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ROYAL BOTANIC GARDENS, KEW

BULLETIN OF MISCELLANEOUS INFORMATION

1934

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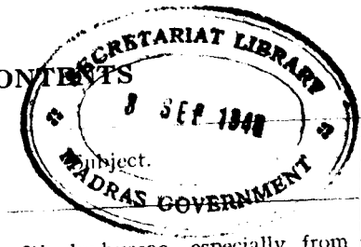
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BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1934

ROYAL BOTANIC GARDENS, KEW

I—SOME INDIAN RHODOPHYCEAE ESPECIALLY FROM THE SHORES OF THE PRESIDENCY OF BOMBAY: IV.*

F. BOERGESEN.

In this, the concluding part of this series, the majority of the algae referred to are represented by material in the Kew Herbarium. By far the greater number of the species belong to the northern part of the Arabian Sea and more especially to the environs of Karachi, a locality which contains a most interesting algal flora showing remarkable affinities with those of areas as distant as the Cape, Australia and Japan south- and eastwards, and with those of the Red Sea, the Mediterranean Sea and even the Atlantic Ocean westwards.

The principal and most valuable collection examined was collected by the late James A. Murray, who was (according to information supplied by Mr. A. D. Cotton) Curator of the Kurrachee Municipal Museum and the author of the following books: "A Handbook to the Geology, Botany and Zoology of Sind" (1880); "Kurrachee to Kandahar"; and "The Plants and Drugs of Sind" (London 1881). His collections were made during the years 1881–3 and contain a large number of well prepared specimens.

I have further been able to examine a big album in folio presented to Kew by Miss L. Frere. It contains a collection of nicely prepared specimens evidently gathered by a beauty-loving dilettante, many of the specimens being arranged artificially in large groups. A third collection, given to Kew by Mr. N. M. Paul, Curator of the Victoria Museum at Karachi, contained several species of much interest.

Finally a few specimens from the Kew Herbarium were gathered by Capt. W. J. S. Pullen, Karachi, 1859.

I desire to thank Sir Arthur Hill, the Director of the Royal Botanic Gardens, Kew, as well as the Keeper of the Herbarium, Mr. A. D. Cotton, for the kindness they have shown me by placing at my disposal these valuable collections by means of which our knowledge of these algologically little-known areas has been increased. I wish also to thank Dr. M. A. Howe, Assistant Director, New York Botanical Garden, who has been so kind as to send me for determination a fine and rather large collection of algae from Karachi. This collection was gathered by Mr. A. B. Kotwal, Karachi, who wrote

*Continued from *K.B.* 1933, 113.

that they came chiefly from Cape Monze. This gentleman moreover sent me some specimens a few years ago for determination.

I must also mention a small collection from Karachi which Mr. K. Naik, at that time staying at Sind College, Karachi, most kindly presented to me during my stay in Bombay. This was preserved in spirit and is consequently very valuable. I much regret that I had no opportunity of visiting Karachi myself. The northernmost localities I visited were Dwarka and the neighbouring Okha Port, where a rich and varied algal flora is found. Some of the species collected there are incorporated in these contributions, and at this locality too, although the algal flora is rather different from that of Karachi, several species occur which are common to some of the above-mentioned remote areas. Finally some species *from* my collections *from* Bombay and South India are included in the present list.

CHAETANGIACEAE.

Gloiophloea fascicularis *Boergs.*, sp. nov. ; a *G. Okamurai* Setch., facie persimilis, thallo latiore, colore in sicco magis rubro, cystocarpiis majoribus inter alia differt.

Frons rubro-purpurea, dichotoma, fastigiato-fascicularis, carnoso-cartilaginea, cylindracea, ad 17 cm. alta, circiter 2 mm. lata. Axis centralis invisibilis. Cortex circiter 80μ crassus ; cortex periphericus 50μ crassus, e filamentis cellularum coloratarum brevibus dichotomis anticlinis, moniliformibus, et utriculis subellipticis majoribus compositus ; cortice interno e filamentis gracilibus formato. Cystocarpia sparsa, lageniformia, circiter 160μ lata et 225μ longa (cum collo).

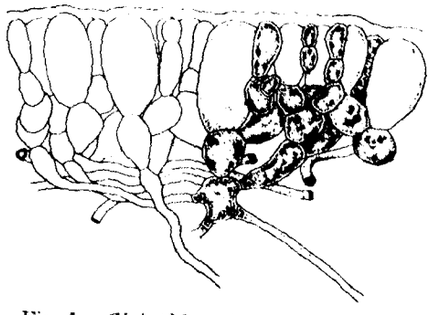
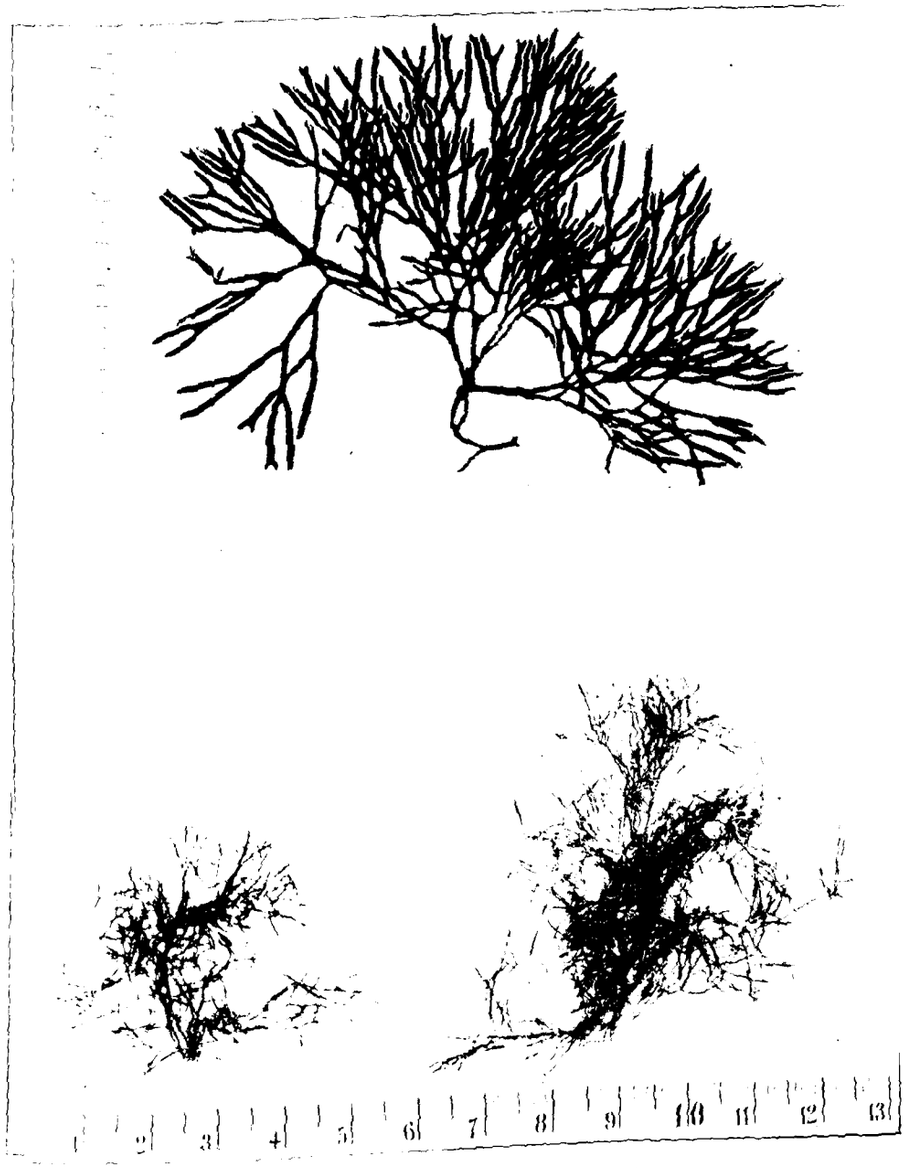


Fig. 1. *Gloiophloea fascicularis* Boergs.
Transverse section of thallus (×600).

