua, Vinca rosea, Gomphocarpus fruticosus, Buddleia madagascariensis, Limnanthemum indicum, Heliotropium indicum, Ipomœa palmata, I. medium, I. leucantha, I. sessiliflora, Solanum nigrum, Scoparia dulcis, Buchnera leptostachya, Asystasia gangetica, Ocimum canum, O. suave, Hyptis pectinata, H. spicigera, Amarantus spinosus, Achyranthes aspera, Celosia trigyna, Polygonum serrulatum, Euphorbia pilulifera, E. indica, E. thymifolia, Phyllanthus nummularifolius, Dalechampia ternata, Sponia affinis, Obetia ficifolia, Boehmeria platyphylla, Smilax Kraussiana, Floscopa glomerata, Imperata arundinacea, Heteropogon contortus, Andropogon hirtus, Sporobolus indicus, Phragmites communis, Gleichenia dichotoma, Lycopodium cernuum, Azolla pinnata, Marsilea diffusa.*

It will thus be seen that the great bulk of the plants common to the three Regions are widely-spread tropical species. Of plants that reach right over the island from the east coast to the west coast there are but few. Of these may be mentioned *Haronga madagascariensis, Abrus precatorius, Dolichos axillaris,* and *Raphia Ruffia.* Perhaps the commonest and most widely spread species in the whole island is a fern, *Gleichenia dichotoma.*

The following is a list, though probably not complete, of the plants which I find to be common to the Eastern and Western Regions:—*Sauvagesia erecta*, *Burasaia madagascariensis*, *Ionidium buxifolium*, *Alsodeia latifolia*, *Flacourtia Ramontchi*, *Sarcolæna grandiflora* (?), *Leptolæna multiflora*, *Schizolæna elongata*, *Sida cordifolia*, *S. urens*, *Hibiscus vitifolius*, *H. surattensis*, *H. tiliaceus*, *Thespesia populnea*, *Heritiera littoralis*, *Dombeya crassipes*, *D. parviflora*, *Cheirolæna linearis*, *Grewia viscosa*, *Corchorus olitorius*, *Erythroxylon pyrifolium*, *Murraya exotica*, *Gomphia dependens*, *G. obtusifolia*, *Chailletia Dichapetalum*, *Ilex madagascariensis*, *Colubrina asiatica*, *Gouania aphrodes*, *Leea guineensis*, *Schmidelia racemosa*, *Cossignia madagascariensis*, *Macphersonia madagascariensis*, *Gluta Turtur*, *Agelæa Lamarckii*, *A. Koneri*, *Æschynomene micrantha*, *Æ. patula*, *Desmodium umbellatum*, *D. triflorum*, *D. lasiocarpum*, *D. incanum*, *Clitoria lasciva*, *Teramnus labialis*, *Mucuna pruriens*, *Dioclea reflexa*, *Canavalia obtusifolia*, *Psophocarpus longepedunculatus*, *Pterocarpus advenus*, *Derris uliginosa*, *Sophora tomentosa*, *Cæsalpinia Bonducella*, *Colvillea racemosa*, *Poinciana regia*, *Cassia Petersiana*, *Bauhinia Hildebrandtii*, *Afzelia bijuga*, *Trachylobium verrucosum* (?), *Cynometra madagascariensis*, *Entada scandens*, *Piptadenia Pervillei*, *Albizzia Lebbek*, *Hirtella Thouarsiana*, *Brexia madagascariensis*, *Weinmannia madagascariensis*, *Rhizophora mucronata*, *Bruguiera Rheedii*, *Bryophyllum calycinum*, *Terminalia Catappa*, *Calopyxis malifolia*, *Pemphis acidula*, *Jussiæa villosa*, *Casearia nigrescens*, *Asteropeia multiflora*, *Modecca peltata*, *Physena madagascariensis*, *Pentas mussændoides*, *Mussænda arcuata*, *Guettarda speciosa*, *Canthium pallens*, *Sphæranthus sphenocleoides*, *Ambrosia maritima*, *Diospyros gracilipes*, *D. haplostylis*, *Tetraclis clusiæfolia*, *Alyxia erythrocarpa*, *Orchipeda Thouarsii*, *Alafia Thouarsii*, *Mascarenhaisia lisianthiflora*, *Strychnos spinosa*, *Ipomœa Pes-capræ*, *Striga hirsuta*, *Brachystephanus Lyallii*, *Justicia haplostachya*, *J. tenella*, *Lippia nodiflora*, *Stachytarpheta indica*, *Premna integrifolia*, *Ocimum gratissimum*, *Leonotis nepetæfolia*, *Piper subpeltatum*, *P. borbonense*, *Tambourissa religiosa*, *Euphorbia pyrifolia*, *E. Boivini*, *E. adenopoda*, *E. tetraptera*, *Acalypha urophylla*, *Macaranga cuspidata*, *Tragia furialis*, *Dalechampia tamifolia*, *Urera acuminata*, *Casuarina equisetifolia*, *Crinum Hildebrandtii*, *Amomum Daniellii*, *Ravenala madagascariensis*, *Flagellaria indica*, *Typhonodorum Lindleyanum*, *Cyperus distans*, *C. dubius*, *Fuirena* *capitata*, *Olyra latifolia*, *Coix Lachryma*, *Eleusine indica*, *E. ægyptiaca*, *Eragrostis ciliaris*, *E. Chapelieri*, *Nastus capitatus*, *Asplenium bipartitum*.

That the flora of the Central Region should differ widely from the floræ of the Eastern and Western Regions is accounted for by the great elevation above the sea of the central part of the island. But how are we to explain the existence of so great a difference between the floras of the Eastern and Western Regions, occupying, as they do, the same latitudinal and altitudinal positions, for of the 2206 plants found in the Eastern and Western Regions only 128 (not reckoning the 100 occurring in all the three Regions) are common to both? I believe the explanation to be simple. The central elevated plateau of the island, which runs from north to south, is undoubtedly of very great antiquity, having existed not improbably from Palæozoic times, and has therefore always formed a barrier between the floras of the Eastern and Western Regions. The floras therefore, even if they were formerly similar, which is doubtful, have had abundance of time to become differentiated in character; and if they were originally different, they have been kept, by the existence of the mountain barrier, distinct to the present day.

The flowering season in Madagascar, generally speaking, is from October to January, but November and December are the months in which more especially the great majority of plants are in bloom. In no part of the year, however, does the climate become sufficiently winterly to cause more than a comparative cessation in the flowering of plants, and very few of the trees and shrubs shed their leaves even in the coldest season. Very many species are in flower for six or eight months, and a goodly number all the year round. Of the latter may be mentioned *Solanum erythracanthum*, *S. auriculatum*, *Geranium simense*, *Cassia occidentalis*, *Rubus rosæfolius*, *Tristemma virusanum*, *Emilia citrina*, *Lobelia serpens*, *Scoparia dulcis*, *Achyranthes aspera*, and *Euphorbia splendens*.

There are comparatively few plants having beautiful flowers in Madagascar. There are no meadows anywhere in the island that can at all compare with our English meadows for floral beauty. Neither do the forests supply what is lacking in the meadows. Any one entering a Malagasy forest with the anticipation of seeing innumerable beautiful flowers would be utterly disappointed, for they are extremely rare. There are indeed pretty flowers in the woods and in the fields, but they have to be looked for; they are so few and far between that they very rarely produce any marked effect in the landscape. Of the plants with beautiful flowers, the first place must be given to the Orchids. *Angræcum sesquipedale*, *A. Ellisii*, *A. superbum*, and some other species of *Angræcum* have long occupied a high position in orchid culture. In the interior of the island there are two or three striking ground orchids. One of these, *Cynorchis flexuosa*, has a flower with a pretty yellow labellum; another, *Disa incarnata*, which grows in marshes in Eastern Imerina, has a very handsome compact spike of brilliant scarlet flowers; and a third, *Disa Buchenaviana*, found on the hillsides of Eastern Imerina near the forest, has a spike of most beautiful blue flowers. In the Ankay plain I have occasionally seen the pretty yellow-flowered *Thunbergia alata*. In the open country in the central parts of the island *Vinca rosea*, with its pretty rose-coloured corolla, is common, as is also *Commelina madagascarica*, with its delicate petals of a very rich blue colour. *Euphorbia splendens*, an inhabitant of a few of the higher rocky hills, and extensively used for hedges in Imerina, has a flower with scarlet or yellow bracts. *Clematis Bojeri* (with its varieties *C. oligophylla* and *C. trifida*), the only erect *Clematis* in Madagascar, and *Tachiadenus longiflora*, belonging to the Gentian Order, and having a large white corolla with a tube about four inches long, occur frequently on the hillsides of the interior of the country. *Tachiadenus platypterus*, found in East Betsileo, is similar to the last mentioned, but has a blue corolla. A small tree, which occurs sparingly on the western slopes of Ankaratra, *Dombeya longicuspis*, has a pretty red flower. *Aristea Kitchingii*, a marsh plant, and *A. angustifolia* possess very pretty blue flowers. *Harpagophytum Grandidieri*, a shrub belonging to the Order Pedalineæ, and found to the north-west of Mandritsara, has bunches of gorgeous red flowers proceeding from a tuft of leaves at the ends of the branches. Among other plants found in Central Madagascar which are noteworthy for their floral beauty may be mentioned *Sparmannia discolor*, four species of *Salvia*, found in the higher parts of Vakin' Ankaratra; *Tristellateia madagascariensis*, a climbing plant with spikes of rich yellow flowers; *Vitis microdiptera*, *Agauria salicifolia*, three species of *Pachypodium*, and two or three species of *Sopubia*. *Stenocline inuloides* is a small shrub with pretty flowers, and is strongly scented, though no plant in the island probably possesses so strong or sweet a scent as *Stenocline incana*, one of the shrubs known by the natives as "Rambiazina." The prettiest flowers found in the eastern forests belong probably to species of *Rhodolæna*, *Dichætanthera*, *Impatiens* (especially *I. Lyallii*), and various Acanthaceous plants. On the east coast there are the *Ixora odorata*, *Stephanotis floribunda*, *Poinciana regia*, *Astrapæa Wallichii*, and *Sarcolæna grandiflora*. *Hemistemma Aubertii* is a shrub with large striking yellow flowers, which is found from Eastern Imerina to the east coast. In Alaotra Lake the well-known *Lotus* of the Nile occurs. In the western part of the island there exist several species of *Ipomœa*, with variously coloured flowers; also *Gloriosa virescens*, *Kigelia madagascariensis*, a shrub or small tree with large red trumpet-shaped flowers, and *Combretum coccineum*, a shrub covered in the season with abundant brilliant scarlet flowers. Scattered about the country in various places there are several species of *Crinum*; and *Buddleia madagascariensis*, a beautiful shrub with panicles of golden yellow odoriferous flowers, is common almost everywhere. This list might of course be considerably enlarged.

A few particulars may now be given with regard to the character of the three botanical Regions.

The Eastern Region.

The Eastern Region occupies the narrow strip of country lying between the Indian Ocean and the great mountain-range which runs almost the whole extent of Madagascar, and forms the chief watershed of the island. This strip of territory averages probably 60 or 70 miles in width, and is over 800 miles long from north to south. It consists, for the most part, of a littoral belt, behind which is a tract of hilly country succeeded by several mountain-ranges. The littoral belt is not more than a few feet above the sea-level, and has doubtless been formed, not by elevation of the land, but by the silting up of sand by the sea, aided by the wind. It varies much in width, but, I believe, never exceeds more than eight or ten miles. It consists of numerous very slightly elevated grass-clothed sand dunes parallel with the seacoast, with numerous lagoons and swamps occupying the hollows. The tract of country to the west of the littoral belt ranges from 100 to about 2500 feet above the sea, and consists of innumerable rounded hills thrown together in wild confusion, reminding one, as has been frequently remarked, of a suddenly congealed stormy sea. To the west of this tract again there rise two or three mountain-ranges running, with more or less continuity, almost the whole length of Madagascar, the highest and the most westerly of which rises about 4500 feet above the sea. And as there are three stages in the physical features of the country from the sea to the highest range of mountains, so there are, more or less corresponding with them, three botanical zones; for although there is no distinct break in the flora, it varies considerably according to elevation. Moreover, in a Region ranging through 12 degrees of latitude, it is not surprising if we find considerable variety in the character of its vegetation, according as we approach or recede from the equator. Notwithstanding this, however, the Region is substantially one.

The soil, with the exception of the sandy littoral belt and alluvial deposits in the great Ankay and Antsihanaka plains and along the courses of the rivers, consists almost wholly of decomposed rocks of the crystalline schist series, especially gneiss. Granite and basaltic rocks here and there also make their appearance *.

The region is traversed by numerous short rivers which rise in the hill-ranges to the west. Many of these rivers, in their attempt to discharge themselves into the sea, form lagoons. These lagoons, which constitute so prominent a feature in the character of the east coast, exist almost continuously for a distance of about 300 miles.

There is a copious supply of rain on the eastern side of Madagascar. This is due to the south-east trade-winds, which, coming from the Indian Ocean, precipitate the greater part of the moisture with which they are laden on the forest-clad slopes before reaching the higher plateau of the island. The only statistics we have in regard to the rainfall of the Eastern Region are those given by Mr. Shaw for the year 1882. He says that at Tamatave the amount of rainfall for that year was 94·94 inches. There can be no doubt, however, that the Region generally possesses a much higher rainfall than any other part of the island, the probability being that the average annual fall reaches from 90 to 100 inches, or even more.

* For further particulars of the Geology of the island see my paper, "Notes on the Geology of Madagascar," in the 'Quarterly Journal of the Geological Society' (Vol. xlv. Part 2, No. 178).

The temperature of the Region of course varies considerably according to elevation and latitude; but statistics are altogether too scanty to be of much service. Mr. Shaw tells us that at Tamatave "the greatest amount of heat registered by the insulated solar radiation thermometer was on the 22nd December, when it stood at 163°. The highest temperature in the shade in a good circulation of air was 93°, which it attained on 24th December and 15th and 25th January. The lowest temperature during the night was 58° on 28th June, and 9th and 10th July."

Of the three botanical Regions into which I have divided the island, the Eastern is by far the most abundantly clothed with vegetation, although probably the number of species of plants which it contains does not greatly exceed that of the Central or Western Regions. Probably no less than two fifths of its area is covered with dense impenetrable continuous forest. The greater part of the country not thus covered is to a large extent occupied by innumerable patches of wood, once probably forming part of the great forest; and even where there are no such patches, vegetation is profuse.

As will be seen from the table on page 260, the Ferns occupy the most prominent position in the flora of the Eastern Region, their proportion being as much as 13·1 per cent. With this exception, there is no Natural Order unduly represented. Compositæ and Leguminosæ come next to the Ferns; but these constitute only 6 and 5·2 per cent. respectively of the flora. Neither is there any genus of plants unduly predominant. The flora, as is the case also with the other Regions, is not characterized by any special or predominant forms of vegetable life. The Guttiferæ, Rutaceæ, Melastomaceæ, Araliaceæ, Myrsineæ, Loganiaceæ, Monimiaceæ, Laurineæ, Balanophoreæ (2 spp.), and Loranthaceæ are almost confined to this region; the Cacteæ (2 spp.), Goodenoviæ (2 spp.), Nepenthaceæ (1 sp.), Coniferæ (1 sp.), Proteaceæ (2 spp.), and Cycadaceæ (1 sp.) entirely so. The genera most abundantly represented are:—*Asplenium* (33 species), *Vernonia* (32), *Polypodium* (25), *Dombeya* (19), *Nephrodium* (17), *Ficus* (17), *Angræcum* (16), *Hypoestes* (16), *Danais* (15), *Acrostichum* (15), *Cyperus* (14), *Viscum* (13); then come *Hibiscus*, *Grewia*, *Oncostemum*, *Diospyros*, *Cyathea*, and *Davallia*, with 12 species each; *Elæocarpus*, *Weinmannia*, *Ardisia*, *Clerodendron*, and *Loranthus*, with 11 each; *Medinilla*, *Liparis*, and *Lycopodium*, with 10 each; *Desmodium*, *Eugenia*, *Panax*, and

Ipomœa, with 9 each; *Erythroxylon*, *Gærtnera*, *Solanum*, *Vitex*, *Macaranga*, *Pandanus*, *Bulbophyllum*, *Pteris*, and *Lomaria*, with 8 each; *Symphonia*, *Impatiens*, *Evodia*, *Helichrysum*, *Peperomia*, *Tambourissa*, *Croton*, *Panicum*, *Pilea*, and *Selaginella*, 7 each; *Garcinia*, *Toddalia*, *Gomphia*, *Crotalaria*, *Æschynomene*, *Oldenlandia*, *Psychotria*, *Senecio*, *Justicia*, *Plectranthus*, *Dypsis*, *Polystachya*, *Mystacidium*, and *Trichomanes*, 6 each; *Sida*, *Elæodendron*, *Cassia*, *Embelia*, *Polygonum*, *Piper*, *Habenaria*, *Cynorchis*, *Hymenophyllum*, and *Pellæa*, 5 each.

The narrow littoral belt contains perhaps the most attractive scenery in the whole island, its soft green sward and numerous clumps of trees and shrubs giving quite a park-like aspect to the country. It might almost be said to constitute a botanical sub-region in itself, so many are the forms of vegetable life found here which do not occur elsewhere in the island. Not only so, but even the very coast-line possesses numerous trees and shrubs peculiar to itself; and any one coming from the interior of the country must be struck with the great and sudden change in the flora when he gets within about a hundred yards of the sea. Here is to be found the tall fir-like *Casuarina equisetifolia*, or beef-wood tree; the beautiful-leaved *Calophyllum Inophyllum*, which yields the oil known in India as Pinnay oil; the *Sarcolæna grandiflora*, one of the finest of the Chlænads; *Afzelia bijuga*, known to the natives as "Hintsina," and affording a useful wood; *Trachylobium verrucosum*, which supplies the Gum Copal exported from the island (the east coast of Madagascar probably being its original home, from whence it has spread to Africa and other places); *Brexia madagascariensis*; *Terminalia Catappa*, the Indian almond, with its large leaves reddening in their decay on the remarkably horizontal branches; *Terminalia Fatrœa*; *Barringtonia speciosa* and *B. apiculata*; *Fœtidia obliqua*; *Ixora odorata*, with its beautiful clusters of delicate white fragrant flowers; *Scævola Kœnigii* and *S. Plumieri*; *Tanghinia venenifera*, the celebrated Tangena shrub, the juice of whose apple-like fruit or nut was formerly, and doubtless in some places still is, used in the Tangena ordeal as a means of testing the innocence or guilt of accused persons; *Cæsalpinia Bonducella*; *Stephanotis floribunda*, with its well-known lovely large white flowers; the beautiful endemic fern-palm, *Cycas Thouarsii*, from which I believe the natives obtain a kind of false sago. Among herbs may be mentioned *Vinca trichophylla*, *Tachiadenus carinatus*, and

Ipomœa Pes-capræ, which straggles far and wide on the sand of the sea-shore. There are also a few as yet undescribed palms. The cocoa-nut palm frequently occurs near villages, where it has been planted; but it is not a native of the island.

Not confined to the sea-coast, but found within the littoral belt, the most prominent vegetable forms are the following:—Several species of *Pandanus*, more especially *P. concretus*, an exceedingly common screw-pine. Another species of screw-pine, probably unknown to science, exists abundantly in the swamps. Its leaves, which are about 4 feet long by 6 or 8 inches wide, are employed, to the exclusion of almost everything else, for wrapping round packages carried from the coast into the interior of the country, and prove effectual in protecting from the rain. They are also extensively used (as are probably also those of *P. concretus*) by the Betsimisaraka and other tribes for the walls and the thatch of their huts. The widely spread *Hibiscus tiliaceus*, which yields so valuable a fibre, is also common here. The natives say that its large flowers are yellow in the morning and red in the evening, which phenomenon I have never seen recorded elsewhere, though I think the native statement is probably correct. *Poinciana regia* also is said to occur in this part of the island. Mr. Ellis describes it as a tree "rising sometimes to the height of 40 or 50 feet, and between the months of December and April presents, amidst its delicate pea-green pinnated leaves, one vast pyramid of bunches of bright dazzling scarlet flowers." The *Astrapæa Wallichii*, a shrub or small tree growing along the sides of streams, is also striking for its beautiful bunches of flowers. Sir Joseph Paxton and Dr. Lindley say that it is "one of the finest plants ever introduced; and when loaded with its magnificent flowers, we think nothing can exceed its grandeur." The *Brehmia spinosa* also inhabits this part of the island, its large, orange-like, hard-shelled fruit possessing a flavour by no means disagreeable. Along the sides of the lagoons and marshes in scattered places may be found the curious pitcher-plant, *Nepenthes madagascariensis*. It is a shrub about 4 feet high, whose jug-shaped pitchers, 4 or 5 inches in length, contain abundant water and numerous insects. *Ouvirandra fenestralis*, the beautiful lace-leaf plant, one of the most curious and remarkable of vegetable phenomena, abounds in the rivers of this part of the country. It is, however, by no means confined to this littoral belt; it exists throughout the Eastern Region, and is found, though not so commonly or so abundantly, in the streams of the high plateau of the island which forms the Central Region. In the marshes are to be found, among numerous other plants, the widely spread *Typha angustifolia*, which is known as "Vondrona." This also occurs in the central parts of the island, where in some places, notably Antsirabe, it is cultivated for the sake of the potash which it yields. Another plant common in the marshes is *Lepironia mucronata*, known by the natives as "Penja." It is a sedge belonging to the Order Cyperaceæ, and is used largely by the native women in the manufacture of sugar-bags which are exported to Mauritius. Straw hats are also made of it. In the north-east of Madagascar, probably not far from the sea, is to be found a liana belonging to Leguminosæ, which has the longest, though not the finest, flower of all the known members of this extensive Order of plants. The total length of the flower, which is probably yellowish, is 30 to 32 centimetres. The plant belongs to the genus *Bauhinia*, and has been named by M. Baillon *B. Humblotiana*. In the western part of this littoral belt are to be seen here and there woods composed of a tree known as "Sanga" (lit. a bunch of hair on the front part of the head), from the fact of its bearing the branches near the summit. What the tree is I do not know, but not improbably it is a species of *Weinmannia*. Several beautiful Orchids are found on the east coast, of which, however, two only, remarkable for their abundance and beauty, need here be referred to, *Angræcum superbum* and *A. sesquipedale*. The former, with its long spike of large and numerous flowers, which are in blossom in June and July, is extremely abundant and beautiful. Whatever else may escape the notice of the traveller, this magnificent Orchid, seated in large numbers on many of the shrubs and trees, forms far too striking an ornament to be passed by unheeded. The *A. sesquipedale*, remarkable for the length of its spur, is not so common as *A. superbum*; nevertheless it is comparatively abundant, generally choosing, I believe, as its habitat, trees which overhang the rivers or lagoons.

To the west of the littoral belt comes that portion of the Eastern Region which I have spoken of as hilly country, consisting, as it does, of innumerable rounded hills. It reaches from about 100 to 2500 feet above the sea. In this second zone the flora begins to assume a different aspect from that of the littoral belt. I can only here notice a few of the vegetable forms which, from their prominence or peculiarity, impress their mark upon the landscape. There is, first of all, that remarkably elegant bamboo, the *Nastus capitatus*, which, in many places, completely covers the hillsides and gives quite a character to the scenery. It waves its bent head gently and gracefully with every breath of air, and, with its bright green constantly nodding plumes, affords one of the most striking and beautiful vegetable phenomena in the whole island. This, or a similar species, also occurs, though by no means so abundantly, in the north-west part of Madagascar. Other hill-sides in this second zone are almost exclusively occupied by *Psiadiado donææfolia*, known to the natives as "Dingandingana," a composite shrub. In the months of September, October, and November this shrub is covered with orange-yellow flowers, producing, from their abundance, a bright cheerful effect in the landscape. It is also found in the Central and Western Regions, but is much less frequent than in the Eastern. *Rubus rosæfolius* is a shrub also found plentifully in this part of the island. It is common about villages and in some of the valleys, and extends westwards as far as the Central Region, where, however, it occurs sparingly. It seems to be in flower and fruit throughout the year; its large red fruit, though somewhat deficient in flavour, being by no means unacceptable. The plant is found also at the Cape, and is common in Tropical Asia. In the more open places the shrub *Leea speciosa* is to be met with. Among epiphytic plants apparently confined to this intermediate zone may be mentioned two species of the American genus *Rhipsalis*:—*R. horrida*, endemic in Madagascar, and the widely spread *R. Cassytha*, occurring in the Mascarene Isles generally, in Tropical Africa, Ceylon, and Tropical America. The curious *Pothos Chapelieri*, a plant only found in Madagascar, may also commonly be seen here, with its paddle-shaped leaves, climbing to great heights up the tree-trunks. It is, I believe, limited in its range to the woods on the lower slopes of the eastern side of the island. Another member of Aroideæ is the *Typhonodorum Lindleyanum*, a gigantic Arum endemic in Madagascar, and growing on river-sides and in marshes to the height sometimes of 12 or 15 feet, and possessing a large white spathe of more than a foot in length. It is also common in the western parts of the island. The natives occasionally use the fruit as an article of food. Among the plants which are abundant in individuals in this intermediate zone may be mentioned *Urena lobata*, *Haronga madagascariensis*, *Mussænda arcuata*, *Scoparia dulcis*, *Sabicea diversifolia*, *Emilia amplexicaulis*, *Elephantopus scaber*, the last of which, in some parts of the Tanala country, grows so abundantly as seriously to impede travelling, various species of *Sida*, *Clitoria lasciva*, with its large, beautiful, shell-like, blue flowers, and *Piper subpeltatum*, both of which are also found in Western Madagascar, and *Orchipeda Thouarsii*, known to the natives as "Kaboka" or "Kangarano," a small tree with abundant milky juice, and a fruit (often two together) about the size of an apple. The tree grows in almost all the warm valleys from the coast to an elevation of about 3000 feet above the sea, as also in the valleys of the western part of the island. But perhaps among the plants most abundant in individuals, *Amomum Daniellii*, the Malagasy Cardamom, occupies the most prominent place. It commences in the littoral belt, but reaches its maximum development at an elevation of from 2000–3000 feet above the sea, in some places almost covering the whole country. This also is one of the plants common to the Eastern and Western Regions. Finally, the famous "traveller's tree," *Ravenala madagascariensis*, finds its most congenial home in this intermediate belt, though it occurs also in the north-west of the island. The tree ranges from the sea-coast to the height of about 1500 feet, after which it begins rapidly to disappear. At an elevation of about 1000 feet it is extremely abundant, much more abundant in fact than any other tree, and with its twenty or thirty large leaves arranged on the summit of the stem like a gigantic fan, is the one striking and peculiar feature in the vegetation. It is not found so much in the forests as on the hillsides in the open country. Its uses, like its native names, are various. The stem yields an edible substance, probably a sweet liquid. The leaf-sheaths contain a supply of pure cool water, from which peculiarity indeed the tree derives its name of "traveller's tree," though, as a matter of fact, it generally grows where fresh cold water is obtainable in abundance. The blade of the leaf, very similar to that of the banana, is largely used by the natives in building their frail huts, and, while still green, as substitutes for spoons, plates, and tables. The tree is known to the Betsimisaraka as "Ravinala," "Ravimpotsy," and "Fontsy." Among other tribes it is called "Bemavo," "Bakabia," and "Akondrohazo." In the whole of Madagascar, where it is endemic, there is no more remarkable vegetable form than the "traveller's tree," and certainly none which affects so much the aspect of the vegetation. The Rofia palm (*Raphia Ruffia*) is also abundant in many of the valleys.

Proceeding westward we reach the third and last stage in the Eastern Region. It consists chiefly, as I have said, of long, more or less continuous, mountain-ranges, which are, for the most part, covered with dense impenetrable forest. Although we still meet with many vegetable forms found on the two lower platforms, there is a considerable change in the character of the vegetation, innumerable trees, shrubs, and herbs here gradually making an appearance which are not found on the lower slopes. The forest, as before remarked, probably occupies two fifths of the entire Eastern Region and is remarkable for its great variety of plant forms, there being no single species, genus, or Order of plants predominant over the rest, or which influences to any great degree the general physiognomy of the vegetation.

A few of the vegetable denizens of this upper zone may be here referred to. The Guttiferæ are represented by about half a dozen species of *Symphonia* and *Garcinia*, some of which yield a kind of gamboge used by the natives for various purposes. Of Sterculiaceæ there are several species of *Dombeya*; and of Tiliaceæ several species of *Grewia*. Belonging to Geraniaceæ there occur some six or eight species of *Impatiens*, one of which, *I. Lyallii*, possesses sufficiently attractive flowers to render it "very suitable to introduce for horticultural purposes." Myrtaceæ has 9 species of *Eugenia*. The Melastomaceæ are chiefly confined to this upper belt and consist of the genera *Dionychia*, *Tristemma*, *Dichætanthera*, *Phornothamnus*, *Veprecella*, *Gravesia*, and *Medinilla*. A few of the members of this Order are handsome shrubs or trees, among which may be specially mentioned *Dichætanthera arborea* and *D. oblongifolia*. The Order Araliaceæ is also almost entirely confined to this forest area, and consists, for the most part, of species of *Panax* and *Cussonia*. As for Rubiaceæ the genera most largely represented are *Danais* (15 spp.) and *Schismatoclada* (4 spp.), a genus closely allied to *Cinchona*. The Myrsineæ also find their headquarters in this higher belt, being represented by a goodly number of *Ardisia* and *Oncostemum*. Here, too, is the special home of the plants belonging to Loganiaceæ, comprising several species of *Gaertnera*, *Nuxia*, and *Anthocleista*. One species of *Anthocleista*, *A. rhizophoroides*, is remarkable for its very large cabbage-like leaves. Its Malagasy name is "Landemy," and it supplies a native remedy for malarial fever, though whether or not it is an effectual one I cannot say. Acanthaceæ are well represented by species of *Justicia* and *Hypoestes*, and some of the prettiest flowers to be found in the forests belong to plants of this family. *Strobilanthes madagascariensis*, though not remarkable for its beauty, is very common in the deepest parts of the forests. The natives know it as "Belohalika." Of Piperaceæ there are several species of *Piper* and *Peperomia*; *Piper borbonense* and *P. pachyphyllum* affording the natives a kind of Cubebs pepper. The Loranthaceæ inhabit these upper forests almost exclusively. There are about a dozen species each of *Loranthus* and *Viscum*. Of Euphorbiaceæ there are a goodly number of *Euphorbia* and *Macaranga*. Of Urticaceæ there are a dozen or more species of *Ficus* and several of *Pilea*. Of Scitamineæ there are among others the well-known *Maranta arundinacea*. It is found in the forests, but I am not aware that the natives know it as one of the plants that yield arrowroot. It is not an indigenous plant, but is a native of America. The Palms contain some half-dozen species of *Dypsis* and one or two of *Phloga*. Ferns are abundant in the forest, and the tree-ferns, of which about 20 are known, chiefly belonging to the genus *Cyathea*, give a special charm to the vegetation.

A large number of trees in the forests afford valuable timber, among which may be mentioned the following:—Various species of *Weinmannia*, known to the natives as "Lalona," especially *W. Bojeriana*, *W. minutiflora*, and *W. eriocarpa*; several species of *Elæocarpus*, as *E. rhodanthus*, *E. quercifolius*, and *E. dasyandrus*, all of which, with others belonging to the same genus, are known as "Vanana" or "Voanana"; one, if not more trees, belonging to the genus *Elæodendron*, which the Malagasy call "Hazondrano." "Valanirana" (*Nuxia capitata*) and "Lambinana" (*N. sphærocephala* and *N. terminalioides*) also afford timber much used in house-building. There are also several species of *Macaranga*, called by the natives "Mokarano," as *M. obovata*, *M. alnifolia*, *M. myriolepida*, and *M. ferruginea*, the last of which supplies abundant resin, the nature of which is unknown. Then there is a species of pine, *Podocarpus madagascariensis*, called by the natives "Hetatra," the only species of the Pine Order (Coniferæ) known in the island. It affords a valuable timber much used in house-building. It is not, as stated in the Kew 'Bulletin of Miscellaneous Information' for May, 1888, "doubtfully native," but truly so. The genus *Tambourissa* contains two or three small trees known as "Ambora." *Dalbergia Baroni*, and probably one or two other members of the genus, which the Malagasy know as "Voamboana," supply a very useful and valuable wood much used by the natives in the manufacture of furniture, &c. *Neobaronia phyllanthoides* is a very remarkable tree with compound phylloclades, from the edges of which spring small bright purple papilionaceous flowers and a coriaceous and indehiscent pod about an inch and a half long. Its native name is "Harahara," and it affords an extremely hard wood used for various purposes. (*N. xiphoclada*, also called "Harahara," possesses similar wood, but it is found in the Central Region.) *Dilobeia Thouarsii* also supplies a hard wood used in carpentry and house-building. It is known as "Vivaona." Then there are several species of *Diospyros*, but whether any of them yield ebony I cannot say. *Diospyros haplostylis*, *D. megasepala*, and *D. sphærosepala* are found in the forest east of Antsihanaka. *D. gonoclada* occurs somewhere between Imerina and the sea, and *D. fusco-velutina* is found on the east coast. *Tetraclis clusiæfolia*, an endemic genus of Ebenaceæ, probably also supplies a useful wood. There are also several trees known by the generic term "Varongy" (not *Calophyllum Inophyllum*, as given in some publications, for this is the "Foraha"), which supply wood much used in house-building. One of these is *Ocotea trichophlebia*, belonging to Laurineæ. Another tree affording a useful wood is "Famelona," but apparently it is as yet unknown to science.

Among trees or shrubs supplying useful products, &c., are *Landolphia madagascariensis* and *L. gummifera*, climbing plants from which is obtained the india-rubber exported from the island; *Urophyllum Lyallii*, which is probably the shrub known by the Malagasy as "Fatray," which yields a bark used by them in the manufacture of rum; *Ravensara aromatica*, called "Havozomangidy," with very aromatic bark, probably also used in the manufacture of rum. Another tree, possibly also a species of *Ravensara*, with the native name "Havozomanitra," possesses a strongly but agreeably aromatic bark (or wood?). The "Nato" tree (possibly *Labramia Bojeri*), found in certain localities, affords a bark largely employed by the natives in dyeing. A tree with a large delicious fruit is the "Voantsimatra" (*Salacia dentata*?), which would doubtless be a welcome novelty to gardeners. *Elæocarpus sericeus* also deserves mention, as its young leaves when pressed and dried form the beautiful objects known as "gold leaves." A bamboo known as "Volotsangana" (*Cephalostachyum Chapelieri*) is one of the most useful of all the vegetable products found in the forests. It is used by the natives for all sorts of purposes, which it would be wearisome to enumerate.

The Central Region.

The Central Region, whose boundaries have been already defined, occupies the elevated plateau of the interior. Its height varies from about 2500 * to 8500 feet, the average possibly being about 4000. Speaking generally the Region consists of bare, brown, desolate, undulating moorlands which, from their lack of verdure, are extremely monotonous and dreary. Trees and shrubs are few and far between; *green* grass is only occasionally to be seen; and flowers possessing much beauty are scarce. There are, however, a few localities here and there to which this description will not apply, but these are mere oases in the great wilderness. The valleys in some places contain a few shrubs and trees, and several of them in the western portion of the Region are almost filled with the shrub *Smithea chamæchrista*. A few patches of forest are also occasionally to be found, but they are so few and so small as to produce little change in the dreary aspect of the country. The Region for the most part is covered with coarse, wiry, brown grasses growing chiefly in tufts. Among the most common of these grasses are *Pennisetum triticoides*, *Aristida Adscensionis*, *A. multicaulis*, *Setaria glauca*, *Andropogon Schœnanthus*, *A. hirtus*, and *A. Cymbarius*. The last two, especially *A. Cymbarius*, grow so thickly and to such a large size (10 or 12 feet) in many of the uninhabited portions of the western part of the Region as to render travelling almost impossible.

The Region includes numerous mountains, among which is Ankaratra, the highest in the island. It is an old much denuded volcano, and is therefore composed of lava, chiefly basaltic, which has flowed from the mountain and covered an area of country probably not less than 1500 or 2000 square miles. In some places there are large alluvial tracts, but with these and a few other exceptions the soil consists of decayed gneiss and allied rocks, for the Central Region, as is the case also with the Eastern Region, is occupied by Crystalline (probably Archæan) schists, chiefly gneiss. The Region, having been dry land for many geological periods, has suffered extensively from denuda-

* The Mandritsara valley is even less than that.

tion, and the rock, in many parts, has decayed to a depth of nearly 200 feet. The many rivers and streams, unceasingly at work, have wrought, in the course of ages, great changes; the river Kitsamby, to the west of Ankaratra, may perhaps be specially mentioned, for the enormous gap it has made in the surface of the country.

I have long been convinced that the soil of Madagascar has been far too highly praised; probably in the western parts of the island, where the rocks are sedimentary, the soil, in many places, would be suitable for agriculture; but in Central Madagascar especially, where the soil consists chiefly of decayed gneiss, it cannot be said to be, as a rule, fertile.

The temperature of the Region varies of course with elevation and latitude. At Antananarivo (the Capital), Mr. Richardson, of the London Missionary Society, has taken observations for some years back, and from figures which he gives ('Antananarivo Annual,' No. xi. pp. 394–396) we learn that, in the year 1887, the greatest heat registered in the shade by a self-registering barometer at a height of 4540 (4700 ?) feet above the sea was on the 6th of November, when it reached 85° Fahr. The coldest day seems to have been August 23rd, when the mercury, at its highest, reached 54°. The next coldest day was June 15th, the mercury standing at 56°. The hottest nights were in January, when the mercury on several occasions did not fall below 70°. The coldest night was on June 16th, the temperature being 38°.

The rainy season occupies the five months from November to March, but during only about a hundred days is there any rainfall, and on many of these the downpour is slight. As a rule the rain commences in the afternoon, about 3 o'clock, and lasts for two or three hours, though sometimes much longer. The time in which there is the greatest rainfall is from about the middle of December to the end of February. During the seven months of the dry season rain very rarely falls. In the year 1887 only 8·37 inches fell in these months, and more than half of that was in September and October. Mr. Richardson, who has for a long time registered the rainfall at the Capital, tells us that the average for the seven years 1881–1887 was 53·46 inches.

The Central Region has been much more thoroughly explored botanically than either of the other two Regions, and it may be safely said that there are comparatively few novelties left to reward future explorers. Herbs and small wiry suffruticose plants preponderate in the flora, trees and shrubs being comparatively few. Of the 1236 species found in the Region about 900 belong to the former and 336 to the latter: that is to say, about three fourths of the plants are herbaceous or suffruticose. In the Eastern Region, on the other hand, and probably also in the Western, more than half of the flora is composed of trees and shrubs.

Another peculiarity of the flora of the Central Region is that, as might be expected, it is of a more temperate character than that of either of the other two Regions. Anonaceæ scarcely seem to occur; Guttiferæ have but one or two representatives; Piperaceæ are rare; Palms do occur, but they are by no means abundant. It is much the same with other tropical Orders. Many of the tropical genera, too, found in the other Regions are either entirely or almost absent in the Central. On the other hand, forms of a temperate type are comparatively abundant. Of Ranunculaceæ there are 18 species in the island (14 of *Clematis* and 4 of *Ranunculus*), about half of which are confined to the Central Region. All the Cruciferæ, of which, however, there are but 3 or 4 species, also belong to it, though *Cardamine africana* slightly oversteps the eastern boundary. At least 30 out of the 34 plants belonging to Crassulaceæ are confined also to this Region. There are only 4 members of Caryophylleæ known in the island, belonging to as many genera, only one ot which is found outside the limits of the Region. Of the 18 species of Umbelliferæ the greater number occur here alone, *Peucedanum capense* and *P. Bojerianum*, as also *Carum angelicæfolium**, being only found at a considerable elevation (6000 feet and upwards). Nearly all the members of Ericaceæ are also confined to this Region. The 5 species of Primulaceæ (4 of *Anagallis* and 1 of *Lysimachia*) also occur only here. Of the 24 species of Gentians nearly all are either confined within the limits of the Region or just exceed them. This is the case also with Irideæ. The only Madagascarian willow (*Salix madagascariensis*), and the only two representatives of the Sandal-wood Order (*Thesium madagascariensis* and *T. cystoseiroides*) also belong here, the willow being abundant at the east foot of Ankaratra mountain,

* This name and some others mentioned in the present paper will be found in Mr. Baker's "Further Contributions to the Flora of Madagascar" which follows this article.

and the latter being small plants confined to the highest mountains.

Here also we have such temperate or sub-temperate genera as the following, those marked with an asterisk being quite confined to the Central Region:—*Linum* *, *Pelargonium* *, *Lebeckia*, *Argyrolobium* *, *Genista* *, *Alchemilla*, *Crassula*, *Kitchingia* *, *Cotyledon* *, *Epilobium*, *Telephium* *, *Hydrocotyle*, *Pimpinella*, *Anthospermum* *, *Helichrysum*, *Stæbe* *, *Cineraria* *, *Hieracium*, *Lactuca*, *Wahlenbergia*, *Vaccinium*, *Agauria*, *Philippia*, *Cynoglossum* *, *Halleria*, *Harveya* *, *Streptocarpus*, *Micromeria* *, *Selago* *, *Salvia* *, *Stachys* *, *Ajuga* *, *Corrigiola* *, *Chenopodium*, *Rumex*, *Aristea* *, *Geissorhiza* *, *Kniphofia* *, *Cæsia* *, *Scirpus*, *Carex*, and *Bromus* *. In addition to these may be mentioned the following species:—*Viola abyssinica* *, *Geranium simense* *, *Caucalus melanantha* *, *Drosera ramentacea*, *Agauria salicifolia*, *Sanicula europæa*, *Hypericum japonicum* *, *Cotula multifida* *, *Limosella aquatica* *, *Juncus effusus* *, *Asplenium Trichomanes*, and *Aspidium aculeatum*.

Viola abyssinica, the only Madagascarian violet, is confined to the higher elevations of the Central Region. *Geranium simense*, the only Geranium in the island, exists abundantly in woody places. *Caucalis melanantha* inhabits the more elevated localities. *Drosera ramentacea* occurs everywhere in Central Madagascar in damp places. *Agauria salicifolia* inhabits chiefly the mountains of the interior, although it slightly invades the Eastern Region. *Sanicula europæa* also occurs in the higher portions of the island. The common bracken (*Pteris aquilina*) and *Lycopodium clavatum* occur also in great abundance, the former near, and the latter in and about, the forests of the interior. The royal fern (*Osmunda regalis*) and the male fern (*Nephrodium Filix-Mas*) are very plentiful in the Central and the higher portion of the Eastern Regions.

Very remarkable is the distribution of the first six of the above plants. The Violet occurs, as Mr. Baker has remarked, at the height of 10,000 feet in Fernando Po, and 7000 feet in the Cameroons in West Africa, almost under the equator, and in the mountains of Abyssinia, as well as in Madagascar from 6000 feet to the summit of Ankaratra, 8494 feet, the highest point in the island. Mr. Thompson has also recently discovered it on the mountain of Kilima-njaro. The Geranium has a precisely similar range of distribution. *Caucalis melanantha* occurs in Central

Madagascar, at an elevation of 9000 feet in Abyssinia, of 7000 to 8000 feet in the Cameroons, and of 7000 feet in Fernando Po; and has also lately been found by Mr. Thompson on Kilima-njaro. *Drosera ramentacea* (as also *Lonchitis occidentalis*, found in North-east Madagascar) appears on the mountains of Angola and Guinea; and *Agauria salicifolia* is common to the mountains of Madagascar, Reunion, the Cameroons, and the high land about Lake Nyassa. *Sanicula europæa* "occurs in Central Madagascar, the mountains of Abyssinia, the Cape, 4000 to 7000 feet in the Cameroons, 4000 feet in Fernando Po, and is widely spread through Europe and other parts of the north temperate zone." It may be added that *Cyanotis nodiflora* var. *madagascarica* finds its home in Angola and Madagascar; and that *Commelina Lyallii*, a variety of *Commelina Mannii* of the Cameroons, also inhabits the interior of the island. These interesting facts point plainly to the existence of a former cold (or temperate) climate within the tropics, followed by a warmer period when these temperate plants, in order to maintain an existence, were compelled to retreat up the mountains, where they remain to the present day.

The genera most largely represented in the Central Region are:—*Helichrysum* (36 species), *Cyperus* (32), *Senecio* (31), *Vernonia* (22), *Habenaria* (20), *Philippia* (18); *Hypoestes* and *Cynorchis*, with 16 each; *Kalanchoe* (16), *Scirpus* (15); *Indigofera* and *Kitchingia*, with 14 each; *Oxalis*, *Crotalaria*, and *Euphorbia*, with 12 each; *Psorospermum* and *Ficus*, 11 each; *Hibiscus*, *Dombeya*, *Desmodium*, *Ipomœa*, and *Panicum*, 10 each; *Clematis*, *Impatiens*, *Mundulea*, and *Conyza*, 8 each; *Hydrocotyle*, *Stenocline*, *Polystachya*, and *Fimbristylis*, 7 each; *Polygala*, *Grewia*, *Vitis*, *Solanum*, *Stachys*, *Eulophia*, *Angræcum*, and *Aloe*, 6 each; *Gymnosporia*, *Eriosema*, *Rubus*, *Oldenlandia*, *Psiadia*, *Utricularia*, *Thunbergia*, *Salvia*, *Phyllanthus*, *Satyrium*, *Vellozia*, *Carex*, and *Andropogon*, 5 each.

Ankaratra, about 20 or 30 miles south-west of the Capital, is as has been already said, the highest mountain in the island, reaching to 8494 feet above the sea. It does not come within the snow-line, snow indeed being entirely unknown in the island. Ice is, however, occasionally seen in the winter season. As this mountain is the highest in the island, it may not be uninteresting if I give here a list of the plants which appear to be confined to it *, and which are endemic in Madagascar. It

* Some of these, and the list does not profess to be exhaustive, may possibly also occur on some of the other high mountains, such as Vavavato.

will be seen from the list that the flora of the mountain has a more or less temperate aspect. The plants are as follows:—*Clematis dissecta*, *Polygala mucronata*, *P. emirnensis*, *Oxalis xiphophylla*, *Impatiens trichoceras*, *Crotalaria orthoclada*, *Indigofera thymoides*, *I. pinifolia*, *Rubus pauciflorus*, *Alchemilla bifurcata*, *Kalanchoe pumila*, *K. brevicaulis*, *Dicoryphe viticoides*, *Rotala cordifolia*, *Telephium madagascariense*, *Hydrocotyle tussilaginifolia*, *Pimpinella ebracteata*, *Peucedanum Bojerianum*, *Panax confertifolium*, *Anthospermum polyacanthum*, *Vernonia inulæfolia*, *V. ochroleuca*, *V. scapiforme*, *Psiadia stenophylla*, *Helichrysum retrorsum*, *H. cryptomerioides*, *Stenocline filaginoides*, *Aspilia Baroni*, *A. Bojeri*, *Hieracium madagascariense*, *Lightfootia subaphylla*, *Agauria littoralis*, *Philippia oophylla*, *P. pilosa*, *P. macrocalyx*, *Lysimachia parviflora*, *Anagallis peploides*, *Jasminum puberulum*, *Cynoglossum cernuum*, *C. discolor*, *Alectra pedicularioides*, *Tetraspidium laxiflorum*, *Hypoestes ascendens*, *Micromeria flagellaris*, *Salvia porphyrocalyx*, *Stachys oligantha*, *S. sphærodonta*, *Ajuga robusta*, *Corrigiola psammatrophoides*, *Euphorbia ensifolia*, *Croton emirnensis*, *Acalypha Radula*, *Aristea angustifolia*, *Kniphofia pallidiflora*, *Rhodocodon madagascariensis*, *Scirpus multicostatus*, *Cladium pantopodum*, *Carex sphærogyna*, *Stipa madagascariensis*, *Eragrostis brizoides*, *Cœlachne madagascariensis*, *Bromus avenoides*, and *B. arrhenatheroides*.

The Western Region.

With the exception of Southern Madagascar, no part of the island is so little known as that included in this Western Region, especially perhaps the territory between Lat. 16° and Lat. 20°. The Region, as a whole, is not very mountainous. There is a mountain-chain, however, of no great height, known as Bongolava, which runs with remarkable regularity parallel to the longitudinal axis of the island for many hundred miles. To the west of this, again, there is the long mountain-range of Bemaraha parallel with Bongolava. But the Region, generally speaking, slopes very gradually down to the sea, and consists of wide, comparatively level or slightly undulating stretches of country, covered with coarse grass and innumerable groves and patches of wood. Running north and south for hundreds of miles, at a distance generally of eight or ten leagues from the sea, there are extensive forests, but how far these are continuous it is impossible to say. These forests, as a rule, are much less crowded with undergrowth, and are therefore less impenetrable, than those on the eastern side of the island.

The country is drained by numerous rivers, of which the Sofia, Betsiboka, Manambolo, Tsiribihina, Kitombo (or Mangoky), and Onilahy, all of which take their rise in the mountains of the interior, are the largest. As for the geology of the country, the rocks apparently belong almost entirely to the secondary formations, and chiefly to the Jurassic and Cretaceous series; indeed the eastern boundary of the Region almost coincides with the limit of the sedimentary strata. As a rule these strata have been but little disturbed and, roughly speaking, have a very slight dip towards the west coast. They consist chiefly of sandstone and limestone, with beds of shale and clay.

The heat is much greater in the western than in the eastern part of the island, but what the temperature may actually be is at present unknown. In the north-west of the island in the month of November I have seen the mercury rise to 140° Fahr. in the sun; but as this was the highest figure on the thermometer, the actual heat was probably greater. In regard to the temperature of the south-western portion of the island, the Rev. A. Walen says:—"In the so-called rainy season the heat on the south-west coast is most intense and, in the middle of the day, is almost unbearable."

Very little also is known in regard to the rainfall of the Region, no record, so far as I am aware, ever having been kept. But there can be no doubt that there is much less rain in Western than in Eastern Madagascar, the moisture brought by the south-east trade-winds being almost entirely absorbed by the eastern mountains. Mr. Walen says:—"The soil of the country is fertile, but on account of the very small rainfall during the rainy season (there are frequently long droughts), it produces very often but little return to an agriculturist, being liable to failure of crops and years of scarcity. During the two years I spent on the coast there was scarcely any difference in the rainfall between the rainy and the dry seasons. The rain was very scarce indeed all the year round. Only slight showers occasionally fell in both seasons of the year, varied by some few heavy squalls from the north-west . . . . . . The rainy season (from October to March) is also the hurricane season. As to the amount of rain there is a great difference between the east coast and the west coast, the former of which gets a superabundance of it all the year round. A year of scarcity has perhaps never been known on the east coast, but it is no uncommon thing on the west coast."

The flora of the Western Region is not yet so well known as that of the other two Regions, and the majority of the 1008 plants I have enumerated as belonging to the Region have been gathered in the north-west, from Lat. 16° 30′ to Cape Amber (including the islands near the mainland, especially Nosibé), and in the country about Ankavandra in Lat. 19°. A few have also been collected in the south-west. The general aspect of the country as regards verdure is much less luxuriant than the eastern side of the island. Vegetation is least dense in that portion of it which adjoins the Central Region, the shrubs and trees being largely confined to the banks of the rivers and streams. The "Rotra," a large tree, which is a species of *Eugenia*, the "Sodindranto" or "Sohihy" (*Cephalanthus spathelliferus*), and a kind of "Lalona" (*Weinmannia lucens*) are the commonest of the trees which occupy the river-courses in this portion of the Region. The two former, however, seem to be abundant on the river-banks in all parts of Western Madagascar, but in the parts nearer the sea they are accompanied by numerous other shrubs and trees, which form a flora peculiar, or almost peculiar, to the river-sides.

The numerous warm valleys of the western part of Madagascar are chiefly occupied by the following trees and shrubs:—A species of *Ficus* (*F. cocculifolia*), *Orchipeda Thouarsii*, the *Eugenia* common on the river-banks, *Hibiscus phanerandrus*, *Alyxia lucida*, the Tamarind (*Tamarindus indica*), and some other trees and shrubs. Some of the valleys are almost exclusively occupied by the Rofia Palm (*Raphia Ruffia*), one of the most abundant trees in the island, though always found in valleys. In the elevated Central Region it exists sparingly, the climate being somewhat too cold for it. The Mango tree, escaped from cultivation, also frequently occurs in abundance in the warm valleys, and attains the dimensions of a very large tree. In marshy hollows and on river-sides the "Viha" (*Typhonodorum Lindleyanum*) is very common. The *Ficus* above mentioned, whose native name is "Adabo" or "Adabovavy"*, has a fruit

* Literally, "the female Adabo." Whenever there are two species of trees, shrubs, or herbs of similar outward appearance (which may or may not be botanically allied), the natives affix the word "vavy"=female, to the one with

from four to six inches in diameter. It is one of the very commonest trees in the western parts of the island, although it is chiefly confined to the valleys and the river-banks. A second species of *Ficus* (*F. sakalavarum*), very similar to this in outward appearance, known as "Adabolahy," but with a much smaller fruit, is also somewhat common, but by no means so abundant as the "Adabovavy." *Alyxia lucida*, a climbing shrub belonging to the Apocynaceæ, has a pod-like, bright scarlet fruit composed of a series of oblong joints. The natives call it "Andriambavifohy," and use the bark and leaves in the manufacture of rum. As for the Tamarind-tree, its original home is unknown. At the present time it occurs in Madagascar (in the Western Region only), Tropical Africa, India, North Australia, Mauritius, and Rodriguez. Now I am strongly of opinion that the tree is truly indigenous in Madagascar, for, in the first place, it does not merely occur (as introduced plants almost always do) near villages, or along the roadsides, or in scattered patches; it is equally distributed and widely spread throughout the whole of Western Madagascar, whether in valleys or on the open plains. It has, moreover, purely native names, which is not always the case with introduced plants. Its names are "Madilo" and "Madiro." It is also called "Kily," from which the word "Sikidy" (divination) is probably derived, the seeds of the tree being employed in the working of the divination board. For these reasons, but chiefly from the mode of its distribution, I am convinced that the tree is truly a native of Madagascar, and that, if it is not also indigenous in other countries, the western part of the island forms its original home. The Sakalava, it may be remarked, employ an infusion or decoction of the leaves as a vermifuge and as a remedy for disorders of the stomach; they also obtain from the tree a kind of black dye.