INDIA : Okha Port, *Boergesen* 5491 (type), cast ashore ; Karachi, *J. A. Murray* (Herb. Kew., a single sterile specimen most probably belonging to this species).

The plant (Plate I) reaches a height of 14–15 cm. The cartilaginous thallus is terete, not constricted, about 2 mm. thick, keeping this size very evenly from the base to summit of the thallus ; it is repeatedly forked, the joints between each fork being about 2 cm.

PLATE I



Gloiophloea fascicularis Boergs., sp. nov. (above).
Gelidium latosplaeos Boergs., sp. nov. (below).
The scale on all plates represents centimetres.

(*To face page* 2

long, more rarely only 1 cm. or up to 3 cm. The colour of the dried plant is light red in the upper, young parts, but it becomes darker in the older portion; the living plant had a fine, rosy-red colour. The axial strand is not visible in dried specimens nor in specimens preserved in spirit. The cystocarps are irregularly scattered. The cortex is 80μ thick; the outer part is about 50μ thick and composed of anticlinal, moniliform rows of coloured cells enclosing utricles in various stages of development and size, from 36μ long and 18μ broad to small ones (Fig. 1). The utricles are more or less broadly rounded at their upper end; when seen from above they are entirely surrounded by coloured cells, compare the surface view of the thallus (Fig. 2). The inner cortex is not much developed and is composed of thin interwoven filaments. On its inner side numerous thin filaments are found, running as a rule in the direction of the central axis, which in the adult thallus is about 230μ thick. The cystocarps are almost spherical with a rather long

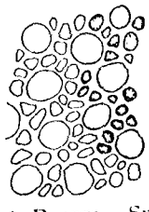


Fig. 2. *Gloiophloea fascicularis* Boergs. Surface view of thallus (×300).

carpostomium; their diameter is about 160μ and their length, together with the neck, about 225μ; the neck alone is about 70μ. The cystocarps are thus a good deal larger than those of *G. Okamurai*. The plant is monoecious, the antheridial sori forming irregularly shaped, more or less continuous layers on the surface of the thallus.

GELIDIACEAE.

Gelidium heteroplatos *Boergs.*, sp. nov.; ab affini *G. crinali* (Turn.) Lamour. thallo latiore et magis compresso, ramificatione magis evoluta, tetrasporangiis in superficie partis planae thalli et pinnis nidulantibus imprimis differt.

Thallus caespitosus, 5–6 cm. altus, e filis repentibus intricatis et filis erectis compositus. Fila erecta e partibus teretibus et planis alternantibus formata, ad 600–700μ lata, irregulariter ramosa, ramis subpinnatis aut oppositis aut alternantibus, apicibus acutis. Tetrasporangia in thalli parte superiore in superficie partis planae et pinnis praesentia.

INDIA: Bombay, Malabar Hill; in the littoral zone on rocks facing the Arabian Sea, Boergesen 5275 (type).

The plant (Plate I and Fig. 3) forms dense tufts upon the rocks about 5–6 cm. high. The thallus is alternately almost terete and compressed, the flat parts reaching a breadth of up to about 600–700μ. The filaments are distichously but very irregularly

ramified, the branches being alternate or secund or sometimes opposite. The branches are given out at more or less acute angles; they are narrow at the base, sometimes nearly terete, but as a rule compressed, broadening out upwards and finally tapering near the generally acute summits.

Seen from above the peripheral cells are oval-roundish about 4–6μ in diameter, in transverse section they are oval-oblong about 12μ long and 6μ broad. Below these cells 3–4 layers of coloured oval-roundish cells are found, the innermost, the larger ones, elongated cylindrical. The uncoloured medullary tissue consists of long subcylindrical intertwisted cells of variable size between which run rhizoids.

The tetrasporangia occur scattered on the upper more or less compressed branches and pinnules (Fig. 3*b*). They take their origin from cells in the coloured layer under the peripheral cells. They are about 26μ broad and 42μ long.



Fig. 3. *Gelidium heteroplatos* Boergs.
a, habit (×2); b, branchlet with tetrasporangia (×12·5).

This plant is related to forms of *G. crinale*, but it differs from this species in its usually much broader thallus and in the tetrasporangial sori covering the surface of the upper branches and branchlets. *Gelidum crinale* f. *luxurians* (Phycotheca Bor.-Am., no. 1138) is perhaps the form most nearly related to the Indian plant.*

*I am very much indebted to M. le docteur J. Feldmann, Paris, for sending some fine material of related forms for me to compare with this and the following species.

Gelidium corneum (*Huds.*) *Lamour.* Essai . . . Thalassiophytes, 41 (1813); Bornet, Algues Schousboe, 270; Boergesen, Mar. Alg. D.W.I. **4**, 114, fig. 124.—*Fucus corneus* Huds., Fl. Angl. 585 (1778); Turner, Fuci, **4**, 146, t. 257a.

INDIA: Bombay, Malabar Hill in rather exposed localities near low water mark; Back Bay (near Wilson College) in a sheltered locality.

Distr. Widely spread.

Most of the Indian specimens agree quite well with my figure quoted above, but the thallus of the Indian plant is a little broader, and its colour is red not purple, as in the West Indian plant. The specimens in one of my collections had short roundish-oval tetrasporic ramuli somewhat recalling Kützing's figures of *Gelidium micropterum* from the Cape (Kütz. Tab. Phyc. **18**, 59).

Echinocaulon myriocladum *Boergs.* sp. nov.; ab *E. setaceo* Feldm., cui facie persimili, thallo tenuiore et interdum compresso, colore in speciminibus exsiccatis obscure violaceo imprimis differt.

Frons caespitosa, 1–2 cm. alta, e filamentis 60–160μ latis, teretibus aut compressis irregulariter ramosis et valde intricatis composita. *Rami* distichi, alternantes, seriati aut oppositi, breves vel longiores, plus minus divaricati, summis acutis. *Tetrasporangia* circiter 27μ lata et 38μ longa, in stichidiis inflatis 100–200μ latis praesentia, in seriebus transversalibus 3–4–6 sporangia continentibus ordinata.