On the west coast, especially perhaps near the mouths of rivers, there are numerous and extensive mangrove swamps. One of the most common of the mangroves is the *Rhizophora mucronata*, which occurs on the sea-shore in many parts of the tropics of the Old World. The Malagasy name of the tree, as probably also of other mangroves, is "Honko."

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the larger leaves (or occasionally larger fruit), and the word "lahy" = male, to the one with the smaller leaves (or smaller fruit). The reason for this I do not know, but it is the universal practice.

The Leguminosæ, as may be seen from the table on page 260, is by far the most abundantly represented Order in the Western Region, occupying as much as 18·8 per cent. of the flora. The Euphorbiaceæ come next, but these are only represented by 7·7 per cent. The Compositæ, which in the Central Region comprise 13 per cent. of the flora, being the head of the list, as also Rubiaceæ, here stand at 3·2 per cent. There seem to be but two Orders, the Hydrophyllaceæ (2 spp.) and Aristolochiaceæ (1 sp.), which are confined to this Region. On the other hand, a goodly number of Natural Orders represented, though in some cases by but one or two species, in the other Regions, are entirely or almost absent from the Western Region. Rutaceæ, Cacteæ, Goodenoviæ, Araliaceæ, Vacciniaceæ, Ericaceæ, Primulaceæ, Myrsineæ, Lentibulariæ, Selagineæ, Illecebraceæ, Phytolaccaceæ, Nepenthaceæ, Proteaceæ, Balanophoreæ, Santalaceæ, Coniferæ, Cycadaceæ, Salicineæ, Burmanniaceæ, Irideæ, Hypoxidaceæ, Naiadaceæ, and Eriocauloneæ are apparently quite absent from the Region; and Ranunculaceæ, Cruciferæ, Guttiferæ, Geraniaceæ, Crassulaceæ, Melastomaceæ, Umbelliferæ, Campanulaceæ, Loganiaceæ, Gentianaceæ, Scrophulariaceæ, Gesneraceæ, Labiatæ, Monimiaceæ, Laurineæ, Loranthaceæ, Urticaceæ, and Liliaceæ have in it but few representatives.

The most abundantly represented genera are:—*Grewia* (28 species), *Hibiscus* (21), *Ipomœa* (18), *Dalbergia* (18), *Euphorbia* (18), *Indigofera* (15); *Croton* and *Cyperus*, with 12 each; *Dombeya* and *Desmodium*, 11 each; *Bauhinia*, *Mimosa*, and *Albizzia*, 9 each; *Alsodeia*, *Buettneria*, *Erythroxylon*, *Mascarenhaisia*, and *Ficus*, 8 each; *Popowia*, *Polygala*, *Commiphora*, *Crotalaria*, *Terminalia*, *Homalium*, and *Acalypha*, 7 each; *Tristellateia*, *Æschynomene*, *Cassia*, *Phyllanthus*, and *Tragia*, 6 each; *Clerodendron* and *Macaranga*, 5 each. It will be seen from this that there is no genus of plants in the Region forming an undue proportion of the flora.

I shall now briefly refer to some of the trees and shrubs which most largely influence the vegetable physiognomy of the Region, or which, as affording valuable timber, or being otherwise remarkable, deserve special mention. Among the commonest trees and shrubs are *Ficus cocculifolia*, the Tamarind, the Rofia Palm (*Raphia Ruffia*), the "Rotra" (*Eugenia*, sp.), the "Sohihy" (*Cephalanthus spathelliferus*), and *Weinmannia lucens*, all of which have been already referred to. In addition to these there are the following :—*Hyphæne coriacea*, a small, probably endemic, fan-palm, which is exceedingly abundant, in some places covering the whole face of the country. The natives call it "Satramira," and use its fruit very largely in the manufacture of rum. Another fan-palm (probably a species of *Hyphæne* or *Latania*), called "Satrambe," is also extremely common. It is a much taller tree than "Satramira." The Sakalava often use its leaves with graceful effect in building their huts. Another fan-palm, a much larger one than the two former, though not so common, is that known as "Befelatanana" (=the big hand); it is possibly *Bismarckia nobilis.* None of these fan-palms occur in either the Central or Eastern Region, except in places where they have been planted. The "Sakoana" (*Sclerocarya caffra*) is also one of the commonest trees in the Region. It possesses an acrid edible fruit used, I believe, by the natives in the manufacture of rum. *Acridocarpus excelsus* is also widely spread. It has long, slender, straggling branches, and looks as though it had but recently given up the habit of climbing, common to so many members of its family. Its native name is "Mavoravina" or "Kirajy." *Albizzia Lebbek*, which the Malagasy call "Bonara" (=Bois Noir), *Brehmia spinosa*, *Urena lobata*, *Erythroxylon platyclados*, called by the natives "Tampia" or "Tampiana," and *Phyllanthus Casticum* must also be ranked among the most common shrubs and trees of this part of the island. All the above live in the open country, and from their abundance and wide distribution give a distinct character to the general vegetable physiognomy of the Region.

Inhabiting this part of the island also is the *Eriodendron anfractuosum*, known as "Hamba" or "Moraingy." It is a somewhat strange-looking tall shrub, a member of the family Malvaceæ. The natives use the hairs from the seeds in stuffing cushions; if, however, they get into the eye, they are said to injure it, if not actually to induce blindness. On the west coast a species of Baobab (*Adansonia madagascariensis*) is plentiful. Of this tree M. Baillon says :—"Son écorce est textile ; elle sert à couvrir les cases et à faire des cordages. Le bois est tendre et spongieux ; à l'époque de la végétation active, il fournit par incisions une sève qui n'est guère que de l'eau et qui est bonne à boire. Il y a, à Mouroundava, des maisons de commerce qui exploitent en grand les semences. M. Grevé ne dit pas quel usage on en fait ; mais je suppose qu'il doit s'agir d'une extraction d'huile. Les fruits renferment outre les semences, une pulpe comestible, analogue, sans doute, à celle du Baobab commun. Mais ce qu'il y a de remarquable, c'est que les maisons de commerce dont il est question exploitent aussi la portion la plus blanche et la plus molle de l'écorce. Peut-être est ce pour en tirer une substance gommeuse ou mucilagineuse, cette sort de suc laiteux dont parle Bernier." The Malagasy names of the tree are "Reniala," "Bontona," and "Za."

Among the most common plants found in woody places may be mentioned the "Manary" (*Dalbergia trichocarpa*, and probably one or two other species of *Dalbergia*), which afford, I believe, a useful timber (exported to Europe ?), and the "Amokombe" (*Gardenia succosa*), from which exudes a kind of gum. In similar places is to be found the "Agy" (*Mucuna axillaris*), a climbing plant which is remarkable for the very virulent stinging properties of the hairs which cover its pod. Not far from the sea grows the "Sorindrana" (*Sorindeia madagascariensis*), a tree with bunches of sweet edible fruit. On the west coast (as also on the east coast) occurs the *Guettarda speciosa*, the tree which yields the wood known by cabinet-makers as zebra-wood. The Sakalava call it "Tambaribarisa."

Of the trees and shrubs found in the forests of the Western Region we possess as yet little definite information, although a large number of them are now known to science. The well-known Malagasy ebony is apparently an inhabitant of these forests. Its wood is smuggled out of the country by the Sakalava, and exported to Europe. But to what species of *Diosypros* the ebony belongs has, I believe, never yet been ascertained. At present there are 22 species of *Diospyros* known in the island. Thirteen of these, if not more, are found in the Eastern Region. It is not unlikely that the tree (or trees) which supplies the ebony is one (or more) of the following:—*Diospyros gracilipes*, *D. toxicaria*, *D. Pervillei*, *D. parvifolia*, *D. lenticellata*, or *D. microrhombus*, the last of which is described as:—"Ebenier de Madagascar; son bois est superbe."

Character and Relationship of the Madagascarian Flora.

Mr. Baker, in the paper he read at the meeting of the British Association at York in 1881, has described the general character of the flora of Madagascar, and has shown its geographical relationship. Of genera that are cosmopolitan he says that "nearly all are represented in the island." As instances he gives the following:—*Cyperus*, *Panicum*, *Polypodium*, *Acrostichum*, *Asplenium*, *Pteris*, *Ficus*, *Piper*, *Phyllanthus*, *Croton*, *Loranthus*, *Psychotria*, *Indigofera*, *Vernonia*, *Solanum*, *Eugenia*, *Ipomœa*, *Vitis*, *Gouania*, *Hibiscus*, *Gomphia*, *Ochna*, *Desmodium*, *Crotalaria*, *Acalyphe*, *Cleome*, *Capparis*, *Cassia*, *Dalbergia*, *Eragrostis*, *Commelina*, *Dioscorea*, *Dalechampia*, *Andropogon*, *Scleria*, *Kyllingia*, *Mimosa*, *Jussiæa*, and *Homalium*.

Of widely-spread species Mr. Baker reckons that there are in the island probably no fewer than 150.

Of tropical species widely dispersed through the Old World there are probably no less than 100 occurring in Madagascar. "Amongst these latter aquatic plants are represented by such species as *Nymphæa Lotus* and *stellata*, *Limnanthemum indicum*, and *Utricularia stellaris*; trees and shrubs of the muddy swamps of the sea-shore by the mangroves and their associates (such as *Rhizophora mucronata*, *Bruguiera gymnorhiza*, *Sonneratia alba*, *Lumnitzera racemosa*, *Thespesia populnea*, and *Avicennia officinalis*); and shrubs not especially maritime by such plants as *Schmidelia racemosa*, *Colubrina asiatica*, *Ormocarpum sennoides*, *Desmodium lasiocarpum* and *umbellatum*, *Premna serratifolia*, and *Securinega obovata*."

The close affinity of the flora with the floræ of the other Mascarene islands Mr. Baker illustrates by showing "the range of a few genera which are confined to the Mascarene group." As instances he mentions *Danais*, *Aphloia*, *Fœtidia*, *Obetia*, *Radamæa*, *Phyllarthron*, *Colea*, and *Stephanodaphne*.

Mr. Baker also shows that there is a close affinity between the flora of Madagascar and that of Tropical Africa, on the one hand, and the flora of the central elevated parts of the island with those of the Cape and the mountains of Central Africa, on the other. This he illustrates by instances too numerous to be here enumerated. There is, however, let me add, probably a closer alliance between the flora of Tropical Africa and that of the Western Region of Madagascar, than with the floras of the Central and Eastern Regions.

Finally, Mr. Baker shows that there is a slight special affinity between the flora of Madagascar and the floras of Tropical Asia and the Malay isles. This is evidenced by the existence in the island of, for example, *Cyclea madagascariensis*, *Murraya exotica*, *Nepenthes madagascariensis*, *Stephanotis floribunda*, *Strongylodon madagascariensis*, *S. Lastellianum*, *Hernandia pel-*

tata, *Afzelia bijuga*, *Barringtonia speciosa*, *Alyxia erythrocarpa*, *Lophatherum geminatum*, *Strobilanthes madagascariensis*, *S. hispidula*, *Lagerstroemia madagascariensis*, *Eriocaulon fluitans*, and *E. fenestratum*, all of which, except the last four, are found in the Eastern Region, and several on the east coast only.

The data upon which the above affinities are based might now be considerably increased, but as further particulars would only serve to confirm the relationship of the flora as shown in the above paragraphs, it is needless to enumerate them.

In regard to the fauna of Madagascar, it has long been known that a considerable number of creatures living in the island at the present time are closely allied to American forms. This affinity is specially marked in some of the reptiles and insects. Now there is also, strange to say, a certain though slight amount of affinity between the flora of Madagascar and that of America. Of the genus *Omphalea*, for instance, belonging to the Order Euphorbiaceæ, there are 8 species, 7 of which belong to Tropical America and 1 to Madagascar. Of the genus *Pedilanthus*, belonging to the same Order, 2 are found in Madagascar, and all the rest (about a dozen) in tropical America. Of the Order Scitamineæ, again, the genus *Myrosma* has one species in Madagascar and 11 in tropical America. The well-known Malagasy "traveller's tree" (*Ravenala madagascariensis*), belonging to the Order Musaceæ, finds its representative in *Phenakospermum guianense*, Endl. (really a species of *Ravenala*), which inhabits N. Brazil and Guiana, and is the only other species of this genus. Of the grasses, *Echinolæna* has one species in Madagascar and one in Guiana and Brazil. *Lycopodium dichotomum*, of the Order Lycopodiaceæ, seems to be confined also to Madagascar and America.

Doubtless this list might be enlarged, but it is sufficient to show that there is a slight relationship between the flora of Madagascar and that of tropical America; and this relationship, whatever the explanation of it may be, is probably to be accounted for by the same causes as those which have brought about the affinity between the two faunas.

In considering the flora of Madagascar as a whole, one of the first things that strikes us is that the island must be of immense antiquity. About three fourths of the species and a sixth of its genera of plants are endemic! And this is as it should be; the genera have for the most part survived the untold ages that have elapsed since their first appearance, while the species have been subjected to enormous modification. Such a very large amount of specific differentiation seems to me to point in the clearest manner to long isolation. The antiquity of the island is also abundantly evidenced by the remarkable character of its fauna, a subject, however, which need not here be discussed. At what period the island was connected with the adjacent continent it is impossible to state with certainty, but as Nummulitic limestone occurs on a great part of the west coast of Madagascar, there seems to have been probably no land connection in Eocene times; and as the inroad of the higher forms of mammals into South Africa from the Euro-Asiatic continent took place, as Mr. Wallace shows, probably in later Miocene or early Pliocene times, Madagascar must have been cut off from the mainland at least not subsequent to the later Pliocene period, as the absence of such mammals in the island proves. This would allow time for the migration of the mammals to South Africa, which would not unlikely keep pace with the gradual lowering of the temperature going on in the northern hemisphere. This also would explain the existence of the "comparatively cold period" succeeded by "a warm period," during both of which, or some part of which, as Mr. Baker points out in one of the propositions given below, Madagascar must have been joined to the mainland. For it is now well known that in the northern hemisphere in Tertiary time there was a gradual lowering of the temperature from that of a tropical to a temperate or evén a cold climate. This being of course reversed in the Southern hemisphere, we should have a cold period followed by a warm one. It seems probable, therefore, that Madagascar was joined to the African continent during some part or parts or the whole of the Miocene (including Oligocene) and early Pliocene periods.

In summing up the character of the flora of Madagascar, Mr. Baker lays down the following propositions:—

1. "The flora of the tropical zone throughout the world is remarkably homogeneous in its general character, and to this general rule Madagascar furnishes no marked exception. There is no well-marked plant-type largely developed in the island which is not found elsewhere, and none absent that one might *à priori* expect.

2. "About one in nine * of the genera are endemic; but they

* More correctly about one in *six*.—R. B.

are all small genera, mostly belonging to the large Natural Orders, and closely allied to cosmopolitan generic types.

3. "There is a close affinity between the tropical flora of Madagascar and that of the smaller islands of the Mascarene group.

4. "There is a close affinity between the tropical flora of Madagascar and that of the African continent.

5. "There are a few curious cases in which Asiatic types which do not occur in Africa are met with in Madagascar, and these bear a very small numerical proportion to the great mass of the flora*.

6. "There is a distinct affinity between the flora of the hill-country of Central Madagascar and those of the Cape and the mountain-ranges of Central Africa."

The history of the island, as indicated by the plants, Mr. Baker sums up as follows:—

1. "A very early comparatively cold period, during which Madagascar was joined to the mainland. The plants which remain from this period now have their head-quarters in Cape Colony, and are found upon the high mountains of continental Africa and Madagascar. When I say cold, I mean a temperate climate, not very unlike ours at the present day.

2. "A warm period, during which (or some part of which) Madagascar was joined to the continent of Africa, and also to Mauritius, Bourbon, and the Seychelles. Shown by the present extension to Madagascar and the lesser isles of the characteristically tropical African species and genera.

3. "A lengthened period of isolation."

In the form of an Appendix I may here give a list of plants introduced into Madagascar by human or other agency which, though many of them have established themselves in the island and become naturalized, can scarcely be incorporated in the native flora.

Introduced Plants.

Brassica campestris occurs in the Central Region; *Sinapis juncea*, Cent. Reg.; *Senebiera didyma*, Cent. Reg.; Arnotto

* I may here mention my belief, though I have not gone into the matter with sufficient care absolutely to prove it, that the Asiatic element in the Madagascarian flora is mostly confined to the Eastern Region.—R. B.

(*Bixa Orellana*), apparently subspontaneous in E., Cent., and W. Regs., in Imerina it is called "Sahy" (=bold), because, as I have been told by the natives, an infusion of its leaves invigorates people in dancing, public speaking, &c., and in former times was given to fighting-bulls to make them fierce; *Hibiscus Abelmoschus*, Cent. and E. Regs.; *H. Sabdariffa*, Cent. and E. Regs.; *Zizyphus Jujuba*, E. and W. Regs.; *Moringa pterygosperma*, E. and W. Regs., on the coast near villages; *Crotalaria fulva*, Cent. Reg.; *Dolichos axillaris*, Cent. and E. Regs., in some places escaped from cultivation; *Fagelia bituminosa*, *Cæsalpinia sepiaria*, largely planted throughout the island for fences and stockades round villages; *Hæmatoxylon campeacheanum*, E. coast, it is the Bois de Campêche, which yields logwood; *Cassia lævigata*, Cent. and E. Regs., chiefly near villages; *C. Sophera*; *C. Fistula*, N. Madag.; *Parkinsonia aculeata*, E. coast; the Sensitive Plant (*Mimosa pudica*), subspontaneous on E. coast; *Leucæna glauca*, Cent. and W. Regs.; *Telfairia pedata*, *Opuntia ferox* (?), used largely throughout the island for fences and stockades; *Eupatorium triplinerve*; *Ipomœa purpurea*, Cent. and E. Regs., subspontaneous; *Ipomœa Bona-nox*, W. Reg.; *Solanum auriculatum*, Cent. and E. Regs., said by the natives to be of comparatively recent introduction; *S. Richardi*, E. Reg.; Cape Gooseberry, Cent. and E. Regs., common in woody places; *Nicandra physaloides*, Cent. and E. Regs.; Stramonium (*Datura alba* and *D. Tatula*), Cent. Reg., waste places; *Angelonia Gardneri*; *Martynia diandra*; *Barleria Prionitis*, Cent. and W. Regs., chiefly near villages; *Verbena bonariensis*, E. coast; *Vitex trifolia*, E. coast; *Amarantus hypochondriacus*, Cent. Reg., near villages; *Gomphrena globosa*, W. Reg.; *Chenopodium ambrosioides*, widely dispersed; *Rivina lævis*; *Myristica fragrans*; the Candle-nut tree (*Aleurites triloba*); *Jatropha Curcas*, throughout the island near villages; Jack-fruit and Bread-fruit; *Canna indica*, E. Reg., near villages; Guinea-grass (*Panicum jumentorum*), subspontaneous in E., Cent., and W. Regs.; *Pennisetum spicatum*, E. Reg.; and *Azolla pinnata*, E., Cent., and W. Regs.

Of plants that are probably introduced may be mentioned the following:—*Stellaria media*, Cent. Reg.; *Malva crispa*, Cent. Reg.; *Abutilon angulatum*, Cent. Reg.; *Hibiscus esculentus*, Cent. and E. Regs.; *H. diversifolius*, Cent. and E. Regs., rarely occurs except in hedges near towns and villages; *Clitoria ternata*, W. Reg. *Phaseolus Mungo*, W. Reg.; *P. adenanthus*, W. Reg.;

P. trilobatus, W. Reg.; *Pterocarpus Marsupium*, E. Reg.; *Poinciana pulcherrima*; *Acacia Farnesiana*, Nosibé; *Bidens leucantha*; *Lactuca indica*, E. Reg.; the Sowthistle (*Sonchus oleraceus*), Cent. Reg.; *Vinca rosea*, now widely spread, especially in Cent. Reg.; *Beaumontia grandiflora*; *Amarantus tristis*, Cent. and E. Regs.; *Myristica philippensis*, N. Madag.; *Phyllanthus distichus* and *P. Urinaria*; *Croton Tiglium*; *Pistia Stratiotes*; and the Ginger-grass (*Andropogon nardus*).

The trees and shrubs cultivated in gardens are too numerous to mention, but the following are among the most common:—*Garcinia Gerrardi*, Cent. Reg.; *Hibiscus Rosa-sinensis*, *H. mutabilis*; *Melia Azederach*; *Acacia heterophylla*; *A. podalyriæfolia*; *Eucalyptus Globulus*; *Callistemon lanceolatus*; the Passion-flowers, *Passiflora incarnata*, *P. cærulea*, and *P. suberosa*; *Luffa acutangula*; *Trichosanthes anguina*; *Zinnia elegans*; *Tagetes erecta*; *Plumbago zeylanica*; *Carissa edulis*; *Nerium Oleander*; *Petunia nyctaginiflora*; *Tecoma capensis*; *Gendarussa vulgaris*, used for hedges; *Stachytarpheta mutabilis*; *Verbena chamædrifolia*; *Salvia coccinea*; *Bougainvillæa spectabilis*; the Camphor-tree (*Cinnamomum Camphora*), known by the natives as "Ravintsara"; *Agave Ixtli*; and *Furcræa gigantea*.

Of introduced fruits, cereals, vegetables, &c., there are:—The Chinese Litchi, on E. coast; Custard-apple, E. and W. coasts (?); *Anona senegalensis*, W. coast, probably introduced; *A. squamosa*; *Spondias dulcis*, E. coast; Cashew-nut, W. coast; Mango, mostly throughout the island; Loquat; Jamrosa; Pomegranate; Guava (common and Chinese, the former almost naturalized in some places); Papaw, E. coast; Banana; Avocado Pear; Orange; Lemon (*Citrus Aurantium*, almost naturalized in some places); Lime (?); Pineapple; Mulberry; Peach; Plum; Apple; Quince; Strawberry; Grapes; Figs (the last seven not being as yet largely cultivated). Then there are the common Indigos, *Indigofera tinctoria* and *Crotalaria incana*, both of which are subspontaneous; the Earth-nuts, *Arachis hypogæa* and *Voandzeia subterranea*; *Phaseolus lunatus*; *Vigna sinensis*; *Dolichos Lablab*; the Pigeon-pea (*Cajanus indicus*), largely cultivated, especially in South Betsileo, for silkworm-feeding; Peas; the Bottle-gourd (*Lagenaria vulgaris*); *Benincasa cerifera*; Melon (*Cucumis Melo*); Water-Melon (*Citrullus vulgaris*); Red Pumpkin (*Cucurbita maxima*); *Momordica Charantia*; Tilseed (*Sesamum indicum*); the Capsicums, *Capsicum frutescens* and *C. annua*;

Castor-oil plant; Cloves (?); the Egg-plant (*Solanum Melongena*); Vanilla; Henna dye (*Lawsonia alba* and *L. inermis*), N., N.E., and N.W. coasts; Hemp; Cotton (*Gossypium barbadense* and *G. herbaceum*); *Piper Betle*, E. coast; Tobacco; Turmeric (*Curcuma longa*); Cocoa-nut, sometimes planted on the coast; Arrowroot (*Tacca pinnatifida* and *Maranta arundinacea*); Millet (*Sorghum vulgare, S. halepense*, and *Panicum miliaceum*); the Bajree of India (*Pennisetum spicata*), cultivated in a few places; the Natchull or Ragee of India (*Eleusine coracana*), cultivated occasionally; Yams (*Dioscorea sativa* and *Colocasia antiquorum*, which latter is the Taro of the South Seas and the common "Saonjo" of the Malagasy); Wheat; Maize; Manioc; Rice; Sweet Potato; Sugar-cane; Coffee; Chicory (rare); Tea is being tried at the present time, but only, I believe, by the inexperienced natives; Potato; Cabbage; Turnip; Radish; Beetroot; Carrot; Onion; Celery; Parsley; Mint; Tomato; Watercress; Lettuce; *Spilanthes Acmella* and *S. oleracea*; and *Brassica juncea*.

Further Contributions to the Flora of Madagascar.

By J. G. BAKER, F.R.S., F.L.S.

[Read 1st November, 1888.]

(PLATES L.-LIII.)

THE following plants are the principal novelties contained in a large collection which the Rev. R. Baron brought home last September. They were collected principally on a journey through the North-west of the island and are more tropical in general character than the collections on which my previous papers have been based. As he has himself laid before us a general summary of the distribution of the plants which he has gathered, it is not necessary for me to say anything more than that the present set of plants does not materially modify any of the geographical conclusions which I have previously advanced.

PITTOSPORUM CAPITATUM, n. sp.

P. ramulis glabris, foliis breviter petiolatis oblanceolato-oblongis acutis rigide coriaceis glabris, floribus in paniculam ramis multifloris dense cuspidatis dispositis, pedicellis brevissimis, sepalis oblongis glabris, petalis oblanceolatis calyce 3–4plo longioribus, staminibus brevibus, ovario piloso.

Branchlets woody, terete, glabrous. Leaves 5-7 in. long, $1\frac{1}{2}$-2 in. broad above the middle, narrowed gradually from the middle to the base, firm in texture, green and glabrous on both surfaces; main veins slender, arcuate. Flowers in a dense peduncled terminal panicle; branches bearing a terminal round head of flowers. Petals $\frac{1}{6}$ in. long. Stamens as long as the calyx. Ovary globose, villose; style as long as the ovary. Fruit not seen.—Ankay, *Baron* 5164!

GARCINIA PACHYPHYLLA, n. sp.

Glabra, foliis petiolatis oblongis obtusis basi cuneatis crassis rigide coriaceis utrinque venis exsculptis, floribus masculis in foliorum axillis glomeratis, sepalis 4 coriaceis rotundis, petalis 4 rotundis late imbricatis, staminibus permultis antheris parvis globosis, ovario rudimentario.

A tree. Branchlets stout, green, terete. Leaves subdistant, opposite; petiole $\frac{1}{2}$ in. long; blade 3-4 in. long, $1\frac{1}{2}$-2 in. broad at the middle, very thick and rigid in texture, green and glabrous, with raised veins on both surfaces. Sepals and petals decussate, the former nearly $\frac{1}{4}$ in. long and broad, the latter but little larger. Stamens about half as long as the calyx.—North-west Madagascar, *Baron* 5757! Sakalava name, *Vavongo.*

GARCINIA APHANOPHLEBIA, n. sp.

Glabra, ramulis gracilibus, foliis breviter petiolatis oblongo-lanceolatis acutis rigide coriaceis venulis tenuibus, floribus masculis parvis axillaribus solitariis vel geminis pedicellatis, sepalis 4 reflexis inæqualibus, petalis obovato-cuneatis, staminibus multis filamentis liberis antheris globosis.

Branchlets very slender. Leaves distant, opposite; petiole very short; blade 4-5 in. long, $1\frac{1}{4}$-$1\frac{3}{4}$ in. broad at the middle, narrowed gradually to the base and apex, rigid in texture but thin, the veins beneath very slender and inconspicuous. Flowers very few; pedicels $\frac{1}{3}$-$\frac{1}{2}$ in. long. Sepals green, reflexing, orbicular, two small and two larger, the latter $\frac{1}{8}$-$\frac{1}{6}$ in. long. Petals not much longer than the sepals. Stamens shorter than the sepals. —*Baron*, next 5797!

PSOROSPERMUM MALIFOLIUM, n. sp.

P. ramulis apice fusco-pubescentibus, foliis parvis petiolatis ovatis glabris, cymis laxis multifloris breviter pedunculatis, pedicellis fusco-pubescentibus flore longioribus, sepalis ovatis pubescentibus, petalis calyce duplo longioribus, staminibus circiter 15 pentadelphis, stylis ovario æquilongis.

A shrub, with copious divaricate woody branchlets, pubescent only towards the tip. Leaves thin, 1–1½ in. long, green and glabrous on both sides. Cymes copious, terminal, 3–12-flowered; pedicels $\frac{1}{6}$ in. long. Sepals ovate, pubescent, $\frac{1}{12}$ in. long. Stamens in 5 phalanges of about 5 each, shorter than the petals. Ovary with 5 styles; stigma capitate. Fruit not seen.—Province of Androna, *Baron* 5582! Near *P. trichophyllum*, Baker.

PSOROSPERMUM MEMBRANIFOLIUM, n. sp.

Glabrum, ramulis apice tetragonis, foliis membranaceis distincte petiolatis oblongis obtusis basi cuneatis facie viridibus dorso pallidis, cymis laxifloris paucifloris, pedicellis elongatis, calycis segmentis ovatis copioso nigro lineatis, staminibus circiter 25 pentadelphis.

Branchlets slender, terete, 4-angled towards the tip. Petiole $\frac{1}{2}$ in. long; blade 2–2½ in. long, an inch broad, green above, whitish green beneath, margined with black dots. Flowers in lax terminal cymes; pedicels slender, glabrous, $\frac{1}{2}$–$\frac{3}{4}$ in. long. Calyx $\frac{1}{8}$ in. long. Petals oblanceolate-oblong, three times the length of the calyx. Stamens half as long as the calyx. Styles 5, as long as the ovary.—North-west Central Madagascar, *Baron* 5452! Allied to *P. discolor*, Baker.

XEROCHLAMYS PUBESCENS, n. sp.

X. ramulis apice ferrugineo-pubescentibus, foliis brevissime petiolatis cordato-oblongis obtusis rigide coriaceis dorso pilosis, floribus paucis subsessilibus terminalibus et axillaribus, involucro campanulato piloso dentibus ovatis, sepalis involucro paulo longioribus, petalis latis, staminibus petalis æquilongis.

A tree, with slender woody terete branchlets, calvate below the tip. Leaves about an inch long, green and glabrous on the upper surface, finely pubescent beneath, with fine immersed venation. Flowers 2–3 at the end of a branchlet, and sometimes one in the axil of an upper leaf. Involucre $\frac{1}{6}$ in. diam., with about 8 teeth. Sepals densely silky, obtuse. Petals $\frac{1}{4}$–$\frac{1}{3}$ in. diam. Filaments filiform, $\frac{1}{3}$–$\frac{1}{2}$ in. long; anthers minute, globose. —Imerina (Lahavohitra mountain), *Baron* 5112! Native name, *Hatsikana*.

LEPTOLÆNA CUSPIDATA, n. sp.

Glabra, foliis brevissime petiolatis ovatis cuspidatis rigide coriaceis, floribus copiose corymbosis, pedicellis brevibus, involucro coriaceo glabro dentibus 10–12 minutis deltoideis inæqualibus, sepalis sericeis involucro paulo longioribus.

A much-branched erect shrub, glabrous in all its parts. Leaves very rigid, $1\frac{1}{2}$ in. long, rounded at the base, conspicuously cuspidate, finely veined. Flowers in copious corymbs at the end of the branchlets; pedicels very short. Involucre brown, wrinkled, $\frac{1}{6}$ in. diam., with about a dozen minute incurved deltoid teeth. Petals not seen.—*Baron*, next 5836! Near *L. multiflora*, Thouars, from which it only differs by its longer laxer flowers and more numerous teeth of the involucre.

HIBISCUS PHANERANDRUS, n. sp.

Glaber, ramulis gracilibus lignosis, foliis oblongis obtusis crenatis vel repandis, floribus paucis laxissime corymbosis, pedicellis elongatis, bracteolis minutis, calycis segmentis lanceolatis, petalis obovatis rubris, filamentorum columna cylindrica petalis longiora, parte libera longe filiformi.

A shrub, with slender terete woody branchlets. Petiole $\frac{1}{6}$–$\frac{1}{4}$ in. long; blade $1\frac{1}{2}$–2 in. long, sometimes deeply lobed at the middle, moderately firm in texture, green and glabrous on both surfaces. Pedicels very slender, erect, finely pubescent, sometimes 2–$2\frac{1}{2}$ in. long. Epicalyx minute and inconspicuous, consisting of about 8 ovate teeth. Calyx $\frac{1}{2}$ in. long, brown, glabrous; segments 5, twice as long as the campanulate tube. Petals bright red, an inch long. Staminal tube considerably longer than the petals; free tip of filaments $\frac{1}{2}$–$\frac{3}{4}$ in. long, spreading horizontally.—Province of Androna, *Baron* 5915! Near *H. Rosa-sinensis*. Native name, *Hafotrankora*.

DOMBEYA GEMINA, n. sp.

D. ramulis dense pilosis, foliis longe petiolatis utrinque pilosis cordato-orbicularibus cuspidatis integris vel obscure bilobatis, floribus in umbellas furcatas longe pedunculatas dispositis, pedunculis pedicellisque dense pubescentibus, sepalis ovatis pilosis, petalis cuneatis marcescentibus, urceolo stamineo brevi, staminibus fertilibus 10, staminodiis elongatis clavatis, stylo apice solum ramoso.

A shrub or small tree, with densely pilose branchlets, leaves, peduncles, and calyx. Stipules persistent; petiole 2–3 in. long; blade 4–5 in. long and broad, with a prominent cusp, thick in texture but not rigid, scabrous above when mature, densely pubescent beneath. Peduncles axillary, erecto-patent, 4–5 in. long; flowers 20 or more in an umbel; pedicels $\frac{1}{2}$–$\frac{5}{8}$ in. long. Sepals sharply reflexing, $\frac{1}{4}$ in. long. Petals reddish, marcescent, $\frac{1}{3}$ in. long. Stamens less than half as long as the petals. Style overtopping the stamens, with 5 falcate forks.—Ankay, *Baron* 5158. Near *D. biumbellata*, Baker.

DOMBEYA XIPHOSEPALA, n. sp.

Glabra, ramulis lignosis gracilibus, foliis brevissime petiolatis oblanceolato-oblongis cuspidatis supra medium crenatis basi subcordatis, floribus axillaribus corymbosis pedunculis pedicellisque elongatis gracillimis, sepalis linearibus anguste reflexis, petalis latis cuneatis marcescentibus, urceolo stamineo brevi, staminibus fertilibus 10, staminodiis elongatis subulatis, stylo apice solum furcato.

A shrub or small tree, glabrous in all its parts. Leaves nearly sessile, 3–4 in. long, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad, moderately firm in texture, green and glabrous on both surfaces, strongly veined beneath. Peduncles 2–3 in. and pedicels 1–$1\frac{1}{2}$ in. long. Sepals glabrous, sharply reflexed, $\frac{1}{4}$ in. long. Petals reddish, marcescent, $\frac{1}{3}$ in. long and broad. Fertile stamens $\frac{1}{8}$ in., staminodes $\frac{1}{4}$ in. long. Ovary quite naked; style longer than the ovary, branched only at the tip.—North-west Central Madagascar, *Baron* 5467! North Antsihanaka, 5493! Near *D. repanda*, Baker.

DOMBEYA BOTRYOIDES, n. sp.

D. ramulis lignosis dense pubescentibus, foliis longe petiolatis cordato-orbicularibus dense pubescentibus obscure crenulatis, floribus in cymas furcatas densas botryoideas axillare pedunculatas dispositis, bracteolis caducis, sepalis ovatis pilosis reflexis, petalis obovato-cuneatis rubellis, staminibus fertilibus 10 filamentis brevibus liberis, staminodiis elongatis linearibus, stylis longe connatis.

A shrub or small tree, with densely pubescent branchlets, leaves, peduncles, and sepals. Leaves distant, alternate; petiole 2–3 in. long; blade 3–4 in. long and broad, resembling that of a *Tilia*, not at all rigid, green on both surfaces, scabrous above when mature, densely pubescent beneath. Flowers in copious dense forked botryoid cymes from the axils of the leaves. Sepals $\frac{1}{8}$ in. long, sharply reflexed. Petals $\frac{1}{4}$ in. long and broad. Stamens very short, with the free filaments about as long as the oblong anthers. Ovary densely pilose; styles free only in the upper quarter.—Valalafotsy district, about villages, *Baron* 5223!

SPEIROSTYLA, genus novum Sterculiacearum.

Bracteolæ nullæ. Calycis tubo campanulato, segmentis 5 ovatis tubo æquilongis. Petala 5 oblanceolato-oblonga obtusa calyce paulo longiora. Stamina indefinita hypogyna petalis breviora, filamentis liberis deorsum leviter applanatis, antheris parvis oblongis dorsifixis. Staminodia nulla.

Ovarium sessile globosum 5-loculare, ovulis in loculo geminis; styli elongati sursum contorte applanati. Fructus ignotus.

This seems to have quite as good a right to be placed in Tiliaceæ as in Sterculiaceæ, but its affinity is obviously with *Melochia*, from which it differs by its free indefinite stamens and the absence of staminodia.

SPEIROSTYLA TILIÆFOLIA, *Baker*. Species sola. (Plate L.)

An erect shrub 12–25 feet high, with brown terete woody branchlets, clothed with stellate pubescence towards the tip. Leaves subdistant, alternate; petiole 2–4 in. long; blade cordate-ovate, 6–10 in. long, 5–6 in. broad, entire, deltoid at the tip, resembling those of a large *Tilia*, thin in texture, green on both surfaces, nearly glabrous above when mature, pubescent beneath, with 5 strong veins radiating from the top of the petiole. Inflorescence an axillary or terminal panicle with dense-flowered corymbose branches; branchlets and calyx densely clothed with drab stellate pubescence; final pedicels short; bracts small, lanceolate. Calyx $\frac{1}{6}$ in. long. Petals whitish, a little longer than the calyx. Stamens about as long as the calyx; anthers almost horizontal. Ovary densely pubescent.—North-west Madagascar, *Baron* 5742! *Hildebrandt* 3262!

GREWIA RADULA, n. sp.

G. ramulis lignosis pilosis, foliis breviter petiolatis oblongis obtusis penninerviis crenatis basi rotundatis facie scabris dorso pubescentibus, cymis ad ramorum apices aggregatis, pedunculis pedicellisque dense pilosis, sepalis magnis lanceolatis pilosis, petalis parvis, staminibus calyce æquilongis, ovario piloso.

A shrub, with slender terete dull brown woody branches, with deflexed final branchlets. Leaves rather like those of *Carpinus* in shape, $1\frac{1}{2}$–2 in. long, crenulate, thick in texture but not rigid, green on both surfaces, pubescent beneath. Cymes restricted to the top of the branchlets; peduncles and pedicels densely pubescent. Calyx $\frac{1}{3}$ in. long, densely pubescent. Fruit not seen.—North Antsihanaka, *Baron* 5494!

GREWIA REPANDA, n. sp.

G. ramulis apice pubescentibus, foliis breviter petiolatis oblongis cuspidatis denticulatis irregulariter repandis triplinerviis facie glabris dorso tenuiter pubescentibus, cymis copiosis 3–5-floris, sepalis petalis staminibusque æquilongis, ovario piloso.

A small tree, with woody terete branchlets, ferrugineo-pubescent towards the tip. Petiole short; blade 1½–2 in. long, very cuspidate, subcordate at the base, moderately firm in texture, green and glabrous above, obscurely ferrugineo-pubescent beneath. Cymes copious, axillary, under an inch long; pedicels shorter than the calyx. Sepals ligulate, ¼ in. long, thinly drab-canescent outside. Petals oblanceolate, obtuse, yellow. Style overtopping the stamens. Fruit not seen.—Province of Befandriana, *Baron* 5692!

GREWIA DISCOLOR, n. sp.

G. ramulis gracilibus lignosis sursum albo-incanis, foliis breviter petiolatis oblongis acuminatis serratis facie viridibus glabris dorso albo-incanis, cymis 2–4-floris, pedicellis elongatis basi bracteatis, sepalis oblanceolatis incanis, petalis calyce æquilongis, staminibus petalis paulo brevioribus, ovario dense piloso.

A shrub or small tree, with very slender canescent branchlets. Leaves 2–3 in. long, finely dentate, subcordate at the base, with a pair of long veins from the base of the midrib, thin in texture, green above, whitish beneath. Cymes few, axillary, 1½ in. long; pedicels ½ in. long; bracts persistent, lanceolate, acuminate, shorter than the pedicels. Sepals and petals ⅓ in. long, the latter yellow, oblanceolate, obtuse. Fruit not seen.—Province of Androna, *Baron* 5443!

GREWIA CERNUA, n. sp.

G. ramulis lignosis dense pilosis, foliis petiolatis oblongis cuspidatis triplinerviis irregulariter crenatis utrinque pubescentibus, cymis axillaribus 2–3-floris cernuis, pedunculis pedicellisque dense pubescentibus, sepalis ligulatis dense pilosis, petalis calyce brevioribus, staminibus petalis æquilongis, ovario oblongo dense hirsuto.

A shrub or small tree, with densely pilose terete woody branchlets. Petiole ¼–⅓ in. long; blade 3–4½ in. long, 1½ in. broad, rounded at the base, irregularly crenate, green and slightly pubescent above, paler and densely shortly pubescent beneath. Cymes produced from the axils of most of the leaves, 1½–2 in. long; pedicels about ½ in. long. Bud ½ in. long, constricted in the middle. Stamens ⅓ in. long. Fruit not seen.—Province of Androna, *Baron* 5446! Allied to *G. Hildebrandtii*, Baill.

GREWIA BRACTEATA, n. sp.

Glabra, ramulis gracillimis lignosis, foliis breviter petiolatis cordato-ovatis acutis serratis penninerviis utrinque viridibus glabris, cymis axillaribus pedunculatis trifloris, pedicellis brevissimis basi bracteis ovatis foliaceis suffultis, flore haud expanso globoso, sepalis parvis oblongis.

A small tree, with slender terete branchlets. Petiole $\frac{1}{4}$ in. long; blade $1\frac{1}{2}$–2 in. long, conspicuously inciso-crenate, moderately firm in texture, green and glabrous on both surfaces. Cymes produced only from the axils of the upper leaves of the branchlets; peduncles under an inch long; pedicels each subtended by a small ovate foliaceous bract. Flower-bud globose, greenish, thinly canescent.—*Baron*, next 5363! Near *G. picta*, Baillon.

GREWIA CELTIDIFOLIA, n. sp.

Glabra, ramulis gracillimis lignosis, foliis oblongis acutis inciso-serratis penninerviis glabris, cymis paucis axillaribus 2–3-floris, sepalis petalisque oblanceolatis æquilongis, staminibus petalis brevioribus.

A shrub or small tree, with slender woody branchlets, glabrous in all its parts. Petiole $\frac{1}{3}$ in. long; blade 2–3 in. long, subcordate at the base, moderately firm in texture, green and glabrous on both surfaces. Cymes produced only from the axils of the upper leaves of the branchlets; peduncles erect, under an inch long; pedicels $\frac{1}{4}$ in. long. Sepals thinly canescent, $\frac{1}{4}$ in. long. Petals yellow. Ovary densely hispid. Fruit not seen.—North-west Madagascar, *Baron* 5354! Near *G. picta*, Baill.

HUGONIA BREWERIOIDES, n. sp.

H. ramulis dense tomentosis, uncis oppositis e ramulis lignosis calvatis ortis, foliis oblongis acutis breviter petiolatis, racemis congestis axillaribus breviter pedunculatis, sepalis ovatis tomentosis, petalis obovato-cuneatis calyce paulo longioribus.

A climbing shrub, with the branchlets, petioles, and leaves beneath densely clothed with short brown tomentum. Hooks spirally twisted, arising in pairs from the calvate mature branchlets. Leaves 4–6 in. long, with about 20 pairs of raised parallel main veins. Flowers in congested racemes from the axils of the leaves; pedicels short. Calyx $\frac{1}{3}$ in. long. Expanded flower an inch in diameter, pale yellow. Stamens not more than a third as long as the petals.—*Baron*, next 5864!

ERYTHROXYLON RECURVIFOLIUM, n. sp.

Glabrum, ramulis gracilibus apice solum angulatis, foliis parvis breviter petiolatis oblongis obtusis basi cuneatis facie viridibus dorso pallidis margine recurvatis, floribus 1–3nis axillaribus breviter pedicellatis, calycis segmentis magnis ovatis acutis, petalis parvis oblongo-unguiculatis, urceolo stamineo calyce multo breviore.

A small shrub, glabrous in all its parts, with slender terete woody branchlets. Petiole very short; stipules lanceolate; blade 1–1¼ in. long, moderately firm in texture, nearly white beneath, with fine anastomosing veins. Flowers produced from the axils of several of the upper leaves. Calyx ⅛ in. long; tube short, campanulate. Stamens overtopping the petals.—Valalafotsy district, *Baron* 5224! Near *E. myrtoides*, Bojer.

ERYTHROXYLON CAPITATUM, n. sp.

Glaberrimum, ramulis apice angulatis, foliis magnis petiolatis oblongo-lanceolatis rigide coriaceis nitidis, floribus terminalibus dense capitatis, pedicellis crassis brevissimis, calycis segmentis ovatis, petalis oblongis facie ligulatis, urceolo stamineo calyce æquilongo, fructu oblongo-cylindrico.

A shrub, glabrous in all its parts. Petiole ½ in. long; blade 4–7 in. long, 1¼–2 in. broad, cuneate at the base, acute or obtuse, very rigid in texture, flat, very glossy above, with fine arcuate main veins. Flowers in a dense globose panicle nearly sessile at the end of the branchlets; pedicels very stout, longer than the calyx. Petals ⅛ in long. Style reaching to the tip of the petals.—*Baron*, next 5832! Near the Mauritian *E. laurifolium*, Lam.

TRIASPIS AXILLARIS, n. sp.

T. ramulis gracilibus apice solum ferrugineo-pubescentibus, foliis breviter petiolatis oblongis acutis glabris, cymis axillaribus folio multo brevioribus, pedicellis ferrugineo-pilosis flore longioribus, sepalis parvis ovatis, petalis orbicularibus breviter unguiculatis, staminibus petalis paulo brevioribus, stylis brevibus flexuosis.

Branchlets slender, woody, terete, calvate below the young tips. Petiole ¼ in. long; blade 2–3 in. long, moderately firm in texture, green and glabrous on both surfaces. Cymes about an inch long; peduncle and pedicels ferrugineo-pubescent. Petals 5, yellowish, ⅙ in. long. Calyx destitute of glands. Stamens 10, ⅛ in. long, equal; filaments filiform; anthers small, oblong. Fruit not seen.—*Baron* 5098! and a variety or nearly allied species, with cymes sometimes terminal on short branchlets and larger oblong sepals.—Province of Androna, *Baron* 5570! *T. floribunda*, O. Hoffm., which Mr. Baron has also gathered, is evidently the same species as *T. mozambica*, A. Juss., and the alleged locality of Mozambique is probably a mistake.

TODDALIA NITIDA, n. sp.

Glabra, inermis, ramulis teretibus, foliis simplicibus breviter petiolatis oblanceolato-oblongis obtusis rigide coriaceis nitidis, floribus parce paniculatis, pedicellis brevibus, calyce parvo tetramero segmentis ovatis, fructu ovoideo 4-loculari pericarpio glanduloso.

A tree, glabrous in all its parts. Petiole $\frac{1}{2}$ in. long; blade 5–6 in. long, $1\frac{1}{2}$–2 in. broad above the middle, narrowed gradually from the middle to the base, green, glabrous and shining on both surfaces, with fine erecto-patent parallel main veins. Flowers in small dense terminal panicles. Fruit-calyx $\frac{1}{12}$ in. diam. Corolla and stamens not seen. Fruit brown, ovoid, $\frac{1}{4}$ in. diam., with a thick brown pericarp, with large immersed glands. —*Baron* 3184!

TODDALIA DENSIFLORA, n. sp.

Glabra, inermis, foliis petiolatis digitatim 3–5-foliolatis, foliolis oblanceolatis obtusis rigide coriaceis, floribus dense parce paniculatis, pedicellis brevissimis, calyce parvo tetramero segmentis rotundis, fructu biloculari globoso pericarpio glanduloso.

A tree, glabrous in all its parts. Petiole 1–$1\frac{1}{2}$ in. long; end leaflets 5–6 in. long, 1–$1\frac{1}{4}$ in. broad above the middle, narrowed gradually from the middle, green and glabrous on both surfaces, with fine ascending main veins. Panicle dense, sessile, lateral. Corolla and stamens not seen. Fruit brown, $\frac{1}{4}$–$\frac{1}{3}$ in. diam.; pericarp with copious immersed glands.—*Baron* 3053!

TODDALIA MACROPHYLLA, n. sp.

Inermis, glabra, foliis longe petiolatis digitatim trifoliolatis, foliolis petiolulatis oblanceolato-oblongis obtusis rigide coriaceis nitidis, floribus dense paniculatis, pedicellis brevibus, calyce minuto segmentis rotundis, fructu globoso 4-loculari 8-costato.

A tree, glabrous in all its parts. Petiole 2–3 in. long, petiolules $\frac{1}{2}$–$\frac{3}{4}$ in.; blade 5–6 in. long, 2–$2\frac{1}{2}$ in. broad, cuneate at the base, bright green above, with fine erecto-patent parallel main veins and copious minute black dots. Flowers (female) in a small dense terminal panicle. Petals and stamens not seen. Fruit brown, woody, $\frac{1}{3}$–$\frac{1}{2}$ in. diam., with eight stout vertical ribs and copious fragrant glands beneath the pericarp.—North Antsihanaka, *Baron* 5488!

ZANTHOXYLUM MADAGASCARIENSE, n. sp.

Glabrum, ramulis aculeatis, foliis petiolatis imparipinnatis foliolis 11–13 rigidulis oblongis sæpissime cuspidatis, floribus fœmineis minutis tetrameris copiose paniculatis, calycis segmentis ovatis, petalis oblongis acutis, staminibus abortivis, carpello unico globoso, stylo brevissimo curvato, stigmate capitato.

A tree, glabrous in all its parts, with prickly woody branchlets. Leaves 6–8 in. long including the $1\frac{1}{2}$–2 in. petiole; leaflets shortly petiolulate, $1\frac{1}{2}$–2 in. long, moderately firm in texture, green and glabrous on both surfaces. Flowers in peduncled thyrsoid panicles 2–3 in. long. Petals $\frac{1}{12}$ in. long. Calyx $\frac{1}{2}$ lin. diam. Carpel always solitary, with a short gynophore, a short oblique style, and a large capitate stigma.—East Androna and East Antsihanaka, *Baron* 5653! We had imperfect specimens of what is doubtless the same plant long ago from Dr. G. W. Parker, F.L.S.

Byttneria nitidula, n. sp.

Sarmentosa, ramulis lignosis teretibus, foliis longe petiolatis cordato-ovatis acutis integris subcoriaceis utrinque glabris, cymis axillaribus et extraaxillaribus multifloris, pedicellis flore longioribus, sepalis ovato-lanceolatis dorso griseo-stellato-pilosis, petalorum ligulis elongatis simplicibus, urceolo stamineo brevi.

A shrubby climber, with slender terete brown glabrous branchlets, without tendrils. Petiole $1\frac{1}{2}$ in. long; blade 4–5 in. long, $1\frac{1}{2}$–2 in. broad, shortly cordate at the base, moderately firm in texture, green and glabrous on both surfaces, with few ascending main veins. Cymes produced from the axils of the leaves and forming also a terminal panicle; pedicels $\frac{1}{8}$–$\frac{1}{6}$ in. long. Bud subglobose, grey outside. Sepals $\frac{1}{12}$ in. long. Petals with a linear ligule longer than the blade, reaching to the tip of the sepals.—North-west Madagascar, *Baron* 5886!

Commiphora (Balsamodendron) cuneifolia, n. sp.

Frutex? ramulis gracilibus teretibus glabris, foliis imparipinnatis ad ramulorum apices fasciculatis, petiolis pubescentibus, foliolis 3–5 obovato-cuneatis obtusis membranaceis utrinque viridibus præter costam glabris, fructu ovoideo compresso monospermo ad apicem attenuato.

A shrub or small tree, with slender terete woody branchlets. Leaves fascicled at the end of short branchlets; petiole slender, pubescent, under an inch long; leaflets obovate-cuneate, entire, the end one about an inch long, the side ones smaller, shortly petiolulate. Detached fruits only seen, which are $\frac{1}{2}$ in. long, with a single seed and a bony endocarp.—North-west Madagascar, *Baron* 5335!

TURRÆA CUNEIFOLIA, n. sp.

Glabra, ramulis gracillimis, foliis breviter petiolatis obovato-cuneatis cuspidatis infra ad venarum axillas pilosis, floribus pedicellatis tetrameris solitariis vel geminis, calyce campanulato truncato, petalis oblanceolato-unguiculatis, tubo stamineo elongato cylindrico apice 10-dentato dentibus antheriferis.

A much-branched shrub, glabrous in all its parts. Leaves $\frac{3}{4}$–1 in. long, $\frac{1}{2}$–$\frac{3}{4}$ in. broad, moderately *firm in texture*, green on both surfaces, with fine ascending veins. Flowers solitary or in pairs from the axils of the leaves on short ascending pedicels. Calyx $\frac{1}{12}$ in. diam. Petals red, 1–$1\frac{1}{4}$ in. long. Staminal column about an inch long, divided at the tip into ten short oblong-lanceolate ascending processes to which the anthers are adnate, without any staminodes between them.—*Baron*, next 5364! Allied to *T. Pervillei*, Baill., and *T. cuneifolia*, Baker.

TURRÆA MALIFOLIA, n. sp.

Glabra, foliis petiolatis oblongis cuspidatis, floribus tetrameris solitariis cum foliis productis, calycis segmentis acutis tubo campanulato æquilongis, petalis oblanceolatis longe unguiculatis, tubo stamineo elongato cylindrico, antheris glabris oblongis apiculatis, staminodiis angustis profunde bifidis.

A shrub, glabrous in all its parts. Petiole $\frac{1}{4}$–$\frac{1}{3}$ in. long; blade $1\frac{1}{2}$–$2\frac{1}{2}$ in. long, green on both surfaces, moderately firm in texture, finely veined. Flowers solitary from the leafy branches; pedicels $\frac{1}{3}$–$\frac{1}{2}$ in. long. Calyx $\frac{1}{8}$ in. long. Petals $2\frac{1}{2}$ in. long, $\frac{1}{6}$ in. broad. Staminal tube $2\frac{1}{4}$ in. long; anthers small, oblong; staminodia $\frac{1}{8}$ in. long, reflexed, divided into two linear segments nearly down to the base.—Province of Androna, *Baron* 5919!

TURRÆA RHAMNIFOLIA, n. sp.

Glabra, foliis petiolatis oblongis vel obovatis cuspidatis infra ad venarum axillas pilosis, floribus tetrameris ad ramos haud floriferos sessilibus glomeratis, calycis segmentis parvis ovatis sericeis, petalis oblanceolatis longe unguiculatis, tubo stamineo elongato, antheris glabris apiculatis, staminodiis quadratis bifidis carnosis.