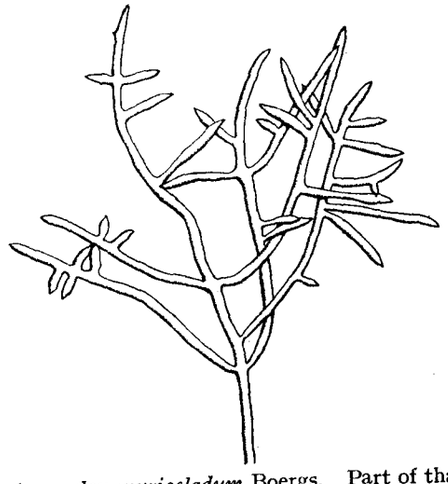


Fig. 4. *Echinocaulon myriocladum* Boergs. Part of thallus (×13).

INDIA: Bombay, Malabar Hill, on rocks in exposed places near high water mark, *Boergesen* 5235 (type).

The plant (Fig. 4) is terete or somewhat compressed and most irregularly ramified, the branches being either alternate or opposite or uniseriate and of very variable length. The filaments are felted together and often attached to each other by groups of congenital

rhizoids, and by this means also the basal filaments are fastened to the rocks. The ends of the filaments are conically attenuated. The colour of the dried plant is violet-blackish ; in water it is red-violet.

The surface cells, as a rule, are without any order, sometimes, though, showing a tendency to being arranged in rows. They are roundish and about 5–6μ broad. The tetrasporangia occur in the inflated upper ends of the filaments in horizontal rows containing

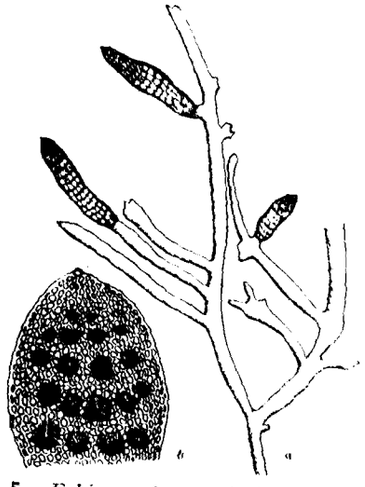


Fig. 5. *Echinocaulon myriocladum* Boergs.
a, part of thallus with stichidia (× 22·5) ; b, part of a stichidium (× 150).

3–6, as a rule 4, sporangia in each row (Fig. 5). This peculiar arrangement of the tetrasporangia has of late been described by Feldmann as occurring in *Echinocaulon ramellosum* (Kütz.) J. Feldm. and in *Gelidium pannosum* Born. non Grün. referable to the genus *Echinocaulon* (compare J. Feldmann : Note sur quelques algues marines de Tunisie, in Station Océanographique de Salammbô, Notes, no. 24, 1931) ; and it might be expected to be found in *Echinocaulon setaceum* and other species hitherto only known as sterile. On account of this peculiar arrangement Feldmann asks whether these plants ought not to be removed from the genus *Echinocaulon*, but he concludes that it is better to keep them in this genus on account of their anatomical structure and because in *E. ramellosum* the seriate arrangement of the tetrasporangia is not always visible, and furthermore because this arrangement is also found in a species of *Gelidium* : *G. melanoideum* Schousboe.

The Indian plant seems to be closely related to the West Indian *Echinocaulon setaceum* ; but the West Indian species has been found in a sterile condition only and, after adding to this the differences mentioned above and their different geographical distribution, I prefer to keep them separate.

Amphiroa fragilissima (*L.*) *Lamour.* Hist. Polyp. Corallig. Flexib. 298 ; Areschoug in J. Agardh, Spec. Alg. **2**, 531 ; Weber van Bosse and M. Foslie, The Corallinaceae of the Siboga-Exp. 89, pl. xvi, figs. 1, 2, 5.—*Corallina fragilissima* L. System. Nat. ed. 12, **1**, 1305.

INDIA : Bombay, Colaba, Back Bay.

Distr. West Indies and warm Atlantic Ocean, Mediterranean Sea, Indian Ocean, Malay Archipelago, Pacific Ocean.

In the specimens which I have gathered of this species the joints were rarely swollen or not at all, neither at the base nor at the top. As a rule the central strand has about 5–6 rows of long cells (about 70μ long) interrupted by a row of short cells about 19μ long.

Amphiroa anceps (*Lamk.*) *Decne.* Sur les Corallines (Ann. Sc. Nat. **2**, sér. 2, t. 18, p. 125) ; Harvey, Nereis Australis, 98, t. 37 ; Weber van Bosse and M. Foslie, The Corallinaceae of the Siboga Exp. 93.—*Corallina anceps* Lamk. Mém. du Mus. **2**, 238 (1815).

INDIA : Karachi, *J. A. Murray* (Herb. Kew) ; Dwarka, where I have gathered it in tide pools.

Distr. South Africa, West Australia, Japan, Malay Archipelago.

The Indian specimens seem to agree very well with the description of Dr. Weber van Bosse. In the specimens examined by me the central strands have 3–4 long cells (about 90μ long) and one short cell about 33μ long. The upper joints in some of the specimens from Dwarka are very much elongated and slender, up to about 1½ cm. long and about 1 mm. broad. In these filaments the central strand was composed of 3–4 rows of long cells (about 70μ long) and one short cell (about 15μ long). Most probably these specimens come near to the form called *Amphiroa nobilis* by Kützing (Tab. Phyc. **8**, 51) referred by Mme. Weber to *Amphiroa anceps*.

Corallina officinalis *L.* Fauna Suecica, 539 (1761).

INDIA : Karachi, *J. A. Murray* (Herb. Kew).

Distr. Arctic Sea, Atlantic Ocean, Mediterranean Sea, Black Sea, Japan.

A few small specimens mounted together on a piece of paper are present in the collection of the Kew Harbarium. They are mostly sterile, only a few young conceptacles are present. The Indian specimens seem to me to show much likeness to some specimens from Japan which the late Professor Yendo has sent to me ; compare too Yendo's Fig. 11 (Pl. III) in his paper " Corallinae verae Japonicae " (Journ. Coll. Science, Tokyo, **16** : 1902).

Jania rubens (*L.*) *Lamour.* Hist. Polyp. Corallig. Flex. 272 (1816) ; Areschoug in J. Agardh, Spec. Alg. **2**, 557.—*Corallina rubens* L. Syst. Nat. ed. 12, **1**, 1305.

INDIA : Dwarka.

Distr. West Indies, Atlantic Ocean, Mediterranean Sea, Red Sea, Natal, Malay Archipelago.

Of this species I have gathered some sterile specimens. Their thallus is about 150μ thick. They formed dense intricated tufts upon steep rocks in pools.

GRATELOUPIACEAE.

Cryptonemia Lomation (*Bertol.*) *J. Agardh*, Spec. Alg. **2**, 227; Epicr. 165.—*Fucus Lomation* Bertol. Opusc. Sc. Bot. **2**, 289 (not seen); Amoenitates Ital. 289, t. iv, fig. 3 (1819).

INDIA: Karachi, *N. M. Paul* (Herb. Kew).

Distr. Mediterranean Sea; Aru Islands.

A single specimen which seems referable to this species is found in the collections of the Kew Herbarium. Unfortunately the specimen is sterile, but its whole appearance as well as its anatomical structure quite agrees with the descriptions. Larger and smaller proliferations issue from the edges of the older parts of the thallus. Mme. Dr. Weber van Bosse in her Liste Alg. Siboga p. 248 mentions this species from Iles Jedan, Ile Aru, and considering that several Mediterranean species have been found in the northern part of the Arabian Sea, it does not seem strange that this species should occur here.

GRACILARIACEAE.

Corallopsis Cacalia *J. Agardh*, Spec. Alg. **2**, 583; Epicrisis, 409. — *Corallopsis Salicornia* Decne. Plantes Arab. 184.

INDIA: Okha Port, cast ashore. Karachi, *K. G. Naik*.

Distr. Red Sea, north coast of Java, Thursday Island.

A few specimens of this species (Fig. 6) originally described from the Red Sea, were found. The lower part of the thallus is irregularly ramified, and at their base the main branches are very little attenuated or not at all. The summits of the branches swell, and

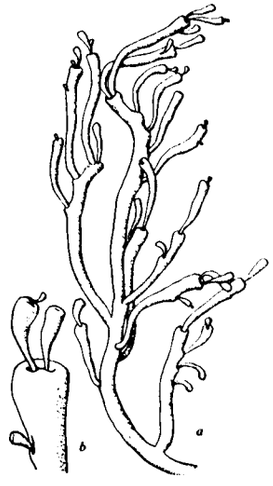


Fig. 6. *Corallopsis Cacalia*. J. Ag.
a, part of thallus (× ·75); b, apex of branchlet (× 1·5).

from the depression in the middle one or sometimes two branchlets are given out. These branchlets are elongated clavate in shape. about 0·5 mm. broad at their base, 2–2·5 mm. at their summits, from which again other similar but smaller branchlets issue. Furthermore such adventitious branchlets are given out occasionally from all parts of the thallus (compare Fig. 6). A transverse section shows a thick cuticle and below it a narrow assimilating tissue composed of 1–3 layers of small cells about 4–6μ thick and under that a parenchymatic tissue the cells of which next to the periphery are still small and contain a few scattered chromatophores, but they quickly increase in size towards the middle of the thallus. The specimens are tetrasporic. The almost globular tetrasporangia are formed in the assimilating tissue; they are cruciately divided and are found scattered over the surface of the thallus. Cotton (K.B.) 1913, 253) has earlier found tetrasporangia in *Corallopsis Urvillei* (Mont.) J. Ag.; they occurred together with systocarps in the same specimen and are produced in special short pedicellate lateral branches.

Gracilaria arcuata *Zan.* Plant. in Mar. Rubr. Huc. Collect. Enumer. 57, t. iii. fig. 2 (1858); Weber van Bosse, Algues Siboga, 429; Feldmann, Notes sur quelques Alg. Mar. de Tunisie (Station Océanograph. de Salammbô, Notes nos. 24, 14, figs. 4–6: 1931)—*Gracillaria dumosa* Harv. Friendl. Isl. Alg. no. 37; Grunow, Alg. Fidschi-, Tonga- und Samoa-Inseln, 42; *Sphaerococcus dumosus* Kütz. Tab. Phyc. **19**, 21, figs. e–f.

INDIA: Karachi 1882, *J. A. Murray* (Herb. Kew), Manora, near Karachi, *Miss L. Frere* (Herb. Kew.); *K. G. Naik*.

Distr. Red Sea, Mediterranean Sea, Malay Archipelago, Japan, Pacific Ocean.

In referring some Indian specimens (Plate III) in the collection of Algae of the Kew Herbarium to this species, I must point out that I have not been able to compare them with authentic specimens, but they seem to agree very well with Zanardini's description and figures, having the same irregular ramification with secundly arranged, arcuately bent branches and branchlets. A transverse section near the base of the thallus in one of the specimens shows that the cortical layer is very thick, composed of small lengthened cells placed in rows, there are up to about 8 cells in each row, in some other specimens I have found rows with only 2–4 cells, thus like the fig. f. of Kützing's figures. Higher in the thallus the cortex becomes thinner and in the young part of the thallus a single layer is present only.

In Icones of Jap. Algae **6**, 40, pl. 272, Okamura records the presence of this species in Japan. To judge from his figure the Japanese plant is more densely ramified than the plant from the Red Sea and India recalling the var. *Snackeyi* Weber, l.c. 430.

Solieria robusta (*Grev.*) *Kylin*, Die Florideengattung Gigartinales (Lund's Univ. Årskr. N.F. Avd. 2, **25**, no. 8, p. 18: 1932).

In part II of these contributions (K.B. 1932, 127) I referred this species to the genus *Agardhiella*, which is like *Solieria* in anatomical structure. Since the publication of my paper Kylin's valuable work quoted above has appeared, in which he points out that in the middle of the gonimoblasts in *Solieria* a large fusion-cell is present, whereas in *Agardhiella* sterile tissue is found instead of this cell. The Indian plant having this large fusion cell must thus be referred to *Solieria*.

In the Kew Herbarium some specimens from Karachi gathered by J. A. Murray, September 1881, are present, in the summits of the branches of which proliferations are to be found. On account of this these specimens were referred to *Solieria dura* (Zan.) Schmitz (= *S. divaricata* (Forssk.) Boergs.). I have compared them with the original specimens found in Forsskål's herbarium in the Botanical Museum, Copenhagen, and have found that they cannot be referred to this species. In my opinion they belong to *Solieria robusta*.

These specimens together with a few others in Miss L. Frere's collection are certainly referable to the var. *Wightii* J. Ag. distinguishable by its compressed thallus, from both sides of which the branches issue. These specimens are also recognizable by the fact that the branches near the base taper rather suddenly to a short thin stipe. Further the anatomy, especially in one of the specimens, is somewhat different from the typical form, the peripheral cells being large and palisade-like about 30μ long and 10μ broad, but in some of the other specimens the cells were smaller, forming transitions to the small peripheric cells of the typical form. I wish still to point out that I have not seen any authentic specimen of the var. *Wightii* known from the Bay of Bengal; but a figure of the original specimen is found in Kylin's above-quoted publication, pl. 5, fig. 10.

Sarconema furcellatum *Zan.* Pl. Mar. Rubr. Enum. 56, t. **8** (1858).

INDIA: Karachi, *J. A. Murray* (Herb. Kew). Sind coast, *N. M. Paul* (Herb. Kew). Dwarka (!).

Distr. Red Sea.