A tree, with slender terete branchlets, those bearing the leaves rugose, like those of an *Erythroxylon*. Petiole $\frac{1}{4}$ in. long; blade $1\frac{1}{2}$–2 in. long, deltoid at the base, conspicuously cuspidate, green on both sides, with erecto-patent main veins, with a tuft of hairs in the axil on the under surface. Flowers in dense sessile clusters at the end or the side of leafless branchlets. Calyx $\frac{1}{8}$ in.

long. Petals $1\frac{1}{2}$ in. long, $\frac{1}{6}$ in. broad. Staminal tube nearly as long as the petals; anthers very small, oblong; staminodia $\frac{1}{12}$ in. long.—Province of Androna, *Baron* 5706!

CHAILLETIA OLEIFOLIA, n. sp.

C. ramulis gracilibus pubescentibus, foliis breviter petiolatis oblongis obtusis maturis rigide coriaceis facie glabris nitidis dorso leviter pubescentibus, cymis densis axillaribus, pedunculo piloso cum petiolo connato, sepalis oblongis dense sericeis, petalis integris oblanceolatis, staminibus petalis æquilongis, filamentis filiformibus, antheris parvis oblongis.

Young branchlets finely pubescent. Leaves spreading, alternate; petiole short, densely pubescent; blade about 2 in. long, rigidly coriaceous, finely penninerved beneath. Cymes one on each side of the apex of the short petiole; pedicels and calyx densely pubescent. Sepals 5, $\frac{1}{8}$ in. long. Petals oblanceolate-unguiculate, $\frac{1}{6}$ in. long.—Antsihanaka, *Baron* 5521!

OLAX ANDRONENSIS, n. sp.

Glaber, ramosissimus, foliis parvis petiolatis oblongis acutis, floribus solitariis vel parce racemosis, pedicellis flore longioribus, calyce truncato, petalis 5 oblanceolatis ad medium connatis, staminibus 5 fertilibus filamentis lanceolatis applanatis.

A much-branched tree, glabrous in all its parts. Leaves shortly petioled, $1-1\frac{1}{2}$ in. long, moderately firm in texture, green on both surfaces, finely veined. Flowers lateral, solitary or a few in a short raceme; pedicels erecto-patent, $\frac{1}{4}-\frac{1}{3}$ in. long. Calyx minute, with a spreading collar-like margin. Petals yellowish, $\frac{1}{4}$ in. long. Stamens rather shorter than the corolla-segments.—Province of Androna, *Baron* 5548!

ELÆODENDRON LYCIOIDES, n. sp.

Glabrum, foliis subsessilibus parvis oblanceolatis obtusis integris rigide coriaceis, floribus tetrameris in paniculas laterales ramis corymbosis dispositis, pedicellis brevibus, calycis segmentis ovatis, staminibus sepalis duplo longioribus, fructu globoso magnitudine pisi.

A much-branched shrub or small tree, glabrous in all its parts. Leaves $1-1\frac{1}{4}$ in. long, $\frac{1}{3}-\frac{1}{2}$ in. broad, narrowed gradually from the middle to the base, firm in texture, green and glabrous on both surfaces, with few distant rather raised ascending veins beneath. Panicles copious, lateral, about an inch long, the lower branches sometimes subtended by large leaves. Calyx $\frac{1}{12}$ in. long; tube turbinate; segments twice as long as the tube. Petals not seen.

M. Smith del.

SPIROSTYLA TILIÆFOLIA, *Baker.*

C. Fitch lith.

Stamens $\frac{1}{12}$ in. long. Capsule hard, globose, $\frac{1}{6}$ in. diam.—North-west Madagascar, *Baron* 5332! Sakalava name, *Moina*.

HIPPOCRATEA MICRANTHA, n. sp.

Glabra, ramosissima, foliis petiolatis oblongo-lanceolatis obtusis obscure dentatis, floribus laxe copiose corymboso-paniculatis, pedicellis elongatis, calycis segmentis parvis ovatis, petalis oblongis obtusis, staminibus brevissimis.

A much-branched shrub or small tree, glabrous in all its parts. Leaves opposite; petiole $\frac{1}{3}$ in. long; blade $1\frac{1}{2}$–2 in. long, $\frac{1}{2}$–1 in. broad at the middle, narrowed gradually to an obtuse point, moderately firm in texture, green and glabrous on both surfaces. Panicles axillary and terminal, very lax. Petals scarcely $\frac{1}{12}$ in. long. Calyx-segments $\frac{1}{3}$ as long as the petals. Fruit not seen. —Province of Androna, *Baron* 5584!

HIPPOCRATEA MALIFOLIA, n. sp.

Glabra, foliis late oblongis integris acutis petiolatis, floribus laxe corymboso-paniculatis, pedicellis brevibus, calycis segmentis parvis ovatis, petalis ovatis obtusis, staminibus brevissimis.

A shrub or small tree, glabrous in all its parts, with slender terete woody branchlets. Petiole $\frac{1}{4}$ in. long; blade $1\frac{1}{2}$–2 in. long, 1–$1\frac{1}{4}$ in. broad, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces, with fine immersed veins. Panicles lateral, much shorter than the leaves; branches and branchlets slender, divaricated; bracts minute, ovate. Expanded flowers $\frac{1}{6}$ in. diam. Petals three times as long as the calyx-segments. Fruit not seen.—North-west Madagascar, *Baron* 5352! Hildebrandt's 3366, referred by Hoffmann to *H. Urceolus*, Tulasne, is a different species from Pervillé's 394, on which Tulasne's plant was founded.

VITIS (CISSUS) MORIFOLIA, n. sp.

Sarmentosa, cirrhifera, ramis sublignosis angulatis gracilibus glabris, foliis petiolatis membranaceis glabris sæpissime palmatim 7-lobatis denticulatis, cymis multifloris in paniculas longe pedunculatas aggregatis, pedicellis brevibus, calyce truncato, petalis ovatis rubellis flore expanso patulis.

A climber, with slender woody glabrous stems. Upper leaves simple, cordate-ovate, acute; lower palmately 7-lobed, deeply cordate, about 2 in. long and broad, the end-segment much contracted at the base; petiole 1–$1\frac{1}{2}$ in. long; stipules ovate, membranous. Cymes numerous, arranged in panicles with a long peduncle; pedicels $\frac{1}{8}$–$\frac{1}{6}$ in. Calyx $\frac{1}{2}$ lin. diam. Petals $\frac{1}{12}$ in. long, reflexing in the expanded flower. Fruit not seen.—North-west Madagascar, *Baron* 5408! The leaves closely resemble those of the deeply-lobed form of *Morus alba*.

VITIS (CISSUS) IMERINENSIS, n. sp.

Sarmentosa, cirrhifera, ramis tetragonis gracilibus parce pubescentibus, foliis longe petiolatis pedatim quinquefoliolatis, foliolis oblongis argute serratis, cymis latis laxifloris ramis ramulisque glabris divaricatis, baccis globosis glabris magnitudine pisi.

A climber, with slender fragile 4-angled branchlets, soon calvate. Petiole 1–1$\frac{1}{2}$ in. long; petiolules $\frac{3}{4}$ in. long, the side ones forked at the middle; leaflets rather fleshy, glabrous or obscurely pubescent, green on both surfaces, the end one about 2 in. long, the others smaller and oblique at the base. Fruiting-cymes 4–6 in. diam. Calyx minute, patellæform, obscurely 4-lobed. Berry globose, $\frac{1}{4}$ in. diam. Seeds 4, large, bony.—Imerina, *Baron* 5157! Allied to Hildebrandt's 2962, from the island of Nossi-bé.

CUPANIA DISSITIFLORA, n. sp.

C. ramulis glabris, foliis abrupte pinnatis, foliolis trijugis oblongo-lanceolatis, floribus pedicellatis in paniculas laxas axillares foliis breviores dispositis, sepalis ovatis, petalis orbicularibus calyce vix longioribus, staminibus pilosis.

A large tree, with glabrous branchlets and leaves. Rhachis of leaves 4–5 in. long, including the 1$\frac{1}{2}$-in. petiole; leaflets erecto-patent, shortly petiolulate, the upper 5–6 in. long, 1–1$\frac{1}{4}$ in. broad, moderately firm in texture, narrowed gradually to the base and point. Panicles about as long as the leaf-rhachis, very lax; branchlets glabrous; pedicels about as long as the flowers. Petals $\frac{1}{12}$ in. long. Stamens about as long as the petals; both filament and anther pilose. Fruit not seen.—Province of Befandriana, *Baron* 5694!

CUPANIA ANDRONENSIS, n. sp.

C. ramulis glabris, foliis quinquefoliolatis, foliolis oblongis obtusis rigide coriaceis, floribus parvis sessilibus vel brevissime pedicellatis in paniculam amplam ramulis puberulis dispositis, sepalis ovatis puberulis, petalis obovatis calyce paulo longioribus, staminibus inclusis.

A tree, with glabrous branchlets and leaves. Leaves 6–8 in. long, including the 1–1$\frac{1}{2}$-in. petiole; leaflets rigid in texture and conspicuously veined, the end one 3–4 in. long. Panicle terminal, 4–5 in. long; branches many, spreading or ascending. Bud globose, $\frac{1}{12}$ in. long. Calyx pubescent, under a line long. Fruit not seen.—East Androna, *Baron* 5558! Habit of *Tina trijuga*, Radlk.

RHUS (§ PROTORHUS) VENULOSA, n. sp.

R. ramulis lignosis pubescentibus, foliis simplicibus breviter petiolatis oblanceolatis obtusis emarginatis rigide coriaceis utrinque glabris venis primariis crebris parallelis, floribus pentameris in paniculas axillares dispositis, ramis pedicellisque pubescentibus, sepalis petalisque ovatis, staminibus petalis brevioribus.

A shrub, with virgate woody branchlets. Leaves alternate or subopposite; petiole $\frac{1}{4}$ in. long; blade 3–4 in. long, 1–1$\frac{1}{4}$ in. broad above the middle, narrowed gradually from the middle to the base; veins under a line apart, straight from the midrib to the margin. Panicles much shorter than the leaves; main branches short, few-flowered. Petals $\frac{1}{12}$ in. long. Calyx minute, campanulate. Stamens nearly as long as the petals; anthers oblong; filaments filiform. Fruit not seen.—North Androna, *Baron* 5756! Native name, *Ambovitsika.*

INDIGOFERA BRACHYBOTRYS, n. sp.

I. ramulis lignosis pubescentibus, foliis imparipinnatis, stipulis subulatis, foliolis 17–19 oblongis mucronatis pubescentibus, racemis brevibus densis axillaribus, bracteis linearibus, calyce obliquo campanulato sericeo dentibus deltoideis, petalis angustis sericeis calyce multo longioribus, ovario lineari multiovulato.

A shrub or small tree, with slender terete pubescent woody branchlets. Leaf-rhachis 5–6 in. long including a short petiole; stipules subulate, silky, $\frac{1}{2}$ in. long; leaflets $\frac{1}{2}$–$\frac{3}{4}$ in. long, opposite, shortly petiolulate. Racemes 1–1$\frac{1}{2}$ in. long; pedicels short. Calyx $\frac{1}{12}$ in. long. Corolla reddish, $\frac{1}{3}$ in. long, thinly silky outside. Pod not seen.—*Baron*, next 5366! Section *Tinctoriæ*, near *I. Lyallii*, Baker.

MUNDULEA HYSTERANTHA, n. sp.

M. ramulis lignosis apice pubescentibus, foliis hysteranthiis imparipinnatis, foliolis 19–23 oblanceolato-oblongis dorso sericeis, racemis multifloris brevibus, pedicellis calyce longioribus, bracteis lineari-subulatis, calyce campanulato dentibus parvis, petalis rubellis, vexillo orbiculari dorso sericeo, legumine magno plano calvato cum foliis producto.

A shrub or small tree, with terete woody branchlets. Leaf-rhachis 6–8 in. long, including the 1–1½-in. petiole; leaflets 1–1½ in. long, opposite, petiolulate, very silky beneath. Racemes dense, produced from the tips of the leafless branchlets; flower-pedicels $\frac{1}{3}$ in. long. Calyx $\frac{1}{8}$–$\frac{1}{6}$ in. diam., campanulate, subglabrous; teeth deltoid-cuspidate. Standard $\frac{1}{2}$ in. long and broad; wings as long, $\frac{1}{4}$ in. broad; keel broad, incurved at the tip. Pod sessile, 3–4 in. long, above $\frac{1}{2}$ in. broad.—Androna, *Baron* 5444!

MUCUNA (§ CITTA) MYRIAPTERA, n. sp.

Sarmentosa, ramulis gracilibus glabris, foliis trifoliolatis glabris, folio terminali oblongo, stipellis setaceis, calyce hispido tubo campanulato dentibus tubo æquilongis vel brevioribus, legumine magno lineari-oblongo lamellis copiosis transversalibus hispidis prædito et apice cuspide pungente subulato instructo.

A climber, with slender sublignose terete stems. Stipules small, lanceolate; petiole 2–3 in. long; leaflets glabrous, moderately firm in texture, turning rather black when dried, 3–4 in. long. Pedicel long, woody, drooping. Calyx-tube above $\frac{1}{2}$ in. diam., with a few fragile bristles: one tooth as long as the tube, the others shorter. Pod 8–9 in. long, above 2 in diam., with copious transverse cuspidate lamellæ, with a few fragile stinging bristles; pungent terminal cusp an inch long.—North Androna, *Baron* 5801! Near *M. flagellipes* and *paniculata*.

VIGNA BRACHYCALYX, n. sp.

Herbacea, sarmentosa, caulibus gracillimis breviter pilosis, stipulis lanceolatis persistentibus calcaratis, foliis trifoliolatis membranaceis parce pilosis, foliolis acutis oblongis integris vel hastatis, floribus solitariis longe pedunculatis, calyce tubo campanulato dentibus parvis, petalis rubellis calyce triplo longioribus.

A very slender herbaceous climber. Petiole 1½ in. long; leaflets 1–1½ in. long, acute, entire, or bluntly lobed on both sides at the base. Peduncles about 3 in. long. Calyx-tube glabrous, $\frac{1}{6}$ in. diam.; teeth deltoid-cuspidate, shorter than the tube. Corolla above $\frac{1}{2}$ in. long; standard obovate, bright red; keel broad, whitish, not rostrate. Legume not seen.—Valalafotsy, *Baron* 5226!

VIGNA POLYTRICHA, n. sp.

Herbacea, sarmentosa, caule gracili piloso, stipulis lanceolatis, foliis trifoliolatis pilosis, foliolis integris lanceolatis basi rotundatis, pedunculis elongatis pilosis, floribus 2–3 sessilibus, calyce dense piloso tubo brevi segmentis linearibus elongatis, petalis luteo-rubellis calyce æquilongis, vexillo orbiculari, carina haud rostrata.

Habit of the widely-spread *V. vexillata*, Benth. Stems, leaves, and calyx densely pilose. Petiole above an inch long; leaflets 2–3 in. long, $\frac{1}{3}$–$\frac{1}{2}$ in. broad, not at all lobed or toothed. Peduncle 3–4 in. long. Calyx $\frac{1}{2}$ in. long. Standard glabrous, orbicular, above $\frac{1}{2}$ in. broad; keel broad, only obscurely beaked at the tip. Legume not seen.—*Baron*, next 5799!

BAPHIA (§ BRACTEOLARIA) CAPPARIDIFOLIA, n. sp.

B. ramulis apice pilosis, foliis oblongis acuminatis subcoriaceis glabris, cymis parvis axillaribus paucifloris, pedunculis pedicellisque pilosis, bracteolis ovatis minutis persistentibus, calycis segmentis 2 ovatis reflexis, petalis parvis oblongis, ovario piloso, stylo curvato.

Branchlets slender, woody, not sarmentose, calvate below the young tips. Petiole $\frac{1}{2}$ in. long; blade simple, 2–3 in. long, $\frac{3}{4}$–1 in. broad, rounded at the base, tapering gradually to the point, green and glabrous on both surfaces. Cymes few, shorter than the petiole; pedicels spreading, $\frac{1}{6}$ in. long. Calyx $\frac{1}{6}$ in. long, split down to the base into two subequal pubescent spreading or reflexing lobes. Petals yellow, $\frac{1}{6}$–$\frac{1}{4}$ in. long. Stamens free, nearly as long as the petals; anthers oblong, minute. Fruit not seen.—North-west Madagascar, *Baron* 5358!

DALBERGIA TRICHOCARPA, n. sp.

D. ramulis tenuiter pubescentibus, foliis impàripinnatis, foliolis multijugis sessilibus confertis oblongis obtusis rigide coriaceis, paniculæ ramis pilosis, calyce minuto dentibus obtusis, legumine oblongo monospermo persistenter piloso.

A shrub or small tree, with terete slender branchlets. Leaf-rhachis about 3 in. long, including the $\frac{1}{2}$-in. petiole; leaflets in 10–12 close pairs, under $\frac{1}{2}$ in. long, truncate at the apex, thick and rigid in texture, thinly pilose, the veins beneath quite hidden and immersed. Flowers forming a long panicle, of which the lower branches are subtended by developed leaves. Calyx $\frac{1}{12}$ in. long. Pod an inch long, $\frac{1}{3}$ in. broad, obtuse, cuneate at the base, sessile, with a single seed in the centre.—Province of Androna, *Baron* 5920! Near *D. eriocarpa*, Bojer. Native name, *Manary*.

DALBERGIA MYRIABOTRYS, n. sp.

D. ramulis gracilibus glabris, foliis imparipinnatis, foliolis 7–9 ovatis acutis longe petiolulatis, floribus permultis minutis in paniculam amplam ramulis densifloris scorpioideis dispositis, pedicellis brevissimis, calycis tubo campanulato dentibus brevibus obtusis, petalis calyce duplo longioribus staminibus monadelphis, ovario glabro stipitato, stylo brevi.

A shrub, glabrous in all its parts, with very slender terete brown branchlets. Leaf-rhachis 5–6 in. long, including the 1-in. petiole; leaflets 1½–2 in. long, moderately firm in texture, green on both surfaces; petiolules ¼ in. long. Flowers in an ample terminal panicle, with dense-flowered scorpioid branchlets. Calyx $\frac{1}{12}$ in. long. Corolla $\frac{1}{6}$ in. long. Pod not seen.—North-west Madagascar, *Baron* 5333! Near *D. madagascariensis*, Vatke.

Dalbergia pterocarpiflora, n. sp.

D. ramulis glabris, foliis imparipinnatis foliolis 11–13 oblongis acutis vel obtusis glabris, paniculæ ramis brevibus patulis paucifloris, calyce pro genere magno, tubo campanulato dentibus ovatis tubo æquilongis, petalis calyce sesquilongioribus, staminibus monadelphis, legumine stipitato tenui ligulato glabro sæpissime 2-spermo.

A shrub or small tree, with slender terete branchlets. Leaf-rhachis 4–6 in. long; leaflets thin, glabrous, under an inch long. Panicles copious, with a pubescent rhachis and many short spreading branches; pedicels about as long as the calyx. Calyx $\frac{1}{6}$ in. long. Corolla ¼ in. long. Pod thin, 2–2½ in. long, under half an inch broad, narrowed to a distinct pedicel twice as long as the calyx.—*Baron*, next 5860 and 5671!

Derris? polyphylla, n. sp.

D. ramis lignosis ferrugineo-pubescentibus, foliis imparipinnatis, foliolis 17–19-jugis lineari-oblongis obtusis, paniculæ ramis elongatis sericeis nodis incrassatis, pedicellis 2–3nis brevibus, calyce tubo campanulato dentibus minutis, petalis rubellis calyce triplo longioribus, staminibus submonadelphis, ovario lineari piloso, stylo incurvato.

Branchlets woody, terete, densely pubescent. Leaf-rhachis half a foot long, including the short petiole; leaflets opposite, about an inch long, moderately firm in texture, green and glabrous on both surfaces. Inflorescence a terminal panicle with several dense racemes half a foot long, with a rigid rhachis, with flowers fascicled from the raised swollen nodes. Calyx silky, $\frac{1}{8}$ in. diam. Petals ½ in. long; standard orbicular. Upper stamen free towards the base. Pod not seen. — North-west Central Madagascar, *Baron* 5381! Seems, so far as material goes, near the Indian *Derris* (§ *Brachypterum*) *scandens*, which has similarly fascicled flowers and raised nodes.

LONCHOCARPUS POLYSTACHYUS, n. sp.

L. ramulis lignosis glabris, foliis imparipinnatis longe petiolatis, foliolis 9 oblongis acutis, floribus in paniculam amplam ramis multis laxis patulis dispositis, pedicellis calyce æquilongis, calyce subglabro tubo campanulato segmentis parvis ovatis, petalis rubellis calyce triplo longioribus, staminibus monadelphis, ovario lineari sericeo pedicellato pauciovulato.

A shrub or small tree, with glabrous leaves and branchlets. Leaf-rachis 6–8 in. long, including the $1\frac{1}{2}$–2-in. petiole; stipellæ minute, setaceous; leaflets moderately firm in texture, green and glabrous on both surfaces, the end one 2–3 in. long. Panicles copious, as long as the leaves; rhachis very slender, slightly pubescent. Calyx $\frac{1}{8}$ in. long. Corolla light red, $\frac{1}{3}$ in. long. Pod not seen.—*Baron*, next 5368! Habit of the tropical African *L. laxiflorus*, G. & P.

NEOBARONIA XIPHOCLADA, n. sp.

Arborea, phyllocladiis 3–4-toties furcatis, ultimis oblanceolatis rigidis argute serratis, floribus ad phyllocladiorum dentes solitariis vel paucis spicatis, bracteis ovatis parvis persistentibus, calyce campanulato dentibus deltoideis, staminibus calyce triplo longioribus, ovaria lineari stipitato glabro 1–3-ovulato.

Phyllocladia 3–4 times branched; ultimate ones 3–5 in. long, $\frac{1}{4}$–$\frac{1}{3}$ in. broad, narrowed gradually to the base, very rigid and thick in texture, marked with close vertical anastomosing veins. Flowers solitary from the lower teeth of the phyllocladia, as many as 5 or 6 in a spike from the upper. Calyx $\frac{1}{12}$ in. long. Petals not seen. Ovary generally 2-ovuled; style short, incurved.—*Baron* 5174! Called by the natives *Harahara*, like the original species of the genus (*N. phyllanthoides*), from which it differs by its narrower, more rigid phylloclades, with the flowers from most of their teeth in spikes.

BAUHINIA (§ PAULETIA) PODOPETALA, n. sp.

B. ramulis lignosis glabris, foliis late ovatis subcoriaceis glabris infra medium bifidis, floribus magnis parce corymbosis, calyce glabro tubo cylindrico limbo integro ovato, petalis longe unguiculatis limbo oblongo vel obovato, legumine magno curvato glabro longe stipitato.

Branchlets slender, woody, terete. Petiole 1–$1\frac{1}{2}$ in. long; limb 3–4 in. long and broad, truncate at the base; segments contiguous, narrowed to the tip. Calyx-tube $\frac{3}{4}$ in., limb $1\frac{1}{2}$ in. long. Petals pale, all with a claw an inch long; blade $1\frac{1}{4}$–$1\frac{1}{2}$ in. long. Stamens 5 large, and the others small. Style above an inch long. Pod sickle-shaped, 8–9 in. long; gynophore nearly an inch long.—North-west Madagascar, *Baron* 5809! Near the Indian *B. acuminata*, Wight et Arn.

Bauhinia (§ Pauletia) punctiflora, n. sp.

B. ramulis pubescentibus, foliis latis cordatis bifidis dorso pubescentibus, segmentis ovatis, floribus 1–2nis, calyce pubescente tubo cylindrico limbo ovato, petalis calycis limbo duplo longioribus, staminibus brevibus, ovario lineari glabro stipitato.

Mature branches slender, terete, glabrous. Petiole an inch long; blade 2–3 in. broad, membranous, dull green on both surfaces, distinctly cordate, bifid less than halfway down. Calyx-tube and entire limb each about $\frac{3}{4}$ in. long. Petals $1\frac{1}{4}$–$1\frac{1}{2}$ in. long, $\frac{1}{3}$–$\frac{1}{2}$ in. broad, copiously spotted with claret-brown on a pale ground. Pistil as long as the petals. Pod not seen.—North-west Madagascar, *Baron* 5341! Near *B. tomentosa*, Linn., and *B. aurantiaca*, Bojer.

Dicrostachys myriophylla, n. sp.

D. ramulis lignosis pubescentibus, foliis bipinnatis basi glandula magna nigra cupulata præditis, pinnis circiter 40-jugis, foliolis multijugis parvis rigidulis lanceolatis, floribus in capitula densa oblonga aggregatis, superioribus hermaphroditis calyce parvo campanulato segmentis ovatis, petalis lanceolatis calyce 3–4plo longioribus, staminibus breviter exsertis, inferioribus imperfectis staminodiis flexuosis longe exsertis.

A shrub with slender, woody, terete branchlets. Leaf-rhachis 5–6 in. long, with a large black gland at the top of the short petiole; branches erecto-patent, 1–$1\frac{1}{2}$ in. long; leaflets very numerous, $\frac{1}{16}$ in. long. Heads 2–3 on short ascending pedicels from the axils of reduced upper leaves. Petals yellowish green, $\frac{1}{12}$ in. long. Staminodia yellow, $\frac{1}{3}$–$\frac{1}{2}$ in. long.—North-west Madagascar, *Baron* 5700!

Bryophyllum rubellum, n. sp.

Glabrum, foliis radicalibus carnosis imparipinnatis, foliolis oblongis obtusis crenatis, floribus in paniculam longissimam ramis arcuatis apice corymboso-cymosis dispositis, pedicellis brevibus, calycis tubo oblongo inflato segmentis deltoideis, corollæ rubellæ tubo subcylindrico segmentis ovatis.

Petiole of root-leaves 2 in. long; leaflets about 5, oblong, sessile, $1\frac{1}{2}$-2 in. long, deeply crenate. Rhachis of panicle a foot long; branches 2–3 in. long, bearing cymes 2–3 in. broad at the tip. Calyx $\frac{3}{4}$ in. long, green, membranous, $\frac{1}{3}$ in. diam.; segments 4, cuspidate, $\frac{1}{4}$–$\frac{1}{3}$ the length of the tube. Corolla apparently bright red; tube as long as the calyx-tube. Stamens reaching nearly to the tip of the corolla-segments.—*Baron*, next 5853!

CRASSULA CORDIFOLIA, n. sp.

Perennis, glabra, foliis caulinis copiosis parvis cordato-ovatis acutis sessilibus decussatis, floribus pentameris copiose cymoso-paniculatis, pedicellis flore æquilongis vel longioribus, sepalis ovato-lanceolatis, petalis oblongis acutis albis calyce duplo longioribus, staminibus petalis brevioribus, carpellis oblongis petalis duplo brevioribus, stylo brevi.

A glabrous perennial, with simple slender erect angled stems 3–6 in. long. Leaves fleshy, green, glabrous, $\frac{1}{4}$–$\frac{1}{3}$ in. long, amplexicaul. Flowers numerous, forming a level-topped panicle 2–3 in. diam. Sepals $\frac{1}{6}$ in. long, with a green back and whitish margin. Petals $\frac{1}{4}$ in. long. Stamens as long as the calyx; filaments filiform; anthers small, globose. Fruit-carpels $\frac{1}{8}$ in. long, tipped with a short erect style.—Ankaratra mountain, *Baron* 5194!

COMBRETUM PHANEROPETALUM, n. sp.

Sarmentosum, ramulis pubescentibus, foliis parvis petiolatis oblongis acutis pubescentibus, floribus dense paniculatis, ramulis dense pubescentibus, bracteis copiosis lanceolatis, calycis tubo anguste infundibulari, dentibus deltoideis, petalis pallidis oblanceolatis obtusis patulis, fructu late alato.

A climber, with slender woody pubescent branches. Leaves only about an inch long, but perhaps not fully developed. Flowers in dense terminal panicles, with densely pubescent branchlets and copious large lanceolate foliaceous bracts. Ovary oblong, densely pilose. Calyx-tube nearly $\frac{1}{4}$ in. long, not more than $\frac{1}{12}$ in. diam. at the throat. Petals $\frac{1}{6}$ in. long, spreading horizontally. Fruit above $\frac{1}{2}$ in. long, with each wing $\frac{1}{4}$ in. broad.—Province of Androna, *Baron* 5568!

COMBRETUM TRICHOPHYLLUM, n. sp.

C. ramulis pubescentibus, foliis brevissime petiolatis oblongis acutis utrinque dense pubescentibus, floribus in spica oblonga densa breviter pedunculata dispositis, calycis limbo obcuneato dense piloso dentibus deltoideis, petalis parvis oblongis luteis, staminibus petalis longioribus.

A shrub with slender woody terete branchlets. Leaves immature when the flowers are expanded, densely pubescent on both sides. Flowers in copious small dense axillary spikes; whole flower $\frac{1}{4}$ in. long. Calyx-tube $\frac{1}{6}$ in. diam. at the throat. Petals oblong, unguiculate, $\frac{1}{16}$ in. long. Stamens overtopping the petals; anthers minute, globose. Fruit not seen.—North-west Madagascar, *Baron* 5739!

CALOPYXIS SUBUMBELLATA, n. sp.

Glabra, foliis breviter petiolatis oblongis acutis, floribus subumbellatis breviter pedicellatis, ovario cylindrico glabro, calycis limbo basi campanulato sursum late infundibulari, dentibus brevibus obtusis, staminibus omnibus ex calyce protrusis, antheris oblongis rubellis.

Branchlets slender, woody, terete. Leaves immature when the flowers are expanded, opposite, shortly petioled. Flowers in congested lateral corymbs, with short peduncles ; pedicels short. Calyx-limb green, glabrous, $\frac{1}{4}$ in. long; tube campanulate in the lower half; upper half obconic. Petals none. Stamens 8, all protruded from the calyx. Style overtopping the anthers; stigma capitate. Fruit not seen.—*Baron*, next 5680!

CALOPYXIS TRICHOPHYLLA, n. sp.

C. ramulis pubescentibus, foliis cordato-oblongis brevissime petiolatis membranaceis pubescentibus, floribus sessilibus ad ramulorum apices congestis, bracteis foliaceis, ovario villoso, calycis tubo basi cylindrico sursum late infundibulari, dentibus brevissimis, staminibus superioribus solum breviter exsertis.

An erect tree, with slender woody branchlets. Leaves opposite, $1\frac{1}{2}$–$2\frac{1}{2}$ in. long, acute or obtuse, green on both sides, more densely pubescent beneath. Flowers in dense clusters at the tips of the branchlets. Ovary ovoid, densely villose; calyx-tube shortly cylindrical; funnel-shaped upper part of the tube $\frac{1}{4}$–$\frac{1}{3}$ in. long and broad. Petals none. Upper rows of stamens just protruded from the calyx. Fruit not seen.—*Baron*, next 5787!

MEDINILLA AMPLEXICAULIS, n. sp.

M. ramulis gracilibus lignosis pubescentibus, foliis cordato-ovatis amplexicaulibus parvis rigide coriaceis, floribus axillaribus 1–2nis, calycis tubo turbinato limbo brevi dentibus latis brevissimis, petalis oblongis rubris, antheris subcylindricis antice bicalcaratis postice unicalcaratis.

A shrub, with slender, woody, obtusely quadrangular branchlets. Leaves distant, decussate, ascending, $\frac{3}{4}$–1 in. long. Flowers from the axils of the leaves, on a slender simple or forked peduncle about $\frac{1}{2}$ in. long, with a pair of minute bracts at the middle. Calyx, including ovary, green, glabrous, $\frac{1}{6}$ in. long; limb collar-like, with very broad short segments. Petals 4, bright red, $\frac{1}{6}$ in. long. Stamens as long as the petals; anther $\frac{1}{8}$ in. long, with two ascending curved subulate spurs from the base in front, and a short descending one behind; filament filiform, as long as the anther. Style as long as the petals.—Forests of East Androna,

M. Smith del. C. Fitch lith.

ROTANTHA COMBRETOIDES, *Baker.*

Baron 5717! I find I used twice the specific name *divaricata* for a *Medinilla*, so Baron 3658, described in Journ. Linn. Soc. vol. xxii. p. 478, may be changed to M. BARONI.

ROTANTHA, genus novum Lythrariearum.

Calycis tubus brevis campanulatus; segmenta 4 ovata patula, tubo longiora. Petala 4 oblonga unguiculata, ad tubi oram inserta, cum segmentis alterna. Stamina 8 cum petalis inserta; filamenta filiformia, petalis longiora; antheræ parvæ globosæ. Ovarium globosum superum, ex calycis tubo protrusum triloculare; ovula in loculo plura, superposita; stylus filiformis; stigma capitatum. Fructus globosus indehiscens magnitudine pisi. Semina plura parva angulata; testa tenuis brunnea.

Closely allied to the Cape *Heteropyxis*, Harv. Thes. ii. t. 128.

ROTANTHA COMBRETOIDES, *Baker*. Species sola. (Pl. LI.)

An erect shrub or small tree, with the habit of a *Combretum*, glabrous in all its parts. Branchlets slender, terete. Leaves oblong, entire, opposite, membranous, $1\frac{1}{2}$–2 in. long, narrowed gradually from the middle to the base on a short petiole, green on both sides, not pellucido-punctate. Flowers in an ample decompound terminal panicle with spreading main branches; pedicels about as long as the calyx. Bud green, globose. Expanded calyx $\frac{1}{6}$ in. diam. Petals $\frac{1}{12}$ in. long, pale. Filaments $\frac{1}{8}$ in. long. —*Baron* 2194! 5032! 5169!

MODECCA CLADOSEPALA, n. sp.

Sarmentosa, cirrhifera, glabra, ramulis lignosis glabris, foliis ignotis hysteranthiis, floribus copiose racemosis, calycis segmentis elongatis supra basin cylindricis, petalis lanceolatis sepalis brevioribus, ovario oblongo breviter stipitato, pericarpio coriaceo lævi.

A woody climber, with slender terete stems and simple tendrils. Flowers laxly racemose on the short woody branchlets; pedicels $\frac{1}{2}$ in. long. Calyx $\frac{3}{4}$ in. long, with a short campanulate tube and long cylindrical segments from an ovate base. Petals about $\frac{1}{2}$ in. long. Mature? ovary oblong, 2–3 in. long, with a smooth green coriaceous pericarp.—Province of Androna, *Baron* 5705!

MODECCA MEMBRANIFOLIA, n. sp.

Sarmentosa, cirrhifera, glabra, caule suffruticoso, foliis pinnatim quinquefoliolatis, foliolis oblongis obtusis membranaceis, floribus parvis corymbosis, sepalis petalisque lineari-oblongis æquilongis, ovario oblongo distincte stipitato.

A suffruticose climber, glabrous in all its parts. Petiole $1\frac{1}{2}$–

2 in. long, bearing 3 large glands; leaflets 2–3 in. long, shortly petioled, very thin, green and glabrous on both sides, minutely mucronate. Pedicels longer than the flowers. Sepals and petals $\frac{1}{2}$ in. long. Ovary reaching to the tip of the petals, with a gynophore as long as itself.—*Baron*, next 5866!

RAPHIDOCYSTIS SAKALAVENSIS, n. sp.

Sarmentosa, caulibus gracilibus apice hispidulis, foliis breviter petiolatis cordato-ovatis scabris denticulatis, floribus axillaribus 1–2nis brevissime pedicellatis, ovario dense hispido, calycis dentibus perparvis, petalis oblongo-lanceolatis, pericarpio crustaceo, seminibus compressis albidis.

An herbaceous climber, with very slender calvate stems and short simple tendrils, much twisted spirally. Leaves distant; petiole $\frac{1}{2}$–1 in. long, densely hispid; blade 2–3 in. long, deeply cordate at the base, green and scabrous on both sides, with the main veins and veinlets beneath raised. Flowers solitary or in pairs from the axils of the leaves. Ovary oblong, $\frac{1}{3}$ in. long, clothed with dense spreading brownish shining bristles; calyx with a short tube and very small deltoid teeth. Petals $\frac{1}{2}$ in. long. Fruit very bristly, with a thin crustaceous pericarp, and abundant oblique oblong seeds $\frac{1}{4}$–$\frac{1}{3}$ in. long.—North Antsihanaka, *Baron* 5911! 5128, common in the forests of East Imerina, is a distinct species, with trifurcate calyx-teeth, but is too incomplete to describe.

ANISOPODA, genus novum Umbelliferarum (tribus *Ammineæ*).

Calycis dentes breves lati. Petala oblonga atropurpurea apice acuta inflexa. Styli brevissimi erecto-patentes. Fructus ovoideus a latere compressus ad commissuram vix constrictus; juga omnia inconspicua haud alata; vittæ ad valleculas solitariæ. Semina ignota.

ANISOPODA BUPLEUROIDES, *Baker*. Species sola. (Pl. LII.)

A perennial herb. Leaves all aggregated in a dense radical tuft; petiole slender, 2–3 in. long, not dilated at the base; blade pinnato-subternate, consisting of 3 leaflets from the end of the axis, and an opposite pair a space below them consisting of two leaflets each; leaflets about $\frac{1}{2}$ in. long, obovate, obtuse, entire or crenate, moderately firm in texture, green and glabrous on both surfaces. Stems stiffly erect, slender, leafless, about 2 feet long. Compound umbels 4–5, the lowest placed low down on the stem and very imperfect, the others consisting of 5–10 umbels, one usually subsessile and the others on peduncles $\frac{1}{2}$–$\frac{3}{4}$ in. long;

M. Smith del.
Fitch lith.

ANISOPODA BUPLEUROIDES. Baker.

bracts 5–6, lanceolate, green, $\frac{1}{8}$ in. long. Flowers 8–10 in a dense globose umbel like that of a *Bupleurum*, $\frac{1}{6}$ in. diam.; bracteoles 5–6, green, oblong-lanceolate, $\frac{1}{12}$ in. long, exceeding the very short pedicels.—North Antsihanaka, *Baron* 5255! The fruit is too young to show its proper character.

CARUM? ANGELICÆFOLIUM, n. sp.

Herbaceum, perenne, foliis radicalibus deltoideis bipinnatis longe petiolatis, foliolis oblongis argute serratis facie viridibus dorso albidis, caule robusto erecto copiose ramoso, bracteis bracteolisque nullis, pedicellis ovario longioribus, calycis dentibus obsoletis.

A robust perennial, with copiously branched erect stems 2 ft. long. Radical leaves in a dense rosette; petiole 6–8 in. long, much dilated downwards; blade as long as the petiole; leaflets sessile, unequal-sided, $1\frac{1}{2}$–2 in. long. Compound umbels very numerous, with many rays; pedicels $\frac{1}{6}$ in. long. Flower-ovary oblong, $\frac{1}{12}$ in. long, slightly compressed laterally; stylopodia conic; style as long as the stylopodia. Petals and mature fruit not seen.—*Baron* 2020! Votovorona and Ankaratra mountains, 5247! We have had this for many years, but the material is still too incomplete to definitely settle its generic position. Native name, *Tsileondroaholahy.*

PEUCEDANUM (BUBON) BOJERIANUM, n. sp.

Perenne, glabrum, foliis parvis cuneatis decompositis, segmentis elongatis anguste linearibus, caulibus gracilibus teretibus, umbellis compositis paucis, bracteis bracteolisque paucis brevibus lanceolatis, pedicellis brevissimis, calycis dentibus deltoideis.

A glabrous perennial, with flowering-stems about 2 feet long, bearing 2–4 multiradiate compound umbels. Leaves spaced out on the stem; petiole of the lower 2–3 in. long; blade $1\frac{1}{2}$–2 in. long and broad; ultimate leaflets about an inch long. Bracts about 5, lanceolate, $\frac{1}{6}$ in. long; bracteoles similar in shape and number, but smaller. Ultimate pedicels about as long as the bracteoles. Immature fruit oblong, with subequal ribs and distinct calyx-teeth.—Ankaratra, *Baron* 5185!; and also collected long ago by Bojer.

NAUCLEA CUSPIDATA, n. sp.

Glabra, foliis petiolatis oblanceolato-oblongis cuspidatis rigide coriaceis, capitulis parvis globosis pedunculatis, calycis segmentis parvis oblongis obtusis, corollæ tubo cylindrico segmentis parvis lineari-oblongis, antheris oblongis ad faucem subsessilibus, stigmate clavato longe exserto.

A shrub, with glabrous leaves and branchlets. Leaves crowded towards the tips of the branchlets; petiole $\frac{1}{2}$ in. long; blade 3-4 in. long, $\frac{3}{4}$–$1\frac{1}{4}$ in. broad, narrower from the middle to the base, firm in texture, green above, paler beneath, with distant erecto-patent main veins. Peduncles 1–$1\frac{1}{2}$ in. long. Head globose, $\frac{3}{4}$ in. diam. when in flower. Flowers concrete. Calyx-segments very small. Corolla-tube $\frac{1}{6}$ in. long; segments $\frac{1}{4}$ the length of the tube. Anthers about as long as the corolla-segments. Fruit edible.—*Baron* 5563! The name in the province of Androna is *Molopangady*.

SABICEA ACUMINATA, n. sp.

S. ramulis teretibus pilosis, stipulis fimbriatis, foliis breviter petiolatis pilosis oblongo-lanceolatis acuminatis facie viridibus dorso persistenter albido-incanis, floribus paucis axillaribus subsessilibus, calyce dense piloso tubo brevi segmentis linearibus elongatis, corollæ tubo subcylindrico elongato, segmentis lineari-oblongis tubo 3–4plo brevioribus.

A shrub, with softly pilose slender terete branchlets. Leaves reaching a length of 3–4 inches, 1–$1\frac{1}{4}$ in. broad below the middle, narrowed gradually to a long point, thin but firm in texture, green above, white beneath, with numerous parallel arcuate-ascending main veins. Flowers subsessile in the axils of the leaves. Calyx densely pilose, $\frac{1}{3}$ in. long; tube short, oblong; segments linear, plumose, $\frac{1}{4}$ in. long. Corolla-tube subcylindrical, densely hairy, a little longer than the calyx-segments; segments 5, $\frac{1}{6}$ in. long. Fruit not seen.—North-west Madagascar, *Baron* 5736! Near *S. diversifolia*, Pers.

IXORA PLATYTHYRSA, n. sp.

Glabra, stipulis ovatis, foliis petiolatis oblongo-lanceolatis acutis subcoriaceis nitidulis, floribus permultis in paniculam amplam latam ramulis corymbosis dispositis, bracteis parvis lanceolatis, calycis tubo parvo campanulato, segmentis lanceolatis acutis, corollæ tubo cylindrico elongato, segmentis lanceolatis tubo 3–4plo brevioribus, stigmate e tubo exserto.

A shrub, probably a climber, glabrous in all its parts. Petiole $\frac{1}{2}$–$\frac{3}{4}$ in. long; blade 5–6 in. long, $1\frac{1}{2}$–2 in. broad, rather rounded, firm in texture, glossy on both sides, the veins beneath but little raised. Panicle orbicular, reaching a diameter of 8–9 inches; bracts small, copious, persistent; pedicels short. Calyx $\frac{1}{12}$ in. long; segments much longer than the tube. Corolla-tube $\frac{1}{2}$–$\frac{5}{8}$ in. long; segments 4, lanceolate, reflexing, $\frac{1}{4}$ in. long. Stamens hidden in the corolla-tube. Stigma bifid, finally just exserted from the corolla-tube. Fruit not seen.—North-west Madagascar, *Baron* 5819!

PLECTRONIA SYRINGÆFOLIA, n. sp.

Glabra, ramulis gracilibus teretibus, stipulis parvis ovatis, foliis breviter petiolatis late oblongis acutis basi rotundatis, floribus in umbellas axillares 2–4-floras breviter pedunculatas dispositis, pedicellis flore brevioribus, calyce tubo infundibulari dentibus minutis, petalis ovatis acuminatis.

A shrub or small tree, glabrous in all its parts, with slender terete branchlets. Petiole $\frac{1}{4}$ in. long; blade $1\frac{1}{2}$–2 in. long, moderately firm in texture, green and glabrous on both surfaces, the veins beneath fine and immersed. Umbels solitary from the axils of many of the leaves on ascending peduncles $\frac{1}{2}$ in. long. Calyx $\frac{1}{12}$ in. long; teeth 5, minute. Bud ovoid, with a distinct cusp. Petals $\frac{1}{6}$ in. long. Fruit not seen. –*Baron* 5019!

DIRICHLETIA LEUCOPHLEBIA, n. sp.

D. ramulis brevibus glabris, stipulis fimbriatis, foliis breviter petiolatis oblongis acutis facie glabris dorso ad venas adpresse albido-sericeis, floribus in cymas terminale paucifloras dispositis, calycis tubo subcampanulato dentibus parvis lanceolatis, corollæ tubo brevi cylindrico sericeo fauce dense piloso, segmentis ovatis parvis.

A shrub or small tree, with brownish subterete woody branchlets, with short internodes. Petiole $\frac{1}{4}$ in. long; blade $1\frac{1}{2}$–2 in. long, narrowed gradually to both ends, silky only on the ascending parallel main veins beneath. Cymes few-flowered, fascicled, terminal, shortly peduncled. Calyx $\frac{1}{8}$–$\frac{1}{6}$ in. long, glabrous; teeth shorter than the tube. Coralla-tube $\frac{1}{4}$ in. long, silky; segments half as long as the tube. Fruit not seen.—North-west Madagascar, *Baron* 5777! The genus is reduced by Baillon to *Carphalea*.

DIRICHLETIA SPHÆROCEPHALA, n. sp.

D. ramulis tetragonis sulcatis breviter pilosis, foliis late oblongis acutis subcoriaceis utrinque pubescentibus, floribus in capitula globosa pedunculata axillare aggregatis, bracteis magnis ovatis acutis foliaceis, calycis segmentis acuminatis tubo infundibulari æquilongis, corollæ tubo elongato angustissimo piloso, segmentis parvis oblongis.

A shrub or small tree, with long straight woody branchlets. Stipules very small, ovate; petiole $\frac{1}{4}$–$\frac{1}{3}$ in. long; blade $1\frac{1}{2}$–2 in. long, about an inch broad, cuneate at the base, moderately firm in texture, green above, drab beneath, with 6–8 parallel raised main veins. Peduncles ascending, about an inch long. Heads 1–1½ in. diam.; outer bracts above ½ in. long. Calyx ½ in. long; segments subequal, very acuminate from a lanceolate-deltoid base. Corolla-tube curved, ¾ in. long; segments ⅛ in. Filaments as long as the segments. Fruit not seen.—North-west Madagascar, *Baron* 5425!

BERTIERA LONGITHYRSA, n. sp.

B. ramulis virgatis pubescentibus, stipulis magnis lanceolatis persistentibus, foliis breviter petiolatis oblongis acutis facie glabris viridibus dorso breviter pubescentibus, floribus in paniculam laxam angustam thyrsoideam dispositis, bracteis lanceolatis, calycis segmentis minutis, fructu globoso magnitudine pisi.

Branches slender, woody, subterete, shortly pubescent. Stipules ½ in. long. Leaves 3–5 in. long, 1–1½ in. broad, acute, deltoid at the base, moderately firm in texture, green and glabrous above, drab when dry beneath, with 7–8 curved ascending parallel finely silky main veins. Panicle 5–6 in. long, 1½–2 in. broad at the base; branches erecto-patent, corymbose; bracts lanceolate, foliaceous. Corolla not seen. Fruit black, globose, ⅙ in. in diam.—*Baron*, next 5789! Very near the Mauritian *B. Zaluzania*, Gaertn.

VERNONIA MECISTOPHYLLA, n. sp.

Arborea, ramulis validis tenuiter pubescentibus, foliis breviter petiolatis oblongo-lanceolatis facie scabris dorso dense glandulosis tenuiter pubescentibus, capitulis magnis multifloris dense corymbosis, involucro campanulato bracteis multiseriatis adpressis rigidis brunneis lanceolatis, achenio glabro 8–10-costato, pappo albo flexuoso setis æquilongis.

Branchlets straight, stout, woody, pubescent upwards. Leaves 6–8 in. long, 1½ in. broad at the middle, subcoriaceous, green and scabrous above, paler and densely glanduloso-punctate beneath. Capitula few, crowded at the tip of the branchlets. Involucre ¾–⅞ in. diam.; bracts in many rows, brown, rigid, adpressed, nearly glabrous. Achene ⅛ in. long, with 8–10 distinct ribs. Pappus and cylindrical corolla-tube each ⅓ in. long.—*Baron*, next 5829!

VERNONIA LEUCOLEPIS, n. sp.

Fruticosa, ramulis gracilibus pubescentibus, foliis petiolatis ovatis utrinque tenuiter pubescentibus, capitulis multifloris corymboso-paniculatis, involucro late campanulato bracteis multiseriatis adpressis dense albido-sericeis exterioribus ovatis intimis lanceolatis, achenio cylindrico glabro, pappo albido setis flexuosis æquilongis.

Stems very slender, woody, terete, coated with short whitish pubescence. Leaves laxly disposed, 1–1½ in. long, acute or obtuse, rounded at the base, moderately firm in texture. Capitula few in a corymb. Involucre broadly campanulate, ⅓ in. diam.; bracts in many rows, all acute, densely white-silky. Achene only seen immature. Pappus flexuose, ⅙ in. long.—*Baron*, next 5838!

VERNONIA MALACOPHYTA, n. sp.

Fruticosa, sarmentosa, ramulis superne flexuosis ubique dense albido-pubescentibus, foliis petiolatis cordato-ovatis integris utrinque dense albido-pannosis, capitulis 15–20-floris dense corymboso-paniculatis, involucro campanulato bracteis pauciseriatis caducis exterioribus ovatis pilosis interioribus lineari-oblongis glabris, achenio glabro pallido, pappo fragili albido.

A shrub or small tree, with slender terete woody branches, zigzag upwards. Petiole of lower leaves an inch long; blade 2 in. long, densely coated, especially beneath, with white tomentum. Heads arranged in ample panicles, with a zigzag rhachis and densely corymbose branches. Involucre ⅙ in. diam.; bracts pale, moderately firm. Achene pale, 4-angled. Pappus ⅙ in. long.—Antsihanaka, *Baron* 5532! Near *V. rampans* and *streptoclada*. Native name *Mandriambavahady*.

VERNONIA RAMPANS, n. sp.

Fruticosa, sarmentosa, ramulis dense breviter pubescentibus sursum valde flexuosis, foliis petiolatis ovatis utrinque pannosis, capitulis multifloris in paniculam amplam ramis corymbosis dispositis, involucro campanulato piloso bracteis pauciseriatis adpressis interioribus linearibus obtusis, achenio glabro, pappo albido flexuoso.

A woody climber, with stems very zigzag towards the top, densely clothed with short soft white pubescence. Leaves not more than 1–1½ in. long, triplinerved from the base, densely matted with whitish soft tomentum below, less densely above. Heads forming corymbs at the end of all the numerous branchlets. Involucre ⅙ in. long; outer bracts small, ovate, densely pilose. Flowers much longer than the involucre. Pappus ⅙ in. long; bristles ciliated, equal.—North Ankay, *Baron* 5520! Near *V. streptoclada*, Baker.

VERNONIA SPEIRACEPHALA, n. sp.

Fruticosa, sarmentosa, ramulis gracillimis sursum pubescentibus, foliis

subsessilibus obovato-cuneatis obtusis utrinque viridibus glabris, capitulis 5–6-floris ad ramarum apices dense aggregatis, involucro infundibulari glabro bracteis adpressis obtusis imbricatis, achenio elongato angulato glabro, pappo albo flexuoso, setis exterioribus brevibus.

A slender woody climber, glabrous in all its parts. Leaves distant, nearly sessile, 2–3 in. long, 1–1¼ in. broad, moderately firm in texture, green and glabrous on both surfaces, narrowed gradually from the middle to the base. Heads in dense corymbs at the end of the branchlets. Involucre ¼ in. long; bracts rigid, obtuse; outer gradually shorter. Flowers half as long again as the involucre. Pappus and achene each ⅙ in. long.—*Baron* 1447! East Androna, 5639!

VERNONIA HILDEBRANDTII, n. sp.

Fruticosa, ramulis dense breviter fusco-pubescentibus, foliis petiolatis oblongis acutis integris utrinque viridibus facie scabris dorso pubescentibus, capitulis 5–6-floris dense corymboso-paniculatis, involucro campanulato piloso bracteis pauciseriatis caducis exterioribus ovatis intimis lineari-oblongis, achenio glabro, pappo albido flexuoso setis æquilongis.

A shrub or small tree, with slender terete woody branchlets, densely coated with short brown pubescence. Petiole ½ in. long; blade 2–3 in. long, 1–1¼ in. broad at the middle, moderately firm in texture, with the spreading parallel main veins beneath conspicuously raised. Capitula in dense terminal panicled corymbs. Involucre ⅛ in. diam.; bracts pale green, very caducous. Flowers twice as long as the involucre. Pappus and reddish corolla ⅙ in. long.—*Baron* 1131! forests of East Imerina, 5144! Also *Hildebrandt* 3636! Allied to *V. Baroni* and *trichodesma*.

VERNONIA KENTEOCEPHALA, n. sp.

Fruticosa, ramulis dense pubescentibus, foliis petiolatis oblongo-lanceolatis acutis facie subcalvatis, dorso pubescentibus, capitulis multifloris in paniculam angustam thyrsoideam dispositis, involucro campanulato bracteis multiseriatis adpressis ovatis cuspidatis exterioribus solum pubescentibus, achenio glabro multicostato, pappo albo flexuoso setis æquilongis.

A shrub or small tree, with densely grey-pubescent branchlets. Leaves 4–6 in. long, 1–1¼ in. broad at the middle, narrowed gradually to both ends, entire, thin in texture, green and obscurely pubescent above, coated with short drab pubescence beneath. Capitula forming a lax thyrsoid panicle 6–8 in. long, with a very pubescent rhachis. Involucre ⅓ in. diam.; bracts brown, rigid, adpressed, with distinct cusps. Achenia brown, with 9–10 ribs. Pappus $\frac{1}{6}$ in. long.—North-west Madagascar, *Baron* 5330 !

VERNONIA ALBOVIRIDIS, n. sp.