When I treated of this species in Kew Bulletin, 1932, 126, I referred to it forms both with slender and stouter thalli. Meanwhile Kylin's paper on the Gigartinales has appeared, and following his treatment of the genus I have re-examined the specimens referred by me to *S. furcellatum*, and have come to the conclusion that the stouter specimens from Dwarka and Karachi belong to this species, whereas the slender ones from Bombay are to be referred to *S. filiforme* (Sond.) Kylin. In the specimens from Dwarka the thallus is rather tough and stiff. The basal part is composed of decumbent or creeping filaments woven together and fastened to stones and gravel from which the erect filaments arise, thus reminding one of Zanardini's figure. Near the base the filaments are about 1·75 mm

thick, decreasing slowly upwards to about 1 mm. My figure 12a, b (l.c.) is from the plant from Dwarka. In this the cells of the parenchymatic tissue are as a rule about 60–70μ broad, their diameter only rarely reaching a length of 110μ. When compared with the size of the cells in the parenchymatic tissue of *S. filiforme*, it will be seen that these cells in the latter are a good deal bigger, and therefore they might perhaps be another feature, in addition to the robustness of the thallus, by which to separate the two species. The specimens from Karachi belonging to the Kew Herbarium have about the same size of the thallus and a similar anatomical structure. The specimens examined by me were sterile.

Sarconema filiforme (*Sond.*) *Kylin*, l.c. 22.—*Dicranema filiforme* Sonder in Bot. Zeitung, 1845, 56. *Cystoclonium filiforme* Kütz. Tab. Phyc. **18**, 18.

INDIA: Bombay: Back Bay, Malabar Hill. Karachi, 1883, *J. A. Murray* (Herb. Kew).

Distr. West Australia.

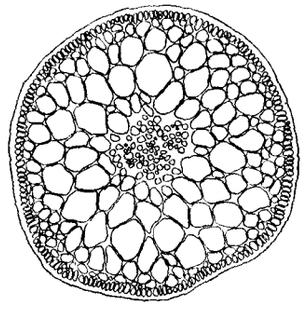


Fig. 7. *Sarconema filiforme* (Sond.) Kylin.
Transverse section of thallus (×55).

The specimens, which I refer here to *S. filiforme*, have as mentioned under *S. furcellatum*, been referred to the latter species, but I now agree with Kylin in referring these forms with thinner, more slender thallus to *S. filiforme*. The thallus in these specimens is from about 0·75 mm. to 0·25 mm. or less thick. A transverse section of the thallus (Fig. 7) shows that in spite of its being rather slender the cells in the parenchymatic tissue are rather large, up to 130μ broad, thus a good deal larger than those in *S. furcellatum*. The breadth of the central cells is also large, about 15μ, and the lumen about 5μ. Therefore some differences as to the anatomical characters seem to be present between the two species, but in order to state this finally more material than I have had is necessary. Some of the specimens were tetrasporic; Fig. 12 c in Part II, showing a part of a transverse section with tetrasporangia, is from a specimen now referred to this species. A few specimens in the collection of the Kew Herbarium showed some likeness to *Sarconema indicum*

(J. Ag.) Kylin (l.c. 22, tab. 8, fig. 17), as they have a similar ramification to that of the original specimen from India found in Herb. J. Agardh in Lund; but I doubt whether this species is anything but a form of *S. filiforme*.

Sarconema furcatum *Boergs.*, sp. nov.; a *S. Montagnei* (Grun.) Kylin differt imprimis thallo e basi ad summum paene aequicrasso et regularius dichotomo, thalli substantia molliore et magis carnosa, colore carneo-lutescente.

Thallus caespitosus, ad 20 cm. altus, indentidem furcatus et dichotomo-fastigiatus, inferne circiter 1 mm. crassus, sursum leniter attenuatus ad 0·5 mm. crassus, summis acutis, in parte adultiore thalli proliferationibus interdum praesentibus. Specimina exsiccatione chartae bene adhaerent.

INDIA: Karachi, *J. A. Murray* (Herb. Kew.); *A. B. Kotwall* (Herb. New York Bot. Garden and Herb. *F.B.*).

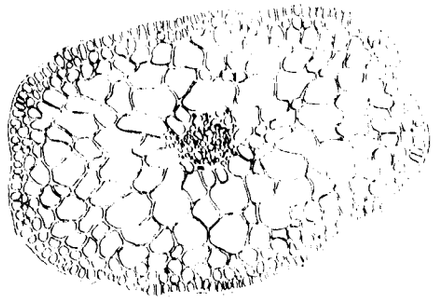


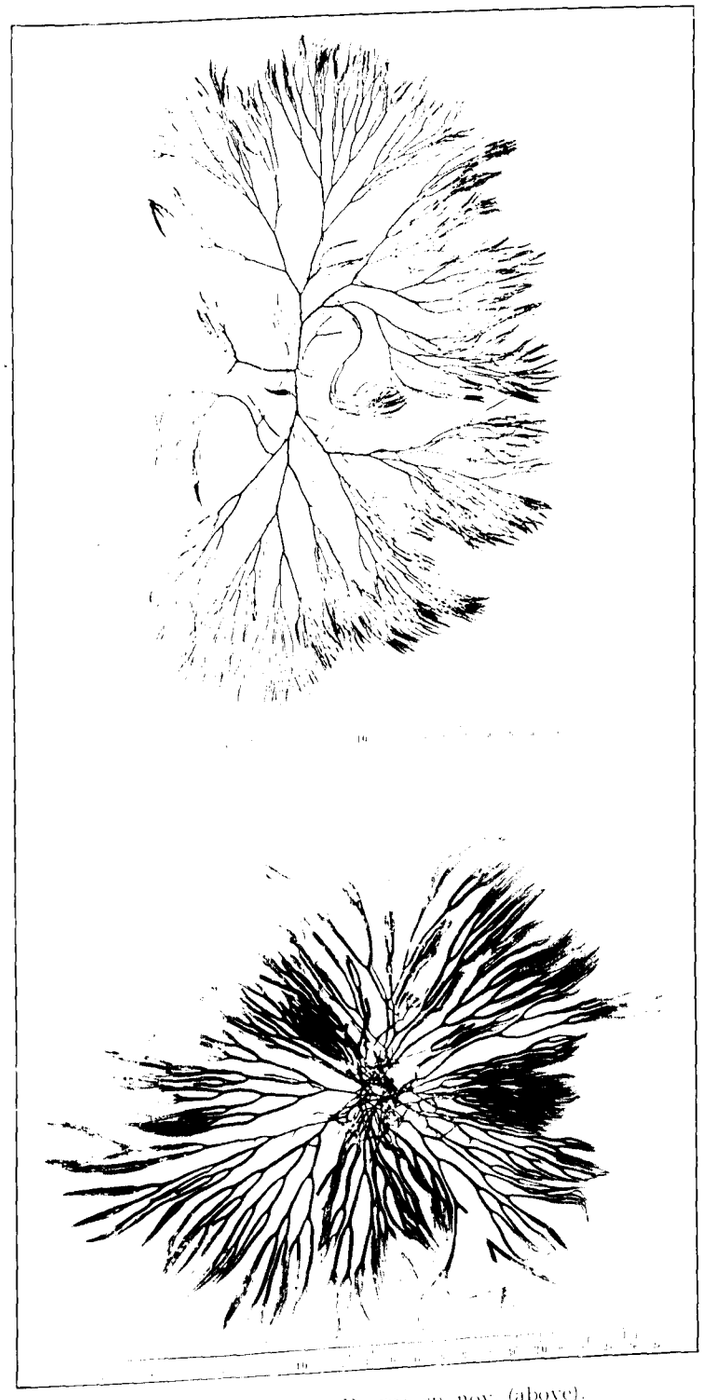
Fig. 8. *Sarconema furcatum* Boergs. Transverse section of thallus (×55).

The thallus (Pl. II) is most certainly compressed, but it must be taken into consideration that only dried material was available for examination. A transverse section (Fig. 8) shows that the peripheral cells are large, oblong, about 20μ long and about half as broad; the parenchymatic tissue is composed of rather big cells the diameter of which is about 100–130μ. The central tissue is small, about as big as the lumen of one of the larger cells in the parenchymatic tissue. The breadth of a single filament is about 18μ and its lumen about 7μ. Found in sterile condition only. The most characteristic features of this species are its thallus which hardly tapers, keeping almost the same size from base to near the summits of the filaments and its somewhat dirty, yellowish-carnose colour in the dried condition.

Sarconema scinaioides *Boergs.* sp. nov.; *S. furcellato* Zan. proximum; differt praesertim thallo crassiore et magis regulariter furcato, substantia magis carnosa.

Frons caespitosa, teretiuscula, repetite regulariter dichotoma, 14 cm. alta et ultra (?), inferne circiter 1–1·5 mm. crassa, in media parte thalli circiter 2 mm. crassa, ad apicem sensim attenuata,

PLATE II



Sarconema furcatum Boergs. sp. nov. (above).
Sarconema scinaioides Boergs. sp. nov. (below).

[*To face page* 12

apicibus acutis. *Color* obscure purpureus. *Substantia* verisimiliter gelatinoso-carnosa, ita ut planta exsiccatione chartae arctissime adhaerent. *Fructus* ignoti.

INDIA: Karachi, *A. B. Kotwall* (Herb. New York Bot. Garden). Manora, near Karachi, Miss *L. Frere* (Herb. Kew).

This species is easily separated from the hitherto known species of *Sarconema* by its thick thallus (*Pl. II*), which is of a fleshy consistency and adheres strongly to paper. A transverse section (Fig. 9) shows that there is a thick cuticle; the peripheral cells are

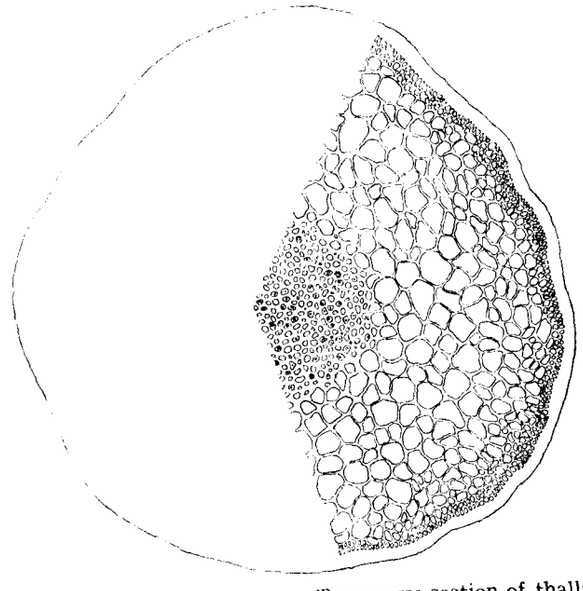


Fig. 9. *Sarconema scinaioides* Boergs. Transverse section of thallus (× 60).

small, oblong, about 12μ passing evenly over into a colourless parenchymatous tissue of rather small cells; the largest measured by me had a diameter of 90μ, but on an average their diameter was about 50–60μ. The central filaments form together a rather thick tissue, in transverse section about 330μ thick. It is composed of numerous thick-walled filaments about 10–15μ thick. In the Kew Herbarium some specimens are present, which perhaps may be referred to this species; transverse sections of the thallus show that they belong to the genus, but they differ from that of the plant described by somewhat longer cells and thinner cuticle. These specimens were gathered at Karachi by *J. A. Murray*.

Meristotheca papulosa (*Mont.*) *J. Ag.* Bidr. Florid. System. **143**; Epicrisis, 584; Weber, Algues Siboga, 402, fig. **152**; Kylin, Florideenordn. Gigartinales, 25, pl. 12, fig. 27 (1932).—*Callymenia papulosa* Mont. Pug. Alg. Yem. in Ann. Sc. Nat. **3**, sér. **13**, 246. *Euhymenia papulosa* Kütz. Tab. Phyc. **17**, 73.

INDIA: Karachi, March 1882, *J. A. Murray* (Herb. Kew), *A. B. Kotwall*; Manora near Karachi, *Miss L. Frere* (Herb. Kew).

Distr. Red Sea, coast of Somali, Malay Archipelago.

To this, as it seems to me most variable species, I refer a few specimens found in the collections examined by me. At first I thought the specimens were to be referred to *M. japonica* Kylin, as they are much larger than Kützing's specimen of *M. papulosa* figured in Tabulae Phycologicae and the specimen from Agardh's Herbarium from which Kylin has reproduced his figure. But after having been able to examine Kützing's authentic specimen and some other specimens belonging to Hauck's Herbarium most kindly lent to me by Mme. Dr. Anna Weberyan Bosse, I am of the opinion that the Indian specimens are referable to *M. papulosa*, although the specimens are larger and even though one of the specimens at least has thicker thallus.



Fig. 10. *Meristotheca japonica* Kylin. Female specimen (×·5).

Kylin points out that the difference between the two species is that the thallus is thicker and more cartilaginous in *M. japonica* than in *M. papulosa*; that this is generally so I have been able to confirm by means of a very fine collection of the Japanese plant belonging to the Kew Herbarium. When comparing the Japanese specimens with those from the Red Sea, Somaliland and the Arabian Sea it will be seen that the structure of the thallus is about

the same. Transverse sections of the thallus in specimens from both areas show at the periphery a layer of small, assimilating cells passing evenly over into larger roundish storage cells, the innermost being the largest and oval; in the middle there is a medullary tissue of loosely interwoven filaments (comp. Okamura, Icon. Jap. Alg. **5,** pl. 235, fig. 11). The only difference is that in most of the Japanese specimens the thallus is thicker and the cells larger. But transitional forms occur. Thus in the collection of the Kew Herbarium a specimen from Mogi, comm. J. Matsumura 1910 and determined by Cotton and Yendo as *Eucheuma papulosa* has a much thinner thallus, quite as thin as the Indian specimen and the same is the case with a tetrasporic specimen from Misaki sent from Yamada and incorporated in the Herbarium of the Bot. Museum, Copenhagen; this specimen has too a rather thin thallus not much thicker than that of the Indian specimens and with small cells also. In my opinion the two species are very closely related, and Cotton and Yendo (K.B. 1914, 220) also considered the Japanese form as belonging to *Meristotheca papulosa*, or *Eucheuma papulosa* as the plant was named by these investigators. In this connection I wish to point out that the geographical distribution seems to be of small importance as several other Japanese algae have been found in the northern part of the Arabian Sea; but to decide the question definitely more material is necessary.