Fruticosa, ramulis tenuiter albo-incanis, foliis breviter petiolatis oblongis rigide coriaceis facie viridibus glabris dorso albo-incanis, capitulis 10–12-floris dense corymboso-paniculatis, involucro campanulato bracteis multiseriatis adpressis obtusis omnibus dense pilosis, achenio glabro, pappo albido flexuoso setis æquilongis.

An erect shrub or small tree, with the branchlets and leaves beneath coated with thin white tomentum. Leaves firm in texture, $1\frac{1}{2}$–2 in. long, subacute, rounded at the base, entire. Capitula forming a dense level-topped terminal panicle. Involucre $\frac{1}{6}$ in. diam.; bracts very numerous, adpressed, obtuse, rigid, densely coated with whitish pubescence. Flowers much overtopping the involucre. Achenia only seen immature. Pappus $\frac{1}{6}$ in. long.—Province of Androna, *Baron* 5595 ! 5609 ! Allied to *V. moquinioides*, Baker.

VERNONIA CORIIFOLIA, n. sp.

Fruticosa, ramulis obscure albido-incanis, foliis petiolatis oblanceolato-oblongis acutis integris rigide coriaceis facie viridibus nitidulis dorso tenuiter albido-incanis, capitulis parvis 4-floris copiose paniculatis, involucro parvo campanulato incano bracteis pauciseriatis adpressis exterioribus oblongis intimis lineari-oblongis, achenio immaturo piloso, pappo albido flexuoso setis æquilongis.

A shrub or small tree, with slender branches, coated with thin white tomentum, like the underside of the leaves. Leaves 4–6 in. long, $1\frac{1}{2}$–2 in. broad at the middle, narrowed gradually from the middle to the base. Flowers in copious lateral panicles mixed up with and overtopped by the leaves. Involucre $\frac{1}{8}$ in. diam. Flowers twice as long as the involucre. Pappus and corolla $\frac{1}{8}$ in. long.—*Baron*, next 5827 ! Near *V. Merana*, Baker.

VERNONIA TRICHODESMA, n. sp.

Fruticosa, ramulis pubescentibus, foliis breviter petiolatis oblanceolato-oblongis acutis inciso-crenatis membranaceis præter venarum axillas glabris, capitulis 7–8-floris dense corymboso-paniculatis, involucro brevi campanulato bracteis pauciseriatis adpressis caducis pubescentibus exterioribus ovatis interioribus linearibus, achenio glabro, pappo albido fragili setis æqualibus.

A shrub, with pubescent woody branchlets. Leaves crowded; petiole $\frac{1}{2}$ in. long; blade 4–5 in. long, $1\frac{1}{2}$–2 in. broad, thin in texture, green on both surfaces, with tufts of hairs in the axils of the distant arcuate main veins beneath. Heads in a dense level-topped panicle 4 in. diam.; branches and short pedicels pilose. Involucre $\frac{1}{6}$ in. diam. Flowers twice as long as the involucre. Pappus $\frac{1}{6}$ in. long.—North Antsihanaka, *Baron* 5486! Near *V. Baroni*, Baker.

SPHÆRANTHUS HILDEBRANDTII, n. sp.

S. caulibus erectis ramosis alatis, foliis oblongo-lanceolatis acutis denticulatis subglabris membranaceis, glomerulis parvis globosis, involucro campanulato glabro bracteis oblongis obtusis, floribus fœmineis pluribus, hermaphrodito solitario corollæ limbo pallide viridulo profunde dentato, achenio dense glanduloso.

An erect annual, with broadly winged stems about a foot long. Leaves 2–3 in. long, about an inch broad, the decurrent base forming the stem-wing. Capitula 30–40 in a globose cluster $\frac{1}{4}$–$\frac{1}{3}$ in. diam. Involucre $\frac{1}{12}$ in. long. Flowers including the achene $\frac{1}{16}$ in. long. Achene rough with glands.—*Hildebrandt* 2896! North-west Madagascar, *Baron* 5740! Near *S. sphenocleoides*, Oliv. et Hiern.

ROCHONIA SENECIONOIDES, n. sp.

Fruticosa, ramulis glabris, foliis sessilibus lanceolatis acutis facie viridibus glabris dorso albo-incanis, capitulis copiose paniculatis, involucro campanulato bracteis pauciseriatis glabris intimis linearibus obtusis, ligulis involucro æquilongis, achenio glabro multicostato, pappo albido setis inæquilongis.

A shrub or small tree, with the habit of an *Olearia*. Leaves alternate, moderately firm in texture, 4–5 in. long, under an inch broad above the middle, acute, narrowed gradually from above the middle to the base. Panicle ample, deltoid; branches racemoso-corymbose; ultimate peduncles $\frac{1}{8}$–$\frac{1}{2}$ in. long. Involucre $\frac{1}{4}$ in. diam.; bracts green, glabrous, rather rigid. Ligules pale yellow, $\frac{1}{4}$ in. long. Achene clavate, glabrous, compressed, $\frac{1}{6}$ in. long. Pappus as long as the achene.—Forests of North-east Imerina, *Baron* 5518! A showy new species of this small endemic genus.

DICHROCEPHALA GOSSYPINA, n. sp.

Perennis, caulibus dense cæspitosis brevibus racemosis albo-gossypinis, foliis sessilibus profunde lyrato-pinnatifidis, capitulis globosis terminalibus pedunculatis, involucro campanulato bracteis foliaceis obtusis, achenio ompresso distincte bimarginato flore aurantiaco æquilongo.

Stems densely tufted, about half a foot long, copiously branched, spreading, like the leaves densely pilose. Leaves sessile, alternate, $\frac{1}{2}$–1 in. long. Heads few to a stem, $\frac{1}{6}$ in. diam. Bracts oblong, dull green, slightly pilose. Receptacle globose. Flowers, including the achene, $\frac{1}{12}$ in. long. Achene glossy, obovoid, pale brown.—North-west Madagascar, *Baron* 5406! A plant very similar in habit, with densely white-cottony stems and obovate nearly entire leaves, gathered by Bojer at Bomatac Bay, and named by him *Dichrocephala lanata*, has a distinct paleaceous pappus, and should probably be considered a new genus. Our material, however, is too incomplete to characterize it properly.

MICROGLOSSA PSIADIOIDES, n. sp.

Fruticosa, sarmentosa, ramis apice solum tenuiter pubescentibus, foliis petiolatis oblongo-lanceolatis dentatis subglabris, capitulis parvis copiose corymboso-paniculatis, involucro campanulato bracteis pauciseriatis adpressis lanceolatis glabris, achenio subcylindrico glabro, pappo albido.

A scandent shrub, with slender woody stems, glabrous except towards the tip. Petiole about an inch long; leaves 4–5 in. long, 1–1$\frac{1}{2}$ in. broad at the middle, acute, deltoid at the base, distinctly toothed, green and glabrous on both surfaces. Panicle 6–9 in. long, the lower branches bracteated at the base by large leaves. Involucre $\frac{1}{6}$ in. long and broad; bracts all lanceolate, brown in the centre, pale towards the edge. Flowers as long as the involucre. Pappus and corolla $\frac{1}{8}$ in. long.—East Androna, *Baron* 5611!

CONYZA THERMARUM, n. sp.

Herbacea, caulibus copiose ramosis sursum pubescentibus, foliis amplexicaulibus oblongo-lanceolatis dentatis subglabris, capitulis magnis corymbosis, involucro late campanulato bracteis æquilongis lanceolatis acutis, exterioribus dense pilosis, achenio subcylindrico glabro, pappo albido fragili.

A copiously-branched erect herb, with slender terete stems. Leaves subdistant, alternate, auricled and amplexicaul at the base, 1–2 in. long. Capitula a few at the end of each branch, on long slender pubescent peduncles. Involucre $\frac{1}{3}$–$\frac{1}{2}$ in. diam.; bracts in a few rows, all dull green, herbaceous. Corolla $\frac{1}{6}$ in. long. Pappus as long as the corolla.—Antsirabe, on lime deposits near hot springs, *Baron* 5237!

BLUMEA BOJERI, n. sp.—Pluchea glutinosa, *Bojer inedit.*

B. caulibus erectis ramosis haud alatis, foliis sessilibus profunde irregu-

lariter pinnatifidis viridibus glutinoso-pubescentibus, capitulis multifloris in paniculam amplam dispositis, involucro late campanulato bracteis multiseriatis adpressis lanceolatis acutis glutinosis, achenio glabro cylindrico, pappo albo flexuoso.

An erect copiously-branched annual or biennial herb, with erect stems 2–3 ft. or more long. Stem-leaves small, sessile, thin, deeply pinnatifid. Panicle reaching a length of a foot and a breadth of 6–8 inches; main branches erecto-patent, corymboso-racemose; final peduncles longer than the heads, very slender, densely clothed with black glands. Involucre campanulate, $\frac{1}{4}$–$\frac{1}{3}$ in. diam.; bracts all adpressed and acute. Flowers as long as the involucre. Achene brown, cylindrical, glabrous. Pappus white, flexuose, $\frac{1}{6}$ in. long.—North-west Madagascar, *Baron* 5348! Bembatoka Bay, *Bojer*!

HELICHRYSUM ACHYROCLINOIDES, n. sp.

Perenne, foliis parvis sessilibus oblanceolatis obscure triplinerviis facie tenuiter dorso dense albido-incanis, capitulis parvis paucifloris copiose corymboso-paniculatis, involucro oblongo deorsum piloso bracteis imbricatis obtusis intimis scariosis albidis, pappo albido.

An erect perennial herb, with a slender simple erect stem, copiously panicled at the summit. Leaves subdistant, alternate, $\frac{1}{2}$–$\frac{3}{4}$ in. long, acute, entire, narrowed gradually from the middle to the clasping base. Panicle 3–4 in. diam., with many erecto-patent branches. Involucre $\frac{1}{8}$ in. long, multiserial; bracts all adpressed, those of the upper half white, glabrous and scariose. Flowers very immature.—East Androna, *Baron* 5657!

HELICHRYSUM CRISPO-MARGINATUM, n. sp.

Perenne, ramulis gracilibus albo-incanis, foliis oblanceolatis spathulatis amplexicaulibus triplinerviis facie tenuiter dorso dense albo-incanis, capitulis parvis multifloris copiose corymboso-paniculatis, involucro campanulato bracteis multiseriatis adpressis obtusis intimis scariosis albidis, pappo albo.

A perennial herb, with very slender stems, thinly coated with white tomentum. Lower leaves $1\frac{1}{2}$–2 in. long, under $\frac{1}{2}$ in. broad at the middle, crisped at the edge, narrowed from the middle to the dilated clasping base. Heads crowded in dense clusters. Involucre $\frac{1}{8}$ in. diam., greenish-white, none of the bracts brightly coloured. Flowers a little overtopping the involucre. Corolla and pappus $\frac{1}{12}$ in. long.—East Androna, *Baron* 5593! Near *H. triplinerve*, DC.

HELICHRYSUM LEUCOPHYLLUM, n. sp.

Perenne, caulibus albo-incanis, foliis parvis sessilibus oblongis acutis facie tenuiter dorso dense albo-incanis, capitulis multifloris magnitudine mediocribus copiose corymboso-paniculatis, involucro campanulato bracteis multiseriatis obtusis scariosis citrinis, pappo albido fragili.

An herbaceous perennial, with slender erect stems, clothed with white tomentum. Leaves many, sessile, reflexed, $\frac{1}{2}$ in. long, only the midrib visible through the dense whitish tomentum of the under surface. Involucre $\frac{1}{6}$ in. diam., hairy in the lower half, bright yellow and glabrous in the upper. Flowers as long as the involucre, a rather darker yellow. Achene minute, cylindrical, glabrous. Pappus and corolla $\frac{1}{12}$ in. long.—North Imerina, *Baron* 5540!

HELICHRYSUM ERICIFOLIUM, n. sp.

Perenne, caulibus gracilibus ramosis deorsum calvatis, sursum tenuiter pilosis, foliis multis parvis sessilibus rigidis linearibus uninerviis margine revolutis, capitulis parvis multifloris dense glomeratis, involucro campanulato bracteis pauciseriatis adpressis interioribus lanceolatis summo apice luteis, pappo albo fragili.

An erect perennial, with slender firm brown branched stems, glabrous towards the base, hairy upwards. Leaves ascending, at most $\frac{1}{4}$ in. long, acute, obscurely pilose, with strongly revolute margins. Clusters of heads single, terminal, $\frac{1}{2}$–$1\frac{1}{4}$ in. diam. Involucre $\frac{1}{8}$ in. diam., greenish-white except at the very tip of the inner bracts. Flowers rather overtopping the involucre. Corolla $\frac{1}{12}$ in. long, yellow and campanulate at the tip.—Antsihanaka, *Baron* 5500! *Hildebrandt* 3547! Near *H. emirnense*, DC.

SENECIO RHODANTHUS, n. sp.

Herbaceus, glaber, caulibus gracilibus erectis ramosis, foliis sessilibus linearibus integris uninerviis margine revolutis, capitulis discoideis parvis laxissime corymbosis, involucro campanulato bracteis 8–9 æqualibus, floribus rubellis, pappo albo flexuoso.

An erect herb, perhaps an annual, with slender branched laxly leafy stems. Leaves $1\frac{1}{2}$–2 in. long., narrowed from the middle to the base. Involucre $\frac{1}{6}$ in. diam.; bracts few, lanceolate, glabrous. Flowers reddish, a little longer than the involucre. Corolla $\frac{1}{6}$ in. long, with a funnel-shaped limb as long as the cylindrical tube. Pappus pure white, as long as the corolla.—Ambatovory in Imerina, *Baron* 5121! Near *S. Boutoni* of Rodriguez.

SENECIO LAPSANÆFOLIUS, n. sp.

Perennis, caulibus albido-incanis, foliis petiolatis cordato-oblongis profunde irregulariter dentatis facie tenuiter dorso dense persistenter albido-incanis, capitulis radiatis parce corymboso-paniculatis, involucro campanulato tenuiter albo-incano.

An erect perennial herb, with a slender erect stem, thinly coated with whitish tomentum. Leaves not auricled at the base of the petiole, which is about an inch long; blade 2–3 in. long, deltoid at the apex, thin in texture, obscurely canescent above, densely beneath, furnished on the margin with several large irregular deltoid teeth. Capitula in a panicle composed of few dense corymbs. Flowers seen only in an immature state.—*Baron* 3394! Near *S. adenodontus*, DC.

SENECIO GOSSYPINUS, n. sp.

Perennis, caulibus albo-incanis, foliis petiolatis basi auriculatis cordato-oblongis crenatis facie tenuiter dorso dense persistenter albo-incanis, capitulis radiatis parce corymboso-paniculatis, involucro campanulato dense albo-incano.

An erect perennial herb, with branched leafy stems. Leaves with a pair of large persistent auricles clasping the stem at the base of the petiole, which is about an inch long; blade 2–3 in. long, firm in texture, obtuse, obscurely tomentose above, densely coated with white tomentum beneath. Head middle-sized, arranged in a sparse panicle with corymbose branches. Involucre campanulate, $\frac{1}{3}$ in. diam., matted with white tomentum. Ligules yellow, as long as the involucre. Achene cylindrical, glabrous. Corolla of the disk-flowers $\frac{1}{6}$ in. long. Pappus white, fragile.—North Antsihanaka, *Baron* 5482! Near *S. adenodontus*, DC.

BRACHYACHENIUM, genus novum Compositarum (tribus *Mutisieæ*).

Capitula homogama discoidea, floribus omnibus fertilibus discoideis tubulosis. Involucrum oblongum, bracteis multiseriatis rigidis adpressis muticis, exterioribus sensim brevioribus, extimis ovatis, intimis lanceolatis. Receptaculum parvum, nudum. Corollæ tubus cylindricus, segmentis linearibus apice falcatis tubo longioribus. Antheræ lineares, magnæ, auriculis basalibus longe caudatis. Styli rami brevissimi. Achenia brevia, turbinata, dense villosa. Pappus multiserialis, persistens, setis stramineis inæquilongis ciliatis.

Allied to *Dicoma*, Cass.

M. Smith del.   C. Fitch lith.

BRACHYACHENIUM INCANUM, *Baker*.

Brachyachenium incanum, *Baker*. Species sola. (Pl. LIII.)

A much-branched shrub, with slender woody branches coated, like the leaves on both sides, with persistent white tomentum. Leaves alternate, shortly petioled, rigidly coriaceous, entire, under an inch long, obovate-oblong, narrowed gradually from the middle to the base, tipped with a small mucro. Capitula solitary at the tip of the branchlets, subtended by one or two small reduced leaves. Involucre above $\frac{1}{2}$ in. long; bracts very rigid, the inner naked, the outer slightly cottony. Corolla $\frac{1}{3}$ in. long. Pappus as long as the corolla. Anthers $\frac{1}{4}$ in. long; auricles as long as the filament.—West Madagascar, on a sterile plain near Trabonjy, *Hildebrandt* 3446! *Baron*, next 5367!

Philippia myriadenia, n. sp.

Ramosissima, ramulis albo-incanis, foliis quadrifariis parvis linearibus rigidis setis brevibus glandulosis densis præditis, floribus ad ramorum apices paucis dense glomeratis, sepalis ovatis glanduloso-hispidis, corolla campanulata lobis obtusis erectis, antheris liberis exsertis filamentis connatis, stylo brevi.

An erect shrub, with copious ascending slender white branchlets. Leaves crowded, ascending, $\frac{1}{8}$ in. long, densely beset with rigid gland-tipped bristles. Corolla $\frac{1}{8}$ in. long. Sepals densely glandular like the leaves, more than half as long as the corolla. Style distinctly exserted from the corolla.—Imerina, *Baron* 5543!

Philippia leucoclada, n. sp.

Ramosissima, ramulis albo-incanis, foliis quadrifariis parvis linearibus rigidis glabris, floribus ad ramorum apices confertis, sepalis crassis ovatis glabris, corolla campanulata profunde lobata, antheris coalitis breviter exsertis, stylo brevi.

A much-branched erect shrub, with slender ascending branchlets, coated with white tomentum. Leaves glossy, glabrous, very deciduous, $\frac{1}{8}$–$\frac{1}{6}$ in. long. Corolla $\frac{1}{12}$ in. long and broad. Sepals more than half as long as the corolla. Stigma large, peltate, only just overtopping the anthers.—North Antsihanaka, *Baron* 5485! Near *P. senescens*.

Philippia senescens, n. sp.

Ramosissima, ramulis tenuiter albo-incanis, foliis quadrifariis parvis linearibus rigidis glabris imbricatis, floribus sparsis, sepalis crassis ovatis glabris, corolla campanulata segmentis oblongis, antheris inclusis coalitis, stigmate exserto.

A small erect shrub, with very numerous ascending slender branchlets. Leaves deciduous, glossy, $\frac{1}{12}$–$\frac{1}{8}$ in. long, the edges recurved so as to show only the white midrib. Flowers few together at the tips of the branchlets; sepals half as long as the corolla. Corolla $\frac{1}{12}$ in. long, deeply cleft. Stigma only just exserted beyond the tip of the corolla-segments.—North Ankay, *Baron* 5538! 5541! Near *P. cryptoclada*, Baker.

PHILIPPIA PILOSA, n. sp.

P. caulibus dense cæspitosis erectis dense pilosis, foliis parvis quadrifariis lineari-oblongis ascendentibus dense pilosis, floribus paucis in glomerulos cernuos dispositis, sepalis lineari-oblongis pilosis corolla campanulata æquilongis, antheris liberis vix exsertis, stigmate exserto.

Stems densely clustered, erect, little branched, about a foot long, densely clothed, as are the leaves, with ascending whitish rather bristly hairs. Leaves about $\frac{1}{6}$ in. long, the whorls not imbricated except towards the tip of the branchlets. Corolla $\frac{1}{12}$ in. long and broad, hidden by the hispid sepals; segments obtuse, erect.—*Baron* 1901! Ankaratra mountain, 5186!

PHILIPPIA ADENOPHYLLA, n. sp.

Ramosissima, ramulis dense hispidis, foliis quadrifariis minutis lineari-oblongis dense glanduloso-hispidis, floribus glomeratis, sepalis ovatis hispido-ciliatis, corolla campanulata profunde lobata, antheris liberis exsertis, stigmate conspicue exserto.

A much-branched shrub, with rather stout branchlets, densely clothed with whitish spreading unequal bristly hairs. Leaves about $\frac{1}{12}$ in. long, rigid, erecto-patent, ciliated with gland-tipped bristles. Flowers in dense clusters at the tips of the branchlets. Corolla broadly campanulate, $\frac{1}{12}$ in. long and broad. Style much exserted beyond the corolla; stigma large, peltate.—Imerina, *Baron* 5542! Near *P. trichoclada*, Baker.

AGAURIA NUMMULARIFOLIA, n. sp.

Fruticosa, ramosissima, ramulis glanduloso-hispidis, foliis brevissime petiolatis orbicularibus rigide coriaceis facie viridibus dorso glaucis, racemis laxis elongatis, pedunculo pedicellisque glanduloso-hispidis, calycis segmentis ovatis obtusis, corollæ tubo urceolato segmentis brevibus.

A much-branched shrub, with slender woody minutely hispid branchlets. Leaves about $\frac{1}{2}$ in. long, naked on both sides, bright green above, very glaucous beneath. Racemes about 2 in. long; pedicels $\frac{1}{6}$–$\frac{1}{4}$ in. Calyx $\frac{1}{6}$ in. diam.; segments reddish, about as long as the tube. Corolla bright red, $\frac{1}{3}$–$\frac{1}{2}$ in. long. Stamens half as long as the corolla. Ovary globose; style $\frac{1}{4}$ in. long.—North-east Central Madagascar, *Baron* 5470! 5902!

Oncostemum nervosum, n. sp.

Fruticosum, ramulis gracilibus apice pubescentibus, foliis breviter petiolatis oblongo-lanceolatis acutis rigide coriaceis utrinque glabris venulis exsculptis, floribus parce umbellatis pedunculis pedicellisque elongatis, calycis segmentis lanceolatis, corollæ segmentis ovatis tubo longioribus, antheris magnis ex filamentorum tubo campanulato exsertis.

An erect shrub, with slender branchlets. Leaves 3–4 in. long, about an inch broad at the middle, narrowed gradually to both ends, rigid, with all the veinlets raised. Peduncles about an inch and pedicels $\frac{1}{3}$–$\frac{1}{2}$ in. long, very slender, erect, the latter glandulose. Calyx $\frac{1}{12}$ in. long. Corolla $\frac{1}{6}$ in. long; tube funnel-shaped. Anthers half as long as the corolla. Fruit not seen.—North Antsihanaka, *Baron* 5492!

Diospyros lenticellata, n. sp.

Arborea, ramulis sursum pubescentibus valde lenticellatis, foliis brevissime petiolatis magnis oblongo-lanceolatis acutis basi cordatis rigide coriaceis utrinque viridibus glabris, floribus fœmineis in racemos breves axillares dispositis, calycis tubo campanulato piloso dentibus parvis deltoideis, fructu oblongo pubescente stylo brevi piloso coronato.

A tree, with terete rugose branchlets, pubescent only towards the tip. Leaves rigidly coriaceous, 6–8 in. long, $1\frac{1}{2}$–2 in. broad. Male flowers unknown. Female flowers in short lax lateral racemes. Calyx of mature fruit $\frac{1}{3}$ in. diam., with 5 small deltoid teeth. Fruit about the size and shape of an acorn.—*Baron*, next 5839!

Mr. Baron has gathered this time (5044) the endemic *Tetraclis clusiæflora*, figured and described in Hiern's 'Monograph of Ebenaceæ,' tab. 11, from specimens gathered by Richard and Pervillé.

Sideroxylon microlobum, n. sp.

S. ramulis glabris, foliis obovato-cuneatis obtusis rigide coriaceis breviter petiolatis utrinque viridibus glabris, floribus axillaribus cernuis pedicellatis, calycis tubo brevi campanulato segmentis 5 ovatis rigidis valde imbricatis, corollæ tubo cylindrico fauce piloso, segmentis brevibus, filamentis brevibus staminodiis magnis alternantibus.

A shrub, with glabrous branchlets and leaves. Leaves crowded, $1\frac{1}{2}$–2 in. long, narrowed gradually from the middle to the base, rigid in texture, with the veins beneath inconspicuous. Flowers few in a cluster; pedicels $\frac{1}{6}$ in. long. Calyx $\frac{1}{6}$ in. long; segments brown, rigid, two outside firmer than the inner. Corolla a little longer than the calyx. Anthers large, lanceolate, acute, alternating with 5 lanceolate acuminate staminodia. Ovary ovoid, hairy, with a long subulate style and capitate stigma. Fruit not seen.—*Baron*, next 5371! Adds the genus, which is abundantly represented in Mauritius, to the Madagascar flora.

CHIRONIA LANCIFOLIA, n. sp.

Perennis, caulibus gracilibus erectis, foliis sessilibus lanceolatis acutis rigidulis margine revolutis, floribus terminalibus parce corymbosis, calycis segmentis oblongis acutis valde imbricatis, corollæ tubo calyce sesquilongiore, segmentis obovatis tubo brevioribus, antheris ex tubo exsertis.

A perennial herb, with short slender erect stems. Leaves about an inch long, arranged in lax decussate pairs, ascending, firm in texture, 1-nerved, glabrous, with very revolute edges. Calyx $\frac{1}{6}$ in. long; sepals rigid, with a broad white margin. Corolla yellow; tube funnel-shaped at the apex; segments $\frac{1}{6}$ in. long. Style reaching to the tip of the corolla-segments; stigma capitate. Fruit unknown.—Antsihanaka, *Baron* 5480! Habit of the Cape *C. baccifera*, L.

NUXIA BRACHYSCYPHA, n. sp.

Fruticosa, ramulis pubescentibus, foliis breviter petiolatis oblanceolato-oblongis facie glabris dorso ad venas exsculptas obscure pubescentibus, floribus in cymas glomeratas axillares dichotomiter furcatas pedunculatas dispositis, calycis tubo brevi campanulato segmentis ovatis, corollæ tubo brevi segmentis oblongis, staminibus infra faucem insertis filamentis brevibus, ovario ovoideo stylo brevi.

A much-branched shrub, with slender branchlets. Leaves in distant opposite pairs, ascending; blade 2–3 in. long, under an inch broad, subacute, firm in texture, green on both surfaces. Cymes produced from the axils of many of the leaves, once or twice forked dichotomously, the flowers aggregated in small dense clusters. Calyx $\frac{1}{16}$ in. diam. Corolla-limb $\frac{1}{12}$ in. diam. Anthers globose, with divaricate lobes; filaments about as long as the anthers. Fruit not seen.—Ambatovory in Imerina, *Baron* 5127!

RAUWOLFIA TRICHOPHYLLA, n. sp.

R. ramis sursum pubescentibus, foliis petiolatis obovato-oblongis cuspidatis utrinque viridibus pubescentibus venulis faciei inferioris perspicuis, floribus corymboso-paniculatis, pedicellis brevibus, calyce parvo campanulato segmentis obtusis imbricatis, corollæ tubo elongato cylindrico, segmentis parvis cuneatis.

Stems stout, green, terete, pubescent only at the tip. Leaves 5–6 in. long, 2–$2\frac{1}{2}$ in. broad, deltoid at the base, thin but rather firm in texture, bright green above, paler beneath, with conspicuous arcuate parallel main veins. Panicles peduncled, many times dichotomously forked. Calyx $\frac{1}{12}$ in. diam. Corolla greenish; tube about $\frac{1}{3}$ in. long, gradually dilated upwards; expanded limb $\frac{1}{6}$ in. diam. Fruit not seen.—*Baron*, next 5843!

RAUWOLFIA CELASTRIFOLIA, n. sp.

Glabra, ramulis sursum angulatis, foliis petiolatis oblongis obtusis basi deltoideis, floribus minutis copiose corymboso-paniculatis, paniculæ ramis pubescentibus, calyce campanulato segmentis ovatis late imbricatis, corollæ tubo brevi, segmentis obovato-cuneatis.

An erect shrub or small tree. Leaves in distant opposite pairs; blade 2–3 in. long, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces, the main veins inconspicuous beneath. Flowers in dense level-topped terminal panicles. Calyx $\frac{1}{12}$ in. diam. Corolla-tube not more than twice as long as the calyx; expanded limb scarcely $\frac{1}{8}$ in. diam. Fruit not seen.—Province of Androna, *Baron* 5451!

MASCARENHAISIA ROSEA, n. sp.

Sarmentosa, glabra, foliis breviter petiolatis oblongis vel oblongo-lanceolatis rigide coriaceis utrinque nitidulis venis præter costam immersis occultis, floribus solitariis vel geminis, calycis segmentis lanceolatis, corollæ tubo supra basin dilatato, segmentis oblongis roseis tubo brevioribus extus puberulis.

A shrubby climber, with glabrous stems and leaves. Leaves $1\frac{1}{2}$–2 in. long, $\frac{1}{2}$–$\frac{3}{4}$ in. broad at the middle, firm in texture, green on both surfaces. Calyx-segments $\frac{1}{6}$ in. long. Corolla-tube $\frac{1}{2}$–$\frac{5}{8}$ in. long, cylindrical at the base, urceolate in the upper three-quarters. Corolla-limb $1\frac{1}{2}$ in. diam., pale red. Anthers inserted at the base of the dilated portion of the corolla-tube. Fruit not seen.—*Baron*, next 5841! Also *Hildebrandt* 3299! from the island of Nossi-bé.

MASCARENHAISIA MICRANTHA, n. sp.

Glabra, foliis breviter petiolatis oblanceolato-oblongis obtusis rigide coriaceis, floribus axillaribus umbellatis, calycis segmentis oblongis obtusis, corollæ tubo brevi sursum campanulato, segmentis ovatis, folliculis cylindricis erecto-patentibus.

A much-branched shrub, with glabrous branches and leaves.

Leaves about 2 in. long, an inch broad, firm in texture, green and glabrous on both surfaces, with fine arcuate main veins beneath. Flowers 2–8 in sessile or shortly-peduncled axillary umbels. Calyx $\frac{1}{12}$ in. long. Corolla-tube twice as long as the calyx, cylindrical in the lower half; limb $\frac{1}{4}$ in. diam., pubescent on the outside. Follicles firm in texture, 3–4 in. long, distinctly striated vertically.—North-west Madagascar, *Baron* 5747!

BREWERIA DENSIFLORA, n. sp.

Fruticosa, sarmentosa, ramulis gracilibus apice pubescentibus, foliis breviter petiolatis oblongis obtusis utrinque glabris, floribus dense copiose corymboso-paniculatis, pedicellis calyce longioribus, sepalis rigidis oblongis dorso convexis, corollæ tubo basi cylindrico sursum patulo extus piloso, sepalis orbicularibus, filamentis infra medium tubi insertis.

Stems very slender, terete. Leaves $1\frac{1}{2}$–2 in. long, obtuse, thin in texture, green and glabrous on both sides. Flowers in a dense terminal panicle, with a pubescent axis and short corymbose branches; pedicels $\frac{1}{6}$–$\frac{1}{4}$ in. long. Calyx $\frac{1}{6}$ in. long; sepals blackish, rigid, glabrous, much imbricated. Corolla $\frac{1}{2}$ in. long; tube cylindrical up to the top of the calyx, then spreading. Filaments inserted at the top of the cylindrical part of the tube. Style deeply bifid; stigmas capitate.—*Baron*, next 5869!

MOSTUEA PERVILLEANA, *Baill. in Journ. Linn. Soc. Par.* 246?

Fruticosa, stipulis confertis persistentibus, foliis breviter petiolatis ovatis integris pubescentibus, cymis terminalibus paucifloris, calyce piloso tubo brevissimo segmentis linearibus, corollæ tubo anguste infundibulari, segmentis brevibus.

A shrub, with slender terete branchlets, with stipules crowded towards the tips, as in *Erythroxylon*. Leaves 1–$1\frac{1}{2}$ in. long, membranous, pubescent on both surfaces. Flowers 3–5 together in peduncled cymes at the end of the branchlets. Calyx $\frac{1}{12}$ in. long, cleft nearly to the base. Corolla yellow, $\frac{1}{2}$ in. long, with a narrowly funnel-shaped tube and small orbicular spreading segments. Stamens 4, short. Style 4-cuspidate at the tip.—North-west Central Madagascar, *Baron* 5454! Dr. Baillon's plant (Ambongo, *Pervillé* 641) is known only in fruit.

COLEA (§ EUCOLEA) RACEMOSA, n. sp.

C. foliis verisimiliter verticillatis, foliolis circiter 15 oblongis brevissime petiolulatis dorso pubescentibus, cymis racemosis paucifloris longe pedunculatis,

latis, calyce pubescente cylindrico-campanulato ore truncato, corollæ parvæ tubo anguste infundibulari segmentis orbicularibus, fructu ignoto.

Leaf-rhachis about a foot long including the 2–2½-in. petiole; leaflets moderately firm in texture, persistently pubescent with raised veins beneath, all obtuse or subobtuse, the upper 2–3 in. long, nearly an inch broad. Peduncle very slender, ½ ft. long; flowers few, forming a lax raceme. Calyx $\frac{1}{6}$ in. long. Corolla under an inch long; expanded limb ¼–⅓ in. diam.—East Androna, *Baron* 5603! Near the Seychelles *C. pedunculata*, Baker.

COLEA (§ EUCOLEA) MACROPHYLLA, n. sp.

C. foliis maximis glabris (verosimiliter verticillatis), foliolis circiter 13 oblongis acutis brevissime petiolulatis, cymis lateralibus breviter pedunculatis, calyce tubo campanulato pubescente ore truncato, corollæ parvæ tubo anguste infundibulari segmentis orbicularibus, fructu elongato lineari compresso.

Leaves 2 ft. long including the 4–5-in. petiole; leaflets moderately firm in texture, green and glabrous on both sides, the upper 9–10 in. long, 3 in. broad, the lower much shorter. Cymes corymbose, lateral, shortly peduncled; pedicels $\frac{1}{12}$–⅛ in., very slender. Calyx $\frac{1}{12}$ in. long. Corolla under an inch long, dilated just above the calyx; limb ¼–⅓ in. diam. Immature fruit 8–9 in. long.—*Baron*, next 5880! Near *C. cauliflora*, D.C.

COLEA (§ EUCOLEA) CONCINNA, n. sp.

C. ramulis gracilibus apice pubescentibus, foliis verticillatis foliolis circiter 13 sessilibus oblongo-lanceolatis, cymis axillaribus paucifloris breviter pedunculatis, calyce pubescente dentibus lanceolatis, corollæ parvæ tubo anguste infundibulari segmentis orbicularibus, fructu ignoto.

A shrub, with woody long straight slender branchlets. Leaf-rhachis 5–6 in. long including the short petiole. Leaflets moderately firm in texture, green and glabrous on both surfaces, the upper acuminate, 1½–2 in. long, about ½ in. broad, the lower small, ovate. Cymes about an inch long; peduncles and pedicels softly pubescent. Calyx $\frac{1}{6}$ in. long. Corolla-tube ¾ in. long; expanded limb ½ in. diam.—North Antsihanaka, *Baron* 5491! 5912!

COLEA (§ PSEUDOCOLEA) MACRANTHA, n. sp.

C. foliis oppositis, foliolis 11–13 lanceolatis membranaceis glabris, cymis lateralibus vel terminalibus sessilibus paucifloris, pedicellis brevibus, calyce magno campanulato dentibus magnis ovatis, corolla magna tubo late curvato segmentis orbicularibus, fructu ignoto.

A shrub, with slender terete woody branchlets. Leaf-rhachis 9–12 in. long including the 1½-in. petiole; leaflets very thin, green and glabrous on both sides, very acuminate, the largest 4–5 in. long, an inch broad. Flowers few together in sessile cymes from the top or side of the woody branchlets; pedicels $\frac{1}{4}$–$\frac{1}{2}$ in., articulated at the apex. Calyx an inch long. Corolla 3 in. long, with the throat of the tube an inch and the expanded limb 2 in. diam. Anthers 2-celled; cells not opposite. Style reaching the throat of the corolla-tube.—North-west Madagascar, *Baron* 5811!

COLEA (§ PSEUDOCOLEA) LONGEPETIOLATA, n. sp.

C. ramulis glabris, foliis oppositis longe petiolatis, foliolis circiter 9 oblongis acuminatis glabris longe petiolulatis, cymis laxis terminalibus subsessilibus, calyce subcylindrico dentibus parvis ovatis, corollæ tubo elongato cylindrico, fructu cylindrico dehiscente endocarpio solubili, seminibus late alatis.

A tree, glabrous in all its parts, with slender rather flattened woody branchlets. Leaf-rhachis above a foot long including the 2–3-in. petiole; leaflets 4–5 in. long, with a $\frac{1}{2}$–$\frac{3}{4}$-in. petiolule. Flowers in a very lax terminal cyme. Calyx $\frac{1}{2}$–$\frac{5}{8}$ in. Tube of the corolla an inch longer than the calyx; spreading limb an inch in diameter. Capsule cylindrical, 3–4 in. long, $\frac{1}{2}$ in. diam., splitting into two valves. Seeds with a quadrate membranous wing half an inch broad.—North-west Madagascar, *Baron* 5322! Habit of *C. Telfairiæ*, with a very different corolla. Native name, *Mangarahara*.

THUNBERGIA DEFLEXIFLORA, n. sp.

Volubilis, fruticosa, foliis petiolatis oblongis acutis glabris rigide coriaceis, floribus laxe racemosis deflexis, pedicellis elongatis cum bracteis magnis oblongis connatis persistenter aureo-incanis, calyce truncato brevissimo, corollæ tubo elongato curvato dense piloso, segmentis brevibus.

A climbing shrub, with woody terete glabrous stems. Leaves simple, entire, 3–4 in. long by half as broad. Racemes lateral, peduncled, 2–3 in. long; pedicels $\frac{1}{2}$–$\frac{3}{4}$ in. long, sharply deflexed; connate golden-yellow bracts $\frac{3}{4}$ in. long. Corolla protruded $\frac{1}{4}$ in. beyond the bracts, densely pilose. Stamens inserted halfway up the corolla-tube. Ovary densely pilose; style exserted beyond the tip of the upper lip of the corolla.—*Baron*, next 5865! Near *T. chrysochlamys*, Baker.

MIMULOPSIS GLANDULOSA, n. sp.

M. ramulis gracilibus glabris, foliis longe petiolatis cordato-ovatis acutis membranaceis, floribus in paniculam laxissimam terminalem dispositis, pedicellis pedunculisque glanduloso-pubescentibus, sepalis lineari-subulatis, corollæ tubo infundibulari segmentis orbicularibus tubo brevioribus.

A shrub, with very slender branchlets. Petiole $\frac{1}{2}$–$\frac{3}{4}$ in.; blade 2–3 in. long. Panicle 6–9 in. long, with few-flowered ascending branches, long slender glandular-pubescent pedicels and lanceolate bracts. Calyx $\frac{1}{2}$ in. long, cleft nearly to the base. Corolla bright yellow, $\frac{3}{4}$ in. long. Stamens shorter than the corolla-tube; two larger anthers 1-spurred at the base.—Forests of East Imerina, *Baron* 5307!

BARLERIA VINCÆFOLIA, n. sp.

Fruticosa, inermis, ramulis apice strigosis, foliis petiolatis oblongis acutis glabris subcoriaceis, floribus paucis ad ramorum apices confertis, calycis segmentis 2 magnis oblongis acutis 3 parvis linearibus, corollæ tubo elongato anguste infundibulari segmentis orbicularibus, staminibus perfectis ad tubum productis.

A shrub, with slender woody branchlets. Leaves shortly petioled, $1\frac{1}{2}$–2 in. long, turning blackish when dried. Flowers solitary or few together at the end of the branchlets. Larger calyx-segments an inch long. Corolla-tube $1\frac{1}{4}$ in. long, $\frac{1}{6}$ in. diam. at the throat; segments $\frac{1}{3}$ in. long. Perfect stamens inserted low down in the corolla-tube, reaching to its throat.—East Androna, *Baron* 5552!

JUSTICIA (§ ANIOSTACHYA) SPIGELIOIDES, n. sp.

Fruticosa, glabra, foliis petiolatis oblongis acutis membranaceis, floribus parvis in cymas densas scorpioideas umbellatas breviter pedunculatas dispositis, calycis tubo brevissimo, segmentis lanceolatis, fructu parvo oblongo acuto.

A shrub, with slender terete glabrous branchlets. Leaves about 3 in. long by an inch broad. Cymes about six in an umbel from the axils of the leaves. Calyx $\frac{1}{6}$ in. long. Corolla unknown. Capsule scarcely protruded from the calyx.—*Baron* 2317! 5021!

BRACHYSTEPHANUS CUSPIDATUS, n. sp.

Fruticosus, foliis petiolatis ovatis acuminatis, floribus dense spicatis, bracteis magnis foliaceis ovatis cuspidatis, calycis segmentis lanceolatis, corollæ tubo elongato cylindrico limbo bilabiato.

A shrub, with glabrous terete woody branchlets. Petiole an inch long; blade 2–3 in. long, entire, very acuminate, moderately firm in texture, green and glabrous on both surfaces. Spikes $1\frac{1}{2}$–2 in. long; bracts an inch long. Calyx sessile, $\frac{1}{6}$ in. long, cleft nearly to the base. Corolla with a cylindrical pubescent tube an inch long and a limb $\frac{1}{2}$ in. long. Anthers and stigma just exserted from the corolla-tube.—Province of Befandriana, *Baron* 5695!

HYPOESTES NUMMULARIFOLIA, n. sp.

Herbacea, perennis, ramulis gracilibus teretibus glabris, foliis longe petiolatis membranaceis ovatis acutis, floribus spicato-paniculatis, involucri uniflori bracteis pilosis lanceolatis, calyce minuto, corollæ tubo cylindrico involucro longiore.

A perennial herb, with very slender terete branchlets. Leaves green, spotted with white, membranous, obscurely pubescent; larger with a petiole above an inch and a blade 2 in. long; smaller roundish. Inflorescence a terminal panicle of a few lax ascending spikes, bracteated at the base by large leaves. Involucre $\frac{5}{8}$ in. long. Young corolla pilose.—South Antsihanaka, *Baron* 5535! Near *H. lasiostegia*, Nees.

HARPAGOPHYTUM PELTATUM, n. sp.

Fruticosum, pubescens, petiolo longissimo, foliis peltatis cordato-orbicularibus breviter palmatifidis membranaceis, floribus ignotis, fructu ovoideo 6-alato apice producto late emarginato, alis setis magnis capitatis armatis.

A shrub, with slender woody branchlets. Petiole reaching a length of 6–8 inches; blade 6 in. long and broad, membranous, densely pubescent, with the petiole inserted a quarter of the distance from the basal sinus to the apex. Capsule 2 in. diam., including the capitate processes with which the six narrow wings are armed, produced at the apex into a broad emarginate beak.—North-west Madagascar, *Baron* 5328! Allied to *H. Grandidieri*, Baill., of which Mr. Baron has now collected, in the province of Androna, fine specimens (No. 5690) in flower and fruit.

VITEX TELORAVINA, n. sp.

Fruticosa, erecta, ramulis dense tomentosis, petiolis elongatis, foliis pinnatim trifoliolatis foliolis obovatis obtusis subcoriaceis facie rugulosis obscure pubescentibus dorso dense pubescentibus, cymis fructiferis laxis multifloris pedicellis pubescentibus, calyce fructifero turbinato adpresso segmentis latis parvis, fructu calyce æquilongo.

An erect shrub, with short branchlets, densely clothed with short pale brown tomentum. Petiole 2–3 in. long; leaflets 2–3 in. long, minutely bullate and dull green on the upper surface, densely clothed with brown pubescence beneath. Cymes lax, axillary. Fruit-calyx tightly clasping the fruit, $\frac{1}{3}$ in. long; lobes short, broad. Fruit brown, glossy, subglobose, $\frac{1}{4}$ in. diam.—

North-west Central Madagascar, *Baron* 5384! Received long ago without flowers from Dr. Parker, under the native name "*Teloravina*."

VITEX MICROCALYX, n. sp.

Fruticosa, erecta, ramulis dense pubescentibus, foliis simplicibus breviter petiolatis cordato-ovatis obtusis coriaceis facie obscure dorso dense albido-pubescentibus venulis exsculptis, cymis terminalibus paucifloris, calyce fructifero magno segmentis semiorbicularibus patulis, fructu depresso-globoso.

An erect shrub, with short branchlets, densely clothed with pale drab pubescence. Leaves 2–3 in. long, very thick and coriaceous, with all the veins and veinlets beneath raised and clothed with whitish pubescence. Fruit-calyx coriaceous, $\frac{3}{4}$ in. long; limb spreading, $1\frac{1}{4}$ in. diam.; lobes half-orbicular. Fruit $\frac{1}{4}$ in. diam.—*Baron*, next 5390!

VITEX CESTROIDES, n. sp.

Erecta, fruticosa, ramulis glabris, foliis simplicibus petiolatis lanceolatis acutis subcoriaceis glabris, cymis sessilibus axillaribus multifloris, pedicellis elongatis, calyce parvo tubo late infundibulari dentibus deltoideis, fructu parvo oblongo.

An erect shrub, with slender terete branchlets. Leaves 3–4 in. long, under an inch broad, tapering gradually from the middle to both ends. Pedicels slender, $\frac{1}{4}$–$\frac{1}{3}$ in. long; bracts lanceolate, minute. Calyx $\frac{1}{6}$ in. long, clothed with adpressed drab bristly hairs; teeth cuspidate. Corolla not seen. Drupe glossy, twice as long as the calyx.—East Androna, *Baron* 5608!

PLECTRANTHUS ALBIDUS, n. sp.

Fruticosus, ramulis albo-incanis, foliis parvis oblongis obtusis facie viridibus dorso albo-incanis, floribus laxe paniculatis, pedicellis elongatis, calycis tubo campanulato costato, corollæ labio superiore minimo, inferiore elongato lobis lateralibus parvis deltoideis terminali magno oblongo, staminibus labio inferiore æquilongis.

A shrub, with woody main branches and slender branchlets, clothed like the underside of the leaves with white tomentum. Leaves shortly petioled, 1–$1\frac{1}{2}$ in. long, moderately firm in texture, dull green above, white beneath. Flowers in lax terminal panicles, with cymose branches; pedicels $\frac{1}{12}$–$\frac{1}{6}$ in. long. Calyx under $\frac{1}{8}$ in. long; teeth ovate, much shorter than the tube. Corolla $\frac{1}{2}$ in. long.—Valalafotsy, *Baron* 5230!

Stachys (§ Stachyotypus) trichophylla, n. sp.

Perennis, ubique pubescens, foliis parvis remotis cordatis ovato-lanceolatis crenatis, florum verticillis inferioribus remotis conspicue bracteatis, calyce dense piloso dentibus deltoideo-cuspidatis, corolla rubra calyce triplo longiore.

An erect perennial, with slender square pubescent stems. Leaves 1–1½ in. long, densely pubescent on both surfaces, dull green above, whitish beneath. Verticils forming a terminal raceme, the lowest remote from the rest and shorter than its subtending bract-leaves. Calyx narrowly funnel-shaped, densely pubescent, $\frac{1}{6}$ in. long. Corolla red, more than twice as long as the calyx; lower lip 3-lobed, longer than the upper. Stamens just reaching the tip of the upper lip.—Imerina, *Baron* 5116! Allied to the European *S. palustris*, Linn.

Deeringia holostachya, n. sp.

Fruticosa, sarmentosa, ramulis obscure pubescentibus, foliis petiolatis oblongis acutis, floribus in spicam simplicem elongatam dispositis, bracteis ovatis, perianthii segmentis oblongis sordide viridibus albido marginatis, staminibus exsertis, ovario globoso, stylis tribus ad basin liberis.

A climbing shrub, with slender woody terete branchlets. Leaves distant, alternate, 1–2 in. long, entire, narrowed gradually to a point, moderately firm in texture, nearly glabrous. Spikes terminal, cylindrical, 6–8 in. long, lax in the lower, dense in the upper half; bracts ovate, shorter than the flowers, scariose beyond its green keel. Perianth $\frac{1}{12}$ in. long. Styles nearly as long as the ovary. Fruit not seen.—*Baron*, next 5858! Near *D. celosioides*, R. Br.

Peperomia brachytricha, n. sp.

P. caulibus gracilibus, ramosis pubescentibus, foliis parvis alternis obovatis obtusis breviter petiolatis pubescentibus venis immersis occultis, spicis copiosis cylindricis laxifloris, floribus sessilibus in rhachidi immersis, fructu subgloboso stigmate sessili.

Stems slender, herbaceous, much branched, half a foot long. Leaves $\frac{1}{3}$–$\frac{1}{2}$ in. long, cuneate at the base, permanently shortly pubescent on both sides, so thick in texture that the veins are hidden. Spikes 1–2 in. long, with fruits immersed in the thick green glabrous axis. Stigma sessile, oblique. *Baron* 5172! Allied to *P. portulacoides* and *P. tanalensis*.

Lasiosiphon Baroni, n. sp.

L. ramulis dense sericeis, foliis breviter petiolatis oblanceolatis basi rotundatis, floribus dense capitatis, bracteis sericeis ovato-lanceolatis, perianthii tubo cylindrico sericeo, segmentis oblongis, staminibus biseriatis, inferioribus ad tubi medium insertis, squamis faucialibus ligulatis.

A shrub, with slender branchlets, densely clothed with whitish silky pubescence. Leaves alternate, nearly sessile, 2–3 in. long, obtuse, thinly silky beneath. Heads dense, peduncled, axillary, about an inch in diameter; bracts $\frac{1}{2}$ in. long. Perianth-tube $\frac{1}{3}$ in. long; segments $\frac{1}{8}$ in. long. Filaments very short; upper 5 anthers only exserted from the tube.—North-west Madagascar, *Baron* 5770! Near *L. Bojerianus*, DC.

LASIOSIPHON ? RHAMNIFOLIUS, n. sp.

Fruticosa, ramulis glabris, foliis oblongis obtusis brevissime petiolatis glabris basi cuneatis, floribus dense capitatis, bracteis parvis oblongis, perianthii dense sericei tubo cylindrico segmentis lingulatis, squamis faucialibus minutis, antheris biseriatis filamentis elongatis, antheris minutis globosis.

A shrub, with slender terete branchlets. Leaves $1\frac{1}{2}$ in. long, moderately firm in texture, green above, glaucous beneath, with arching raised main veins. Flowers in dense peduncled heads from the axils of the leaves; bracts dark brown, $\frac{1}{4}$ in. long. Perianth densely white-silky, $\frac{1}{2}$ in. long; segments 5, $\frac{1}{3}$ as long as the tube, with a pair of minute scales at the base. Filaments $\frac{1}{3}$ in. long, very slender, all inserted low down in the tube. Fruit not seen.—Vonizongo district, *Baron* 5115! Very different from the other Lasiosiphons in its stamens, and may prove a new genus.

VISCUM VACCINIIFOLIUM, n. sp.

Foliosum, ramosissimum, glabrum, foliis petiolatis oblongis acutis rigide coriaceis triplinerviis basi cuneatis, floribus 2–4nis axillaribus sessilibus vel brevissime pedunculatis, bracteis ovatis, ovario tuberculato, perianthii segmentis lingulatis ovario 2–3plo brevioribus.

A much-branched shrub, with slender glabrous woody branchlets. Leaves in subdistant opposite pairs, under an inch long, thick, green, indistinctly triplinerved. Flowers in sessile or nearly sessile umbels in the axils of the leaves all down the stem; bracts opposite, ovate, thick, green, spreading horizontally. Ovary in the flowering stage $\frac{1}{12}$ in. long. Perianth greenish yellow.—Forests of East Imerina, *Baron* 5287! Another species allied to *V. triflorum*, DC.

PEDILANTHUS PECTINATUS, n. sp.

P. caulibus crassis carnosis multiangulatis, angulis aculeis deltoideis corneis pectinatis armatis, foliis magnis petiolatis oblanceolatis membranaceis

mucronatis, pedunculis elongatis, capitulis multis confertis, involucro splendide rubro segmentis oblongis, fructu globoso brevi, seminibus brevibus.

Stems green, fleshy, with many acute angles armed with pectinate pale brown spines, above an inch in diameter, spines included. Leaves 6–8 in. long, 2–3 in. broad, thin, green, glabrous, finely veined, narrowed gradually from the middle to the short petiole. Peduncles 5–6 in. long, terminal with the leaves on the fleshy branches; heads twenty or more in a dense cyme. Involucre $\frac{1}{6}$ in. diam.; its bracts bright scarlet. Fruit $\frac{1}{6}$ in. diam., composed of 3 triquetrous cocci.—North-west Madagascar, *Baron* 5461!

EUPHORBIA (§ ANISOPHYLLUM) ANAGALLOIDES, n. sp.

Herbacea, perennis, caulibus gracillimis ramosis, foliis oppositis stipulatis parvis oblongis integris obtusis laxe subtiliter pilosis, capitulis solitariis axillaribus pedunculatis, involucro campanulato appendicibus latis haud cornutis, fructu lævi turbinato.

Stem much-branched, very slender, not more than 2–3 in long. Leaves in subdistant opposite pairs, firm in texture, $\frac{1}{6}$ in. long, obtuse, emarginate, clothed with fine deciduous hairs. Heads solitary from the nodes of the upper half of the stem on peduncles about as long as the leaves. Involucre $\frac{1}{12}$ in. diam.; appendages oblate-oblong. Fruit glabrous, deeply trisulcate, $\frac{1}{12}$ in. diam.—*Baron* 5094! Between *E. prostrata* and *E. trichophylla*.

MACARANGA ALCHORNEIFOLIA, n. sp.

Fruticosa, ramulis teretibus glabris, foliis petiolatis obtusis crenatis glabris triplinerviis, floribus fœmineis in racemas laxas axillares dispositis, fructu globoso glabro triloculari copiose echinato.

A shrub, glabrous in all its parts, with slender terete branchlets. Petiole slender, an inch long; blade 2–3 in. long, moderately firm in texture, green and glabrous on both surfaces, triplinerved, and similar in appearance to that of *Alchornea triplinervia*. Racemes rather longer than the petiole. Fruits $\frac{1}{4}$ in. diam., armed with copious irregular spines.—*Baron*, next 5773!

MACARANGA PLATYPHYLLA, n. sp.