Altogether I have been able to examine three Indian specimens, two of which belong to the Kew Herbarium and one to the collection of algae sent to me for determination from the New York Botanical Garden. One of the specimens, apparently only a part of a plant,

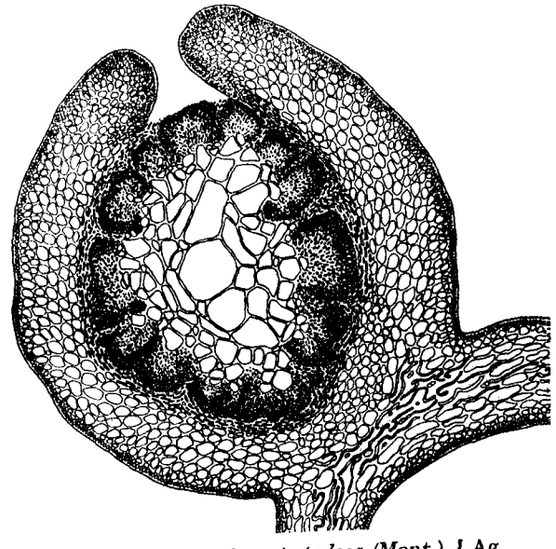


Fig. 11. *Meristotheca papulosa* (Mont.) J.Ag. Longitudinal section of a cystocarp (×33).

is female. It consists of a flat piece about 14 cm. long and 4–5 cm. broad (Fig. 10); its margin is irregularly sinuate and dentate. In its upper end a larger incision is found and from the upper end of the lobes on both sides of the incision several proliferations, up to 5 cm. long, arise. The consistency of the rather thick thallus is cartilaginous and its colour is brick red. Along the margin and scattered upon the flat surface large, nearly spherical, very much protruding cystocarps are present. And among these are numerous procarps like small papillae, in various states of development (compare Kylin's Fig. 5*c*). A longitudinal section of a cystocarp (Fig. 11) shows in the middle of the gonimoblasts a sterile perenchymatic tissue of cells larger in the middle smaller towards the periphery, from which the spore-building filaments issue forming roundish bodies and interrupted by bundles of sterile filaments; the wall of the cystocarp is thick, with an opening above. A transverse section of the cystocarp has already been given by Mme. Weber, p. 403, fig. 152. Another specimen, belonging to the Kew Herbarium, is tetrasporic. The thallus of this specimen is a little thinner than the female one. Along the irregularly sinuated and dentate margin numerous proliferations are found and several issue too from the surface of the thallus; here also short, scattered processes occur. The tetrasporangia are found spread over the surface and are zonately divided. Still another specimen, a sterile one, is found in the Kew Herbarium. It is a somewhat larger and broader specimen, the thallus of which is irregularly subdichotomously divided several times with rounded axils between the lobes. Its margin is irregularly sinuate and dentate and a few proliferations are present. The surface of the thallus is glabrous. The colour of this specimen is lighter brick red with scattered darker spots, and it is most probably a bleached one that has been found cast ashore.

RODOPHYLLIDACEAE.

Cystoclonium purpureum (*Huds.*) *Batters*, Catal. Brit. Mar. Alg. 68 (1902); Rosenvinge, Mar. Alg. Denm. 589 (1931). *Fucus purpureus* Huds. Fl. Angl. 471 (1762). *Cystoclonium purpurascens* Kütz., Phyc. gen. (1843) 404; Kylin, H., Entwicklungsgesch. der Florideen (K. Svenska Vetensk. Handl. **63**, 22, 1923). For more literature see Rosenvinge, l.c.

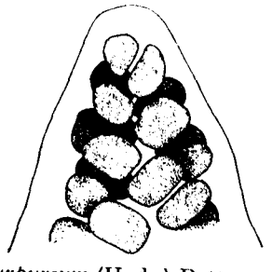


Fig. 12. *Cystoclonium purpureum* (Huds.) Batters. Apex of thallus (×600).

INDIA: Karachi, *J. A. Murray*, June 1883 (Herb. Kew).

Distr. North Atlantic, European and American coasts.

In the collections belonging to the Kew Herbarium several specimens of an alga (Plate IV) are present, which, although they are sterile, I do not hesitate to consider as belonging to this species, to which they had also been provisionally referred by a former investigator. As described by Kylin and later by Rosenvinge, *C. purpureum* increases by an apical cell which, by means of oblique walls, gives off segments below, alternately to right and left. As Fig. 12 shows, this is also the case in the Indian plant. A transverse section of the Indian plant agrees, too, with that of *C. purpureum* (compare for instance Kylin, l.c. p. 23–24, fig., 14*c*) having a peripheral assimilating layer of oblong densely placed cells and below that a storage tissue consisting of nearly isodiametric cells nearest the peripheral ones, then more lengthened cells and in the middle a medullary tissue composed of long, hyphae-like cells. The hairs were not observable and tendrils were not present. Near the base of the main stem of one of the specimens the characteristic decumbent branchlets of this species were present (Plate IV).

The occurrence of this species so far from its hitherto known distribution is of much interest.

HYPNEACEAE.

Hypnea musciformis (*Wulf.*) *Lamour.* Essai. Thalassioph. 43.—*Fucus musciformis* Wulf. in Jacquin, Collectanea, **3**, 154, tab. 14, fig. 3 (non vidi). For further synonymy see De Toni, Syllog. Alg. **4**, 472.

INDIA: Karachi, *J. A. Murray* (Herb. Kew); Manora, *Miss L. Frere* (Herb. Kew).

f. denudata Kütt. Tab. Phyc. **18**, 21.

Karachi, *J. A. Murray* (Herb. Kew); *A. B. Kotwall* (Herb. New York Bot. Gard.).

Distr. Most warm seas.

This species is common along the shores of India. In the collection of Algae belonging to the Kew Herbarium several typical specimens richly provided with tendrils are present. Some specimens of *f. denudata* are also found in the Kew Herbarium.

Hypnea Valentiae (*Turn.*) *Mont.*, J. Agardh, Spec. Alg. **2**, 540; Hauck, Ueber ein. v. I. M. Hildebrandt im Rothen Meere u. Ind. Ocean gesamm. Algen in Hedwigia **26**, 20, 1883.

INDIA: Karachi, *J. A. Murray* (Herb. Kew). Bombay, Malabar Hill, Back Bay. Tuticorin, Hare Islands.

Distr. Most warm seas.

In the paper quoted above Hauck points out that several forms formerly considered as species and all distinguishable by means of more or less densely placed branchlets on the main branches belong to this species. Furthermore stellate bulblets are often present. I agree with Hauck's treatment of these forms, for such a changeable

alga as *Hypnea* with its great ability for making new shoots everywhere will certainly be much influenced by various external conditions. The Indian specimens which I refer to this species are also rather variable, but they all agree in having more or less densely placed short branchlets along the main branches.

Hypnea spicifera (*Suhr.*) *Harv.* in J. Agardh, Alg. Liebm. **14**; Spec. Alg. **2, 445**; Epicrisis, **562**; Kütz. Tab. Phyc. **18, 29.**—*Gracilaria spicifera* Suhr in Flora **2,** 731, t. 2, fig. 14 (1834). *Hypnea spicigera* Harv., Ner. Australis, t. 49. *Hypnea Harveyi* Kütz. l.c. 28.