Arborea, ramulis crassis apice ferrugineo-tomentellis, foliis longe petiolatis late ovatis subrepandis subcoriaceis basi subtruncatis leviter cordatis, floribus fœmineis in paniculas laterales dispositis, ramulis pubescentibus,

bracteis orbicularibus fimbriatis, calyce minuto, ovario orbiculari uniloculari pubescente haud echinato.

A small tree, with stout woody branchlets, downy at the leaf-bearing tip. Petiole 3–4 in. long; blade half a foot long and broad, green and obscurely pubescent above, whitish beneath, with raised cross-veins, and the petiole attached a little above its base. Panicles erecto-patent, lateral, about as long as the petioles; bracts $\frac{1}{6}$ in. diam., greenish, pubescent, deciduous. Immature fruit about the size of a pea, crowned by a short curved oblique stigma. –North Androna, *Baron* 5711!

FICUS (§ UROSTIGMA) ASSIMILIS, n. sp.

F. ramulis gracilibus glabris, foliis longe petiolatis ovatis acuminatis utrinque viridibus glabris, stipulis parvis lanceolatis, receptaculis parvis racemosis globosis glabris, pedicellis receptaculo brevioribus, bracteis minutis ovatis.

A shrub, with slender branchlets, glabrous in all its parts. Petiole $1\frac{1}{2}$ in. long.; blade 4–5 in. long, $2–2\frac{1}{2}$ in. broad, rounded at the base, moderately firm in texture, bright green on both surfaces, the arcuate main veins $\frac{1}{4}–\frac{1}{3}$ in. apart, anastomosing just within the margin of the leaf. Receptacles $\frac{1}{4}–\frac{1}{3}$ in. diam., crowded on the leafy branchlets; pedicels $\frac{1}{6}$ in. long.—North-west Madagascar, *Baron* 5821! Nearly allied to *F. infectoria*, Roxb.

FICUS (§ UROSTIGMA) PACHYCLADA, n. sp.

F. ramulis percrassis lignosis glabris, stipulis parvis lanceolatis, foliis petiolatis oblongis acutis rigide coriaceis glabris, receptaculis parvis globosis sessilibus pilosis ad ramulorum apices glomeratis, bracteis magnis ovatis.

Final woody branches $\frac{1}{4}–\frac{1}{3}$ in. diam. Leaves 5–6 in. long $2\frac{1}{2}–3$ in. broad, unequally rounded at the base, the main veins distinct, distant, arcuate. Receptacles numerous, crowded at the tip of short branchlets, sessile, $\frac{1}{3}$ in. diam., clothed with inconspicuous adpressed hairs, and each subtended by three large adpressed bracts.—Ankay, *Baron* 5162! Allied to *F. Baroni* and *F. apodocephala*, Baker.

FICUS OXYSTIPULA, n. sp.

F. ramulis gracilibus glabris, stipulis longis angustis, foliis breviter petiolatis lanceolatis acuminatis glabris, venis tenuibus primariis subpatentibus, receptaculis globosis glabris magnitudine mediocribus longe pedunculatis, bracteis minutis.

A glabrous shrub, with slender flexuose final branchlets. Stipules $\frac{3}{4}$ in. long, narrowed gradually into a very slender point;

petiole $\frac{1}{2}$ in. long; leaves 5–6 in. long, $\frac{3}{4}$–1 in. broad, narrowed gradually to the base and a long point, thin in texture, with inconspicuous veining. Receptacle nearly an inch in diameter. Peduncle as long as the receptacle.—North-west Madagascar, *Baron* 5331!

FICUS GUATTERIÆFOLIA, n. sp.

F. ramulis gracilibus glabris papillosis, foliis magnis breviter petiolatis lineari-oblongis obtusis glabris rigide coriaceis, receptaculis globosis glabris magnitudine mediocribus, bracteis orbicularibus valde imbricatis.

A shrub, with slender woody terete branchlets, glabrous in all its parts. Petiole $\frac{1}{2}$ in. long; blade 8–9 in. long, 2 in. broad, deltoid or rather rounded at the base, green and glabrous on both surfaces, the main veins erecto-patent, $\frac{1}{2}$ in. apart, anastomosing just within the edge of the leaf. Receptacles $\frac{3}{4}$–1 in. diam.; bracts several, orbicular, much imbricated.—North-west Madagascar, *Baron* 5812! Sakalava name, *Tsitinda.*

FICUS STENOCLADA, n. sp.

F. ramulis gracillimis glabris, foliis breviter petiolatis oblongo-lanceolatis utrinque viridibus glabris, stipulis parvis lanceolatis, receptaculis globosis magnitudine mediocribus, pedicellis receptaculo brevioribus, bracteis minutis.

A shrub, with very slender branchlets, glabrous in all its parts. Petiole $\frac{1}{4}$–$\frac{1}{2}$ in. long; blade 4–5 in. long, 1–1$\frac{1}{4}$ in. broad at the middle, acuminate, deltoid at the base, moderately firm in texture, green and glabrous on both surfaces, the main veins $\frac{1}{4}$–$\frac{1}{3}$ in. apart. Receptacles $\frac{3}{4}$ in. diam.; pedicel $\frac{1}{2}$ in. diam.; bracts ovate, obtuse.—North-west Madagascar, *Baron* 5882!

FICUS BROUSSONETIÆFOLIA, n. sp.

F. ramulis scaberrimis, foliis longe petiolatis utrinque viridibus scabris, junioribus lobatis, adultis cordato-ovatis crenatis venulis faciei inferioris omnibus exsculptis, receptaculis globosis scabris magnitudine mediocribus pedicellatis, bracteis minimis.

A large tree, with very scabrous young branchlets. Petiole $\frac{1}{2}$–1$\frac{1}{2}$ in. long; adult leaves 4–5 in. long, deeply cordate, obtuse or minutely cuspidate, green above, whitish below, very scabrous on both surfaces. Receptacles mainly apart from the leaves, $\frac{1}{2}$–$\frac{3}{4}$ in. diam., scabrous; pedicels sometimes $\frac{1}{2}$ in. long.—Androna, *Baron* 5691! Sakalava name, *Ampana.*

PANDANUS (§ SUSSEA) ANGUSTIFOLIUS, n. sp.

P. foliis linearibus angustissimis, pedunculo brevi monocephalo cernuo, capitulis fructiferis parvis globosis, drupis 30–40 ampullæformibus unilocularibus tertio superiore libero, stigmate parvo sessili centrali.

Leaves subcoriaceous, spine-margined, $1\frac{1}{2}$–2 ft. long, $\frac{1}{4}$ in. broad above the dilated base, tapering gradually to the point. Peduncle short, slender. Fruit-head globose, 2–3 in. long and broad, consisting of 30–40 drupes, which are about $\frac{3}{4}$ in. long, half an inch in diameter, with a small sessile reniform stigma.—*Baron* 5269! Allied to *Sussea lagenæformis*, Gaudich. Atlas Bonite, tab. 25. figs. 11–14.

PANDANUS (§ SUSSEA) MYRIOCARPUS, n. sp.

P. foliis elongatis linearibus argute serratis, pedunculo cernuo monocephalo, capitulis fructiferis ovoideis, drupis permultis unilocularibus ad apicem concretis, stigmate parvo sessili centrali.

Leaves 4–5 ft. long, $\frac{3}{4}$–1 in. broad above the base, coriaceous, margined with copious pungent spines. Woody branch $\frac{3}{4}$ in. diam. Fruit-head ovoid, obtuse, 4 in. long, 3 in. diam.; peduncle stout, cernuous, above half a foot long. Drupes very numerous, tetragonal, an inch long, $\frac{1}{4}$–$\frac{1}{3}$ in. diam. Stigma minute, reniform, sessile.—North-west Madagascar, *Baron* 5921! Allied to *Sussea microstigma*, Gaudich. Atlas Bonite, t. 38, but heads single and much larger.

PANDANUS SPARGANIOIDES, n. sp.

P. foliis linearibus rigidulis argute serratis, pedunculo pedali valido erecto, capitulis 6–8 parvis sessilibus globosis vel ovoideis, drupis circiter 50 unilocularibus cuneatis conspicue rostratis triente superiore liberis, stigmate secus rostrum decurrente.

Leaves about 3 ft. long, rigid, acutely triquetrous, $\frac{3}{4}$–1 in. broad low down, tapering gradually to the point. Peduncle stout, erect, bearing 6–8 sessile fruit-heads about 2 inches long and broad. Drupes glossy brown in the exposed part, half an inch long, $\frac{1}{6}$ in. diameter above the middle, cuspidate with a beak $\frac{1}{8}$–$\frac{1}{6}$ in. long, down which the stigma is decurrent.—*Baron* 5268! Very like *Sparganium ramosum* in inflorescence and general habit. Native name, *Vakoamboalavo*.

KNIPHOFIA ANKARATRENSIS, n. sp.

K. foliis linearibus firmulis tripedalibus conspicue crebre nervatis margine scabris, pedunculo foliis paulo breviore, racemo oblongo densissimo, pedicellis flore triplo brevioribus, bracteis pedicellis subæquilongis, perianthio subcylindrico 8–9 lin. longo lutescente viridi striato segmentis parvis ovatis, genitalibus longe exsertis.

Leaves in a dense tuft, firmer in texture and more rigid than usual in the genus, acutely keeled, $\frac{1}{3}$–$\frac{1}{2}$ in. broad low down, tapering gradually to the point. Peduncle moderately robust, stiffly erect. Raceme very dense, 3–4 in. long; pedicels $\frac{1}{4}$ in. long, articulated at the tip; bracts lanceolate, white. Perianth constricted above the ovary, $\frac{1}{12}$ in. diam. at the throat of the tube. Stamens exserted nearly $\frac{1}{4}$ in.; anthers oblong, minute. Capsule globose, $\frac{1}{4}$–$\frac{1}{3}$ in. diam.—Ankaratra mountain, *Baron* 5256! Allied to the Cape *K. sarmentosa*.

Chlorophytum gracile, n. sp.

C. foliis linearibus membranaceis glabris vix petiolatis venis laxis perspicuis, pedunculo gracili foliis breviore, racemo elongato laxo simplici vel parce ramoso, pedicellis 2–4nis medio articulatis, bracteis superioribus parvis infimis foliaceis, perianthio perparvo albo-viridulo, staminibus perianthio vix brevioribus, capsulis latis profunde lobatis, seminibus in loculo geminis.

Leaves about a foot long, $\frac{1}{2}$ in. broad at the middle, narrowed gradually to the base and apex; veins about 6 on each side of the midrib. Peduncle arcuate, very slender. Raceme about a foot long; pedicels $\frac{1}{6}$–$\frac{1}{4}$ in., very slender, spreading; upper bracts ovate-cuspidate, minute. Perianth campanulate, $\frac{1}{6}$ in. long; segments linear-oblong, white, keeled with green. Anthers oblong, slightly longer than the filaments. Capsule $\frac{1}{6}$ in. diam., deeply lobed laterally. Seeds black, compressed.—East Imerina, *Baron* 5927! Allied to the widely-spread Tropical-Asian and Australian *C. laxum*, R. Br.

Cœlachne madagascariensis, n. sp.

C. caulibus dense cæspitosis gracilibus teretibus, foliis parvis multis linearibus, spiculis sessilibus vel brevissime pedicellatis in paniculam laxam oblongo-rhomboideam dispositis, glumis omnibus muticis, vacuis parvis oblongis vel ovatis, floriferis oblongis pallidis.

Stems densely tufted, under a foot long. Leaves many, spaced out upon the stem, with a blade $\frac{1}{2}$–$\frac{3}{4}$ in. long. Panicle 1–1$\frac{1}{2}$ in. long; branches spaced out, short, erecto-patent; spikelets 5–6 on the largest branches, oblong, about a line long. Glumes all similar in texture; outer sterile glume oblong, $\frac{1}{3}$ the length of the spikelet; inner ovate, nearly as long as the outer. Flowers two to a spikelet; flowering-glumes oblong, nearly a line long.—*Baron* 5063!, in swamps. Adds this Tropical-Asian and Australian genus to the Madagascar flora.

DANTHONIA LASIANTHA, n. sp.

D. caulibus elongatis dense cæspitosis, foliis subulatis, spiculis villosis trifloris pedicellatis in paniculam laxam dispositis, glumis vacuis brunneis membranaceis valde inæqualibus, flore inferiore hermaphrodito gluma florifera brunnea oblongo-lanceolata acuminata, flore secundo imperfecto gluma florifera pallida inter dentes apicales aristata, flore tertio minuto.

Habit of the European *Deschampsia flexuosa.* Stem very slender, terete, about a foot long. Leaves spaced out on the stem, with a filiform convolute blade 3–4 in. long. Panicle erect, effuse, 3–4 in. long; branchlets very slender. Spikelets brown, $\frac{1}{6}$ in. long, with a small tuft of soft hairs at the base and densely hairy inside. Outer sterile glume lanceolate, less than half as long as the spikelet; inner brown, hyaline, $\frac{1}{6}$ in. long. Lowest flower perfect, with a flowering-glume like the inner sterile glume in shape, size, and texture. Second flower imperfect, with a membranous pale hyaline flowering-glume with a large awn between its two long points. Third flower very imperfect.—*Baron* 5234! Near the Cape *D. villosa*, Nees. Adds this mainly Cape genus to the Madagascar flora.

DIPLACHNE SACCHAROIDES, n. sp.

D. caulibus elongatis teretibus, foliis pluribus magnis linearibus, spiculis 4-floris villosis in paniculam amplam dispositis, glumis vacuis parvis membranaceis ovato-lanceolatis, floribus 3 inferioribus perfectis glumis floriferis oblongo-lanceolatis inter dentes apicales longe aristatis, flore supremo reducto imperfecto.

Stems erect, above a foot long. Leaves thinly, finely veined, $\frac{1}{2}$ in. broad, reaching a foot in length. Panicle a foot long, with many very compound very slender ascending branches. Spikelets narrow, $\frac{1}{4}$ in. long, full of fine soft whitish hairs. Sterile glumes oblong-lanceolate, acuminate, brown, membranous, $\frac{1}{12}$ in. long. Flowering glume similar in texture, lanceolate, $\frac{1}{6}$ in. long, with an awn half its length.—East Androna, *Baron* 5553! Allied to the other Madagascar species, *D. aristata*, Baker, differing by its more ample panicle and fewer flowers in a spikelet.

CYATHEA REGULARIS, n. sp.

C. frondibus amplis firmulis glabris regulariter bipinnatis, pinnis oblongo-lanceolatis rachidibus inermibus glabris, pinnulis petiolatis lineari-oblongis obscure irregulariter crenulatis, venulis basi sæpissime furcatis, soris costularibus contiguis biseriatis, indusio magno membranaceo campanulato glabro persistente integro vel lobato, receptaculo glabro.

Pinnæ $1\frac{1}{2}$ ft. long; rhachis pale brown, without paleæ or spines.

Lower pinnules $2\frac{1}{2}$–3 in. long, $\frac{5}{8}$–$\frac{3}{4}$ in. broad, narrowed to an obtuse tip, rounded to a truncate base more cut away on the lower than the upper side, all except the uppermost distinctly petioled. Veins close and very distinct. Sori arranged in a single row close to the midrib on each side of it. Indusium opening widely and breaking up but little.—East Androna, *Baron* 5604! Habit exactly of the Brazilian *Alsophila Tœnitis*.

LINDSAYA PLICATA, n. sp.

L. rhizomate gracili repente, paleis lanceolatis fuscis membranaceis imbricatis, stipitibus strictis nudis castaneis, frondibus rigidulis lanceolatis glabris simpliciter pinnatis, pinnis oblanceolatis obtusis sessilibus dimidio superiore parce lobatis, soris apicalibus globosis vel oblongis, indusio persistente glabro.

Rhizome short-creeping, epigæous, about a line in diameter, densely clothed with minute spreading brown paleæ. Stipe wiry, brown-black, naked, stiffly erect, 3–5 in. long. Frond 4–8 in. long, under an inch broad, with a rachis exactly like the stipe. Pinnæ very numerous, very ascending, $\frac{1}{2}$–$\frac{3}{4}$ in. long, rather rigid in texture, with veins so prominent that they appear plicate; lobes 3–5, confined to their upper half on both sides. Sori confined to the tips of the lobes; outer valve of the indusium formed of the unaltered edge of the frond; inner rigid, pale green.—North-west Madagascar, *Baron* 5820! 5887! A very distinct species, near *L. cultrata*.

PELLÆA TRIPINNATA, n. sp.

P. frondibus deltoideis tripinnatis utrinque viridibus glabris, rachidibus castaneis dense pilosis, pinnis lanceolatis erecto-patentibus petiolatis infimis maximis, pinnulis deltoideis, segmentis tertiariis sessilibus contiguis parallelis lanceolatis vel lineari-oblongis, soris segmentorum marginem totam occupantibus, indusio lato glabro persistente.

Rootstock not seen. Stipe short, wiry, castaneous. Frond under a foot long, moderately firm in texture, green and glabrous on both surfaces. Lower pinnæ the largest, distinctly petioled, 4–5 in. long, an inch broad. Pinnules, only the lowest fully pinnate, an inch long, with tertiary segments under a line broad. Sori so broad that only a small vacant space is left between them. Final veins distant, free, erecto-patent, forked.—East Androna, *Baron* 5674! Indusium of *P. consobrina*. Cutting of the small forms of *P. hastata*.

REPORT ON THE BOTANICAL COLLECTIONS FROM CHRISTMAS ISLAND, Indian Ocean, made by Captain J. P. Maclear, Mr. J. J. Lister, and the Officers of H.M.S. 'Egeria.' By W. BOTTING HEMSLEY, A.L.S.

[Read 21st March, 1889.]

THE principal facts in the present Report have already appeared elsewhere—some in one place, some in another *; but it has nevertheless been thought desirable to bring them together and give a complete list of the plants collected, with their general distribution, similar in form to the reports on the floras of various islands prepared by me for the Botany of the 'Challenger' Expedition, and to that I contributed to the Society's Journal on the Vegetation of Diego Garcia †.

The island now under consideration should not be confounded with another of the same name situated near the equator in mid-Pacific. It lies about 200 miles south of the western end of Java, from which it is separated by a depth of 2450 fathoms; and the Keeling group, 500 miles to the westward, are the nearest islands. The formation appears to be chiefly of coral-limestone, rising in a succession of almost perpendicular cliffs and terraces to an altitude of nearly 1200 feet, and covered almost everywhere with a dense entangled vegetation, including gigantic buttressed trees from 100 to 170 feet high. In shape the island is irregularly four-sided, and some twelve miles in its greatest diameter. Neither running nor stagnant water was found; yet, from the luxuriant vegetation, the rainfall must be considerable and rain frequent.

Captain Wharton quotes largely from an account furnished him by Captain Aldrich, the Commander of the 'Egeria'; and both he and Mr. Lister specially mention large trees. Among the largest are *Inocarpus edulis* and a species of *Eugenia*, which we have not been able to match with any species in the Kew Herbarium, and have not ventured to describe as new, because so

* Captain J. P. Maclear in 'Nature,' xxxvi. p. 13; W. T. Thiselton Dyer in 'Nature,' xxxvi. p. 78, and xxxviii. p. 475 (Address, Section D, Brit. Assoc. 1888); J. J. Lister in 'Nature,' xxxvii. p. 203; and Captain J. L. Wharton in 'Proceedings of the Geographical Society,' 1888, pp. 613–624. And at a Meeting of the Zoological Society of London on the 4th of December, 1888, a paper by Mr. Lister was read giving a general account of the natural history of Christmas Island

† Vol. xxii. pp. 332–340.

many of the described Malayan species of this exceedingly large genus are not represented in the herbaria of this country. The trunk of the *Inocarpus* especially is highly curious, and is described in detail by Ellis ('Polynesian Researches') and Seemann ('Flora Vitiensis'); and Mr. Lister brought home sections of a young one in which the three buttress-projections are deeper than the central portion. Captain Aldrich measured one of the largest buttressed trees met with, which was about 800 feet above the sea-level. Outside the buttresses on the ground it was 75 feet in circumference; at 2 feet above the ground 56 feet; from the outer edge of the biggest buttress to the trunk nearly 14 feet, and 15 feet 6 inches to the top of the buttress. This may have been the *Eugenia* in question, as the *Inocarpus* does not appear to attain such large dimensions; or it may have been a fig-tree, though no specimens of any species were collected. That fig-trees exist in the island may almost be taken for granted; because they are among the earliest arboreous colonists in coral islands. There are also very large trees in the island without buttresses; and Captain Aldrich mentions that Lieutenant Baker measured one in the neighbourhood of Flying-fish Cove, which was perfectly straight, and at 4 feet from the ground was 34 feet in circumference. This is probably the tree we have not been able to determine at Kew, and is here doubtfully referred to the *Burseraceæ*.

As Mr. Lister states, a large proportion of the trees bear edible fruits; and there is every reason to suppose that the island has been stocked with plants by winds, carrying the spores of cryptogamous plants, and by birds, carrying the seeds of phanerogamous plants, and to a much smaller extent by ocean-currents. With the exception of two or three spots, the coast consists of overhanging cliffs rising out of deep water, and there is no port or extensive beach; hence there are comparatively few littoral plants. With regard to those plants described as new, it should not be assumed that they are endemic, because so much remains to be done in the investigation of the flora of Java and other islands.

In conclusion, I should add that I have acted as editor rather than author of this Report, though I am responsible for the new species described by myself. The plants were first compared under Professor Oliver's supervision, and a provisional report was furnished by him, the gist of which was that most of the plants could not be exactly matched with their congeners from

Java, but yet do not differ sufficiently to be specifically distinguished—an indication of considerable age of the flora of [the island.

The total number of species enumerated, or mentioned, is 80, namely:—55 flowering plants, 17 vascular cryptogams, and 8 cellular cryptogams. But probably a thorough botanical exploration of the whole island would yield at least double this number.

Enumeration of the Plants.

ANONACEÆ?

A branch bearing two or three leaves may belong to this Order; but it is important to determine it; and it is only mentioned because a specimen of the wood—that of quite a small tree—was sent.

MENISPERMACEÆ.

A branch of a plant of this Order bearing leaves only.

MALVACEÆ.

ABUTILON sp., an var. *A. indici*? gracillimum, foliis subintegris longe acuminatis.

A. indicum is widely spread in the tropics.

There are imperfect specimens of a second species of this genus.

HIBISCUS TILIACEUS, *Linn.*—One of the commonest sea-coast trees in the tropics, and extending to some subtropical regions, and particularly abundant in Polynesia, reaching the most remote islands.

AMPELIDEÆ.

VITIS PEDATA, *Vahl*?—Widely spread in India and Malaya.

LEEA HORRIDA, *Teysm. & Binnend*?—Java.

BURSERACEÆ?

Arbor grandis, trunco 13 ped. diametro, foliis bipinnatis, foliolis alternis obliquis integris, fructu breviter stipitato lignoso

v. corneo triloculare, loculis unispermis, seminibus (immaturi tantum visis) exalbuminosis.

In foliage this is very near *Ganophyllum*, Blume; but the fruit is different from that attributed to it in Hooker's 'Icones Plantarum' (t. 1308), and in the absence of flowers its exact position cannot be determined. It does not seem probable that it is a new genus, though we have failed to match it.

LEGUMINOSÆ.

Erythrina, sp. n.?—The material is insufficient for description.

Inocarpus edulis, *Forst.*—A large buttressed tree reaching the summit. Malay Archipelago, New Guinea, and Polynesia eastward to the Marquesas.

The collection contained ripe fruit which has enabled Professor Oliver to correct Gaertner's misconception of the nature of the seed. See Hooker's 'Icones Plantarum,' xix. t. 1837.

COMBRETACEÆ.

Terminalia Catappa, *Linn.*—A native of tropical Asia, often cultivated for its fruit.

MYRTACEÆ.

Eugenia, sp.—A large buttressed tree, upwards of 100 feet high.

We have not been able to identify this with any described species; but the material is hardly sufficient for description in so difficult a genus.

Barringtonia racemosa, *Blume.*—A tree about 100 feet high. Southern India, Malaya, and Polynesia.

LYTHRARIEÆ.

Pemphis acidula, *Forst.*—Tall shrub on the shore. Eastern Africa to Polynesia, and Australia.

CUCURBITACEÆ.

Zehneria mucronata, *Miq.*—India to South China and Malay archipelago.

ARALIACEÆ.

Heptapleurum ellipticum, *Seem.*—Creeper from the summit. India, Malaya, and North Australia.

RUBIACEÆ.

Randia densiflora, *Benth.*—Small tree at 600 feet. India, South China, Malaya, and North Australia.

COMPOSITÆ.

Blumea spectabilis, *DC.*—North side at an elevation of about 700 feet. Western peninsula of India and Ceylon.

GOODENIACEÆ.

Scævola Koenigii, *Vahl.*—Cliffs on the shore. India, Malaya, Australia, and Polynesia.

MYRSINEÆ.

Ardisia complanata, *Wall.*—Dwarf tree from the summit. Chittagong, Malay peninsula and archipelago.

SAPOTACEÆ.

Sideroxylon sundaicum, *Miq.*—Malay archipelago.

APOCYNACEÆ.

Ochrosia Ackeringæ, *Miq. in Ann. Mus. Bot. Lugd.-Bat.* iv. p. 138 (syn. Lactaria calocarpa, *Miq. in Fl. Ind. Bat. Suppl.* i. p. 553, nec *Hassk.*), var. foliis angustioribus minus obtusis. Tall tree, from 900 feet to summit.

Sumatra.

The Christmas-Island specimens are quite young flowering branches and detached nearly ripe fruit. The latter is exactly like that on authentically named specimens; but the leaves are thinner as well as narrower, though this is probably due to their very young condition.

ASCLEPIADEÆ.

Hoya Aldrichii, *Hemsl.*, n. sp.—Affinis *H. cinnamomifoliæ*, differt foliis quinquenerviis floribus minoribus albidis vel rubris petalis supra pubescentibus.

This species belongs to a small group characterized by the leaves being 3- to 5-nerved longitudinally, all of them natives of the Malayan region. Captain Maclear collected the same plant, but without flowers.

BORAGINEÆ.

Cordia subcordata, *Lam.*—A sea-side and insular tree from Eastern Africa and Malaya to North Australia and throughout Polynesia.

Ehretia buxifolia, *Roxb.*; syn. E. heterophylla, *Spreng.*—Deccan peninsula and Malaya to the Philippines and Formosa.

All the leaves of the Christmas-Island specimens are smooth; in others some of the leaves are smooth and some scabrid on the same shoots.

Tournefortia argentea, *Linn. f.*—A sea-coast plant of tropical Asia, Polynesia, North Australia, and the Mauritius.

SOLANACEÆ.

Solanum biflorum, *Lour.*; syn. S. decemdentatum, *Roxb.*, S. Zollingeri, *Dun.*, &c.—Malay peninsula and archipelago.

Physalis minima, *Linn.*—Generally dispersed in tropical countries.

Datura alba, *Nees.*—Widely spread in tropical countries, though often only as a colonist.

ACANTHACEÆ.

Dicliptera Maclearii, *Hemsl.*, n. sp.—*Herba* annua, erecta, $1\frac{1}{2}$–2-pedalis, caule tereti viridi minutissime puberulo ramoso ad nodos incrassato, ramulis gracilibus. *Folia* longe petiolata, membranacea, lanceolata, ovato-lanceolata vel ovato-rhomboidea, maxima cum petiolo 6 poll. longa, utrinque valde attenuata, acutissima, glabrescentia, subtus pallidiora; petiolus gracillimus. *Cymæ* axillares, pauciforæ, brevissime pedunculatæ; bracteæ exteriores aculeiformes, interiores (florales) obovatæ vel obovato-rotundatæ, longe aculeato-cuspidatæ, per paria approximatæ, bifloræ; bracteolæ angustissimæ calycem superantes. *Flores* sessiles; calyx 5-partitus, segmentis angustissimis puberulis;

corolla parcissime puberula, fere æqualiter bilabiata, labio superiore integro; stamina 2, exserta, antheris bilocularibus. *Capsula* discoidea, vix sesquilineam diametro, straminea, parce puberula, disperma; semina discoidea, muriculata.

VERBENACEÆ.

CALLICARPA LONGIFOLIA, *Lam.*—From the summit. Malay peninsula and archipelago and North Australia.

TECTONA GRANDIS, *Linn. f.*—The teak is widely spread in India and Malaya.

LABIATÆ.

ANISOMELES OVATA, *R. Br.*—Generally spread in tropical Asia.

NYCTAGINEÆ.

BOERHAAVIA REPANDA, *Willd.*—From the summit. Widely spread in tropical Asia.

PISONIA EXCELSA, *Blume.*—All over the Malay archipelago.

AMARANTACEÆ.

ACHYRANTHES ASPERA, *Linn.*—Warm parts of Asia, Africa, America, E. Australia, and almost throughout Polynesia.

DEERINGIA CELOSIOIDES, *R. Br.*—India, Malaya, Australia, and New Caledonia.

PIPERACEÆ.

PEPEROMIA, sp., an var. P. LÆVIFOLIÆ, *Miq.* ?—Too young for exact determination. From the summit.

LAURINEÆ.

HERNANDIA OVIGERA, *Linn.*—From the summit. Malaya.

EUPHORBIACEÆ.

EUPHORBIA HYPERICIFOLIA, *Linn.*, var. ?

This has more the habit and glands of *E. Atoto*, Forst., though in other respects it is nearer *E. hypericifolia*, as defined in Hooker's 'Flora of British India;' and, as there limited, it is dispersed nearly all over the tropics.

CLEIDION JAVANICUM, *Blume.*—India, including the Deccan, Ceylon, and Malaya.

MACARANGA TANARIUS, *Muell. Arg.*—Malay peninsula and archipelago.

URTICACEÆ.

CUDRANIA JAVANICA, *Tréc.*—Eastern Africa, India, Malaya, and Eastern Australia.

LAPORTEA CRENULATA, *Gaud.*—India and Malaya.

FLEURYA RUDERALIS, *Gaud.*—Malay archipelago and Polynesia.

ORCHIDEÆ.

(By R. A. ROLFE, A.L.S.)

PHREATIA LISTERI, *Rolfe*, n. sp.—*Planta* dense cæspitosa, $2\frac{1}{2}$–4 poll. alta. *Folia* anguste linearia, obtusa, basi attenuata, 2–$3\frac{1}{2}$ poll. longa, $1\frac{1}{2}$–2 lin. lata, subdisticha. *Scapi* erecti, graciles, $2\frac{1}{2}$–3 poll. longi, bracteis subulato-lanceolatis, 1–$1\frac{1}{2}$ lin. longis, floribusque subsessilibus minutissimis. *Sepala* ovata, subacuta, $\frac{1}{3}$ lin. longa. *Petala* sepalis subsimiles, minora. *Labellum* cochleato-ellipticum, concavum, integrum, basi contractum, sepalis paullo longius. *Columna* brevissima. *Capsula* elliptico-oblonga, $1\frac{1}{2}$ lin. longa.—On tree-trunks.

In habit this plant resembles *P. limenophylax*, Benth., from Norfolk Island, and *P. minutiflora*, Lindl., from Borneo, though its leaves are longer than in either. To the latter it is very closely allied, both in the size and structure of its flowers; but in that species the lip is gradually narrowed towards the base. Lindley's drawing represents three linear basal keels, while in the present one the lip narrows very abruptly, and the crest appears to be rather of the nature of a spherical somewhat swollen callus; but this point was difficult to make out in the excessively minute dried flowers. The present species is twice the size of the Bornean one.

PHREATIA CONGESTA, *Rolfe*, n. sp.—*Planta* repens, 4–5 poll.

alta. *Pseudo-bulbus* ovoideo-elongatus, diphyllus. *Folia* anguste linearia, obtusa, basi attenuata, 3–4½ poll. longa, 2–3 lin. lata. *Spicæ* laterales, brevissimæ, subcongestæ, ovoideæ, ¾–1 poll. longæ, bracteis ovato-lanceolatis, floribusque subsessilibus minutissimis. *Sepala* ovato-oblonga, obtusa, ½ lin. longa, trinervia. *Petala* sepalis subsimiles, minora, uninervia. *Labellum* ovatum, subconcavum, integrum, obtusum, trinervium, basi contractum, sepalis paullo brevius. *Columna* brevissima. *Capsula* fusiformi-oblonga, 2½ lin. longa.—From high tree-trunks.

A markedly distinct species, though its relationship to *P. contracta*, Miq., may be closer than can be determined from Miquel's imperfect description.

Doritis, sp. n.? (specimina fructifera tantum adsunt).—On tree-trunks on the ridge or highest part of the hill above Flying-Fish Cove.

PALMÆ.

Didymosperma, sp.—On sea-shore.

There are good specimens of this palm or palms, though the fruit is wanting; but there is a little uncertainty about the leaves belonging to the same species as the inflorescence. Except in size, it does not differ materially from *D. porphyrocarpa*. Mr. Lister appears to have been of the opinion that the specimens represent two species; it seems probable, however, that they are male and female of the same species.

PANDANEÆ.

Pandanus, spp.—There are incomplete specimens of three species in the collection, one of which, having thin, almost flaccid leaves, is said to form a thicket some 10 feet high on the edge of the shore.

CYPERACEÆ.

Fimbristylis cymosa, *R. Br.*—Java to Australia and the Sandwich Islands; but, as understood by some botanists, it has a much wider range.

GRAMINEÆ.

ISCHÆMUM MURINUM, *Forst.*—Malaya and Polynesia.

ERAGROSTIS PLUMOSA, *Link.*—India, China, and Malaya.

FILICES.

(By J. G. BAKER, F.R.S.)

DAVALLIA SOLIDA, *Swartz.*—Tropics of the Old World.

DAVALLIA DISSECTA, *J. Sm.*—Malay Archipelago.

ASPLENIUM NIDUS, *Linn.*—Warm regions of the Old World.

ASPLENIUM FALCATUM, *Lam.*—Warm regions of the Old World.

ASPLENIUM (§ EUASPLENIUM) CENTRIFUGALE, *Baker*, n. sp.—*A.* caudice erecto, stipitibus brevibus brunneo-viridibus parce paleaceis, paleis basalibus lanceolatis membranaceis, frondibus glabris viridibus oblongo-lanceolatis, pinnis multijugis contiguis petiolatis inæquilateraliter oblongo-lanceolatis profunde pinnatifidis basi anteriore cuneatis basi posteriore cuneato-truncatis, venis flabellatis, soris brevibus supra medium venarum impositis, indusio firmulo persistente.

A near ally of the Himalayan *Asplenium laciniatum,* Wall., from which it differs in the position of the sori, which are placed almost entirely in the lobes of the pinnæ above the middle of the veins, leaving the central entire portion of the pinna sterile. Stipes 2–3 in. long. Lamina 4–5 in. long, $1\frac{1}{2}$–2 in. broad. Central pinnæ the longest, an inch long by $\frac{1}{4}$–$\frac{1}{3}$ in. broad. Sori $\frac{1}{8}$–$\frac{1}{6}$ in. long.

NEPHRODIUM TRUNCATUM, *Presl.*—Tropics of the Old World.

NEPHRODIUM SYRMATICUM, *Baker.*—Tropical Asia.

NEPHRODIUM INTERMEDIUM, *Baker.*—Tropical Asia.

ASPIDIUM MEMBRANACEUM, *Hook.*—India and China.

NEPHROLEPIS ACUTA, *Presl.*—Cosmopolitan in the tropics.

NEPHROLEPIS RAMOSA, *Moore.*—Tropics of the Old World.

POLYPODIUM ADNASCENS, *Swartz.*—Tropical Asia.

Polypodium irioides, *Lam.*—Tropics of the Old World.

Vittaria elongata, *Swartz.*—Tropics of the Old World.

Acrostichum flagelliferum, *Wall.*—Tropical Asia.

Acrostichum (§ Gymnopteris) Listeri, *Baker*, n. sp.—*A.* rhizomate late repente crassitie cygni pennæ, stipitibus sterilibus elongatis subnudis haud contiguis, frondibus lanceolatis membranaceis acutis basi attenuatis, venis primariis perspicuis parallelis, intermediis in areolas copiosas hexagonas anastomosantes venulis liberis inclusis productis, frondibus fertilibus linearibus stipitibus longioribus.

A well-marked new species, allied to the Himalayan, Ceylonese, and Malayan *A. variabile*, Hook. Stipes of the sterile frond 7–8 inches long. Sterile frond 9–12 in. long, 2 in. broad, narrowed gradually to the apex and more suddenly to the base. Fertile frond 4–5 in. long, under $\frac{1}{2}$ in. broad at the middle, narrowed gradually to both ends.

LYCOPODIACEÆ.

Lycopodium Phlegmaria, *Linn.*—Tropics of the Old World.

MUSCI.

(By C. H. Wright.)

Neckera Lepineana, *Mont.*—Malay archipelago and Polynesia.

Thyridium fasciculatum, *Mitt.*—Malay archipelago, Polynesia, Chili.

HEPATICÆ.

Ptychanthus squarrosus, *Mont.*—Tasmania, Fiji.

Lejeunia serpyllifolia, *Libert.*—Europe, India, Socotra, tropical and South Africa, North and South America, and Australasia.

LICHENES.

Usnea trichodea, *Ach.*—Very widely spread in the tropics, and extending into some temperate regions.

FUNGI.

(By Dr. M. C. Cooke.)

Polyporus (§ Fomes) australis, *Fries.*—Warm regions of both hemispheres.

Polyporus (§ Fomes) conchatus, *Fries.*—Europe, Asia, Australasia, North and South America.

Stereum lobatum, *Kunze.*—Warm regions of both hemispheres.

Studies in Vegetable Biology.—V. *Apiocystis* a *Volvocinea*, a Chapter in Degeneration. By Spencer Le M. Moore, F.L.S.

[Read 20th December, 1888.]

(Plates LIV.–LVI.)

Introductory.—During the autumn of 1885 I chanced, while examining some Algæ from a pond at Lee, to come upon a type then believed to be undescribed. This organism was bottle-shaped or pyriform, the narrow end attached almost exclusively to threads of *Cladophora fracta*, Kuetz., but occasionally to those of *Mesocarpus Pleurocarpus*, De Bary, as well. In its earliest stage it consisted of a colourless sac containing a single gonidium, from the distal end of which proceeded two cilia having the remarkable property of piercing the parent wall, and extending therefrom some distance into the surrounding water. This gonidium divided, the successively formed daughter cells following suit, while the parent wall grew coincidently, and eventually appeared as a large sac (zoosporangium) with upwards of a hundred biciliated gonidia ranged upon its wall. Being acquainted with the rare type called by Naegeli *Apiocystis Brauniana*, which I had been fortunate in finding several years previously, the resemblance between that and the ciliated organism was at once seen; but the protruding cilia prevented recognition of identity, as they seemed to point to a volvocineous affinity by arguing the intercalation of a cœnobial phase or phases. At the time above mentioned but scant opportunity offered for studying the life-history of the supposed novelty. However, in the spring of this year I again had the good fortune of 1885, and, as time permitted and a continuous supply seemed available, part of the bygone year has been devoted to this interesting type, with results which it is proposed to describe in the following pages.

In his 'Gattungen einzelliger Algen' (1849) we find the first description and figures* of *Apiocystis Brauniana*, at the hands of its discoverer, Naegeli. The spheroidal zoospores of this alga fix themselves by their anterior colourless end, usually upon a thread of *Cladophora fracta*, and clothe themselves with a claviform membrane, constituting a sac. The zoospore then divides in a plane coinciding with the axis of the sac, the two daughter cells becoming four, then eight, and so on till their number is thirty-two, after which numerical regularity ceases. This process may continue until as many as sixteen hundred cells are formed; these lie upon the walls of a large sac, which has now become stalked. The cells are at first disposed uniformly upon the wall of the sac; but afterwards they lie in several layers. Division takes place in all directions of space. Naegeli also notes that the cells of old sacs are at times disposed eight together in a ring —the result of threefold division: of these eight, four are at first internal to the others, but they afterwards move so as to lie in the same plane with them. Zoospores escape through an opening in the wall of the sac; but there is no relation between size of the sac and zoospore-emission, which may take place from small sacs. The cells, he adds, usually lie quite separated from each other, for they invest themselves with a wall; although it sometimes happens that only the second or third generation does this, the result of which is frequent grouping of the gonidia into masses of four or eight surrounded by a common envelope. A small form, linear or narrowly claviform, Naegeli distinguishes as the variety *linearis*; and he also says that during the autumn the sacs are sometimes covered with delicate cilia. From this last fact it is clear that he must have had in view the above-mentioned ciliated form, which he regarded as merely a phase of the non-ciliated. In this opinion I entirely coincide; and comparison of the accompanying figures with those of Naegeli's work will, it is hoped, leave no doubt upon any mind as to the propriety of this course.

But scant references to *Apiocystis* are to be met with. It is

* Naeg. Gatt. einzell. Algen, p. 67, tab. ii. A.

mentioned by Kuetzing* and also figured by that author; and we find Fresenius†, a few years after Naegeli, giving a short account of the ciliated form, which he was the first to discover in Germany—it was originally lighted upon at Zurich. Fresenius distinguishes under the name of *A. minor* a form which he found on a species of *Mougeotia*; it is less markedly pyriform than *Apiocystis Brauniana*, is paler green in colour, it usually contains but one gonidium, and has a darkly-contoured granule (*Körnchen*) which he compares with the red spot of some Algæ; moreover it possesses a contractile vacuole. I have found no other floristic reference to *Apiocystis* in continental literature. It was discovered in this country by Henfrey ‡ among some Algæ brought from Wimbledon; and Mr. A. W. Bennett § has announced its occurrence in Cornwall. Strangely enough, it turns up in New Zealand, where it was found by Berggren growing upon *Vaucheria* threads ‖. *Apiocystis* would thus appear to be a widely distributed, but at the same time extremely local, type.

Description of Apiocystis.

Fig. 1 of Plate LIV. represents the earliest stage of the ciliated form—an attached pyriform sac with its biciliated gonidium, the strong cilia reaching far out into the surrounding water: in fig. 2 the gonidium is shown divided in a plane at right angles to the growth-axis, and the proximal gonidium has thrown out a pair of cilia similar to those of its distal fellow. Upon this point my experience is at variance with that of Naegeli and of Fresenius, both these authors describing the first division as taking place in the longitudinal plane, a condition of things seen by me but once out of many score specimens. Division of the two gonidia of fig. 2 gives us the four gonidia of fig. 3, each gonidium provided with a pair of long cilia: by further division the stage represented in fig. 4 is reached. If figs. 1 *a*, 3, and 4 are compared with figs. 1 *b* and 2, much difference will be noticed

* Species Algarum, p. 208, and Tabulæ Phycologicæ, vi. tab. 68.

† Abhandl. Senckenb. Naturforsch. Gesell. Band ii. p. 237, tab. xi. figs. 1–20.

‡ Quart. Journ. Micros. Sc. 1856, p. 52.

§ Journ. Roy. Micros. Soc. 1887, p. 9.

‖ See Nordstedt's 'Freshwater Algæ collected by Dr. S. Berggren in New Zealand and Australia,' 1888.

in the size of the cilia, the largest of which can only be described as gigantic; for besides reaching to a distance at least ten times as great as the length of the gonidia, their thickness is so considerable as to render them easily visible with a $\frac{1}{2}$-inch or even a 1-inch objective. Each cilium can be traced penetrating the common wall by means of its own aperture, to be inserted upon the colourless extremity of the gonidium; in the surrounding water the cilia lie straight and perfectly motionless. The spheroidal, or at most very slightly ovoidal, gonidia have each a conspicuous vacuole which seems to be in a condition of permanent diastole, contractility never having been observed in it. Lying close to the vacuole, often at its proximal end, is a small nucleus visible only after staining; hæmatoxylin and acetic-methyl green are the best reagents for showing it up, especially the latter, which dyes surrounding parts less deeply than does hæmatoxylin. The chloroplast also contains several small pyrenoids scattered through it.

The mother-sac grows in all three dimensions of space, so that the gonidia are soon clearly seen to be ranged round its wall, its interior being filled with water. Meanwhile gonidial division is proceeding apace, though not necessarily at the same rate in all cases; for larger undivided gonidia may frequently be seen lying beside the smaller products of segmentation: this accounts for the rarity of arithmetical exactitude where the number of gonidia exceeds eight and sometimes even a lesser number; it will be remembered that Naegeli mentions thirty-two as the limit below which there is no irregularity. In many cases division of the gonidium is preceded by secretion of a firm wall round it (Pl. LV. fig. 12*a*); but it is sometimes difficult to see this wall, because the gonidium lies so closely within it. It is a frequent occurrence for two or more gonidia to be found in close apposition (Pl. LV. fig. 11, & Pl. LVI. fig. 23, &c.); and careful examination may be rewarded by the discovery of a delicate common wall running round them. In this way may be produced small masses of gonidia which may either break up by the destruction of this common wall, the gonidia rearranging themselves upon the *Apiocystis*-wall, or, owing to the former's persistence, may, as will hereafter be explained, remain connected even after great chages have been brought about in the *Apiocystis*-wall itself. In figs. 12 *a–e*, Pl. LV., an endeavour has been made to show this method of gonidial multiplication: both here, and also where there is no investing-wall, the gonidia lie either in one plane from the first, or the successive divisions are in three planes mutually at right angles; in this latter case, however, stretching of the investing-wall is usually followed by shifting of the gonidia into one plane. It is in this way that the numerous gonidia—about three hundred in the largest of my specimens—are ultimately found to be ranged with more or less uniformity upon the parent wall.

Apiocystis is usually more or less pyriform in shape; but variations from this form sometimes occur. The small specimen shown in fig. 16, Pl. LV., is nearly cylindrical, and in fig. 15 is but shortly stalked: at fig. 6, Pl. LIV., is shown a rarely seen sessile variety; and that of the succeeding figure is very remarkable, consisting of four pouches upon one stalk, each pouch with a number of closely massed gonidia: occasionally, too, the alga is rather ploughshare-shaped than pyriform. The stalk, especially when thin, is usually free from gonidia, except sometimes near the base, where a few may occur (fig. 11, Pl. LV.).

At the point of attachment to the *Cladophora*-cell there is almost always a brown discoloration visible from very early stages onwards. This would seem due to the presence of a substance, possibly of resinous nature, produced by the metabolic activity of the protoplasm of the zoospore. It appears, however, to be insoluble both in chloroform and in carbon bisulphide. The suggestion has been made to me that this discoloration is the result of injury to the *Cladophora*-wall, which is, so to say, eaten into for a short distance by the *Apiocystis*; but against this view may be urged the fact of the discoloured part projecting very frequently beyond the general surface. *Sciadium*, *Hydrianum*, *Characium*, and other fixed Algæ have a similar discoloration at their point of attachment.

After growth has continued for some time, the gonidia escape and swim about by means of their cilia. There are several ways in which this may happen: indeed, *Apiocystis* is chiefly remarkable for its polymorphism in this respect, and for the morphological interest accompanying some of these methods of zoospore-liberation. What is perhaps the most ordinary way is shown at fig. 8, where the gonidia are seen to be withdrawn from the wall of the zoosporangium, in the interior of which they are swarming with great activity: an aperture has made its appearance in the side of the wall and through it a zoospore is in the act of passing.

This agrees exactly with Naegeli's figure; but the gonidia do not always swarm within the zoosporangium at the same time; one may often find some in active movement, while others are still firmly fixed in position upon the wall, where they remain until long after the escape of their fellows. Under the most favourable circumstances the zoosporangium may be evacuated within half an hour of the first gonidium detaching itself from the wall; but much longer time is frequently taken, intervals sometimes of an hour or more recurring between the escape of two zoospores. The zoospore frees itself by gentle rocking from side to side, accompanied by a certain amount of movement about a vertical axis; as its deliverance approaches, somewhat violent swaying may sometimes be noticed, which would seem to indicate adhesion between the cilia and the zoosporangial wall, or at any rate the existence of some obstruction to the indrawing of the cilia. As an exceptional case, swarming may occur when but few gonidia have been formed: on one occasion it was studied in an *Apiocystis* with only six gonidia; and fig. 16, Pl. LV., shows that at least one gonidium has escaped from a small individual which could not have had more than four gonidia. It will be noticed that the exit-aperture is in this case almost central, but a little nearer the base than the apex. Swarming zoospores were never seen to copulate within the zoosporangial cavity: hence my surmise of a few years back *, that *Apiocystis* and *Chlorochytrium* would eventually prove closely allied forms, turns out an incorrect one. The liberated zoospores swim for about half an hour, when they settle upon a *Cladophora*-cell, lose their cilia and fix themselves by the colourless end; a new pair of cilia is formed distally, soon after the gonidium has secreted round itself a colourless wall.

A second way by which the zoospores may escape is shown in figs. 9 *a* and *b*, Pl. LIV. Here, instead of the zoosporangial wall breaking down at one point, large portions of it may undergo degeneration before a single zoospore has succeeded in making its exit. In fig. 9 *a*, while the proximal moiety retains its sharp contour, the distal portion has lost it, the wall here having been converted into gelatinous matter about which mention will be made directly. The boundary of this gelatinous matter is indicated in the figure by a faint line; but it is not so distinct in nature; indeed, the refractive index of this matter being so similar to

* Journ. of Bot. 1884, p. 138. The gametangial nature of the *Chlorochytrium* zoosporangium was discovered by Klebs (Bot. Zeitung, 1881).

that of water, it is only by the movements of aquatic creatures, such as Infusoria, that the precise limits of the *Apiocystis* can be accurately defined. The zoospore marked "*y*" in this figure has just succeeded in disengaging itself at a point upon the right-hand side; while that denoted by the letter "*x*," after escaping from a point lower down, has got entangled again, and a quarter of an hour elapsed before it was able to set itself free. The other zoospores followed one by one at intervals, and the gelatinous matter dissolved away, leaving the proximal half of the zoosporangium in position: this, in turn, broke down (Pl. LIV. fig. 9 *b*), the zoospores escaping here in the same way as before. That the cavity of the zoosporangium was not obliterated even now was proved by the occasional escape of a zoospore into it preparatory to its swimming away; also by the fact that upon focussing down, a fresh set of underlying gonidia came into view. When the gonidia in fig. 9 *b* had been reduced to the number of eight, a fresh supply of water was introduced beneath the cover-slip; and this streaming in caused the gelatinous matter to break up and move away with the zoospores embedded in it. The only sign now that a few hours previously a large zoosporangium with scores of gonidia was growing upon the spot is the discoloured point of its attachment to the *Cladophora*-wall; old cells of *Cladophora fracta* infested with *Apiocystis* may sometimes be seen with several of these marks upon them.

The cell-wall is at first very thin; but after a time its capacity for imbibition increases. In this state an inner, more refractive portion of the wall can be distinguished from an outer, considerably thicker part. The reactions are somewhat peculiar: iodine colours the wall only the faintest brown, and this is seen especially in the inner portion; addition of sulphuric acid simply darkens the brown stain without imparting to it any tinge of blue or violet. With Schulze's solution a pale brown is obtained. Picric blue does not dye the outer portion, and its blue colour is taken up to but the slightest extent by the inner. The whole wall stains well with hæmatoxylin, likewise with saffranin and gentian violet; fuchsin, too, will rapidly colour both wall and cilia; and this is a very good way of bringing the latter into view when their presence is doubtful; but on running in dilute glycerine, the colour is at once discharged, showing that suberin is not present. Capacity for imbibition continually increasing, the inner highly refractive portion ceases to be visible; one would hence imagine that the somewhat peculiar modification of cellulose of which the wall is originally composed has been converted into either gum or mucilage; but this does not appear to be the case, for I could find no trace of swelling with caustic potash, and corallin soda was not taken up to the slightest extent *. From the fact of iodine and sulphuric acid imparting no blue or violet tinge the presence of gum rather than mucilage might be inferred, and possibly there may be some forms of gum which refuse to take up corallin soda. But this being doubtful, I am forced to content myself with calling the swollen-up substance "gelatinous matter" for want of a more precise term.

Cœnobial Zoospores.

The original idea with which this research was entered upon, viz. that the exserted cilia imply a cœnobial phase, was found to be correct under certain circumstances; and we will now consider these additional methods whereby the *Apiocystis* zoospore is enabled to escape into the surrounding medium. A good instance of this will be seen on Pl. LVI. fig. 25; here the gonidia lie, for the most part, in pairs within a common investing wall. On carefully examining the surface of the zoosporangium, openings in it approximately equal in extent to that of the investing wall were seen (*a* in the above figure): an opening denoted by the letter *b* is seen from the side; through this a small cœnobium (*c*) has made its escape. When first seen, the cœnobium, which resembled in every way the pairs of gonidia still upon the zoosporangial wall, was quite close to the opening; but by the time that it was drawn (about a day after its first discovery) it had become separated from the wall. It was not motile, however, being retained in position and its cilia being prevented from moving by surrounding gelatinous matter. Fig. 15, Pl. LV., shows a somewhat similar condition of things, which was of frequent occurrence, but only during warm weather. All efforts to liberate such cœnobia by inducing currents of water upon the glass slide proved unavailing; and the zoosporangium from which fig. 25 was drawn was kept under observation for several days without any ensuing change. I shall refer to this matter later on.

That *Apiocystis* really produces small cœnobia similar to those

* On these points *vide* Bower, 'Practical Botany,' ed. 2, part i. p. 41, and App. B.

in figs. 15 and 25 is certain. The evidence is two-fold. On a warm afternoon at the beginning of June *I saw a cœnobium, precisely like that of* fig. 25 *c*, *detach itself from the zoosporangial wall and swim about inside the zoosporangium.* Unfortunately just at that moment I was called away, and never had the good fortune of repeating the observation, and ascertaining what becomes of such cœnobia. But besides this, *I have found very occasionally free feebly motile cœnobia in the neighbourhood of zoosporangia in the condition of* fig. 25. One of these—biscuit-shaped like fig. 25 *c*, and, like it, two-celled—is shown in fig. 26; and a larger form, with which fig. 13 may be compared, is the subject of fig. 27, Pl. LVI.

But besides this, two other kinds of cœnobia—presumably of *Apiocystis*—were observed. The first is shown in Pl. LVI. fig. 28: upon a dome-shaped wall were ranged about forty cells with long cilia; part of the wall, carried posteriorly in the rapid movement of which the cœnobium was capable, had to some extent broken down, giving to the cœnobium the appearance of being the top of an *Apiocystis* zoosporangium. So much so was this the case, that immediately upon seeing it I exclaimed, "At last here is the cœnobium I have been looking for during so many weeks!" Zoosporangia with a large opening in the lower part through which zoospores—possibly cœnobial ones—have apparently escaped may sometimes be observed (Pl. LVI. fig. 30); and it is clear that if the rest of the proximal part of the wall were to break down, we should get the condition of fig. 28. Of such cœnobia I saw but four or five, and regret to say that though I did my utmost to directly observe so extremely interesting a fact as the breaking away of the distal half of a zoosporangium, success did not crown my efforts. I shall have a few words to say upon this later on: all that can be now stated is that cœnobia strikingly like the top of an *Apiocystis* zoosporangium, and either actually such or examples of an undescribed motile organism, occur *in the same locality with Apiocystis.* I venture to think, however, that it would be unsafe to found any positive opinion unfavourable to the suggestion propounded above, in view of the probably rapid manner in which the cœnobia might, by means of their powerful cilia, free themselves from the proximal part of the zoosporangium, to the consequent minimizing of the chances of direct observation.

The last form of cœnobium is that of fig. 29, Pl. LVI., which was drawn immediately upon my getting a sight of what was going forward. The two zoospores denoted by *c* were moving together and quite apart from the rest; the four denoted by *a* were also moving together, but their motion was but feeble, and still feebler was that of the two marked *b*; the middle one was motionless. Immediately north of these zoospores was a brown discoloration, betraying the former presence of an *Apiocystis* zoosporangium; and I am inclined to believe that this was the last stage in its zoospore-liberation; but inasmuch as in all cases in which I have studied the escape of the zoospores from start to finish, no evidence of such a cœnobial phase has come to hand, the identity of these zoospores with those of *Apiocystis*, large examples of which they much resembled, must remain doubtful. No trace of an investing wall was observed here, and the connecting substance could not be distinguished from the water. After moving about for a little while, these zoospores became isolated.

Other Phases in the Life-history.

It will be observed that many of the gonidia, even when their fellows are provided with cilia, are figured as devoid of those appendages. In some cases (*e. g.* figs. 9, 14, 29) cilia were discovered only with great difficulty. I am not, however, disposed to think that the gonidia are in these cases eciliate throughout life. Probably identity in refractive index between the gelatinous matter and the water may to some extent account for this, the former swelling up round the cilia; and besides this, gelatinization of the wall may be accompanied by disappearance of the cilia. This opens up the question whether the forms drawn and described by Naegeli as eciliate were so in reality. His restriction of cilia to autumnal states is an obvious mistake, many of my figures having been drawn during the spring and summer, and individuals with long cilia being still in existence this present month (December). One is therefore justified in suspecting, not that his earlier observed forms were eciliate, but that his attention was not directed to the cilia until later in the year. And if this should be thought impossible in the case of so well-tried an observer as Naegeli (working, however, with the instruments of forty years ago), I may mention that it has often happened to me to come upon a presumably eciliate specimen in which the fact of ciliation has been made out only in the case of a few gonidia, and after much manipulation with the mirror. To this day I am in doubt whether, in any of its typical forms, *Apiocystis* ever is eciliate throughout life; but there is no doubt that eciliate phases do occur, as will now be explained. Should the temperature fall below some unascertained point, growth of the zoosporangium is greatly impeded: instead of developing into the ordinary form, it remains stunted, and tends to increase more or less equally in all three dimensions, sometimes with predominance in the transverse plane (Pl. LV. fig. 20). In this state it is liable to be mistaken for a species of *Palmella*, but can be at once distinguished by its usually remaining attached to the *Cladophora* thread. When, as sometimes happens, it becomes detached, it can be easily known from *Palmella* on account of its saccate character, which enables one, on focussing down, to come upon a second stratum of underlying gonidia. There is really very little difference between the condition shown in fig. 9 *a* and that in figs. 20 and 21, for instance: in the latter the process of gelatinization is much more gradual; so that one may watch these *Palmella* states for days together without detecting any difference in them.

Division of the cells in these *Palmella* masses may frequently be seen, and investing walls sometimes surround the cells just as in the ordinary forms; but cilia are never to be discovered. During the heavy rains of June, July, and August, and occasionally at an earlier period of the year, the *Apiocystis* wall frequently assumed the curious appearance shown by figs. 17–19, it being studded with minute highly refractive particles, which I suppose must have been tiny particles of mud from the pond's bottom, for the frequent and violent storms rendered the water very muddy. I do not know whether adhesion of these particles was the cause or the consequence of gelatinization—probably the latter; but it almost always happens, though not invariably, that when once the wall has become studded with them, the rapid methods of zoospore-liberation are in abeyance, the zoosporangia growing from this time forward usually in the *Palmella* form. Specimens with these studded walls are almost always eciliate: fig. 19 shows an exceptional condition, in that the gonidia are furnished with long cilia. A singular point is that very young zoosporangia may sometimes be affected in this way; such a case is shown at fig. 17, where there is but one eciliate gonidium; and the next figure is that of a young zoosporangium whose stalk alone is studded with particles.

In addition to the *Palmella* state there are two other vegetative modifications, both of which came under notice during the cold weather of the beginning of November. The first, represented in figs. 23 and 24, Pl. LVI., consists of groups of very small green cells surrounded by a common wall, the whole lying embedded in gelatinous matter. Fig. 24 shows a state of things not far removed from that of fig. 17, only here the two gonidia have secreted a wall, and their protoplasm has divided without any increase of its quantity supervening; the letter *x* of fig. 23 points to two gonidia which have not undergone division. Such forms as these are known to systematists as the genus *Glœocystis.* Fig. 22 shows, besides undivided cells (*x*) and cells undergoing simple division (*y*), as well as a single *Glœocystis* group (*g*), small mulberry masses (*b*) surrounded by a common envelope; and these agree in all essentials with the genus *Botryocystis* of algologists.

To recapitulate the facts of this vegetable polymorphism. We have:—

I. Escape of zoospores as originally described by Naegeli—all of them swarming together within the zoosporangium, and escaping by an aperture in its wall.

II. Gradual emptying of the zoosporangium by the above method.

III. Gelatinization of the whole wall and escape of the zoospores from any point.

IV. Passage of cœnobia with a definite wall into the zoosporangium; this may be compared with I. and II.

V. Cœnobia with a definite wall detach themselves at any point externally; this is comparable with III.

VI. Probable escape of the distal portion of the zoosporangium as a cœnobium.

VII. Probable short-lived (as such) cœnobial phase, the cells connected by invisible gelatinous matter.

VIII. *Palmella* state.

IX. *Glœocystis* state.

X. *Botryocystis* state.

And if to these are added the spheroidal condition of fig. 6, the pocketed of the succeeding figure, the ploughshare-like form, the lobed form of fig. 14, and lastly the curious mud-studded modifications of the wall, we have, as I venture to think, an amount of polymorphism such as has never before been described for any alga.

Some further Remarks.

From the foregoing statements it is to be gathered that there is a direct relation between the condition of the wall and the way in which the zoospores are set free. Should the wall break down at only one point, the rest of it retaining, or losing to but a slight extent, its original characteristics, the zoospores will escape at that point: in this case the inner portion of the wall is the first to become modified, otherwise the zoospores embedded therein would not be able to disengage themselves; and this also happened with the zoosporangium in which I saw the inwardly-discharged cœnobium. The reverse holds good when zoospores or cœnobia are discharged outwardly; here it is the outer portion of the wall which first undergoes degeneration. With reference to the difficulty of making out cilia in some states of the zoosporangium, it has already been mentioned that they are liable to drop off when the wall has undergone much degeneration, the pathological change of the latter apparently involving also the cilia passing through it: we know that the same thing happens with *Eudorina*, *Pandorina*, &c., as a prelude to each phase of their history.

Reference to methods of culture has been purposely delayed until now that details about the zoosporangial wall have been given. The great difficulty in the observer's way here, as with many other algæ, is the extreme delicacy of organization—the rapidity of response to the action of unfavourable conditions as respects light, temperature, and above all of oxidation—which characterizes these plants. That I have been quite unable to cultivate *Apiocystis* in such a fashion as to allow of continuous observation will therefore scarcely excite surprise. The main reason for this failure is the readiness shown by the wall to break down—to lose its distinctively cellulose nature—upon the slightest occasion. This will usually happen in three or four days by simply bringing indoors the vessel in which the culture is going forward; and mere removal of the *Apiocystis* to a watch-glass acts prejudicially upon its health, even when the water is frequently changed; as may hence be concluded, hanging-drop cultures are out of the question. When speaking of externally-escaping cœnobia, it was mentioned that such were never seen actually breaking away from the zoosporangium ; indeed, cœnobia-bearing zoosporangia were kept for a week in watch-glasses in the hopes of their yielding motile cœnobia, but in all cases without success; moreover, failure became more apparent day by day as the amount of gelatinous matter increased, and the cœnobial wall, and especially the cilia, got more and more entangled. Now under natural conditions this gelatinization is kept more in abeyance; and I feel convinced that the cœnobia do not experience this difficulty in making their escape when in their native habitat, aided, as they must be, by currents in the water produced by winds and by the swaying of plants, as well as by movements of aquatic creatures, to say nothing of the friction of *Cladophora* threads one against the other. Unfortunately these are conditions impossible of artificial production. The *Palmella*, *Glœocystis*, and *Botryocystis* states are, however, less susceptible ; for I have succeeded in keeping them alive and apparently quite healthy for upwards of a week, even underneath a cover-slip, by frequently renewing the water, and preventing its evaporation by placing the slide under a bell-glass.

One very curious point is that, when in the fixed state, the cilia do not move. I attended carefully to this ; but was never able to distinguish ciliary motion apart from external disturbance, as in running in fresh water under the slide &c. Even the cilia of the cœnobia of figs. 15 and 25, *c*, were motionless, apparently for the same reason that the cœnobia themselves were so, viz. entanglement in gelatinous matter. This will not account for quiescence in other cases, *e. g.* a young unicellular zoosporangium with undifferentiated wall : here we must suppose that the power to move has been lost; and this is just what would be expected, since movements, even of the most violent kind, would obviously be useless in view of the firm adhesion contracted between the *Cladophora* and its messmate. Still the fact is somewhat remarkable, seeing that in almost all the phyla of the animal kingdom stationary cells with motile cilia are of constant occurrence. How it is that the cilia of the free cœnobia are enabled to move, I cannot say : possibly the introduction of fresh water into the zoosporangium and dissolution of the zoosporangial wall may relieve the cilia of an embargo upon their movement consequent on their passage of the *thick* wall, the seat of movement residing near their closely invested base ; but this is mere conjecture.

Sexual Reproduction.

During the month of June I was fortunate enough to find the zoospores of *Apiocystis* in the act of copulation. The zoogametes seem precisely similar to the asexual reproductive cells, and the gametangium resembles the zoosporangium. The conjugating cells get involved in pairs; and after remaining so for a little time they touch and then fuse at the colourless extremity, and ultimately form one mass. The zygote remains oblong in contour —at least this was the form of the few observed; but what becomes of it I am unable to say. As the event proved, it was fortunate that a few drawings of the copulation were made (the principal ones form figs. 31, *a*, *b*, *c* of this memoir), because its closer study being for the moment deferred, almost immediately thereafter heavy rains set in, which, stirring up the mud at the bottom of the pond, caused interference with the growth of the *Apiocystis*, and propitious weather was not experienced until September, when no sexual reproduction was met with. For these reasons all that can at present be said upon this head is that *Apiocystis* reproduces itself in the isogamous, not in the oogamous manner.

Classification.

Although several points in the life-history of *Apiocystis* remain to be worked out, it is submitted that enough evidence has now been proferred to warrant readjustment of its position in the algal system, former relegations (*Palmellaceæ*, Kuetzing*, Rabenhorst †, Cooke ‡, Nordstedt §; *Characiaceæ*, Bennett ‖) being obviously unsatisfactory. In determining the position of *Apiocystis* it seems impossible to ignore the cœnobial phases; and, heretical though it may at first sound, to deny, in face of the frequent—if not under normal circumstances constant—presence of external cilia, that its affinity is with those motile organisms which do not lead an attached existence. I propose, therefore, to place our plant among the *Volvocineæ*, where, in consequence of its isogamous reproduction, it will stand close to *Pandorineæ*. Objection may perhaps be urged against the use of the term *Vol-*

* 'Species Algarum,' p. 208.

† 'Fl. Eur. alg. Aq. dul. et submar.' sect. iii. p. 43.

‡ 'Brit. Freshwater Algæ,' p. 18.

§ *Loc. cit.* p. 20.

‖ *Loc. cit.* and Journ. Linn. Soc. vol. xxiv. p. 55.

vocineæ; but it seems to me better to employ it in the old sense, as the name of a suborder including within its limits all motile types with external cilia, rather than to restrict it to oogamous forms alone. Indeed, it seems possible to classify all the *Chlorophyceæ* upon this system: thus, for instance, among the filamentary forms (*Confervoideæ*) we may distinguish the oogamous families *Cylindrocapseæ*, *Sphæropleæ*, and *Œdogonieæ* from the isogamous *Ulothricaceæ*, *Conjugatæ*, and *Siphonocladeæ*; and we may separate, among *Siphoneæ*, the oogamous *Vaucherieæ* and the isogamous *Botrydieæ*. Soo, too, *Volvoceæ* (oogamous) and *Pandorineæ* (isogamous) will be two families of *Volvocineæ*. This classification is more in accordance with phylogeny than is one which makes, as it would seem, too great a distinction between oogamy and isogamy—important though the differences between them are; since in all probability but few botanists would maintain all oogamous forms to have descended from one common stock, and all isogamous from another.

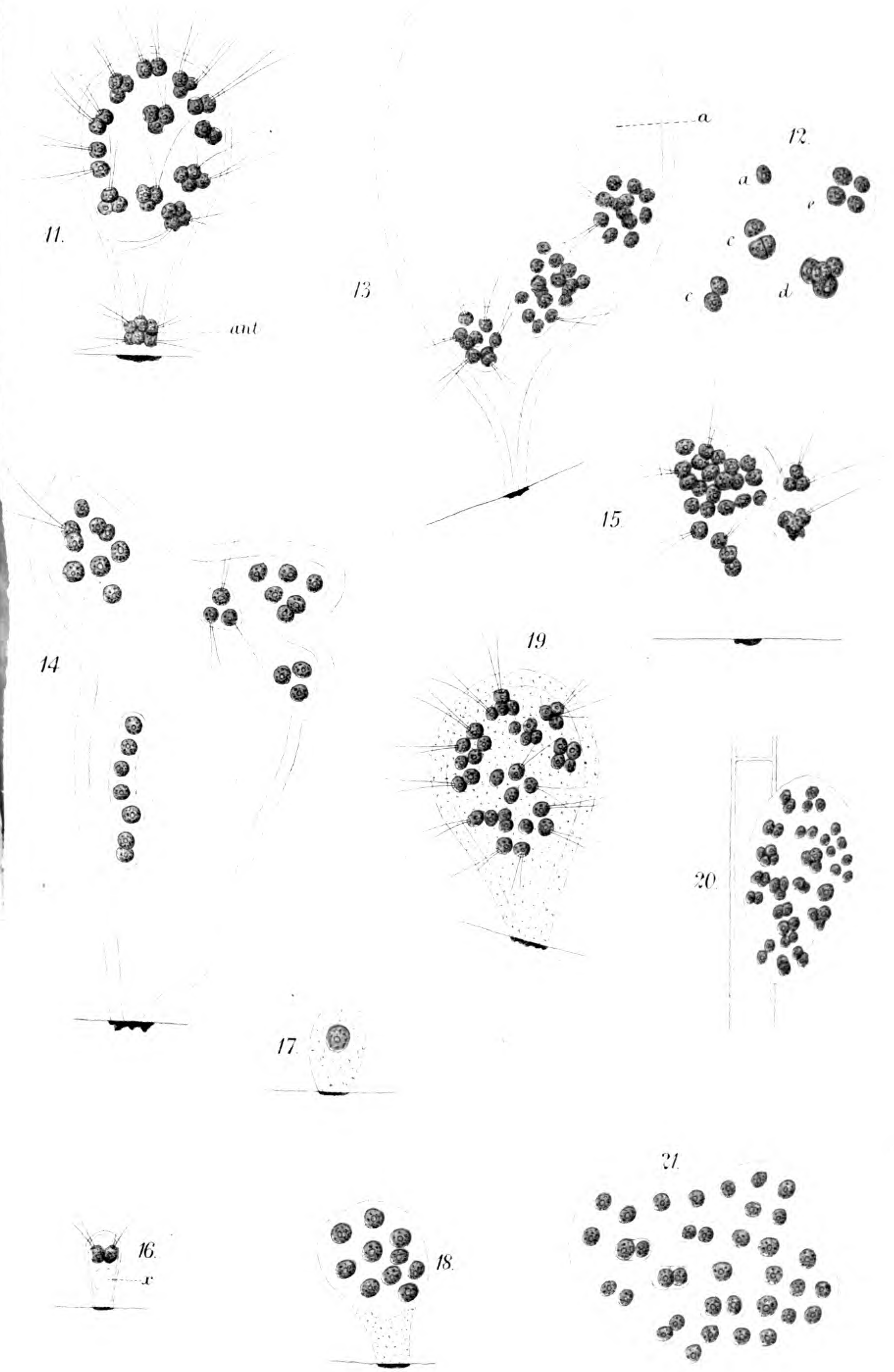
Apiocystis is therefore a degenerate type of *Volvocineæ*: origiginally able to move freely, thanks to its powerful cilia, it has in large measure exchanged this way of life for an attached existence. The alternative view is that it is an up-grade type, and not a down-grade one at all; that we have here the form whence *Volvocineæ*, or at least *Pandorineæ*, have sprung. I venture to think this view to be untenable, seeing that the cilia, which in the vast majority of cases are not used in propelling either the organism as a whole, or considerable parts of it, are developed even to a far greater extent than are those of all hitherto described *Volvocineæ*. Even Lamarckians, with their "prophetic structures," would scarcely dare to class these wonderful ciiia among such. This point being settled, we are enabled to draw one wide corollary from it: viz. *that in the vegetable as in the animal kingdom degeneration is the penalty for abdication of a free existence.*

The *Volvocineæ* would seem to be types of relatively high organization, motility giving them great advantages in respect of light, temperature, &c. over other algæ. How, then, can retrogression be accounted for? It would appear that *increase in size* is to be looked upon as the cause. This increase implying multiplication of the gonidia, would of course be favourable to a species; but if carried beyond a certain point, it would be accompanied by the drawback of diminished motility: in fact, with every advance in size, the object of motility would tend to be defeated. *There would be one way, and one way alone, of obviating this, viz. increase in the size of the cilia; and it is apparently to this that the exceptional length of* Apiocystis *cilia is to be ascribed.* Moreover, the larger the cœnobium, the greater the difficulty it would experience in moving about among masses of algæ; nay, we might expect that, if of relatively great size, it would tend to become entangled in slimy matter of animal or vegetable origin which is so frequent in ponds; and to this it would be especially liable on account of the long cilia. Indeed, any one who has paid any attention to, say, *Pandorina* must often have seen its cilia entangled, and the cœnobia for a time to all intents motionless organisms. Suppose the *Apiocystis* to have been at some former time in this condition throughout the greater part of its life, the large cœnobia able to move along through the water, but ever liable to entanglement, it might now be advantageous to the alga to fix itself, and thereby ensure a position during sunlight favourable to its metabolism by simply rising with its host among the disengaged bubbles of oxygen. In this way we can account for *polarity* in *Apiocystis*—for that distinction between base and apex which never shows itself in other *Volvocineæ.*

It is not proposed to place *Apiocystis* among the *Pandorineæ.* Some botanists, disregarding the manner of its sexual reproduction, might perhaps view its sedentariness as justifying its exclusion from *Volvocineæ* proper, which latter might be distinguished as *Holocœnobiæ*; and until lately I was myself inclined to follow this course. Having been led to reconsider my views, however, I think it would be well to define a third family, to be called *Merocœnobiæ*, in which may be included *Apiocystis* and any other organism with occasional cœnobial phases. At the present time we do not know of such with certainty; but Borzi* has recently figured and described under the name of *Physocytium confervicola* a remarkable fixed alga, evidently closely allied to *Apiocystis.* It has the peculiarities, especially interesting in view of the polymorphism described in this memoir, that its wall becomes gelatinous previously to the escape of the zoospores, and that it can live as a *Glœocystis*; moreover, its reproduction is isogamous. True, Borzi did not notice exserted cilia; but these, if very fine, might easily escape observation, or he might have chanced upon eciliate specimens alone; indeed it is doubtful whether *Physocytium* will be able to maintain its position as a

* 'Studi Algologici,' p. 71, tab. vi.

E. Carter sc. APIOCYSTIS BRAUNIANA, *Nägeli*. Mintern Bros. imp.



E. Carter sc.

APIOCYSTIS BRAUNIANA, *Nägeli*

Mintern Bros. imp.

APIOCYSTIS BRAUNIANA *Nägeli*.

genus, the long and slender stalk being scarcely enough to warrant generic rank. However, it may possibly be a type allied to *Apiocystis*, which, although descended from Volvocineous ancestors, has lost its external cilia, and so betrays to-day no sign of its origin, its relation to merocœnobial and holocœnobial forms being to some extent comparable to that borne by some fixed Tunicata to *Appendicularia* and craniate Vertebrata respectively; but this cannot be decided until *Physocytium* has been made the subject of further investigation.

DESCRIPTION OF THE PLATES.

(Unless otherwise stated, the magnification is 400 diameters.)

Plate LIV.

Fig. 1. Earliest fixed condition: *a*, with large, *b*, with smaller cilia.
2. The gonidium has divided by a transverse septum.
3. Four-celled, and fig. 4, eight-celled state.
5. Small zoosporangium with somewhat larger cells than ordinary.
6. Subspheroidal zoosporangium, the stalk wanting.
7. Curious form consisting of four pockets upon a common stalk.
8. Zoospores swarming inside the zoosporangium; one of them in the act of passing out through a hole in the side.
9. The zoosporangial wall breaking down before the escape of the zoospores: *a*, proximal part of wall still retaining its cellulose character; *b*, the proximal part broken down, and many of its zoospores already escaped; *y*, a zoospore swimming away.
10. A zoospore come to rest upon a *Cladophora fracta* thread; it has lost its cilia, but has not yet secreted a wall.

Plate LV.

Fig. 11. Form with grouped cells: *ant*, a group of "antipodal gonidia" left at the bottom of the stalk.
12, *a–e*. Details in the division of the gonidia, × 600.
13. Large zoosporangium with grouped gonidia (these drawn only at the bottom): *a*, space left after passage of a group of gonidia—as a cœnobium?
14. Lobed zoosporangium, only a few of whose gonidia are drawn; on the right-hand side is a row of gonidia surrounded by a very delicate investing wall.
15. Zoosporangium with cœnobia standing out from its wall.
16. Small zoosporangium which has already emitted at least one zoospore.

PLATE LV. (*continued*).

Fig. 17. Very young zoosporangium, the wall of which has already broken down; its only gonidium has lost its cilia, if, indeed, it ever possessed them.

18. Small eciliate zoosporangium, the stalk covered with fine mud-particles and apparently breaking down.

19. A zoosporangium with its wall covered with tiny mud-particles; cilia present in spite of this.

20. *Palmella* state; still attached to its *Cladophora* cell.

21. The *Palmella* mass.

PLATE LVI.

Fig. 22. Gelatinous matter, formed by the breaking down of a zoosporangial wall, investing *b*, *Botryocystis* cells; *g*, a *Glœocystis* cell; *x*, undivided cells; and *y*, cells which have undergone simple division.

23. Top of an attached zoosporangium with *Glœocystis* cells; *x*, cells still undivided.

24. Peculiar *Glœocystis* condition of a young zoosporangium.

25. A zoosporangium with several holes (*a*) in its wall through which cœnobia would seem to have passed; *b*, an opening by means of which the cœnobium, *c*, has made its escape.

26. A free biscuit-shaped two-celled cœnobium with the cells lengthily ciliate, and in all respects similar to those of the preceding figure.

27. A larger free cœnobium.

28. A large rapidly-moving cœnobium, apparently formed by breaking off of the distal portion of a zoosporangium: *a*, front; *b*, side view.

29. Apparently the last stage in the liberation of zoospores: the gonidia of the three groups *a*, *b*, and *c* were moving together in each case; the connecting substance could not be seen.

30. A zoosporangium whose proximal half has been evacuated by zoospores, with one exception: such a condition as this might be the forerunner of the large cœnobium of fig. 28.

31, *a–c*. Conjugation of zoogametes; also zygote, × 600.

[POSTSCRIPT.—Since this memoir was written, Messrs. Bennett and Murray have published their useful 'Handbook of Cryptogamic Botany,' a work in which many reforms of nomenclature are carried out. Although I fully approve of this course, revision of the nomenclature of this memoir has been deemed inadvisable, as involving too much alteration of the type. I cannot, however, follow the authors in their classification of *Volvox* and its allies, which they place in a class Cœnobieæ, together with Hydrodictyeæ, Pediastreæ, and Sorastreæ, the relations of the last three groups being too obscure in my judgment to justify the proposed grouping: besides which I think that penetration of the cell-wall by cilia is a fact sufficiently striking to warrant the separation, as a class, of all Algæ so constituted.—S. L. M.]

On the Characteristics of Plants included under *Erythroxylon Coca*, Lam. By D. Morris, M.A., F.L.S., Assistant Director, Royal Gardens, Kew.

[Read 20th December, 1888.]

The well-known Coca-plant has been noticed and described by botanists and travellers for more than three hundred years. The earliest detailed account of the plant is given by Nicolas Monardes, and published in 1574 (Seville, by Escrivano). A further description appeared in the third part of his 'Historia medicinal,' published at Seville in 1580. This was translated into Latin by Clusius and appears in a condensed form in his 'Exoticorum libri decem' in 1605. Clusius is usually, but erroneously, quoted as the earliest authority on Coca. The plant was first described as a species by Lamarck in the 'Encyclopédie Méthodique' in 1786 from specimens brought from Peru by Joseph de Jussieu. Cavanilles (Diss. t. 229) figured it from the same specimens, and a representation of it also appears in the inedited plates of Ruiz and Pavon (Ic. ined. t. 398). The first figure published in this country appeared in the 'Companion to the Botanical Magazine' (1836), vol. ii. t. 21, with a description by Sir William Hooker, from specimens gathered by Mathews near Chinchas, Peru.

A full account of the uses, property, mode of cultivation, and value of Coca in South America is given by Pœppig in 'Reise in Chile, Peru und auf dem Amazonenströme'*. Up to that time, and for many years afterwards, Coca-leaves were simply looked upon as the source of a nervous stimulant employed by the inhabitants of Peru and Bolivia in the same way as the Chinese use opium or the East-Indians chew betel. Latterly, however, Coca-leaves have come into prominence in civilized countries as the source of Cocaine, a valuable alkaloid possessing anæsthetic properties when applied to the mucous membranes. They are also used to produce a tonic-nerve stimulant. The cultivation of Coca-plants in the tropics of the New and Old Worlds has elicited the fact that there are numerous forms of Coca-plants possessing more or less distinct characters, the result of seminal variation influenced by soil and climate. The plants have been cultivated for so long a period that their original home in South America cannot now be traced.

* A translation appears in 'Companion to Bot. Mag.' vol. i. p. 161.

The typical plant (fig. 1), described by Lamarck and figured by Cavanilles, is an erect shrub or small tree, with oval pointed leaves, dark green above, pale beneath, and marked with a characteristic areolation. Besides those already quoted, figures representing the type are given in Le Maout and Decaisne's 'Traité de

Fig. 1.

Erythroxylon Coca, Lamarck.
1. Flower. 2. Ovary and stigmas. 3. Fruit.

Botanique,' p. 321, and in Baillon's 'Hist. des Plantes,' v. figs. 80–87. Specimens are in the Kew Herbarium from Mathews, no. 2023, from Pearce, and from McLean, all collected in Peru. Plants are cultivated in the Botanic Gardens of Ceylon and British Guiana, and at the Jardin des Plantes, Paris.

The leaves of typical plants become dark green, or even brown, in drying. It has been shown by an interesting series of chemical analyses just concluded by Mr. Alfred G. Howard, F.C.S., F.L.S., with Coca-leaves received at Kew, that leaves of the type contain a high percentage (·60) of crystallizable cocaine, with little, if any, uncrystallizable cocaine.

The most distinct variety differing from the type—and very similar to specimens collected in New Granada by Triana in the Vallée du Magdalena in 1851, and by Purdie at Sta. Martha in 1845—is a plant grown at the Royal Gardens, Kew, from seed received

Fig. 2.

Erythroxylon Coca, var. *novo-granatense*. (From 'The Garden,' 1876.)
1. Flower. 2. Ovary and stigmas. 3. Leaf.

by Mr. Abraham Dixon about 20 years ago. This plant is characterized by pale green, obovate or emarginate leaves, by a diffuse branching habit, and by abundant foliage. In many Colonies this is the only Coca-plant under cultivation. As regards its chemical characteristics, the leaves contain a large amount (·76 per cent.) of cocaine, about one half of which, however, is uncrystallizable. In this respect it is similar to what is known in commerce as Truxillo Coca.

It may be distinguished as:—

Var. NOVO-GRANATENSE, *Morris in Kew Bull.* Jan. 1889; foliis oblongo- vel obovato-lanceolatis, basi æqualiter cuneato-acutis, apice rotundatis vel emarginatis membranaceis superne læte virentibus, subtus subglaucis.

This is figured in Bentley and Trimen's 'Medicinal Plants,' vol. i. pl. 40, and in 'The Garden,' vol. ix. (1876) p. 445. Fig. 2 (above) is from the latter. Specimens from cultivated plants have been received from Jamaica and St. Lucia, and others very similar from the Agricultural and Horticultural Society of India.

Intermediate between the type and the variety just described are many forms of Coca which exhibit characters more or less distinct. Specimens collected in South America by Spruce in 1854 on the Rio Negro are of this intermediate character. Cultivated specimens from the Botanical Gardens, Java, and from Darjeeling (Cresswell) and Alipore (Blechynden) agree with these; they yield, as a rule, a high percentage (·43) of crystallizable cocaine and a small percentage (·08 to ·17) of uncrystallizable cocaine.

These, briefly stated, are some of the points which distinguish various forms of *Erythroxylon Coca.* The variety here described may be looked upon as a lowland plant capable of cultivation under hotter conditions than the type. It yields, it is true, less crystallizable cocaine than other forms, but in total alkaloid it is quite as rich. Like *Cinchona succirubra*, it may be useful for making decoctions. In this respect there is a singular parallelism between Coca-plants and Cinchona-plants.

[A detailed account of *Erythroxylon Coca* as an economic plant is given in the 'Kew Bulletin,' Jan. 1889. Its early history is further discussed in the 'Kew Bulletin,' Sept. 1889, pp. 221, 222.]

NEW CAPE PLANTS, chiefly from those distributed by Messrs. MacOwan and Bolus. By P. MACOWAN, F.L.S., Director of the Botanic Garden, Capetown.

[Read 21st March, 1889.]

MOST of the new species here described have been distributed in the "Herbarium Normale Austro-Africanum," issued at intervals since 1884, by Mr. Bolus and myself. It is necessary to state that the collation of original types, whenever obtainable, and the correction of some errors in published descriptions, are due to the liberal cooperation of the authorities of the Royal Herbarium of Kew, without whose assistance these sets of Cape plants would have had but slender claim to authentic nomenclature.

POLYGALA GYMNOCLADA, *MacOwan*, n. sp.—Suffruticosa, caule virgato, glabro, sursum 2–3-chotomo, sparsim foliaceo, deorsum nudo; foliis sessilibus, subdistantibus, glabris; racemis terminalibus plurifloribus subsecundis; pedicellis floribus æquilongis; bracteis subulatis, minutis, cito deciduis; sepalis ovato-cymbiformibus, margine membranaceis, alis suborbiculatis, basi obliquis, obtusis, carinam æquantibus; petalis lateralibus cultriformibus ad medium auriculatis, basi pubescentibus.

Hab. In graminosis circa Kokstad, in ditione Griqualand East, alt. 4800 ped., Dec. 1883, *Tyson*, no. 1120; *Herb. Norm. Austr.-Afr.* no. 884. Bazija, transflum. Bashee, *Baur*, no. 63, 243. Somerset East, *MacOwan*, no. 1693. *Cooper*, no. 927.

A slender virgate suffrutex, generally quite nude and unbranched below, with the aspect of *P. hottentotta*, Presl. Leaves 6–9 lines long, ½–1 line broad. Alæ 2 lines long, purplish pink.

POLYGALA CONFUSA, *MacOwan*, n. sp.—Basi suffruticosa, caule ramoso, ramis tenuibus, laxis, patentibus, pubescentibus; foliis alternis aut rarius oppositis, breviter petiolatis, subdistantibus, ovatis, glabris vel pubescentibus; racemis plerumque lateralibus, laxis; bracteis minutis, persistentibus; pedunculis flore longioribus, deflexis; alis ovato-orbicularibus, valde obliquis, venosis, petalis lateralibus sigmoideis, margine superiore incurvata; capsula obcordata; seminibus nigris, exalatis, pubescentibus.

Hab. Inter frutices montis Malowe in ditione Griqualand East, alt. c. 4000 ped., Febr. 1885, *Tyson*, no. 2082; *Herb. Norm. Austro-Afr.* no. 890, *foliis acutioribus*. Buffalo River, Brit. Kaffraria, Feb., alt. c. 1200 ped., *MacOwan*, no. 1266; & Nov., alt. c. 3000 ped., *MacOwan*, no. 1325. Bazija, *R. Baur*, no. 17; *Cooper*, no. 165, 301, 1914, 1926; *Gerrard*, no. 1202; *Wood*, no. 1805.

This plant is allied to *P. Ohlendorfiana*, Eckl. & Zey., and has frequently been distributed as a variety of that species. The leaves vary on the same branch both in size and acuteness—some being an inch long, others only half that size. Mr. Baur's specimens have leaves varying from elliptic to typically ovate.

AGATHOSMA WRIGHTII, *MacOwan*, n. sp. [§ Eu-Agathosma].—*A.* ramulis minute pubescentibus; foliis patentibus demum deflexis, ellipticis, planis, supra plus minusve transversim rugosis, subtus sulcatis, glabris vel pilis paucis hinc inde instructis; umbellis 12–15-floris, pedunculis glabris, prope basin bracteatis; calyce glabro, lobis obtuse ovatis ecarinatis; petalis ellipticis in unguem linearem sparse pilosum desinentibus; filamentis sterilibus linearibus petala æquantibus piloso-ciliatis; ovario et stylo glabris.

A small bush, 1 to $1\frac{1}{2}$ foot high, of compact habit, with numerous short floriferous twigs. Leaves of the older branches about 4 lines long, $1\frac{1}{2}$ line broad; those of the flowering-twigs $2\frac{1}{2}$ lines long, ultimately deflexed. Peduncles $2\frac{1}{2}$–3 lines long, glabrous, but minutely roughened with immersed glands; bracts solitary, or less frequently 2 placed alternately, minute, with a red glandular tip.

Hab. Stony places on the heights behind Simonstown, Cape of Good Hope, alt. 1200 feet, June 1884, *Herb. MacOwan*, no. 2550; *Herb. Norm. Austro-Afr.* no. 555.

This handsome *Agathosma* differs from *A. thymifolia*, Schlecht., by the much longer and pilose petal-claw, the sterile filaments piloso-ciliate for two thirds of their length, and the much larger size of the plant. The leaves occasionally show a few scattered white hairs chiefly at the margin. It was first gathered by Chas. Wright, the botanist attached to the American Survey under Commodore Wilkes, during the short stay of the squadron in the harbour of Simonstown; the late Dr. W. H. Harvey acknowledges his services to Cape Botany in the preface to the third volume of the 'Flora Capensis.'

This seems a suitable opportunity to note that the *Agathosma*, distributed as "no. 560, Hb. MacOw.; *A. minuta*, Schlecht., Bothasberg, prope Grahamstown," was placed by Dr. Sonder, in 1874, as a variety of *A. thymifolia*, Schlecht. It will be found in almost all the sets distributed by me since 1865.

ASPALATHUS ARGYRELLA, *MacOwan*, n. sp. (§ Sericeæ.)—Procumbens, ramosa subsericea; foliis sessilibus, exstipulatis, 3-foliatis, foliolis oblongo-lanceolatis, subobtusis, utrinque argenteo-sericeis; floribus capitatis violaceis; bracteis obovato-lanceolatis; pedunculis folia æquantibus; calycibus dense villosis; carina villosa; vexillo rotundato dorso villosulo.

Hab. Sandy, stony places on the mountains behind Nieuwekloof (Tulbagh Road Station), Cape of Good Hope, alt. 1500 feet, October 1885; *Herb. MacOw.* n. 2773; *Herb. Norm. A.-Afr.* no 567.

This is the plant collected by Wright on the "Simonsbay Hills," referred to *A. villosa*, Thunb., by Harvey; but it is perfectly distinct from Drège's Cederberg plant, which is marked by Harvey in the Kew Herbarium as being certainly the same as Thunberg's plant, whilst Wright's specimens at Kew have a ? placed after the name. It is a procumbent species with violet-purple flowers. Leaves $2\frac{1}{2}$–3 lines long, about 1 line broad; bracts consimilar but broader. Heads rather dense, from 6–8-flowered. In drying, the indument becomes slightly fulvous, but when fresh is quite silvery.

HELICHRYSUM ARGYROLEPIS, *MacOwan*, n. sp. (§ Xerochlæna.) —Suffruticosum, ramis pluribus, virgatis, pubescentibus; foliis sessilibus, e basi latiore, linearibus, minute albido-tomentosis, margine subreflexis, nervo medio prominulo apice nigro-mucronulato; capitulis ad apicem ramorum pedunculoideorum solitariis, turbinatis; squamis involucri imbricatis, pluriseriatis, erectis, interioribus ovato-lanceolatis, albis, nitidis, exteris brevioribus, ovatis, plus minus fusco-sordidis.

Hab. In corona summi montis Malowe, in ditione Griqualand East, alt. c. 6000 ped., Martio 1886, *W. Tyson*, no. 2788; *Herb. Norm. Austr.-Afr.* no. 834; *Nelson*, no. 549; *J. M. Wood*, no. 1914.

Rami fertiles pedunculoidei, pedales, usque ad apicem sparsim foliati; alii breviores, foliis apicem versus confertis. Folia

$\frac{3}{4}$–1 poll. longa, vix lineam lata, mucronulo plus minus recurvato. Capitula $\frac{1}{2}$–$\frac{3}{4}$ poll. diam., vix (ex sicco) radiantia. Affinis *N. squamoso*, Thunb.

SENECIO NAPIFOLIUS, *MacOwan*, n. sp. (§ Plantaginei.)—*S.* caule herbaceo, erecto, sulcato, apice corymboso-paniculato; foliis radicalibus lyrato-pinnatisectis deorsum angustatis, grosse dentatis, subglabris, superioribus minoribus, demum bracteiformibus, semiamplexicaulibus; corymbo composito, subfastigiato; pedicellis longiusculis hinc inde bracteolatis; involucro c. 20-phyllo, calyculato; radiis 10–12, latis, 5-venosis, flavis; pappo amplo, scabro; acheniis (immaturis) glabris.

Hab. In clivis superioribus montis Boschberg, pone pagum Somerset East, Cape of Good Hope, alt. 3000–4000 ped., Jan. 1887; *Herb. Norm. Austr.-Afr.* no. 746.

Radix perennis, caulis basi pollicem crassus, bipedalis. Folia inferiora crebra, 12–15 poll. longa, utrinque viridia, lobus terminalis c. $2\frac{1}{2}$ poll. longus et latus. Capitula plura, c. 7 lin. longa, 5 lin. lata. Bracteolæ calyculi lineares, incurvi, sparsim in pedunculo effusi.

This fine species may stand near *S. decurrens*, DC., and *S. digitalifolius*, DC. The leaves at the base of the stem are very like those of wild plants of *Brassica Napus*, L.

SENECIO HARVEIANUS, *MacOwan* (syn. S. vimineus, *Harv. in Fl. Cap.* iii. p. 401, non *DC. Prodr.* vi. p. 400), *Herb. Norm. Austr.-Afr.* no. 873.

By Mr. N. E. Brown's comparison with types in the Kew Herbarium, this plant is Harvey's *S. vimineus*, but not the species so named by DeCandolle. Mr. Tyson's numerous and well-preserved specimens enable some corrections to be made in the description given in the 'Flora Capensis.' Stems several from a central rootstock, ascending, at first simple, then dividing into numerous approximate branchlets, becoming pedunculoid and 1–3-leaved upwards. The inflorescence is not "spreading," and the dark-tipped character recorded of the involucral scales is not constant, being probably dependent on age. In the Herb. Norm. specimens, many of the scales are membranous and white at the tip as well as at the margin.

Hab. In summo monte Malowe, in ditione Griqualand East, Mart. 1886, alt. 6000 ped., *W. Tyson*, no. 2759; *Herb. Norm. Austr.-Afr.* no. 873.

SENECIO TYSONI, *MacOwan*, n. sp. (§ Rigidi.).—*S.* caule elato, stricto, scabro, in corymbum laxum 5–7 cephalum abeunte, rarius 1-cephalo; foliis sessilibus, deorsum confertis, sursum sparsioribus, e basi latiore, lineari-oblongis, acutis, margine leviter revoluto, denticulato, supra griseo-viridibus, scaberulis, subtus arcte albo-pubescentibus; pedunculis elongatis, bracteatis, 1-cephalis; capituli bracteolis lanceolatis acutis scabro-pubescentibus; squamis involucralibus c. 10, late lanceolatis, acutis, margine membranaceis, discum vix æquantibus; radiis 10–12, flavis, pappo amplo scabro, acheniis (immaturis) striatis pubescentibus.

Hab. In montibus Zuurbergen dictis, prope "Stafford's Post" in ditione Griqualand East, alt. 4500 ped., Martio 1886, *W. Tyson*; *Herb. Norm. Austr.-Afr.* no. 877; *W. T. Gerrard*, no. 1695, *fide N. E. Brown in Herb. Kew.*

Stem closely covered with leaves below, about 2 feet high. Leaves 2–2½ in. long, 3–4 lines broad, smaller and more scattered above. Inflorescence variable, being sometimes a lax corymb of five or more pedunculoid one-headed branches, or sometimes a single terminal head topping the peduncular apex of the main stem.

SENECIO PRIONITES, *MacOwan*, n. sp.—Herbaceus, caulibus binis pluribusve e rhizomate nudo adscendentibus, plus minus costatis, glanduloso-pubescentibus; foliis radicalibus ovato-lanceolatis, obtusis, in petiolum longum deductis, grosse irregulariterque dentatis, caulinis sessilibus, auriculatis, grosse serratis, omnibus utrinque glanduloso-pubescentibus; capitulis paucis, corymboso-paniculatis, discoideis, c. 50-floris; squamis involucralibus c. 14, discum æquantibus, deorsum concretis; calyculo e bracteolis 5–8 linearibus acutis; pappo copioso, scabro, albissimo.

Var. *β*, LAXA.—Caulis vix costatus, folia radicalia sinuato-dentata, cum petiolo 7–9 poll. longa, laxa, viscoso-glandulosa, calyculi bracteolæ pauciores.

Stem about 18–20 inches high, roughly glandular. Radical leaves 3–4 in. long, about 1 in. wide, coarsely toothed, the margin slightly thickened and repand. Peduncles and involucral scales scabro-glandular, the latter concrete for ¾ their length.

Hab. Dry grassy slopes near summit of Bruintjeshoogte, district of Somerset, alt. 5000 feet, *P. MacOwan*, no. 1730. Var. *β*, moister localities on Boschberg, at 4500 feet, Dec., Jan.

This species, referred to in Journ. Linn. Soc. (Bot.), vol. xviii.

1881, p. 392, has capitula resembling those of *Senecio asperulus*, DC., with foliage of the more entire-leaved forms of *S. erosus*, Linn. f. In the var. β the leaves are almost as glandular as those of *S. concolor*, DC.

BOWKERIA SIMPLICIFLORA, *MacOwan*, n. sp.—Fruticosa, 4–5-pedalis; ramis pubescentibus; foliis plerumque ternis, raro binis, oppositis oblongis v. oblongo-ovatis, acutiusculis, repando-denticulatis v. subintegris, 2½–5 poll. longis, ¾–1½ poll. latis, undique pubescentibus, rugulosis, venis subtus prominulis; floribus 1–3, pedunculis unifloris subuncialibus pubescentibus; bracteis ovatis acutis, ½ uncialibus; sepalis resinosis, late ovatis; corolla ovoidea, inflata; staminibus didynamis omnino inclusis; capsulis breviter cylindricis diu persistentibus septicidis.—Trichocladus verticillatus, *Eckl. & Zey.*, no. 2271! *in Herb. Gubern. C. B. S.—Enum. Plant. Afr. Extratrop.* p. 356.

Hab. Winterberg, Jun. (*fructifera*), *Eckl. & Zey. loc. cit.* Upper slopes of mountains near Seymour, district of Stockenstrom, alt. 5000 feet, Jan. 1886; *W. S. Scully in Herb. Norm. Austr.-Afr.* n. 592. Fort Donald, Griqualand East; *W. Tyson*, n. 1638. Bazija, Tembuland; *R. Baur*, n. 206, *ex parte*. [Kaffrarian mountains, Chumie, Greikas Kop; *Mrs. Barber* 21, *in Herb. Kew.*]

This plant will probably be found in other collections than those cited, mixed with *B. triphylla*, Harv. Indeed, in the Cape Government Herbarium is a specimen collected in Kafirland by the Rev. J. Brownlee, marked *B. triphylla* by Harvey himself. I have not received the 3-flowered, true *B. triphylla* of 'Thesaurus Capensis,' pl. 37, from any recent collector except Mr. Baur, who sent several flowering twigs mixed with *B. simpliciflora*. There is a regular gradation in the inflorescence of the three species known to me. The one now described has the largest flowers and simple peduncles; *B. triphylla* comes next, with a 3-flowered cyme; while *B. cymosa*, MacOwan*, has much

* B. CYMOSA, *MacOwan*, n. sp.; ramis pubescentibus; foliis ternis breviter sed distincte petiolatis, 2–4 poll. longis, ¾–1¼ poll. latis, oblongo-lanceolatis, acutis vel acuminatis, basi rotundatis, integris, utrinque pubescentibus, rugulosis, venis subtus prominulis, cymis bis vel ter trichotomis, multifloris, bracteatis, pubescentibus; bracteis parvis, $\frac{1}{12}$–$\frac{1}{8}$ poll. longis; pedicellis gracilibus ¼ poll. longis; sepalis $\frac{1}{8}$–$\frac{1}{6}$ poll. longis, rotundato-ovatis, obtusissimis, pubescentibus; corolla ½ poll. diam., labio superiore erecto subrotundato, apice obtusissimo

smaller flowers gathered into a twice-ternate cyme. This last plant is from the collections of the late J. H. M'Lea at the Macamac Goldfields. I have no hesitation in referring Eckl. & Zey. 2271 to this species. It is somewhat singular that Zeyher should have met with *Bowkeria simpliciflora* only in an almost leafless state, and with nothing but the dry persistent capsules to indicate its probable relations.

BERKHEYA DEBILIS, *MacOwan*, n. sp. (§ Stobæa.)—*B.* caule erecto, herbacea, debili, pubescente; foliis radicalibus subrosulatis, membranaceis, supra viridibus, subtus tenuiter albo-tomentosis, ovato-oblongis, basi attenuatis, profunde pinnatifidis, lobis latis, oblongis, acutis, irregulariter sinuatis, ad angulos spinoso-mucronatis, interstitiis latiusculis, spinellosis; caulinis minoribus, cordato-amplexicaulibus, haud decurrentibus, sinuato-pinnatifidis, lobis distantibus, adscendentibus, acutis, spinosis; capitula c. 12-radiata; squamis involucralibus longe triangularibus, basin versus spinulosis, pappus e squamis acutis, brevissimis; acheniis glabris.

Hab. In udis sylvarum montis Malowe, in ditione Griqualand East, alt. c. 4500 ped., Martio 1886, *W. Tyson*, no. 2760; *Herb. Norm. Austr.-Afr.* no. 874; *J. M. Wood*, no. 1902, 3158; *in Herb. Kew. fide N. E. Brown.*

Inflorescentia laxe corymbosa. Capitula 6 lin. lata. Folia radialia 12–18 poll. longa, 4–5 poll. lata; caulina 6–8 poll. longa, $2\frac{1}{2}$–3 poll. lata.

This must be near to *Berkheya sonchifolia* (*Stobæa*, Harv., Fl. Cap. iii. p. 496), though differing by the glabrous achenes and acute pappus-scales, as well as by the deeply-cut ascending leaf-lobes.

BERKHEYA CAFFRA, *MacOwan*, n. sp. (§ Stobæa.)—*B.* caule erecto, herbaceo, striato, sursum puberulo; foliis utrinque viridibus; radicalibus oblongo-ovatis, basi attenuatis, sinuatis, supra minute puberulis, subtus (venis exceptis) nudis, margine spinellosis; caulinis ad basin in alas longissimas plus minus spinulosas productis, pinnato-sinuatis, lobis rotundatis; capitulis paucis

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emarginato vel breviter bifido, labio inferiore subgloboso inflato, margine recurvo, obtuse tricrenato.

In woods, Macamac, Transvaal Republic, *J. H. M'Lea* (*Bolus* no. 3001); *Mrs. Saunders* no. 154 (*Wood* no. 3891); *Herb. Kew.* &c.

radiatis; squamis involucralibus subulato-triangularibus, margine geminato-spinosis; pappi squamis obtusis; acheniis glabris.

Hab. In clivis circa Clydesdale in ditione Griqualand East, alt. 2500 ped., Martio 1886, *W. Tyson*, no. 2755; *Herb. Norm. Austr.-Afr.* no. 875.

Apparently near to *Berkheya* (*Stobæa*) *petiolata*, DC. The radical leaves are 12–14 inches long, and about 3 inches broad. The stem-wings from the leaves are conspicuous, and even follow the depauperate bracteæform leaves close to the inflorescence. Capitula 7 to 9 lines diameter.

LOBELIA LAXA, *MacOwan*, n. sp.—Glaberrima; caule erecto in scapum abeunte; foliis radicalibus oblongo-ovatis, in petiolum angustatis, integris v. vix crenulatis, caulinis paucis, sparsis, lineari-oblongis, sessilibus, obtusis, plus minus denticulatis; racemis laxis; pedicellis axillaribus, solitariis, elongatis, distantibus; calycis tubo cylindrico lobos subulatos æquante; corolla quam calyx duplo longiore; antheris duobus inferioribus barbatis.

Hab. In wet grassy places about Kokstad, in Griqualand East, Cape of Good Hope, alt. 5000 feet, November 1882, *W. Tyson*; *Herb. Norm. Austr.-Afr.* no. 571.

This *Lobelia* has something of the habit of *Cyphia Phyteuma*, Linn., or of the rosulate-leaved *Wahlenbergiæ*. Stem short, passing into a laxly flowered scape about 18 inches high. Radical leaves subrosulate, numerous, 1–2½ inches long, ½ to 1 inch wide, entire or obscurely crenato-dentate, the upper leaves oblong, decreasing, all quite glabrous. Raceme 3- to 6-flowered; pedicels 1 inch long. Calyx-lobes 2 lines long. Flowers bright blue.

GRISEBACHIA EREMIOIDES, *MacOwan*, n. sp.—*G.* ramulis pubescentibus; foliis ternis linearibus patulis reflexisve, margine et dorso medio sparsim glanduloso-pilosis; bracteis approximatis lanceolatis obtusis, margine tenuiter ciliatis; sepalis concavis, ovato-rotundatis acuminatis, margine ciliatis; corolla infundibuliformi sursum inflata albida, quam calyx duplo longiore; antheris muticis; ovario pubescente.

Hab. Witsenberg, Tulbagh, Nov., Dec.; Houwhoek, Caledon, July, *Zeyher*, no. 1117. Tulbagh Waterfall, Oct. 1884, *MacOw* no. 2685.—*Herb. Norm. Austr.-Afr.* no. 564.

A small ericoid bush with the aspect of *Eremia*, from 6–12 inches high, covered with numerous, often much abbreviated ramuli, which on the upper branches are often densely floriferous. Zeyher's specimens, marked 1117, in the Cape Government Herbarium, are from two widely separated localities, and represent the plant in poor condition and sparsely flowered. When luxuriant, as in the Herb. Norm. examples, the short flowering ramuli are so closely set as to give a spicate appearance to the terminal branches. The leaves are sometimes quite entire, sometimes obscurely denticulate. The corolla, calyx, and bracts are white or pale pink. The mid-vein of the sepals is conspicuously thickened to the drawn-out apex, and gives them a somewhat keeled appearance.

Geissorhiza Bellendeni, *MacOwan*, n. sp.—*G.* bulbo pisiformi, squamis imbricatis, foliis infimis linearibus, vix lineam latis, vena media utrinque prominula, caulinis latioribus acutis, deorsum inflato-vaginantibus, ecostatis, scapo plerumque simplici, minute glanduloso-pubescente; spathis inæquivalvibus, margine anguste membranaceis, valva exteriore ovata, inflata, ecostata, interiore ½-minore, acuta; perianthii segmentis sursum saturate cæruleis, alibi subpellucidis; foveola nectarifera nulla; antheris lineari-sagittatis, stylum æquantibus; stigmatibus recurvis, margine ciliatis.

Hab. In arenosis subhumidis, Groenkloof, in ditione Malmesbury, Caput Bonæ Spei; *Herb. Norm. Austr.-Afr.* n. 810.

This plant is probably the one referred to by Ker in Bot. Mag. xvii. sub t. 598, as var. β. *spithamæa* of his *Ixia Rochensis*. He says:—"Variety (β) we have only seen in a dried state, by which we could not ascertain whether it possessed the small nectareous excavation at the base of each segment so remarkable in (α), and consequently are uncertain whether it ought to be considered a mere variety or a distinct species." It has been long in cultivation in the Capetown Botanic Garden, and is readily distinguishable from *Geissorhiza Rochensis*, Ker, which is a stouter plant with perfectly glabrous scape and leaves, the spathæform leaf and outer spathe-valve rib striate, the latter being truncate at the apex. In this latter species, too, the inner spathe-valve is biplicate, and only the angles of the plicæ are green, the rest being membranous. There is a considerable variation in the apex of the outer valve of *G. Bellendeni.* In some specimens it is very acute, in others bluntish; but never truncate as in

G. Rochensis. Besides this, *G. Bellendeni* may be distinguished from *G. Rochensis* before flowering by the subglaucous stem and foliage. It is covered with microscopic glandular prominences, which in drying collapse and are much less evident. I rely on the spathes, the absence of nectariferous pores, and the indument as distinctive characters, rather than on the pellucid perianth-base, which is rather of the non-distinctive nature of a colour difference. I may be permitted to add that the figure of *G. Rochensis* quoted above (Bot. Mag. t. 598) is a caricature. The perianth forms a hemispheric cup, not a flat six-rayed star as represented.

Babiana macrantha, *MacOwan*, n. sp.—*B.* cormo ovoideo, fibris persistentibus stipato, foliis bifariis, 2–3-pollicaribus, oblongis, acutis, basi in petiolum oblique desinentibus, 5-costatis villosis; scapo vix spithameo pubescente, simplici vel rarius distachyo; spathis inæquivalvibus, extus pubescentibus; valva exteriore oblongo-lanceolata, acuta, apice sphacellata, perigonii tubum superante, interiore profunde bipartito, segmentis dorso angulatis, margine late membranaceis; perianthio omnino regulari, late infundibuliformi, patente, sulphureo, ad fundum macula purpurea notato; filamentis stylum æquantibus; antheris linearibus purpureis, stigmata superantibus; ovario ovoideo, villoso.

Hab. In humidis circa stagna prope pagum Darling, in ditione Malmesbury, Caput Bonæ Spei, alt. c. 500 ped., Oct. 1887; *Herb. Norm. Austr.-Afr.* no. 811; *MacOwan.*

Folia 2–3 poll. longa, 4–5 lin. lata, ad costas venasque intermedias villosa. Flos in genere maximus, diametro c. 2-pollicaris, segmentis obovatis, deorsum angustatis, exterioribus sub apice recurvo-mucronulatis.

This fine *Babiana* appears to be very rare.

On Malformations in *Fuchsia globosa*. By Dr. J. C. Costerus. (Communicated by Dr. Masters, F.R.S., F.L.S.)

[Read 6th December, 1888.]

(Plates LVII.-LX.)

Introduction.

In the following pages I have attempted to give an enumeration and description of the principal malformations in *Fuchsia globosa*. As will be seen, the monstrosities are arranged according to the organs which are affected. Though in this way the same flower is sometimes dealt with in different sections, and consequently it does not at once give all the malformations belonging to any one flower, still this method of arrangement presents the advantage of affording a true idea of the extent of the modification to which every single part is subjected. Occasionally, however, a description of the whole of a malformed flower will be given, viz. in cases in which all or nearly all its parts are affected at the same time. Although, generally speaking, the observations refer to *Fuchsia globosa* only, remarks about other species are not excluded. As to the question which varieties of *Fuchsia* have yielded me the greatest material, it must be said that for various reasons I have thought it better not to give names.

In the first place it is very difficult to discover the true names of many varieties of *Fuchsia*, and secondly it is hardly possible to distinguish the flowers after immersion in alcohol. Moreover, it must be observed, that most of the authorities quoted merely speak of *Fuchsia*, without adding any particulars from which the name may be inferred; but my principal reason arises from the circumstance that the various kinds are not accurately known as regards their origin. It is well known that the name of *Fuchsia globosa* was first given to a plant of which the flowers had a scarlet calyx and brownish-violet petals. Very soon after its introduction (about 1830) the flower attracted a good deal of attention, and easily got a prominent place next to *Fuchsia coccinea*, the first species of this genus that appeared in European gardens (1788). Though *Fuchsia globosa* is certainly of American origin, yet there is some obscurity about its earliest history. It is still a moot point whether it is a good species, or a hybrid of *Fuchsia macrostemma*, Ruiz & Pav., from Chili—as for the matter of that also *F. conica*, *F. longiflora*, *F. recurvata*, *F. gracilis*, *F. mutabilis*, and *F. tenella* are assumed to be. Suppose now *F. globosa* had been kept free from the influence of other species after its introduction into Europe, and only its own seedlings had been intercrossed, yet even then the numerous varieties now existing could not be considered as the offspring of one single species.

But the *Fuchsia globosa* of 1830 has actually been intercrossed with *F. conica*, and above all with *F. fulgens*, which, having been discovered by two Spaniards, was brought to England in 1837 by Hartweg. About the time when these intercrossings were performed by English florists, in Germany new varieties were obtained by fecundating *F. globosa* with the pollen of *F. longiflora*, *F. reflexa*, *F. Harrisonii*, *F. mutabilis*, *F. virgata*, *F. Targetti*, and others. Some time after *F. corymbiflora* and *F. macrostemma* were used for the same purpose. It is obvious that in this way the number of sorts increased surprisingly, and we need hardly wonder at the fact that as early as 1849 a celebrated florist could offer 150 varieties. After that time there appeared Fuchsias with white corollas, striped petals, speckled calyces, double flowers, &c.; while, on the other hand, the older varieties dropped into the second rank, and ultimately vanished from the lists *.

The above sufficiently proves that the Fuchsia has a multiple origin, as Darwin puts it. It would undoubtedly be an interesting investigation to compare the cultivated varieties with the wild species; for "a botanist well acquainted with the parent forms would probably detect some curious structural differences in their crossed and cultivated descendants; and he would certainly observe many new and remarkable constitutional peculiarities" †.

Such a study, however, would not only require a compl te acquaintance with the wild species, but also the most thorough information about all the varieties now existing. But this is not the object of the present paper. In it I propose to treat of the great number of malformations of Fuchsias, and after what I

* How easily Fuchsias are fertilized by one another's pollen is also proved by the experiments of C. F. von Gaertner (Versuche und Beobachtungen über die Bastarderzeugung im Pflanzenreich, 1849), who obtained perfect seeds by pollinating *Fuchsia fulgens* by *F. coccinea*, and *F. globosa* by *F. macrostemma*.

† The Variations of Animals and Plants, &c., 1875, p. 338.

have observed about their history, their great number will hardly cause surprise. And though it be not possible to trace the parent forms of *Fuchsia globosa* in this way, still the conclusions drawn from the examination, taken in connection with morphology, may be found to throw some light upon the ancestors of the genus *Fuchsia* and its relation to the other genera of the same family.

Generally speaking, all the different parts of the flower do not show the same liability to modification, a fact that has also been noted in other plants. As far as our Fuchsias are concerned, the stamens are the least subject to modification, while, on the other hand, the four petals in very many flowers have more or less altered or diminished their size or have even quite disappeared. Next follow the sepals, which, though sometimes changing their position from superior to inferior, and not seldom becoming foliaceous instead of being coloured, yet in most flowers remain normal. Finally comes the pistil, of which part it may be said that it is the most constant of all the parts of the flower. This rule about the variability of course holds good only for the specimens which we have had an opportunity of examining, and which have been raised by cuttings from special varieties. It is, however, not improbable that the examination of other varieties would bring to light other malformations.

The present paper is the outcome of a long continued observation of monstrous Fuchsias by Mr. J. J. Smith, Jun., and myself. Most of the flowers described were grown in the nursery of Messrs. Groenewegen & Co., Amsterdam. Mr. Smith, whose connection with the said gentlemen gave him an excellent opportunity for watching any monstrosities that might occur, has moreover undertaken to furnish the more elaborate drawings.

In the second place, Prof. Hugo de Vries put at our disposal, for the purposes of this investigation, all the specimens relating to *Fuchsia* contained in his copious collection of monstrosities. Most of these preparations are distinguished by a transparency that bears witness to the excellence of Prof. de Vries's method of alcoholic preservation. I may observe by the way that some 2 per cent. hydrochloric acid added to the alcohol produces this remarkable effect *.

* Nature, 1886, Dec. 16. Also 'Maandblad voor Natuurwetenschappen,' 1886, pp. 4 and 80; *id.* 1887, p. 45.

In the third place, we have tried to collect the results of other authors as far as we could get at them, and have incorporated them with our own.

The chief authorities referred to are:—

W. F. R. SURINGAR, in 'Nederlandsch Kruidkundig Archief,' 2e Serie, 1e Deel.

MAXWELL T. MASTERS, Vegetable Teratology (German Translation), 1887.

CHARLES DARWIN, The Variations of Animals, &c.

FRANZ BUCHENAU, in 'Abhandlungen vom naturw. Vereine zu Bremen,' vi. Band, 3 Heft.

HEINRICH SIMROTH, in 'Zeitschrift für die gesammten Naturwissenschaften, redigirt von Dr. C G. Giebel,' iii. Folge, 1879, Band iv.

CH. MORREN, in 'Bulletin de l'Académie Royale des Sciences, des lettres et des beaux arts de Belgique,' tom. xviii. 11e Partie.

ED. PRILLIEUX, in 'Bulletin de la Société botanique de France,' tom. viii., 1861.

J. PLAYFAIR MCMURRICH in 'The American Naturalist,' September, 1884.

Short notes from P. MAGNUS in Bot. Zeit. 1879, p. 710; L. WITTMACK, ibid. 1877, p. 501; and Prof. TH. LIEBE, in Bot. Jahresbericht, 1880.

For the structure, the history, and the development of *Fuchsia*, we have consulted:—

Dr. A. W. EICHLER, 'Blüthendiagramme,' 1875.

DANIËL POPOVICIU BARCIANU, 'Untersuchungen über die Blüthen-Entwickelung der Onagraceen,' 1884.

Neerland's Plantentuin, onder redactie van Dr. C. A. J. A. OUDEMANS, 3e Jaargang 1867.

Manuel de l'Amateur des Jardins. Traité général d'horticulture par DECAISNE et NAUDIN.

And for apetalous Fuchsias:—W. B. HEMSLEY, "The Apetalous Fuchsias of South America," in the Journal of Botany, British and Foreign, March 1876.

Before entering on our task we have to offer our hearty thanks not only to Prof. de Vries of Amsterdam, but also to Prof. Liebe of Berlin, for his obliging readiness to put at our disposal his drawings (figs. 29, 30) and a dried specimen of abnormal Fuchsia.

§ 1. *Additional Parts in the Flower of Fuchsia.*

Fuchsia has an inferior ovary, a tolerably long calyx-tube, four sepals, four petals, eight stamens arranged in two rows of four each, and on the top of the four-celled ovary a honey-gland and a style with a four-lobed stigma. It should further be noted that the antipetalous stamens are external to the antisepalous ones, an arrangement for which the term "obdiplostemonous" is used. In § 2 the question will be discussed whether these outer stamens are to be regarded as intercalated elements, or as outgrowths from the petals.

Besides the parts named, there often appear additional parts which seem to grow out from the edge of the calyx-tube. They have the shape either of little threads, straight or curved, or take the form of petals. Fig. 1 shows in *a* the shape of a thread, in *b* that of a petal, and in *c* a combination of the two. In double Fuchsias the number of additional parts as compared with the four ordinary ones may be very large; in them also some thread-like parts appear between the others, and even an additional stamen sometimes may be seen. Although the additional petals closely resemble the ordinary ones, yet many of them are much narrower, others attracting attention by incisions, and appearing therefore lobed.

In the case of a great many additional petals being together in one flower, owing to their cramped and crowded position, they are bent to and fro, twisted or folded. For reasons, afterwards to be explained, special attention is drawn to a peculiar outgrowth from the inner side of some of the additional petals; it essentially consists of a thickening of the midrib, and will be described together with the petals in § 2.

The augmentation of the petals has no influence whatever on the two whorls of stamens, parts which in many other plants, for instance roses, anemones, &c., are easily affected under the same circumstances. However numerous the additional petals may be, the stamens are always 8 in number, and the single parts in most cases appear unaltered. It is strange, therefore, that Masters considers petalody of the stamens to be the chief cause of doubling in *Fuchsia* *.

Goebel, on the other hand, in his interesting paper "Beiträge zur Kenntniss gefüllter Blüthen"†, says "the andrœcium and

* Veg. Terat., Germ. transl. p. 572.

† In Pringsh. Jahrb. für Wiss. Botanik, 1886, p. 247.

gynæcium are normal in double Fuchsias, it very rarely occurs that some of the stamens are affected by petalody."

The above, however, does not preclude the presence of additional stamens. We possess, for instance, a flower with thirteen stamens, consequently five more than the ordinary number. But instead of additional petals, we find here a great many thread-like appendages, as just described. Even the remarkable fact presents itself here, that the normal petals have not appeared at all. It will soon become manifest that by the latter circumstance, *Fuchsia* betrays a tendency that may be regarded as proper to the whole genus.

As to the relation between the thread-like parts and the other parts of the flower, it often happens that a thread-like element has grown together with a stamen, so that the latter part appears as shown by Pl. LVII. fig. 3. In this case the little thread may have a petaloid extension on the right side and on the left (fig. 1 *c*), and in this form join the stamen. The sepals are also sometimes adherent for some little distance to the parts named, and in one instance the style even showed a thread-like appendage grown together with its lower part. In the latter case, however, the excrescence probably was a production of the pistil itself.

The strangest additional parts occurring in *Fuchsia* are mentioned by Masters; they are flower-buds on pedicels alternate with the petals. This phenomenon in flowers which are otherwise normal affords an instance of *axillary prolification*, whereas the additional petals, threads, &c. exemplify what is by Masters styled *polyphylly*.

The cause of polyphylly is explained by Goebel in his paper on double flowers cited above. As for the Onagrariaceæ examined, he pronounces chorisis to be the cause.

According to Goebel the primordial tubercles of a petal will divide into various pieces, the latter generally developing into separate parts. An incomplete division causes lobed petals, a form which we, however, found both in ordinary and in additional petals. Goebel considers a production of intercalated parts, quite independently of existing ones, very improbable, because a ramification of the tubercles can easily be detected*. This conclusion, however, does not tally with the fact that in double flowers the number of vascular bundles is greater than in single ones. This difference in number, though in many cases trifling, may be considerable in other flowers. In examining the calyx-tube of a single flower, we find only the vascular bundles ascending to

* Goebel, in Pringsh. Jahrb. für Wiss. Bot. 1886, p. 247.

the sepals, the petals, and the stamens. In a double flower, however, some additional bundles may appear, which can be traced a long way downward. But since in this direction, especially in the circumference of the ovary, they gradually become very indistinct, I could not detect any connection with the bundles normally occurring. Although I readily admit—from the personal observation of full-grown flowers—that chorisis of the petals causes doubling, yet I think there is another cause of augmentation, viz., the intercalation of parts connected with bundles which have their origin in the lower part of the flower *.

§ 2. *The Variability of the Petals and their Relation to the Antipetalous Stamens.*

One of the commonest occurrences in *Fuchsia* is the tendency to vary its petals; even flowers looking quite normal at first sight, show in many cases slight traces of alteration. The modifications which deserve most attention, because they are most frequent, are of three sorts. The first appears as a cup-like formation, the second is due to an enation from the inner side of the midrib, the third by the growing together of the petal with the antipetalous stamen. In the last case the petal displays a tendency to grow smaller, and even to disappear altogether. Staminody of the petals seems to be very rare; the changes that are usually classed as such are nearly always of the second or the third kind. Only once, besides other alterations, we have observed something resembling an anther, in a petal (Pl. LVIII. fig. 4, *an*). That, however, actual staminody of petals may occur, is to be inferred from a statement by Suringar, who mentions a flower of which two petals had changed into stamens †. The same authority describes foliaceous petals, where he mentions a corolla consisting of four spathulate petals, whose upper side is slightly tinged with green, while the margins of three of them are toothed. Whether petals can ever take the shape of small tubercles, as Buchenau admits (Pl. LVIII. fig. 5), seems very doubtful; our objections to this view will be found on p. 414. We shall now treat the principal modifications in detail.

* In the calyx-tube of single flowers, now and then some small groups of minute cells may be seen; they are not unlikely the first degrees of development of vascular tubes persisting in this stage. Are such flowers the offspring of double flowers?

† The two other petals are described to have changed halfway into stamens; it is probable, however, that they have grown together with the stamens, as we shall by-and-by show is of frequent occurrence.

(*a*) *Formation of cups.*—Pl. LVII. fig. 6 shows a petal in the first phase oftransformation into a cup. One of the margins is bent inside to the thickened midrib, with which it coheres. In this way a small cup-shaped space is marked out. From figures 7 and 8 the subsequent stages of this variation may be gathered, and at the same time it will be seen that there is a connection between this alteration and a narrowing of the base. There are also cases in which both margins are bent and grow together with the midrib (fig. 9). A perfect cup is shown magnified two diameters in fig. 10; it was supported by a rather long claw, which is not always the case. Such perfect cups will often be found to grow together with an antipetalous stamen.

(*b*) *Enation.*—Many petals of *Fuchsia* possess a midrib, somewhat wider at the base, and at the same time more than usually projecting. Pl. LVII. fig. 11 shows a nerve of which nearly one fourth has been modified in this sense. When comparing this petal with a series of others, one gets the conviction that this projecting part is the first indication of a stamen. When scrutinizing figs. 12 and 6, we see the rib getting more distinct and gradually differentiating, and finally developing into a head at the top (fig. 13). A microscopic examination of this swollen end and of the anther-wall of *Fuchsia* brings to view a striking similarity, and thus affords fresh evidence of the view just referred to. In connection with the same point figs. 7 and 14 (Pl. LVII.) are highly instructive, since the production from the petal has become so distinct, that no microscope needs to be resorted to for recognition of the real nature of the newly formed stamen. In this way even two fresh stamens may be formed, as fig. 4 (Pl. LVIII.) shows. The same figure shows as a third outgrowth between the stamen and the petal a petaloid structure with thickened margins; therefore it is not unlike an anther with petaloid connective. A pair of similar dark lines were seen also on the petal itself, and thus conferred on it something of a staminoid character. Disregarding the peculiarity just described, the cases cited put it beyond doubt that a petal of a Fuchsia is capable of producing a stamen (sometimes even two), or in other words of splitting into two parts, of which the outermost is a petal, the innermost a stamen. If the cases of real division, or enation, were not ready to hand, cases like those delineated in figs. 6, 7, 11, 12, and 13 (Pl. LVII.), might easily be mistaken for metamorphoses of the petals into stamens; in other words, for staminody of the petals.

But as it is, this view cannot be reasonably held. We again draw attention to the fact that in the same way the additional parts may thicken their midrib, and consequently become equally capable of producing a more or less incomplete stamen (fig. 2).

As to the variations described under the heading *a* and *b*, it will have become clear that either or both may affect the same petal *.

(*c*) *Adhesion of the petal to the antipetalous stamen and its attenuation.*—The process of enation, in its results just referred to, may easily give rise to a confusion with staminody, but the danger becomes much greater in the case of the variation which we are about to describe. A well-marked instance of mimic staminody of this sort came under my observation some years ago, and was described by me as an example of genuine staminody †. A closer examination, however, of a great number of flowers revealed the real cause, viz. adhesion of a petal to a stamen.

Generally speaking the process may be supposed to take place as follows:—starting from the fact that in a normal flower a stamen is anteposed to a petal, the first modification is a tapering of the basis of the petal so as to form a claw.

In this stage the petal either remains quite independent of the stamen, or the claw grows together with the filament. In a subsequent stage, the claw and the filament have quite coalesced into one single part, bearing an anther and a reduced lamina at top. Let this petaloid appendage be supposed to grow gradually smaller (for instance, as shown in Pl. LVII. fig. 15) and finally even to disappear, then the ultimate result of this variation must be a stamen inserted at the spot as a rule occupied by both a petal and a stamen. The different stages of coalescence of petal and stamen in conjunction with a gradual falling off of the former part are illustrated by figs. 15, 16, 17, 18, and 19. For the sake of clearness we have added to the figures floral formulæ, which briefly express the degree of adhesion.

$\frac{\mathrm{P}}{\mathrm{St}}$ indicates that petal and stamen are wholly separate, no matter whether or not the petal has a claw, whether it has the ordinary shape, or has become cup-shaped. (Pl. LVII. figs. 16 & 17.)

* Since in double flowers of *Fuchsia* additional stamens occasionally appear between the additional petals, it is not improbable that the former are produced by the latter.

† Nature, 1885, May 21.

$\left|\begin{matrix}P\\St\end{matrix}\right.$ signifies adhesion of claw and filament in such a manner that they may be distinguished as separate parts. (Pl. LVII. fig. 18.)

$\begin{matrix}P\\St\end{matrix}$ indicates that one filament bears an anther and a petaloid appendage, irrespectively of the size of the latter. (Pl. LVII. figs. 15, 19, and 20.)

$\underline{\underline{St}}$ denotes that the stamen takes the place of both petal and stamen, or, in other words, the petal has disappeared.

These various degrees of modification, of which only the leading stages have been described, can only be minutely studied if a great number of monstrous flowers are at the disposal of the student; still, it is a remarkable circumstance that even in the same flower various degrees of modification and adhesion may be found together. For the purpose of promoting a readier insight into these points, and at the same time of giving some idea of the frequency of the variations in question, we give a list of flowers of which the variations have been expressed in the formulæ just explained.

Previous to this it may be noticed that in the case of petal and stamen having become united, the midrib and the filament have as a rule joined one another, although in a few cases the stamen has joined one of the margins; in the latter case this margin bends towards the middle, so that the stamen retains its normal position. Next, a petal, though it has grown together with the stamen, may have become cup-shaped, as shown in fig. 20. In the following list the latter modification has been expressly noticed, as well as the fact of the petal being clawed.

List of various cases of Adhesion of Petals to Antipetalous Stamens.

1.	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$
2.	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P*\\St\end{matrix}$
3.	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$	$\left|\begin{matrix}P\\St\end{matrix}\right.$	$\begin{matrix}P\\St\end{matrix}$
4.	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P\\St\end{matrix}$	$\begin{matrix}P*\\St\end{matrix}$	$\left|\begin{matrix}P*\\St\end{matrix}\right.$

5.	P St	P St	P St		(a trimerous flower).
6.	P St	P St	P St	P St	
7.	P St	P St	P St	P St	
8.	P St	P St	P St	P St	
9.	P St	P** St	P** St	P St	
10.	P** St	P** St	P** St	P St	
11.	P St	P St	P St	P St	
12.	P St	P St	P St		(a trimerous flower).
13.	P St	P St	P St	P St	(of frequent occurrence).
14.	P St	P St	P St	P* St	
15.	P St	P St	P St	$\underline{\underline{\text{St}}}$	
16.	P St	P St	$\underline{\underline{\text{St}}}$	$\underline{\underline{\text{St}}}$	
17.	P St	P St	$\underline{\underline{\text{St}}}$		(a trimerous flower).
18.	P St	$\underline{\underline{\text{St}}}$	$\underline{\underline{\text{St}}}$	$\underline{\underline{\text{St}}}$	
19.	P St	$\underline{\underline{\text{St}}}$	P St	P St†	
20.	P 0	$\underline{\underline{\text{St}}}$	P 0	little thread	

* Cupped. ** With a long claw.

† This flower shows the four stages of development at the same time; it was, however, impossible to decide whether the stamen marked $\underline{\underline{\text{St}}}$ was absent or had coalesced with the antisepalous stamen inserted by its side, which itself had joined the next antipetalous stamen.

The last flower (No. 20) hardly belongs to the series, but deserves attention for reasons to be by-and-by explained.

The above twenty cases, which constitute only a part of those observed, sufficiently prove the tendency of the petal to disappear. If only in No. 18 the small appendage to one of the stamens had not developed, a flower would have been produced with two whorls of stamens and destitute of a corolla; the flower would be what Linnæus called a *mutilus flos**, but would at the same time represent the conformation which is normal in apetalous Fuchsias, of which *Fuchsia procumbens* may be found in nurseries. We have actually met with flowers without petals altogether, their formula being $\underline{\underline{St}}$, $\underline{\underline{St}}$, $\underline{\underline{St}}$, $\underline{\underline{St}}$.

The same relation between the petals and the antipetalous stamens in malformed Fuchsias is alluded to in a paper by Prillieux, as cited in the introduction; with this difference, however, that Prillieux does not describe the final disappearance of the petals. Having described the process, he goes on to say:—"En résumé, la monstruosité de *Fuchsia* que j'ai observée, consiste uniquement dans un changement particulier de la forme des pétales, accompagné le plus communément de la soudure des pétales monstrueux avec les étamines vis-à-vis d'eux."

By "changement de forme," Prillieux means the narrowing of the petal to a claw, which he considers the first stage of the modification. The adhesion of claw and filament is by him looked upon as the next stage, which may become more or less complete.

That with regard to our Fuchsias and those of Prillieux "growing together" is not a perfectly accurate term, need hardly be pointed out. Of course the parts that have "grown together" have never been independent of each other in the flower where they coalesce. Morren has a felicitous term for this relation. He was studying the so-called "Scaramouche," a variety of Fuchsia, which he says is easily propagated by cuttings. As shown by Pl. LVIII. fig. 21, which we take from his paper, superposed to each sepal there is a stalk or claw, splitting up into one or more stamens, and a petaloid appendage on the external side. The most striking peculiarity of this flower is surely the union of the antisepalous with the antipetalous stamens, which are themselves joined to the petals, or, adopting Morren's words, the various elements have

* Linnæus says in his 'Philosophia Botanica,' "Mutilus flos nobis est, qui corollam non promit, quamquam eandem promere deberet."

parted company higher up than usual. The union may, it is true, be seen in some of our monstrous flowers too, but not so frequently as in Scaramouche.

As for the modified insertion of the petals, Morren emphatically points out that the petals have not been *produced* by the stamens, but have moved a longer or shorter way up the stamen. He calls this phenomenon "métaphérie" or "monstruosité par transport." This "métaphérie" may proceed so far that the petaloid appendage reaches the top of the connective and gives birth to a stamen, of which the anther-cells are placed on the edges of a small stalked leaf. "Gliding" is the term used by Morren to characterize this process, in which the petal may detach itself from the stamen at any height. But evidently Morren has not seen the petal disappear altogether. In the Scaramouche flower represented in the drawing, the noteworthy fact of the floral parts being superposed to the sepals would constitute the greatest difficulty if it were a peculiarity of the whole sort. But the drawing of another flower shows that it is not one of the constant characteristics of Scaramouche. It is very probable that also in the flower described, the parts are inserted at their ordinary place but have been forced aside by coalescence with the antisepalous stamens.

The frequency of petals and antipetalous stamens growing together renders it probable that the internal organization of the flower is such as to predetermine the irregularity. And, in fact, anatomical examination reveals the circumstance, that the petal and the superposed stamen are supplied by the same vascular bundle, which bifurcates on the edge of the calyx-tube. This vascular bundle runs through the whole calyx-tube, and may be traced downward to the peduncle. The relation of the sepals to the antisepalous stamen is quite different; both of them have a separate bundle, which may be followed up through the whole calyx-tube and the parietes of the ovary as far as the top of the peduncle. In consequence, twelve vascular bundles may be seen going up through ovary-wall and calyx-tube—four supplying the sepals, four going to the antisepalous stamens, and four to the petals and the antipetalous stamens taken together. This, taken in connection with the monstrous adhesion of the antipetalous stamen to the petal as before described, proves that the petals and the outer row of stamens have been produced by the bifurcation of one whorl, and that consequently the number of autonomous whorls is not five but four.

The questions now arise: Which whorl is primary, and which has developed from the primary one? Do the petals belong to the original series, and did they give birth to the stamens, or are the antipetalous stamens the older elements which have subsequently produced petals? This question is closely connected with another: Are the apetalous Fuchsias of South America and New Zealand the representatives of the prototype, from which the corolla-bearing Fuchsias have developed themselves, or are they to be regarded as the descendants? Both suppositions are in themselves possible, and both throw a strong light upon the cause of the otherwise inexplicable arrangement of either the petals or the antipetalous stamens with regard to the cells of the ovary. If, however, one of these whorls is suppressed, the irregularity disappears, and the law of alternation remains in full force.

The following facts tend to render it probable that the petals are to be looked upon as the primary parts, from which the outer stamens have grown out, or, in other words, that the original diagram must have been as shown in Pl. LIX. fig. 37 *b*. In proof of this we would first adduce the Fuchsia of Simroth: this botanist possessed a flower which for convenience' sake we represent by the diagram in fig. 37*a*. It shows that two of the petals have no stamen in front of them. Besides, the sepal at the top of the diagram was foliaceous, whereas the lowermost was red as usual; the two lateral ones being half green, half red, so that the green half of each sepal was turned upward and the red half downward. According to Simroth, the flower may be conceived to consist of two parts, of which the undermost is quite normal, whereas the uppermost shows modification owing to the absence of antipetalous stamens and the phyllody of the sepals. Now Simroth takes the uppermost half to be a reversion to a former structure, and shows that the ancestral Fuchsia differs from the present form by two characters—1, the absence of an outer whorl of stamens; 2, the possession of a leafy calyx. We readily agree to this view and will try to strengthen it by further arguments, which would certainly seem necessary to furnish a firm base to Simroth's opinion.

Some years since the development of the flowers of some Onagrariaceæ was examined by Barcianu. His investigations brought to light that the outer or antipetalous stamens do not belong to the autonomous organs of the flower. It is not until the calyx and the other whorls have been given off from the receptacle, that on the inner surface of each of the petals a small tubercle is protruded, which afterwards turns out to be the commencement of an antipetalous stamen. This result is the same in all the Onagrariaceæ examined by Barcianu, so that the only inference possible is, that the stamens in question are secondary organs.

It is indeed a remarkable fact that in some plants the small tubercle does not grow out to a stamen. This is the case in *Circæa*, in which genus the antisepalous stamens are produced in the ordinary way, but the antipetalous ones do not advance beyond a slight protuberance at the base of the petal. *Eucharidium* behaves in a similar way, with this difference, however, that the protuberances grow somewhat larger. In *Lopezia* only, no trace even of antipetalous stamens was found by Barcianu, even in the youngest stages of the petals. As to its diagram, therefore, this flower altogether agrees with the ancestral progenitor of *Fuchsia* surmised by Simroth.

Finally, there is one more circumstance to be considered. In the beginning of this section, attention was drawn to the frequent occurrence of excrescences from the petals. Starting from a simple thickening of the base of the midrib, gradually a protuberance is formed which becomes more and more like a stamen, and in the fully developed stage actually becomes a stamen. Once we even met with two stamens connected with the base of a petal. The additional petals, as described in § 1, may also produce stamens. If now we see that the petals of *Fuchsia* betray a strong tendency to produce stamens, and on the other hand that the stamens never give off a petal (at best are to a certain extent transformed into one), the answer to the question is not difficult. The only legitimate conclusion to be drawn is, that the petals of *Fuchsia* belong to an older whorl than the antipetalous stamens *.

If we consider this point as satisfactorily disposed of, what is to be inferred from the monstrosities observed by us and from such as are described by Morren and Prillieux? Simply this, that the petals of *Fuchsia* are apt to retreat to the background, and even to disappear altogether. That not only cultivated Fuchsias show this tendency is evident from observations made of some New-Zealand representatives of this genus, which according to Hemsley possess only very small petals. They constitute the transition to those species in which no petals at all are present, and which are natives of both New Zealand and South

* According to Eichler this explanation of obdiplostemony of the Onagrariaceæ has already been suggested by St. Hilaire. Eichler readily admits it and founds his argument on Barcianu's researches as also on the fact that stamens are produced by petals in some double flowers (Bluthend. i. p. 337).

America. Already in our prefatory remarks we mentioned the New-Zealand species *Fuchsia procumbens* *, cultivated in the nursery of Messrs. Groenewegen & Co.; other apetalous species are *F. macrantha*, *hirsuta*, *insignis*, *apetala*, *membranacea*, and *salicifolia*, all from South America †. It would be interesting to inquire whether in the first stage of the flowers of these plants any trace of petalline tubercles could be detected, and whether now and then by way of reversion well-marked petals occur.

As to the biological cause (1) of the formation of an additional whorl of stamens, (2) of the disappearance of the petals, the *rationale* of the former might be the production of a greater quantity of pollen. As for the latter change, which regarded in itself must be prejudicial to a due pollinization, it should be kept in mind that the calyx has size and colour which enable it to sufficiently replace the corolla. Indeed, it is by no means improbable that the tendency of the petals to grow smaller is closely connected with the colouring of the calyx-tube, and that consequently the calyx-tube and sepals of *Fuchsia* were formerly green—a supposition which, being the rule in the whole family, is by Simroth taken for granted on the strength of the flower observed by him.

§ 3. *Deviations in the Stamens.*

As compared with the floral envelopes, the stamens may be pronounced to be little liable to aberration. This remark only applies to the shape of these organs, modifications in the number of the parts of the flower in general being dealt with in a subsequent section.

In the first place, we would make a few remarks on the appendages of anther and filament. In Pl. LVII. fig. 22 the anther-cells are more or less separated from one another, in consequence of the connective having grown out further than usual. This outgrowth is sometimes not unlike a second anther, as shown in fig. 23. Cases different from these are represented in fig. 24, where the connective is simply elongated and tapering; a similar conformation, but on a larger scale, is shown in fig. 25. The stamen

* *Fuchsia procumbens* was in 1834 discovered by Rich. Cunningham in Northern New Zealand, and introduced into England about 1873. According to Sir J. Hooker, it was also introduced earlier.

† In *Isnardia* too the petals are wanting, as also the antipetalous stamens. This would seem to imply that the petals disappeared before they gave off an antipetalous stamen.

mentioned before (fig. 23) has two appendages, of which fig. 26 gives a back view. In the latter two cases the appendages spring from the boundary between filament and anther, but in fig. 3 a filiform appendage is seen leaving the filament. This thread may be compared with an outgrowth described by Goebel *; according to whom it appears now and then on the inner side of the antisepalous stamens, and contains pollen-grains. It seems very probable that these thread-like outgrowths are sometimes additional parts of the floral axis, as already explained in § 1; but, on the other hand, there are cases in which it is quite open to us to look upon them as the result of chorisis of the stamen which shows them.

There is every reason to suppose that the stamens of *Fuchsia*, like those of so many other plants, have a tendency to petalody. Masters distinguishes the following cases :—

1. The anther-cell becomes completely or partially petaloid, the filament remaining unaltered.

2. The connective has grown out into a tubular petal.

3. The whole stamen has been transformed into a cup-shaped petal.

4. The filament is unchanged, the anther has the shape of a petaloid cup, from the middle of which spring two imperfect pollen-cavities, whereas the other pollen-cavities are petaloid.

5. The filament is petaloid, and bears an anther-cell on each side.

We can supplement these by the following cases, of which some, undoubtedly, correspond to those already mentioned.

Suringar describes a flower in which three of the antisepalous stamens are replaced by three spathulate petals, and three of the outer whorl of stamens are normal, the fourth having become a petal.

In the flower described by Buchenau (Pl. LVIII. fig. 5), according to his explanation, one of the antisepalous stamens had developed to an organ that is partly sepaloid, partly petaloid. Whether the part thus interpreted is inserted at the right place, viz. opposite to a sepal, it is impossible to determine from the drawing.

Sometimes we have ourselves found a stamen appearing petaloid on one side, normal on the other (Pl. LVII. fig. 27). As regards one of these cases, we are quite sure that the altered stamens were superposed to the petals.

* In Pringsh. Jahrb. für Wiss. Bot. 1886, p. 247.

We also possess a flower having only one (episepalous) stamen with an anther bearing a petaloid appendage on its back (Pl. LX. fig. 28 *c*).

Next an episepalous stamen, of which the filament on both sides was winged in a petaloid way *; this calls to mind No. 5 of Masters, but differs from it in having a normal anther at top.

No less remarkable are the cases of petaloid stamens drawn by Frank in his 'Krankheiten der Pflanzen,' p. 260, fig. 40.

But it may have already occurred to the reader that anthers with a petaloid appendage at the top display a striking similarity to the coalescence of a stamen with a reduced petal. This resemblance should put us on our guard, and renders it somewhat doubtful whether the drawing of Frank just cited and the cases under 1, 2, 3, and 4 of Masters are really always stamens, and induces a suspicion that sometimes they may stand for a stamen to which a reduced petal is adherent, as represented in our figs. 15 and 19. For this reason it seems advisable, if there is question of an antipetalous stamen of *Fuchsia* being altered, to state expressly whether or not the petal behind it is present. So much for petalody.

That the stamens also are liable to pistillody appears from a remark of Masters †, where he speaks of a *Fuchsia* with a foliaceous calyx and normal petals, but of which the stamens were transformed into ovaries. The typical inferior ovary, on the other hand, was wanting.

It seems needless to dwell upon staminodes and imperfectly developed anthers; they occur repeatedly, especially in incomplete flowers. The frequent cohesion of neighbouring stamens we shall leave unnoticed here, since a separate section will be devoted to various sorts of coalescence. If in this way two filaments have grown together, they form a ribbon-like structure strongly resembling certain simple filaments which have been flattened radially. Filaments of this shape, not infrequently being twisted, show accordingly a close resemblance to certain fasciated stems.

§ 4. *Abnormalities in the Calyx.*

Though the calyx is much more radically disturbed than the stamens, we have treated the latter organs directly after the petals, on account of the close relation between them.

* One wing of this variety may be seen in No. 3203 of the de Vries collection.

† Veg. Terat., Germ. ed. p. 228.

The most striking deviation affecting the calyx of *Fuchsia* is indubitably its passage into parts hardly differing from petioled foliage-leaves. This change may affect either the whole sepal or only a part of it; the sepal thus altered may either remain superior or become inferior. In Pl. LVIII. fig. 5, taken from Buchenau, we see that two of the sepals (each with an episepalous stamen) have sunk down below the ovary; both though of different size, are quite foliaceous. Special attention is drawn to a couple of protuberances at the foot of each foliaceous sepal, the whole number consequently being four.

In nearly the same way one of our own flowers showed two inferior sepals affected with complete phyllody, whereas Suringar describes a flower, of which only one of the four sepals was in that condition. The same authority mentions a flower of which all the four sepals together had been transformed into petioled detached leaves, very closely resembling foliage-leaves. This case of Suringar, however, differs from the two preceding ones by the sepals not being inserted at the base of the ovary, but half-way up, a position which in normal flowers is termed half-superior.

The following cases all concern modified sepals, which are not below the usual level, but are placed either on the edge of the calyx-tube or directly at the top of the ovary. In a reduced flower of our collection one of the four sepals is green, and has the same peculiar incisions as the foliage-leaves.

Again, in the collection of Prof. de Vries, among other striking specimens with foliaceous sepals, there is a flower of which one sepal is foliaceous as to one half; this half is much larger than the coloured half, and extends downward over the tube though without growing together with that part. We ourselves possess a flower of which two sepals show such a one-sided expansion, which may be followed up over the surface of tube and ovary as far as the peduncle. But in this instance the expansion was in connection with tube and ovary.

J. Playfair McMurrich saw a sepal, "which on one side was of the colour and structure usual in the sepal of *Fuchsia*, while the other half is exactly similar to the half of a foliage-leaf of the same plant, presenting a green colour, the toothed margin and the ordinary venation being also the same width as half a foliage-leaf, and thus much broader than the portion on the other side of the midrib." The principal peculiarity of this case was that the modified (leafy) half was separated from the calyx-tube, and modified so as to represent a leaf-petiole at the bottom. The separation extended down to the base of the ovary.

In the flower previously mentioned (Pl. LIX. fig. 37 *a*), Simroth found one green petal and facing it a normal one; but the interjacent sepals were half coloured, half green, so that the green portions were adjacent to the green, and the coloured to the coloured sepal.

P. Magnus showed to the members of the "Brandenburger botanische Verein" Fuchsias with leafy sepals; the report of the proceedings which we have seen leaves it undecided whether there was any displacement of the sepals at the same time.

Pl. LVIII. fig. 29, for which we are indebted to the kindness of Prof. Liebe, shows, besides other peculiarities, two normal and two green rather small sepals.

On 19th November, 1887, we obtained a trimerous flower grown in a greenhouse, which showed two normal sepals together with one which on one side of the midrib was green, but on the other coloured as usual. The former portion extended down to the top of the petiole. Also in this case a small petiole might be discerned, bearing on one side a lateral protuberance of the same shape as the four in Buchenau's flower (fig. 5). This case, which in every respect but one is similar to McMurrich's, is specially interesting on account of this very protuberance. Buchenau in his case considered them to be the representatives of the wanting petals. But when we see that appendages of this kind very often occur at the base of Fuchsia-leaves, the plausibility of this view is greatly lessened. These small excrescences, or stipules, are particularly conspicuous in No. 3204 of the de Vries collection, at the base of two foliaceous sepals, which have detached themselves from the tube. Now in this flower the four petals appear normally, so that the transformation of petals is altogether out of the question. We therefore consider that where the petals of *Fuchsia* disappear, they do so in accordance with what has been advanced in § 2.

The just mentioned flower of Prof. Liebe deserves a special description. Putting aside the phyllody of two sepals, and the circumstance of two petals being somewhat sepaloid, our attention is at once directed to the abnormal peduncle which supports the flower. In the first place, the peduncle is unusually long; in the second place, it bears two pairs of opposite leaves, one of them not far from the base, the other halfway up the peduncle (Pl. LVIII.

fig. 29). Whether or not they are decussate is not clear, but it seems that the alternation at right angles was intended by the draughtsman. The occurrence of two subsequent pairs of leaves would not have so much surprised us, if Prof. Liebe had not afforded us an opportunity of examining the following abnormality :—in a flower (Pl. LX. fig. 30), on the boundary of the ovary and tube there appears a whorl of four leaves, which are slightly red at the base and especially on the ribs, but which for the rest closely resemble the sepals. A similar whorl of leaves is seen on the peduncle. What organs do these two sets of leaves represent? As for the uppermost we are driven to the conclusion that here we have chorisis of either the calyx or the corolla, according as they are in the same vertical line with the former or the latter. In a dried specimen sent us for examination by Prof. Liebe, their position was not clear. If this is the correct explanation, chorisis must have taken place, either of the vascular bundles ascending to the sepals or of the petal-bundles. If this is the right explanation, which only a microscopic examination would enable us to decide, there would be no objection against considering the lower whorl as also a product of chorisis. The case then comes very near to median prolification, the flower having twice grown through its calyx—always supposing it is the calyx which is twice repeated. The first flower shows on the whole the same deviation, though the number of leaves in each whorl is only two (fig. 29). It would consequently need no other explanation than the one we have attempted to give.

The above case corresponds in many respects with fig. 98 of Masters's 'Teratology' (German translation). There, too, on the outer side of the ovary we find two green leaves, though at different heights. Add to this that in the axil of each of these leaves a stamen is given off, the stamen of the lowermost of the two leaves has bifurcated, bearing an anther at the top of each branch. Whether here we have two coalesced stamens at hand, or only one splitting up, cannot be gathered from the drawing. On the preceding page (p. 207) Masters speaks of a *Fuchsia* in which he found two leaves on the surface of the fruit, in the axils of which were two stamens. The same appearance is presented in this case.

We may now pass in review the other aberrations in the calyx, which aberrations, however, are decidedly less important from a phylogenetic point of view.

In the first place, we may mention the cohesion of the sepals which usually emerge as free parts from the edge of the tube. This cohesion may actually extend from the base up to the top; we examined, for instance, a flower of which the sepals formed one whole, so that the flower remained closed and the petals could not get at the light.

In another flower a small hole was visible at the top of the flower, too small indeed to afford a way out for the petals, the stamens, and the pistil. A circular cleft between the ovary and the calyx-tube justified the inference that there must have been a strong strain of the sexual organs on the almost closed calyx.

Starting from these instances, one may find represented nearly all imaginable degrees of cohesion: for instance, three sepals almost quite grown together opposite to one, that is isolated; or in another flower the sepals coalesced two and two, in such a manner that there seemed to be only two broad sepals, slightly incised at the top. But of numerous other instances which came under my observation, I mention one more only, in which the sepals cohered at their bases up to one-fifth of their length.

The remaining remarks chiefly refer to appendages of the sepals. The most peculiar case relating to these appendages is the one observed by Wittmack, who saw "a trimerous calyx of a second flower" springing from the upperside of a sepal.

Again, Masters mentions spurs on the calyx of *Fuchsia*, while we ourselves have at times observed a tooth-shaped appendage on one or two of the sepals just under the apex, but also sometimes on the margin. This appendage was not unlike the small teeth on the margin of foliage-leaves.

In November 1887 several flowers in a greenhouse bore pointed and ridge-shaped excrescences on the outer side of the calyx. No regularity was to be observed in their position. With this kind of aberration may be classed membranaceous ridges on the inner side of the sepals, disposed in such a manner as to flank the midrib of the sepal.

From these outgrowths must be distinguished such filiform appendages as have been dealt with in § 1, under the name of additional parts. Now and then they appear inserted on the inner side of the sepals, and may be traced to the calyx-tube. But also as regards these parts, it must remain undecided whether such a thread is produced by a petal by the process of chorisis, or whether it is an additional production from the floral axis.

That the sepals are sometimes of different size, and that within the limits of a given variety the length of the calyx-tube may vary, hardly needs exemplification. Nor have we thought it necessary to illustrate by drawings the frequent occurrence of longitudinal slits in the calyx-tube, which arise from ruptures of the epidermis and some of the deeper cell-layers; they should not be confounded with the deep furrows, which, though rarely, may be seen at the outer side of the tube. An express examination shows that in these cases the eight vascular bundles going up to the stamens strongly project at the corresponding places inside.

This is just the reverse of what Hemsley says about New-Zealand Fuchsias: "the calyx-tube is more or less prominently eight-ribbed, the ribs corresponding to the lines of the attachment of the filaments."

By way of conclusion to this section we mention a flower delineated and described by Morren. This flower belongs to the Scaramouche variety mentioned before, and has a double number of sepals, disposed in one single whorl, whereas all the other elements, though modified, show the ordinary number. Whether this polyphylly was induced by lateral chorisis, cannot be gathered from the description. It is worth noting that in this flower one of the sepals had left the whorl and had sunk down under the ovary, where it presented a yellowish-green colour, and bore an antisepalous stamen in its axil. If others of these eight sepals had been displaced in the same direction, the case would have offered great resemblance to the flowers of Prof. Liebe, treated in this section.

§ 5. *Abnormalities in the Pistil.*

Like the stamens, the pistil rarely shows any considerable aberrations as to its structure and position.

As regards the *ovary*, only one modification of its position has come under our observation. We allude to the superior ovary shown in Pl. LX. fig. 28; from our notes we add the following:—"Ovary small, superior, its surface for the greater part covered with a glandular disk (nectary); style slit open and laid flat, with three (or four?) small protuberances (stigmas) at top. Moreover the sepals are seen only slightly cohering under the ovary, a calyx-tube being consequently wanting. The petals resemble the sepals in shape *,

* Two sepals a^1 and a^2 cohere so as to form one part.

and the single stamen is provided with a petaloid appendage at the top of the anther."

In another flower (Pl. LX. fig. 31) the ovary was indeed inferior, but extended far upward, so as not only to fill up the calyx-tube but even to emerge from it. The transverse section showed nothing abnormal.

Suringar describes just the same aberration as to the position of the ovary in a flower which shows still other disturbances.

Also in the collection of Prof. de Vries, No. 3306, such a superior, and at the same time inferior, ovary may be seen. It should further be noted that in our case the style gets thicker upward, and terminates in a sort of cone with a stigma dividing into two lobes. In this very abnormal flower one of the stamens has grown together with the ovary, viz., its upper portion.

As for the style in general, it only sometimes happens that it may be flattened in one direction and broadened in another. Such a style is commonly affected by a spiral twisting (Pl. LX. fig. 32), just as often may be seen in fasciated stems and branches. This flattening must not be confounded with a style split open, as described on the foregoing page. Besides the one there referred to, we possess one which has been laid open at top only, so that the three stigma-lobes (the flower being trimerous) are lying in one plane. The stigma, which is globose in normal Fuchsias, shows two furrows intersecting rectangularly, sometimes with prominent lobes inclosing a small funnel-shaped space. If these lobes happen to be unequal, the cup of course is irregular. Especially worth noting was a stigma, of which the lobes projected in such a manner as to produce an exact resemblance to the stigma of *F. ampliata*, a plant introduced from the neighbourhood of Quito into Kew Gardens in 1877 *. Another peculiarity of this plant is seen in the arrangement of the leaves, they being ternately whorled. This property, normal in *Fuchsia ampliata*, is an abnormality of rare occurrence in our Fuchsia.

§ 6. *Various cases of Coalescence.*

Although in the preceding sections there have already been cited various instances of coalescing parts which are free under normal circumstances, it will be our task in the present section to

* *Fuchsia ampliata*, native of the Andes of Ecuador, described by Sir J. D. Hooker in the 'Botanical Magazine' (1885), t. 6839.

deal with such cases in which transformation is subordinate, and the coalescence itself is the main point to be considered. We may bring the cases of coalescence under two groups—the first containing the growing together of whole flowers, and of flowers with other parts of the plants; whereas the second includes different parts of the same flower grown together.

(*a*) *Coalescence of whole flowers* [*synanthy*], *&c.*—As is generally known, not seldom two flowers are developed in the axils of the leaves instead of one. In this case the flowers must have a strong tendency to coalesce. In fact such a growing together is by no means rare and may be met with in all possible stages. The slightest degree is a simple connection of the peduncles, which still show the separate parts by a distinct furrow. In a subsequent stage this furrow may disappear, and consequently a perfect union arise. Pl. LIX. fig. 33 illustrates this phase, and furthermore a cohesion of the tubes and the bases of the adjacent sepals.

In another example—one of the specimens of the collection of Prof. de Vries, which abounds in modifications of this sort—the sepals of both flowers were disposed in one whorl. Two of the sepals had joined each other so completely as to betray a binary character by a small incision at the top only. As regards the petals and stamens of the two flowers, they appeared arranged separately round their own styles, so that the whole gave the impression of two flowers surrounded by a single calyx.

About another flower we find in our notes: "two flowers grown together, one pentamerous, the other trimerous. In the trimerous one a supernumerary stamen is present. Ovaries cohering, so are the calyx-tubes; a sepal of the former coalesces back to back with a sepal of the latter, but their midribs do not exactly correspond.

Again, we examined a flower belonging to Prof. de Vries with the formula S (8) P 8 St 8+8 O $(\bar{8})$. In this case two flowers had completely coalesced. We observed, however, that the stigma was divided into eleven slight lobes and the style flat. Though eight cells were present in the ovary, still one could see in the lower part of the ovary two separate placentas, which tended to converge higher up, but did not unite altogether.

A very surprising instance of coalescence is shown in figs. 34 and 35, drawn from specimens in the de Vries collection. Two opposite peduncles have grown together some way with the internode between them! The drawing illustrates one peduncle continued almost straight, but the other strongly bent. In both, the tissues round the vascular bundles are singularly thick, so as to give the impression of these peduncles being winged. This disturbance, together with the wavy curvature, is evidently attributable to a difference in rapidity of growth between the peduncle and the internode; the peduncles which tended to stretch out more rapidly were obstructed by the slower growing internode. The consequence was that the vascular bundles got curved, and the cells of the surrounding tissues expanded in a radial direction.

A coalescence of a flower with the foliage-leaf directly beneath it is of more frequent occurrence. Of this change, which seems to be easiest accomplished at the top of the stem, various degrees may be observed.

In Pl. LIX. fig. 36 is shown adhesion of a leaf *a* to a flower *b*. An examination of the specimen itself is necessary to show the peduncle grown together with the petiole; moreover, the midrib of the leaf has joined the ovary and the calyx-tube; but higher up the leaf gets free, and unlike the basal portion, which is only one-sided, becomes complete. Between this flower and the leaf springs another flower, which we have disregarded in our drawing. The same ovary moreover slightly adhered to the base of the petiole of the leaf *c*, in the axil of which a flower is inserted.

The ovary gradually passes into the calyx-tube, and may be distinguished from it externally by the colour. The flower (*b*) further possesses seven floral enveloping leaves, which seem disposed in a dextro-spiral manner. The little floral leaf *n* is the lowermost, and is next to the foliage-leaf *a*, which itself is inserted a little lower. Though *n* in the main agrees with a foliage-leaf as regards its shape, still the left margin by its red colour betrays a passing into true floral envelopes.

A case like the above, though somewhat less complicated, is seen in the de Vries collection under No. 3203. The same collection also contains cases which are very difficult to explain. Witness No. 3401 for instance. There we find a long stalk bearing two peduncled flowers and a petioled leaf at the top. Can, in this case, two peduncles and a petiole have coalesced a considerable way up? It is possible, but by no means sure *.

* I am much inclined to answer the above question in the affirmative, since in the autumn of 1888 I saw, in the Botanical Gardens at Amsterdam, a branch of *Fuchsia* which showed a foliage-leaf *in the axil* of another one. Near the base of the former leaf there was a small excrescence to be seen, which could be

In the same bottle there is a peduncle of which the flower has coalesced with a green leaf; on its lower portion two leaves spring at different heights, one of them even with an axillary flower. Has a leaf-bearing stem grown together with a peduncled flower? Here, too, we must leave the matter undecided.

It is manifest that the leaves springing from Prof. Liebe's flowers have a significance quite different from those preceding; according to our opinion the phenomenon in Liebe's flower being a formation of additional parts, or a sort of incomplete prolification, in which a flower once or twice grows through its calyx. Here, on the other hand, the point in question was coalescence of flowers with extra-floral parts, in which in every separate case it must be examined what sort of parts enter into the coalescence.

(*b*) *Growing together of two embryos.*—Though most of our observations concern *Fuchsia globosa,* there is no sufficient reason to leave unmentioned a remarkable case of two embryos of different species growing together. We give the case as it is mentioned by Darwin *:—

"A distinguished botanist, Mr. G. H. Thwaites, states that a seed from *Fuchsia coccinea* fertilized by *F. fulgens* contained two embryos, and was 'a true vegetable twin.' The two plants produced from the two embryos were 'extremely different in appearance and character,' though both resembled other hybrids of the same parentage produced at the same time. These twin plants 'were closely coherent, below the two pairs of cotyledon-leaves, into a single cylindrical stem, so that they had subsequently the appearance of being branches on one trunk.' Had the two united stems grown up to their full height instead of dying, a curiously mixed hybrid would have been produced."

(*c*) *Union of floral organs.*—If we remember that the vascular bundles of the sepals and the antisepalous stamens in the calyx-tube are situated close to one another, we might infer even *à priori* that adhesion of a sepal to an antisepalous stamen above the ordinary place of divergence might occur. Such a union has indeed repeatedly come under our observation. Once only it

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nothing but an axillary leaf-bud in a state of very slight development. In the same way the other cases mentioned may be explained by a sudden arrest of the buds, whereas the organs produced by them show an active growth and eventually may coalesce. Prof. de Vries has had this monstrosity photographed.

* Variations of Animals and Plants, &c., 1875, i. p. 426.

occurred that the filament thus adhering was flanked by a pair of petaloid wings.

Petals adherent to sepals have been observed by Goeschke *.

Of greater frequency is the union of stamens of different whorls. In this way there arise cases which, if they were normal, would consign such plants to Linnæus's 16th, 17th, and 18th Classes. Out of the many cases observed, we only mention the most remarkable :—

```
1.      St      St      St    St
          \       \       \  /  \
           St      St      St    St
```

There are in this case three bundles, two consisting of two, and one of four stamens; the upper row represents the antipetalous stamens.

2. To the inner side of a sepal there was adherent a compound body consisting of one antisepalous stamen, one antipetalous stamen with a petaloid appendage. In this case consequently four elements of four separate whorls were united.

3. In a tetramerous flower the antisepalous stamens were bent inward and united both with one another and with the style. The antipetalous stamens, on the other hand, were bent outward and quite independent of each other. Two of the latter bear small appendages, as last rudiments of the corolla, the other two stamens showing nothing behind them. The ovules of this peculiar flower were few and abortive, though the small ovary looked normal out- and inside.

4. An antipetalous stamen is adherent to the adjoining antisepalous stamens (Pl. LVIII. fig. 38) and at the same time to the petal, which has expanded into a sort of arched roof over the three anthers. On the other side, the five remaining stamens constitute a whole, with respect to which two petals behave just in the same way. Only the fourth petal has remained free, and occupies the usual place on the edge of the tube.

The diagram (Pl. LIX. fig. 39) shows the peculiar relation of the organs mentioned. The two bundles were united so as to form a single tube beneath.

At the close of this section we again draw attention to Pl. LVIII. fig. 21, the drawing of a Scaramouche; as may be seen there, the twelve parts, which usually are free, have grown together in four parts; their position *opposite* to the sepals has been referred to above.

* Masters, 'Vegetable Teratology,' German translation, p. 52. This instance is not cited in the original work.

§ 7. *Deviations from Ordinary Number.*

As is the case in most other plants, deviations from ordinary number are not uncommon in Fuchsias. A trimerous flower is the most frequent instance of this abnormality. We have met with trimerous Fuchsias innumerable times, now with some of the parts disturbed, in other cases quite normally constructed. On a woody Fuchsia at St. Leonards-on-Sea, which overshadowed a seat, I noticed in 1887 a great number of trimerous flowers. It would therefore be easy enough to obtain a trimerous Fuchsia by cuttings, just as there is no difficulty in propagating Scaramouche and other varieties by the same method. Whether this flower would find permanent favour with the public is a different question; the florist would most probably have greater success by growing pentamerous Fuchsias such as may repeatedly be observed, or hexamerous ones *, of which latter a specimen is found in the de Vries Collection, under No. 2803 †.

Besides those recorded, now and then dimerous Fuchsias came under our observation, having the pistil disturbed in every case. As examples of this sort of monstrosity, which calls to mind *Circæa lutetiana*, we cite the following formulæ:—

1. S (2) P 2 St 2+2 C ($\bar{4}$)‡.
2. S (2) P 2 St (2)+0 C 0§.

3. A specimen picked in a greenhouse on 19 Nov. possessed 2 sepals, of which one probably was equivalent to two, 3 petals, 4 stamens, of which one was a staminode, no pistil.

We think the following cases very remarkable on account of their showing two typical numbers in one flower:—

1. S (4) P 3 St 3+4 C ($\bar{4}$).
2. S (4) P 2 St 2+4 C ($\bar{2}$).

In the former case the 1st, 4th, and 5th whorls show the number 4, but the 2nd and 3rd the number 3. In the latter there are two superposed whorls of four each, and the remaining of two each.

3. S (3) P 4 St 4+3 C ($\bar{3}$).

In this case, twice occurring in the de Vries collection two petals each with an antipetalous stamen are placed in the space between two sepals. In the calyx-tube, in accordance with the

* We had no opportunity of examining the ovary.

† We possess a heptamerous flower of *F. fulgens*, while Prof. de Vries has one with 8 sepals, 5 petals, and 14 stamens. The ovary was absent.

‡ St 2+2 means two antipetalous + two antisepalous stamens.

§ Or St 0 +(2); owing to the cohesion of the two stamens, their place of insertion could not be distinctly seen.

modified number of parts, only 7 vascular bundles could be discovered. They distinctly contrast with the quite bleached tissues round them when held against the light.

4. S (4) P 0 St 4+4 C $(\bar{3})$.

A partially increased number is shown by :—

5. S (5) P 5 St 4+5 C $(\bar{4})$*.

6. S (4) P 4 St 4+4 C $(\bar{5})$.

In the above cases some regularity may be observed, but this is not so in many others, for instance :—

7. S (3) P 2 St 3+2 S $(\bar{3})$ †.

Cases similar to this one are so numerous, and when compared with each other so very different, that we may safely leave them unrecorded. To this may be added that the sepals and the petals often cannot be distinguished from each other, nor in consequence of this can the whorls of the stamens. Thus, the flower described on p. 418, under No. 3306 of the de Vries collection, presents a pentamerous whorl of enveloping parts, of which two are leaf-like and one is a sepal, but the other two show so doubtful a character as to allow no positive statement about their nature. Consequently this is also the case with the stamens, which together with the half-superior, half-inferior pistil already described complete the flower.

Wholly apart from the preceding, something ought to be said about deviation from ordinary number in connection with a deviation from the cyclic arrangement of the parts of the flower. The de Vries collection exhibits a couple of remarkable examples of this sort, of which one shows a dexter spiral, the other a sinister one. 1. The spiral arrangement to the left is :—S, S, S (slightly foliaceous) ; S, S, S, S (petaloid) ; S (petaloid) ; P (with thickened margin) ; P, P, St, St, St (with petaloid filaments) ; St, St, St, St : together 18 parts. Ovary abortive and indistinctly 4-celled. 2. The spiral is turned to the right :—S (half foliaceous) ; S, S (half foliaceous) ; S (on the inner side slightly petaloid) ; S (half foliaceous) ; S, P, P, P, P, St (with petaloid appendage) ; P, 8 stamens : together 20 parts. Ovary very imperfect. Both flowers particularly small.

Spiral arrangement probably is of rather frequent occurrence in *Fuchsia* ‡. No. 3411 of de Vries for instance shows two sepals

* The stigma was pentangular and 5-lobed.

† The petals are appendages of two of the stamens.

‡ See also p. 420 and figs. 36 and 37.

superposed, so that one as usual springs from the edge, but the other is inserted somewhat lower. If we start from the latter and turn the flower, we get the impression of the upper sepal being at the upper end of the spiral winding.

A similar aberration of number as well as of position of the parts came under my observation some years ago in a monstrous specimen of a Foxglove, which showed an extraordinary degree of median prolification, the flowers nearest to the top of the inflorescence being altered in the manner described.

As for the deviations from number it must be finally observed that numbers which in *Fuchsia* are considered abnormal are normal in other genera: thus many species of *Jussiæa*, having according to Eichler, the numbers 5 and 6, many species of *Gaura*, for instance *G. tripetala* 3, and lastly *Circæa* 2 in its flowers.

Conclusion.

It need hardly be pointed out that in the foregoing pages only the principal variations have been described. A great number of slight changes, such as dense hairiness of the ovary and calyx-tube, unequal size of the petals, an abnormal length of the tube, a splitting open of the same part, &c., are phenomena scarcely worth enumerating. Alterations arising from wounds have also been left unnoticed, as they only rarely came under our observation. In one such case we noted the tube bent at right angles with the ovary; in the concavity of the bending, one of the sepals seemed to have been broken off when the flower was in an early stage of development; besides the margin turned towards this side of the nearest sepal was brown, probably from the same cause.

As I have said in the introduction, it was my intention to bring together the variations observed by several writers * and by myself, to group them and to draw some conclusions from them.

Before entering on this last part of our task, we shall, to facilitate reference, arrange the observed monstrosities in the following manner:—

List of Monstrosities.

* An aberration, which we had no opportunity of examining, is an incipient median prolification, described by Masters, Veg. Terat., Germ. transl. p. 150.

In the above list the numbers of the figures and pages have been cited, in order to facilitate identification of the deviation described. Though a great many aberrations have been mentioned, this list will probably have to be amplified in consequence of eventual new observations.

The facts observed and recorded would seem to justify the following conclusions :—

1. *Fuchsia* descends from a *tetramerous* flower with a *foliaceous* calyx, a *polypetalous* corolla, *one whorl* of (antisepalous) stamens, and a four-celled inferior pistil.

It should be noted here, that notwithstanding the deviations from ordinary number as described in section 7, there is no definite reason for assuming another number than four, for instance 2, 3, 5, or 6, to have been the original one. That the calyx must be assumed to have been green, is not only to be derived from the numerous cases of abnormal virescence, but also from the circumstance that nearly all the genera of the Onagrariaceæ have green calyces. It is moreover remarkable that *Fuchsia serratifolia* (from Peru) has a bright green calyx, whilst *F. splendens* from the Fotanpeque mountain has green sepals on a scarlet tube. Further, *F. apetala* from Peru has rosy green-tipped sepals, while *F. excorticata* from New Zealand has a calyx which is at first green, in a subsequent stage blue, and finally red.

The assumption of a polypetalous corolla of course needs no explanation, nor does the absence of the antipetalous stamens after the reasoning in section 2 about this subject. We only wish to add that they may be wanting also in other genera.

Our assumption of an inferior ovary is based on the rare occurrence of a different position. The few cases of a superior ovary showed this organ at the same time imperfect. Our conclusion also as to this point agrees with the fact that in the whole family the ovary is inferior.

2. The calyx-tube of the original Fuchsia was probably short, perhaps even absent, it has subsequently become lengthened in connection with the colouring of the sepals, which change must evidently have had to do with the fertilization of the flowers by insects.

This thesis is supported by the variable length, the fission, and even the absence of the tube, but chiefly by the marked tendency of the stamens, sepals, and petals to coalesce. We have given in sections 2 and 6 various instances of petals and antipetalous stamens being connected with each other a long way up beyond the edge of the tube. This tendency persists in the normal calyx-tube, for which reason it is probably as little original in *Fuchsia* as it is now in *Epilobium* and many other genera of the same family. Also within the limits of the genus *Fuchsia* considerable differences exist as to the length of the normal calyx-tube; on these differences Decaisne and Naudin based their division of American Fuchsias into *bréviflores* and *longiflores*.

That *Œnothera* possesses a calyx-tube can no more be an objection to the hypothesis, than its having a row of antipetalous stamens. It is quite possible and even probable that *Œnothera* has gone through a similar development as *Fuchsia* has done.

3. The apetalous Fuchsias of South America and New Zealand have departed further from the origin than the species with petals have done.

4. In connection with the diagrams and floral formulæ given by Eichler for the principal genera, it would hardly seem hazardous to set up the following scheme of the phylogenetic development of the Onagrariaceæ (see opposite). Being unacquainted with the occurrence of the tube in this family, we have left it unnoticed in this rough draught of a pedigree.

Appendix.

After having drawn up the foregoing paper, I had an opportunity of examining four figures, which were obligingly sent by Dr. Maxwell T. Masters. As they represent very remarkable deviations, it may be worth while to describe them, and, as far as possible, to bring them into connection with the monstrosities before mentioned.

In one flower (Pl. LX. fig. 40) all the parts are more or less perigynous. Whilst the stamens (probably two) are adnate to the style, the floral envelopes are free, but placed rather irregularly. There are two leaves, L, which, though completely foliaceous, are to be considered as sepals; a cicatrix at *c* makes it probable there has been a third one of the same sort. Next follow a couple of leaves S_1 and S_2, both deeply divided, and subsequently three leaves P. The last-named are most likely petals; S_1 and S_2 are either petals or sepals, perhaps also transitional forms between the two. The honey-gland, which is pretty large, encloses a portion of the ovary.

Another flower (Pl. LX. figs. 41 *a*, 41 *b*) affords a good illustration of median prolification. The lowermost flower, which follows immediately on the peduncle, consists of a white calyx and petals of the usual colour. The stamens are described by Dr. Masters: "As usual, some of them partly petaloid." Next comes a second

S 4 P 4 St 4 C ($\bar{4}$). (*Eucharidium.*)

(Number decreasing.)

S 4 P 4 St 2 C ($\bar{4}$). *Lopezia*, (*Semeiandra*, *Diplandra*).
S 4 P 0 St 4 C ($\bar{4}$). *Isnardia.*
S 2 P 2 St 2 C ($\bar{2}$). *Circæa* *.
S 4 P 4 St 1 C ($\bar{4}$). *Riesenbachia.*
S 4 P 4 St 4 C ($\bar{2}$). *Trapa.*

(Number increasing.)

S 4 P 4 St 4 C ($\bar{4}$), with indications of a second whorl of stamens. Species of *Eucharidium*, *Clarkia pulchella*, *Cl. marginata.*

S 4 P 4 St 4+4 C ($\bar{4}$). *Epilobium*, *Gaura*, *Jussiæa*, *Œnothera*, *Fuchsia.*

In the New-Zealand and small-flowered American species there seems to be a tendency towards a separation of the sexes †.

S 4 P 0 St 4+4 C ($\bar{4}$). *Fuchsia apetala*, *macrantha*, &c.

* Although according to Barcianu very slight indications of stamens are present, we think it better to place it on the left.

† According to Hemsley, in Journ. Bot. March, 1876.

flower consisting of a long white calyx-tube, and normal sepals, petals, and stamens. The style inside this secondary flower belongs, of course, to the ovary placed between the peduncle and the first flower.

The most natural explanation seems to be the following:—The upper flower is to be considered as the flower properly so-called; it is normal and complete in all respects, if at least we add the ovary to it. All the remaining parts, making up the undermost flower, may be looked upon as additional parts, perhaps formed by division of the parts of the real flower, in the same way as the additional sepals in Liebe's flowers (figs. 29 and 30) and in that of Masters (p. 415). Masters's flower comes still nearer to the flower in question for the simple reason that there are also stamens developed above the ordinary number. From these and other cases mentioned before, it follows that additional parts of this sort may develop *under*, *on*, and even *above* the ovary. Whether they are really to be considered as products given off by the twelve vascular bundles, will have to be ascertained by anatomical investigation. At any rate it should be kept in mind that the above parts are not to be confounded with those described in § 1; those in § 1 always spring from the edge of the calyx-tube, whereas those mentioned now are produced lower.

The same point of view may be taken of the highly complicated flower (Pl. LX. fig. 42); in this case, too, the upper flower is, so to say, the primary one, whilst on the boundary between peduncle and flower a number of extra parts in various shapes are present. The extraordinary length of the upper flower deserves attention, and the numerous stages of metamorphosis in the lower one.

If the proposed explanation is the right one, the expression "median prolification," as applied to *Fuchsia*, obtains a different meaning from the ordinary one. In ordinary cases, such as in Roses, Anemones, Foxgloves, &c., the additional parts are produced *past* the flower, in *Fuchsia before* the same*.

To judge from his notes to the drawings and written communications, Dr. Masters seems rather inclined to consider the lower flower as the real one; this would also seem to follow from his surmise that the long tube in fig. 42 may be a further stage of development of the honey-gland in fig. 40.

* Only the case cited on p. 425, footnote, seems to be an instance of true median prolification, owing to the open ovary.

Regarded by itself, this hypothesis does not lack plausibility, since researches by Dr. S. Stadler* have proved that honey-glands are always connected with vascular bundles, whether these are specially adapted to the honey-gland or modify their course in their behalf, or, finally, the honey-glands happen to be placed just where vascular bundles abound. According to Stadler, in *Œnothera*, an Onagrariad that is in not a few respects like *Fuchsia*, there exist vascular bundles exclusively destined for the supply of the nectary, though in a limited number. It is therefore by no means impossible that in our case the nectary supplied by vascular bundles attained a degree of development so as to form the tube in question.

On the other hand, it must be observed that the nectary, though irregular in shape, sometimes (especially when the ovary is superior) never tends to change into a petal, sepal, or stamen, so far as our observations go; it is therefore not probable that it would, as it were, all of a sudden develop into a tube with sepals, petals, and stamens. Besides, it is not known whether or not the honey-gland is actually absent; if the nectary were present, the supposition of its metamorphosis would at once lose all ground.

In the third place, the supposition that the flower with the long tube is the primary one, and the parts beneath are of secondary origin, is much more in accordance with the flowers of Liebe, Masters, and so on.

I beg leave to subjoin a few more remarks based on observations by Mr. H. W. Heinsius, Assistant in the Phytophysiological Laboratory in Amsterdam. Mr. Heinsius has obligingly lent me his notes and sketches of monstrous Fuchsias, from which I deduce the following conclusions :—

1. Often two sepals have become united in a very broad whole, the composition of this whole is always proved by two circumstances: (*a*) the presence of two ribs, (*b*) the occurrence of two stamens opposite to it.

2. That in one flower two typical numbers are possible; the antisepalous (inner) stamens are then in accordance with the number of sepals, the antipetalous ones with that of the petals. This fully agrees with our statements in § 7 on this point. The way in which this difference in number in one flower comes about cannot as yet be satisfactorily determined. There may be

* 'Beiträge zur Kenntniss der Nectarien und Biologie der Blüthen,' von Dr. S. Stadler (Berlin, 1886).

dédoublement at the bottom of it. That this may occur sometimes, may be gathered from one of Heinsius's observations. In a pentamerous flower one of the petals was doubled in such a manner that the bases of the two parts did, indeed, stand next to one another; but the laminas covered each other almost completely. Consequently the whole number of petals amounted to six. This was also the case with the stamen opposite the petal mentioned, and even with one of the cells of the ovary standing on the same radius. In this flower, consequently, a petal, a stamen, and an ovary-cell, all corresponding to one another, had actually doubled in the most complete manner.

3. That a sepal may be foliaceous and sometimes petal-like.

4. That an antipetalous stamen may coalesce with the petal to which it is opposed.

5. That stamens may be grown together.

6. That a stamen may be adnate to the style. This was evident in an instance in which the style stands quite free in the calyx-tube and a stamen springing in the ordinary way from its edge slopes to the style, just as a ladder standing against a wall, and then completely grows together with it. Style and stamen are therefore free at their bases, but united at their upper ends.

7. The presence of spurs on sepals, even sometimes on petals. About spurs on sepals, it is stated that they are hollow or solid. I myself observed a hollow spur in a specimen in the Zoological Gardens of Amsterdam. The flower attracted attention by the fact of the tube and the lower half of each sepal being red, but only the upper halves green, and toothed here and there. One of the sepals was small, and bore a light green spur on the narrow basis.

8. That the position of the petals is sometimes disturbed. As is generally known, the petals are twisted so that one edge of a petal covers an adjoining one, and one is itself covered. In some cases recorded by Heinsius both edges of a petal were free, whilst of an adjoining petal either edge was covered.

In conclusion I would again draw the attention to the stipules of *Fuchsia*. These organs seem to be very variable. As a rule they escape notice, and are not even mentioned in books. Still they exist in many (perhaps in all) cases. A stout plant with trimerous leaf-whorls in the Zoological Gardens of Amsterdam, for instance, shows them, though very small and deciduous.

I saw them large and persistent for a long time in some poor specimens which passed the very severe winter of 1887–88 in a greenhouse. It would seem that the temperature has something to do with their persistency.

DESCRIPTION OF THE PLATES.

Plate LVII.

Fig. 1. Various forms of additional parts on the edge of the calyx-tube of a double flower of *Fuchsia*. a^1, a^2, thread-like; *b*, petal-like; *c*, intermediate.

2. An additional petal, lobed, with thickened midrib.

3. Filiform part coalesced with a stamen.

4, 5. See Plate LVIII.

6. Petal, with thickened midrib and indication of a cupped condition.

7, 8, 9, 10, 11, 12, 13. Petals in which the thickened midrib gradually passes into a stamen; and the development of the cup-shaped form shows various degrees of completeness. Fig. 10, ×2. At the inner side is a thickening which resembles an anther.

14. Slightly magnified. A petal with a stamen and a petaloid appendage.

15, 17, 18, 19, 20. Various stages of coalescence of the petal with the antipetalous stamen. In fig. 20 the petal is cup-shaped.

16. A petal with antipetalous stamen in normal condition.

21. See Plate LVIII.

22. Stamens of which the anther-cells are slightly separated by a lengthened connective.

23, 26. Anther with filiform appendages. The front, represented in fig. 23, shows the anther-cells separated by an excrescence resembling an anther.

24. Connective, elongated and curved.

25. Elongated connective.

27. Stamen, petaloid on one side (front and back view).

28. See Plate LX.

29. See Plate LVIII.

30, 31. See Plate LX.

32. Style, flattened and contorted.

Plate LVIII.

Fig. 4. A clawed petal. From the inner side of the lamina spring two stamens and a petaloid appendage. The two edges of this appendage and the left margin of the petal are like the wall of an anther-cell.

5. (After Buchenau). Monstrous flower, with two foliaceous sepals, which are placed beneath the ovary. From the axil of each springs a stamen; on both sides of each sepal is inserted a stipule. The two other sepals are normal. Antisepalous stamens: two displaced like the two green sepals, one half-sepaloid, one half-petaloid, the fourth somewhat petal-like. Antisepalous stamens: three normal, one sterile.

PLATE LVIII. (*continued*).

Fig. 21. (After Morren.) "*Scaramouche*" Fuchsia.

29. (Copied from a drawing by Prof. Krause, lent by Prof. Th. Liebe.) Two pairs of green leaves on the peduncle, apparently, from their position, decussate. Two sepals virescent.

38. Bundle of monadelphous stamens, bifurcating higher up. One of the petals has remained at the ordinary place of insertion; but the others have been raised during growth as far as the base of the anthers.

PLATE LIX.

Fig. 34. Two adherent peduncles, with two partly adherent flowers.

33. Two united flowers.

35. No. 34, turned slightly to the side to show the strong curvature of the right peduncle.

36. Branch with two leaves. In the axil of the leaf *c* is the flower-leaf, *a*; from the axil spring two flowers, of which *b* only is represented. This has grown together with leaf *a*. The lowermost floral leaf *n* almost completely green.

37*a*. Diagram of Simroth's Fuchsia. Uppermost sepal green, undermost normal: the adjacent sepals have a green half turned towards the green one.

37*b*. Diagram of the probable ancestor of the Onagrariaceæ.

39. Diagram of the same flower, showing the relation between the stamens and three of the petals.

PLATE LX.

Fig. 28. Monstrous flower. The imperfect pistil is superior: a^1, a^2, a^3, a^4, sepals; a^1 and a^2 almost coherent; b^1, b^2, b^3, b^4, petals; *c*, stamen with petaloid appendage on the anthers.

30. (Copied from a drawing by Prof. Liebe.) A whorl of four green leaves on the peduncle: a similar whorl springs from the boundary between ovary and calyx-tube.

31. An ovary not only filling the whole calyx-tube, but even emerging from it.

32. Fasciated, spirally-twisted style, magnified.

33–37. See Pl. LIX.

38. See Pl. LVIII.

40. Monstrous flower, with several perigynous sepals and petals. Stamens adnate to the style. Ovary superior, one-celled, with three parietal placentas. Honey-gland much developed. (Magnified; drawn by Mr. W. G. Smith from a flower received from Baron von Mueller, lent by Dr. Masters; see p. 428.)

41*a*. A monstrous flower, showing median prolification. There are two white calyces. The petals are normal in both flowers, but some of the stamens in the lowermost flower are partly petaloid. (Magnified; lent by Dr. Masters.

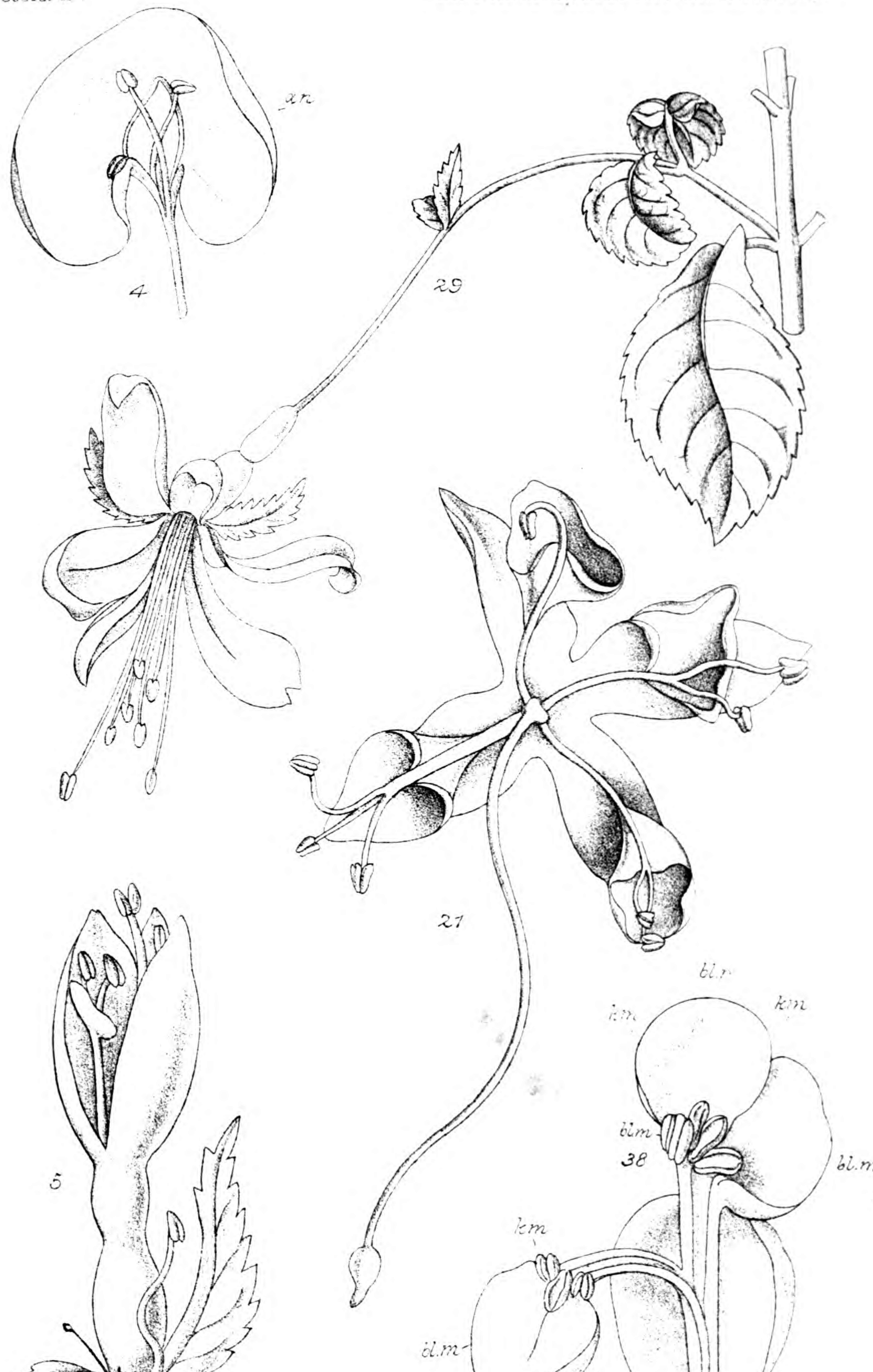
41*b*. Vertical section of the same flower.

42. Highly complicated flower, showing median prolification, dialysis, metamorphosis, and stamens adhering to the petals. (Magnified; lent by Dr. Masters.) For explanation, see p. 428.

J. C. C. & M. T. M. del.

MALFORMATIONS IN FUCHSIA GLOBOSA.

Linn. Soc. Journ. Bot. Vol. XXV. Pl. 58.



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MALFORMATIONS IN FUCHSIA GLOBOSA.

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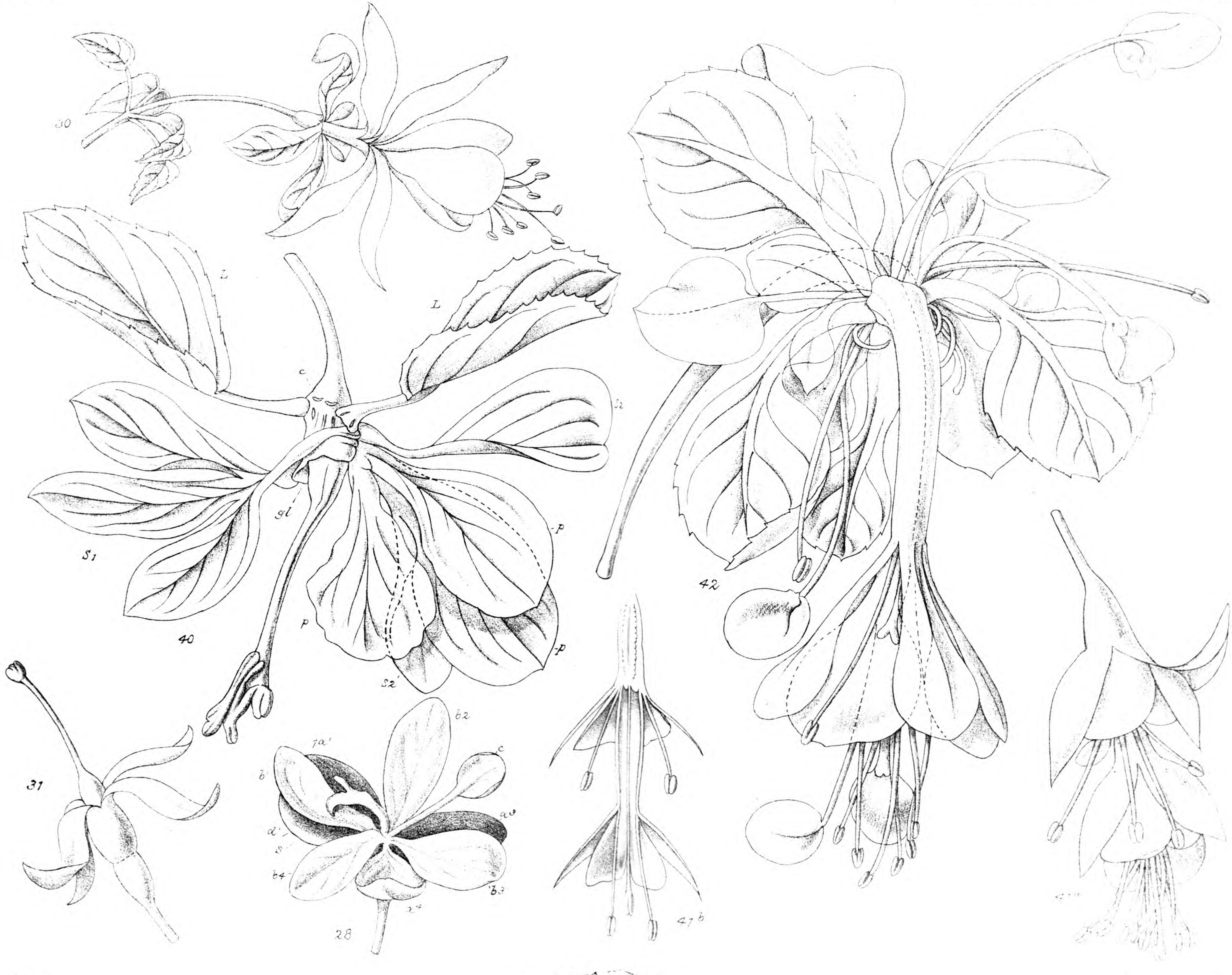
MALFORMATIONS IN FUCHSIA GLOBOSA.



MALFORMATIONS IN FUCHSIA GLOBOSA

Notes on the Ingestion of Food-material by the Swarm-cells of Mycetozoa. By Arthur Lister, F.L.S.

[Read 4th April, 1889.]

Before proceeding to describe the manner in which the swarm-cells of Mycetozoa take in and digest their food-material, it may not be out of place to refer to some experiments bearing on the mode of feeding of the plasmodium of *Badhamia utricularis*, the account of which appeared in the 'Annals of Botany' for June 1888. In that paper I described the action of the plasmodium on starch, as well as on thin slices of *Agaricus campestris* and other fungi; I especially drew attention to its feeding on living *Stereum hirsutum*, the favourite pabulum of this species of *Badhamia*.

In following those experiments I observed that when the plasmodium had become loaded with the food-material with which it had been supplied, many of the large vacuoles became charged with undigested matter, which collected as a dark ball in the centre of the hyaline contents of the vacuole. I repeatedly saw these vacuoles push out as bubbles on the surface of the plasmodium and burst, discharging a cloud of refuse, consisting of fragments of starch and broken fungus-hyphæ, into the water.

When the plasmodium creeps over a glass plate and is not immersed in water, the rejected matter is left with a certain amount of plasmodium substance on each side of the retreating veins, leaving a map of the network after the plasmodium has withdrawn.

This appears to be of some interest in its relation to the behaviour of swarm-cells described in the sequel.

The following account of a cultivation of plasmodium from the spores of *Chondrioderma difforme* has also a bearing on the same:—

These spores germinated in water under a coverslip in about twelve hours. On the 11th day after sowing, many of the swarm-cells had assumed the character of microcysts, and a large proportion had withdrawn their cilia and were moving slowly as amœbæ, with a tendency to adhere when they came together. On the 13th day several young plasmodia were seen with rhythmic streaming of their granular contents, the current continuing for about a minute in each direction.

When in their wanderings the young plasmodia met, or came in contact with amœboid swarm-cells, they coalesced; the investing hyaloplasmic substance offered for a time a resistance to union, this at length gave way, and the contents of one gushed into the other. When a microcyst was met with in the line of march, it was taken in as foreign matter and enclosed in a vacuole; it was slowly absorbed in the course of three or four hours.

Active swarm-cells, which had probably hatched out later than the others, though often seen to approach the plasmodia, and even to lie for some minutes enfolded by their pseudopodia, never coalesced, and in time wandered away again. The plasmodia did not all unite, but continued to crawl over the glass for four days longer, when the conditions became unfavourable, and they dwindled away without developing into sporangia *.

Referring to the process of nutrition in the Mycetozoa, De Bary states † "that the food is taken in during the swarm-cell condition only in a fluid state or state of solution, and this is also the case, at least in most instances, with the plasmodium."

This is a point on which there has been some controversy.

Mr. Saville Kent, in the appendix to his 'Manual of the Infusoria,' described in 1881 the appearance of swarm-cells of *Physarum tussilaginis*, which contained vacuoles filled with bacteria of the same kind as abounded in the surrounding medium. He also relates how, on adding pulverized carmine to the water, the granules were freely ingested, and, as in the case of the bacteria, were collected within "sphæroidal vacuoles."

Although this experiment clearly shows that the swarm-cells of *Physarum tussilaginis* take in food-material in other than in the fluid state, yet as De Bary's high authority, published so

* In sowings of *Chondrioderma difforme* spores on blotting-paper with cress seeds, I have always found the sporangia begin to form in eleven to fourteen days from the date of sowing, and may continue to make their appearance for four months.

I have had the plasmodium of *Badhamia utricularis* in constant streaming movement for more than a year, though many cultivations from the original stock of plasmodium have changed to sporangia at different intervals during that time. Sclerotium of the last named species, after two years' preservation, has changed to sporangia within a fortnight of being revived; while other plasmodium, revived from the same sclerotium, has continued to stream without change for five months, although both were fed with *Stereum hirsutum*, and were apparently under precisely the same conditions.

† De Bary, Mycetozoa. Oxford edition, p. 452.

lately as 1887, still stands in support of his view, and as it appears to be a matter of considerable physiological interest, I venture to offer the following observations on the swarm-cells of *Stemonitis fusca* and some other species which have come under my notice.

On October 9, 1888, I gathered ripe sporangia of *Stemonitis fusca*, the spores of which were unusually rapid in developing. Within an hour and a quarter after placing the spores in water under a thin coverslip they began to hatch, and in a couple of hours the water teemed with swarm-cells; they emerged in four to ten minutes after the rupture of the spore, and in about a quarter of an hour the cilium was protruded. Almost immediately behind the cilium, and occupying the greater portion of the conical anterior part of the cell, lies the nucleus, and behind this again extends the main protoplasmic substance containing minute granules and often several vacuoles. Sometimes only one contracting vacuole is observed, but frequently six or seven others may be seen, appearing and disappearing at irregular intervals. There is continued change of position of the vacuoles and the contents of the body of the organism; the nucleus, however, always retains its place in the conical end.

This change of position of the contents varies in character in different species; in the large swarm-cells of *Amaurochæte atra* there is a remarkable flow suggesting an approach to streaming movement, more than the mere mixing together occasioned by the spasmodic jogging of those of *Stemonitis*.

The rounded posterior end of the swarm-cell is frequently seen to broaden out and to extend pseudopodia, either as irregular projections or as extremely delicate threads.

On one occasion I had under a square coverslip many hundreds of swarm-cells of *Stemonitis*, which had been hatched two days previously, and were in rather a flagging condition. I happened to have in a wine-glass of water some pieces of *Stereum hirsutum* which had been soaking for some days, and the water was turbid with large bacilli, measuring 3 to 6 μ in length. I admitted a drop of this water under the coverslip. The bacilli rapidly spread among the swarm-cells, which soon appeared to revive from their sluggish condition, the jogging movement and the lashing of the cilia becoming much more active; at the same time I noticed that many had bacilli, in some cases as many as six or seven, attached to the pseudopodia produced from the posterior extremity. Shortly after, many vacuoles were seen to contain foreign matter.

I dried several drops of the preparation and stained with magenta, and mounted in balsam ; the mountings showed deeply-stained bacilli, principally in a large vacuole near the nucleus. Next day I wetted another dusting of spores, and in a couple of hours, when the pure water was thickly peopled with swarm-cells, I added a drop of the water crowded with bacilli ; as on the previous occasion, bacilli were soon observed attached to the rugged posterior region, and others were seen enclosed in vacuoles. I watched one swarm-cell with a wriggling bacillus adhering to a delicate pseudopodium; it was gradually drawn inwards as the pseudopodium contracted. I then saw an extension of protoplasmic matter fold over the bacillus, and absorb it into the interior substance ; shortly after I saw it conveyed into a large vacuole near the nucleus, which already contained three bacilli. I watched these for an hour; they gradually became more and more indistinct, until nothing was visible but a faint indefinite residuum. No fresh bacilli were taken in during this time.

In the next observation a bacillus 5 μ in length was attached to a pseudopodium so extremely fine, that its continuity could only be determined by the violently moving captive indicating the distance to which the thread extended. In the course of a few minutes the bacillus was drawn inwards, and, as in the former case, an extension was folded over it, and it was taken into the interior, where it was soon surrounded with a vacuole; another large vacuole containing two other bacilli was stationed near the nucleus, but during the twenty minutes it was under observation the two vacuoles remained distinct. In another instance, when a large bacillus was caught by a pseudopodium and drawn up to the main body, a tube-like process was extended, investing it almost to its extremity ; the bacillus was then sucked in, and as it lay athwart the swarm-cell in a large vacuole, it was of so great a length that the ovoid cell was bulged out on each side by the stiff rod; a violent jerking movement followed, such as I have repeatedly noticed after the ingestion of food, and in a few minutes the bacillus was bent double, the vacuole decreased in size, and in a quarter of an hour its contents had become less distinct by the process of absorption. (See figs. 1–6, p. 440.)

Numbers of observations of a similar character were made, which I need not describe in detail.

During one observation, a swarm-cell took in at different times two black particles of inorganic matter: one was enclosed in a vacuole and remained there as long as the observation was continued; the other, after being shifted into all parts of the body-substance, was simply turned out at the posterior end, not apparently by the rupture of a vacuole.

Powdered carmine was readily seized upon. On one occasion I watched for twenty minutes the efforts of a long irregular pseudopodium to embrace a large granule, but the finger-like extensions seemed unable to grasp it; at length they succeeded, and the object was drawn in, when the posterior end of the swarm-cell assumed, and retained until the close of the observation, the usual rounded form.

I have seen carmine discharged in the same manner as the black particle above described. And here I would refer to what suggests a power of discrimination in different species of swarm-cells. While, as just stated, carmine was greedily incorporated by swarm-cells of *Stemonitis*, I have supplied it to those of *Amaurochæte*, which I had in full vigour and vast abundance; but although they spread out pseudopodia which occasionally caught hold of a carmine granule and retained it for some seconds, none were taken in. I have tried the experiment two or three hours after their issuing from the spores, and also when they had been hatched for more than a day, but in no instance have I seen a granule of carmine within the substance of *Amaurochæte*.

Although in *Stemonitis fusca* carmine was retained for many hours, I was unable to detect any absorption, though I made careful drawings from time to time of the size of the particles, and no colour was communicated to the clear contents of the vacuoles in which they were enclosed, such as is referred to by De Bary (p. 452) in the plasmodium of *Didymium Serpula*. I have watched the swarm-cells of *Trichia fragilis*, which hatched three days after placing the spores in water, when the preparation abounded with bacilli; these behaved in the same way as those of *Stemonitis*, throwing out more or less delicate pseudopodia, to which bacilli adhered, and were then drawn in and stored in vacuoles; many contained three vacuoles, each holding four to five bacilli.

I have had the same results with the spores of *Chondrioderma*

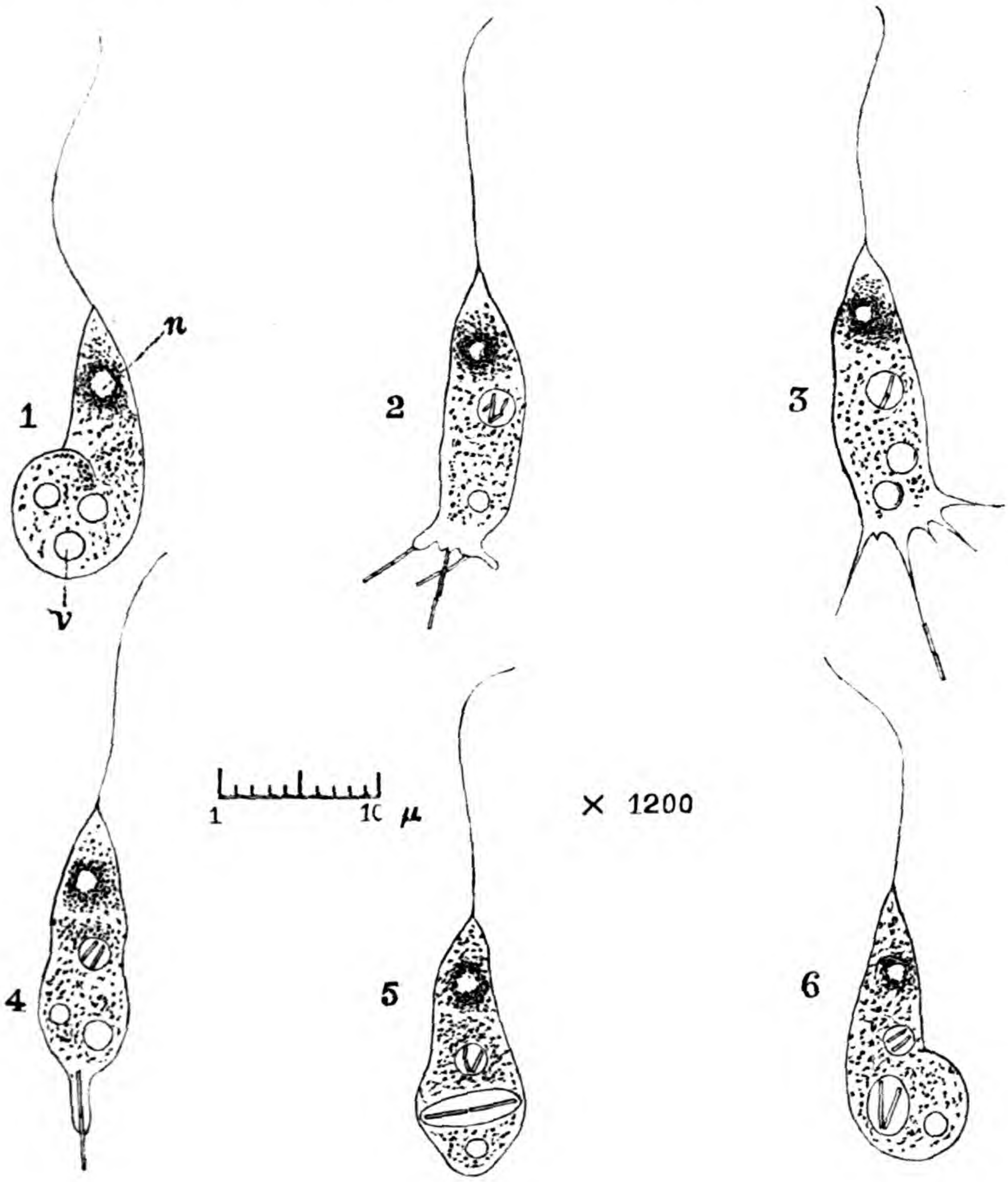


Fig. 1. Swarm-cell of *Stemonitis fusca* of the usual form when swimming. *n*, nucleus; *v*, vacuoles.

Fig. 2. Swarm-cell with three bacilli adhering to expanded posterior extremity.

Fig. 3. A swarm-cell with delicate pseudopodia, to one of which a bacillus is attached.

Fig. 4. The same swarm-cell, the bacillus in the act of being drawn in, and partly invested with a tube-like extension of the body-substance.

Fig. 5. The same bacillus, contained in a long vacuole, and bulging out the sides of the swarm-cell.

Fig. 6. The same bacillus, bent double after violent jerking movement of the swarm-cell.

difforme. Here, as in other species, the spores of different gatherings are uncertain in the time they take to hatch, but the swarm-cells usually appear in about twelve hours after placing the spores in water. They are protean in their forms, changing from the ciliated and elongated shape to stellate amœbæ, which throw out pointed pseudopodia apparently from all parts (though this is very probably deceptive). Then in a minute or less they will resume the normal swarm-cell character, and often show remarkable activity as they crawl over the surface of the glass, the contents with the ingested matter and vacuoles mixing together in a complete turmoil. They take in material of various description, such as bacteria, alga-cells, and inorganic matter, and may be seen discharging refuse together with a portion of their own protoplasmic substance in the same way as we observe rejected matter left behind by retreating plasmodium. This throwing off of a part of the body-substance with refuse matter I have repeatedly seen in the swarm-cells of *Trichia fallax* in a very striking manner.

In all these experiments I have invariably observed that food-material was taken in only at the posterior end of the swarm-cell; and where I have seen refuse matter discharged, it has been from the same region. I have rarely been able to observe the discharge of any residuum of bacilli; they appear to be almost wholly assimilated.

[NOTE.—Since this paper was read, I have observed the swarm-cells of *Chondrioderma difforme* capture and absorb bacilli on many occasions. In one instance, after taking in two stout bacilli (one measuring $3{\cdot}8\,\mu$ by $\cdot 7\,\mu$), and enclosing them in separate vacuoles, the swarm-cell remained quiescent for a length of time. I watched the gradual process of digestion with a Beck's $\frac{1}{10}$ immersion-lens, and when, after remaining under observation for nearly an hour and a half, the swarm-cell swam off with vigorous lashing movement of the cilium, every trace of the two bacilli and their containing vacuoles had disappeared, and only the contracting vacuole remained in the faintly turbid protoplasmic substance of the creature.]

INDEX.

END OF THE TWENTY-FIFTH VOLUME.

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

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THE JOURNAL

OF

THE LINNEAN SOCIETY.

VOL. XXV. **BOTANY.** NOS. 165–169.

CONTENTS.

See Notice on last page of Wrapper.

LONDON:

SOLD AT THE SOCIETY'S APARTMENTS, BURLINGTON HOUSE, PICCADILLY, W.,

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1889.

LINNEAN SOCIETY OF LONDON.

LIST OF THE OFFICERS AND COUNCIL.

Elected 24th May, 1888.

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NOTE.—The Charter and Bye-Laws of the Society, as amended up to the 21st April, 1881, have been reprinted, and can be had on application.

RULES FOR BORROWING BOOKS FROM THE LIBRARY.

As amended by the Council, 15th March, 1888.

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1. No more than Six volumes shall be lent to one person at the same time without the special leave of the Council or one of the Secretaries.

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NOTE.—*Certain other works are included in this prohibition, such as costly illustrated works; and volumes belonging to sets which could not be replaced if lost.*

The GENERAL INDEX to the first twenty volumes of the Journal (BOTANY) and the Botanical portions of the Proceedings from November 1838 to June 1886 is now ready for delivery to the Fellows on Application.

It may also be had in sheets, for binding. Fellows are desired to state, when applying, if the Index is required in sheets, else it will be supplied in cloth.

NOTICE.

This part is the first portion of Vol. XXV. Nos. 170–173 will complete it. No. 174 forming the first part of Vol. XXVI. (continuation of "Flora Sinensis") is in the press; and with it will be issued the Titlepage and Contents of the first Vol. on that subject (Vol. XXIII.).

Special attention is requested to the foregoing, as applications are constantly made to the Librarian, which would be unnecessary were the last page of the wrapper of each Journal consulted.

Remaining Meetings of

THE LINNEAN SOCIETY OF LONDON.

SESSION 1888–89.

1889. FEBRUARY,	Thursday,	7	1889. MAY,	Thursday,	2
"	"	21*	"	Friday (*Anniversary*)	24
MARCH	"	7	JUNE,	Thursday	6
"	"	21*	"	"	20
APRIL	"	4			
"	"	18			

* These dates were incorrectly printed on the cards first circulated. Corrected cards have since been issued.

The Chair will be taken at EIGHT o'clock in the evening precisely, at every Meeting, excepting on the 24th of May, the day appointed for the Anniversary Elections, when the Chair will be taken at *Three* o'clock in the afternoon.

The LIBRARY is open daily from 10 A.M. till 5 P.M. and till 9 P.M. on the Meeting nights; and the Reading-room adjoining from 10 A.M. till 6 P.M., but on days of Council Meetings and on Saturdays, only till 4 P.M.

JUNE 8. *Price 5s.*

THE JOURNAL

OF

THE LINNEAN SOCIETY.

VOL. XXV. **BOTANY.** No. 170.

CONTENTS.

See Notice on last page of Wrapper.

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1889.

LINNEAN SOCIETY OF LONDON.

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NOTE.—The Charter and Bye-Laws of the Society, as amended up to the 21st April, 1881, have been reprinted, and can be had on application.

JULY 27. *Price 3s.*

THE JOURNAL

OF

THE LINNEAN SOCIETY.

VOL. XXV. **BOTANY.** No. 171.

CONTENTS.

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RULES FOR BORROWING BOOKS FROM THE LIBRARY.

As amended by the Council, 15th March, 1888.

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1. No more than Six volumes shall be lent to one person at the same time without the special leave of the Council or one of the Secretaries.

2. All books shall be returned before the expiration of Six weeks from the time of their being taken out, but if not required by any other Fellow, they may, on application, be kept for a further period of Six weeks.

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The GENERAL INDEX to the first twenty volumes of the Journal (BOTANY) and the Botanical portions of the Proceedings from November 1838 to June 1886 is now ready for delivery to the Fellows on Application.

It may be had in cloth, or in sheets for binding. Fellows are desired, when applying for copies, to state in which form they desire to receive it.

NOTICE.

This is the third part which has been issued of Vol. XXV. No. 172 will complete it. Vol. XXVI. (continuation of Messrs. Forbes and Hemsley's 'Index Floræ Sinensis') is in course of simultaneous issue. The Parts of each already published are as under:—

Vol. XXV., Nos. 165–170 already published.

No. 171, the present Number.

No. 172 will complete the Volume.

Vol. XXVI., No. 173 already published.

Nos. 174–180 are reserved for the continuation of the 'Index Floræ Sinensis.'

Special attention is requested to the foregoing, as applications are constantly made to the Librarian, which would be unnecessary were the last page of the wrapper of each Journal consulted.

The Apartments of the Society will be closed as usual during the month of August; and it is requested that all borrowed books be returned to the Librarian before the 31st July.

The first four Meetings of the next Session will be held as under. Due notice will be given of the remaining Meetings of the Session. The Chair will be taken at Eight o'clock precisely:—

1889. Thursday, November	7.	1889. Thursday, December	5.
„ „	21.	„ „	19.

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Vol. XXV., Nos. 165–169 already published.

No. 170, the present Number.

Nos. 171–172 will complete the Volume.

Vol. XXVI., No. 173 already published.

Nos. 174–180 are reserved for the continuation of the 'Index Floræ Sinensis.'

Special attention is requested to the foregoing, as applications are constantly made to the Librarian, which would be unnecessary were the last page of the wrapper of each Journal consulted.

Remaining Meeting of

THE LINNEAN SOCIETY OF LONDON.

SESSION 1888–89.

1889. JUNE, Thursday 20.

The Chair will be taken at EIGHT o'clock in the evening precisely.

The LIBRARY is open daily from 10 A.M. till 5 P.M. and till 9 P.M. on the Meeting nights; and the Reading-room adjoining from 10 A.M. till 6 P.M., but on days of Council Meetings and on Saturdays, only till 4 P.M.

JANUARY 28.

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THE JOURNAL

OF

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VOL. XXV. **BOTANY.** No. 172.

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James Britten, Esq.
P. Herbert Carpenter, D.Sc., F.R.S.
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NOTICE.

This Part, which contains Titlepage and Index, completes Vol. XXV. Vol. XXVI. is reserved for the continuation of Messrs. Forbes and Hemsley's "Index Floræ Sinensis," the first number of which (No. 173) has been already published. Nos. 174–180 will complete the Volume.

Special attention is requested to the foregoing, as applications are constantly made to the Librarian which would be unnecessary were the last page of the wrapper of each Journal consulted.

The ensuing Meetings of the present Session will be held as under:—

1890.	Thursday, February	6		1890.	Thursday, May	1
	„ „	20			Saturday (*Anniversary*) „	24
	„ March	6			Thursday, June	5
	„ „	20			„ „	19
	„ April	3				
	„ „	17				

The Chair will be taken at EIGHT o'clock in the Evening precisely at every Meeting, excepting on the 24th May, the day appointed for the Anniversary Elections, when the Chair will be taken at THREE o'clock in the afternoon.