INDIA: Karachi, *A. B. Kotwall* (New York Bot. Garden). Karvar, Bengi Bay.

Distr. Cape.

In the collection of algae from Karachi belonging to the New York Bot. Garden two specimens are found which I think are referable to this species. One of these is a female plant, the other is sterile. Both specimens are covered with ramuli and short branchlets from the upper ends of the main branches to near their base, thus not having the long naked basal part of the branches generally found in this species. In this respect they are very similar to Kützing's figure of *H. Harveyi*. Some of the specimens from Cape found in J. Agardh's Herbarium in Lund are quite like the Indian specimens. A small rather delicate tetrasporic specimen from South India I think is also to be referred to this species.

CERAMIACEAE.

Centroceras* clavulatum (*Ag.*) *Mont.*, in Exploration Scientifique de l'Algérie, Algues, 140 (1846); J. Agardh, Spec. Alg. **148**; Epicrisis, 108.

INDIA: Karachi, *J. A. Murray, N. M. Paul* (Herb. Kew). Dwarka. Bombay: Back Bay, Malabar Hill, Bandra, Karvar. Tuticorin: Hare Island.

Distr. All warm seas.

Several forms are present, some with many spines, some with few or only a single one at each joint, but quite spineless forms, referable to *C. cinnabarinum*, were not found in the collection.

Ceramium miniatum *Suhr.* MS. in J. Agardh, Spec. Alg. **2,** 135; Analecta Algologica, Contin. 2, p. 18; Harvey, Phycologia Australica, t. 206 A.

INDIA: Karachi, *J. A. Murray* and *N. M. Paul* (Herb. Kew). Bombay: Malabar Hill, Bandra.

Distr. Peru, West and East coasts of Australia.

In "The Marine Algae of Peru" (Memoirs of the Torrey Bot. Club, **15**: 1914) p. **157**, Howe says that he doubts whether the plant figured by Harvey in the above-quoted work really belongs to

*Dr. H. E. Petersen has most kindly determined the species of this genus and of *Ceramium*.

this species. But Dr. H. E. Petersen tells me that he is certain Harvey's plant represents *C. miniatum*, though he has not seen authentic material. The Indian specimens agree well with Harvey's figure and likewise with specimens determined by J. Agardh.

Ceramium gracillimum *Griff.* et *Harv.*, Phycologia Britannica, t. 206. J. Agardh, Epicrisis, 95; Analecta Algol., Contin. 2, p. **43.**—*Ceramium byssoideum* Harv. Nereis Bor. Am. 218. *Ceramium transversale* Collins and Hervey, Alg. Bermuda, 145, pl. v, figs. 29–31; Boergesen, Marine Algae in Ostenfeld, Plants from Beata Island, St. Domingo in Dansk. Bot. Arkiv. **4,** no. 7, 27.

INDIA: Tuticorin, Hare Island.

Distr. Most warm seas.

Most probably *Ceramium gracillimum* is the correct name for this species, but Dr. H. E. Petersen tells me it is desirable to see authentic material. In Britton, "Flora of Bermuda," (1918) Howe states (p. **531**) that *C. transversale* is to be referred to *C. byssoideum*. Compare too my remarks in the paper quoted above.

Ceramium rubrum (*Huds.*) *Ag.* var. *virgata* Ag. Spec. Alg. **2,** 149. J Agardh, Spec. Alg. **2**, 128; Epicrisis, 100.—*Ceramium vimineum* J. Agardh, Analecta Algologica, Contin. 2, p. 38.

INDIA: Karachi, *J. A. Murray* (Herb. Kew).

Distr. The Arctic Sea, Western coast of Europe to the South of Cadiz, Brasilia; "*in mari australi*" (J. Ag.).

Two well preserved specimens of this form of *Ceramium rubrum*, widely spread in the Arctic Sea and in the Northern Atlantic Ocean, are present in the collection of algae belonging to the Kew Herbarium. Their occurrence in the Arabian Sea is therefore rather astonishing. According to Dr. H. E. Petersen the specimens agree very well with specimens, for instance, from Denmark, the Faroes and Iceland.

DELESSERIACEAE.

Nitophyllum punctatum (*Stackh.*) *Grev.* Alg. Brit. 79; Harvey, Phyc. Brit. pl. 202; Kylin, Studien über die Delesseriaceen in Lund's Univ. Årskr. N. F. Avd. 2, **20,** no. 6, p, 69, 1924.—*Ulva punctata* Stackh. in Linn. Transact. **3,** 230.

INDIA: Karachi, March 1882 and June 1883, *J. A. Murray* (Herb. Kew); *Miss L. Frere* (Herb. Kew); *A. B. Kotwall* (Herb. New York Bot. Gard.).

Distr. Warmer Atlantic Ocean, Mediterranean Sea.

In the collection of the Kew Harbarium several fine specimens from the Indian Ocean are found which I do not hesitate to refer to this species. Besides sterile ones, tetrasporic and cystocarpic specimens are present. The oblong-roundish tetrasporangial sori and the cystocarps are scattered over the surface of the thallus. As far as I have been able to see on dried material the carpospores are placed terminally upon the gonimoblasts, one of the characters by means of which the *Nitophyllum* group, according to Kylin, is

separated from the *Myriogramme* group. Furthermore the specimens all agree in having a thin membranaceous rosy-red thallus without veins; it adheres well to paper. Upwards the thallus is monostromatic, near the base it is composed of 3–4 layers of cells; the plant has a quite short stipe and is fixed by means of a small irregularly shaped disc. It forms more or less dense tufts. A number of incisions, generally deep, divide the thallus into lobes, which are linguiform or subcuneate with broader upper ends. The upper margin of the thallus is sinuate or emarginate. In some specimens the side of the lobes along the incisions is entire without proliferations; in others proliferations are found in great numbers. As a rule the proliferations are forked or sinuate at their upper ends.

RHODOMELACEAE.

Laurencia obtusa (*Huds.*) *Lamour.* Essai . . . Thalassioph. 42.

INDIA: Karachi, *J. A. Murray* (f. *typica*) (Herb. Kew). Dwarka, var. *divaricata*.

Distr. All warm seas; var *divaricata*: Red Sea, var. *majuscula*: West Australia.

Besides the var. *majuscula* mentioned in Part III (K.B. 1933, 135) some specimens are to be found in the collection of algae at Kew, which are to be referred to the typical *L. obtusa*. Furthermore I have collected at Dwarka a few specimens of var. *divaricata* (J. Ag.) Yamada (l.c. 223, t. 16 a). In the medullary tissue of this variety lenticular thickenings are not present, and the surface cells in transverse section are almost square and not projecting.

Laurencia filiformis (*Ag.*) *Mont.*, Voyage Pol. Sud, 125; J. Agardh, Spec. Alg. **2**, 745; Epicrisis, 644; Yamada, Y. Notes on Laurencia, 226, pl. 18, fig. a.

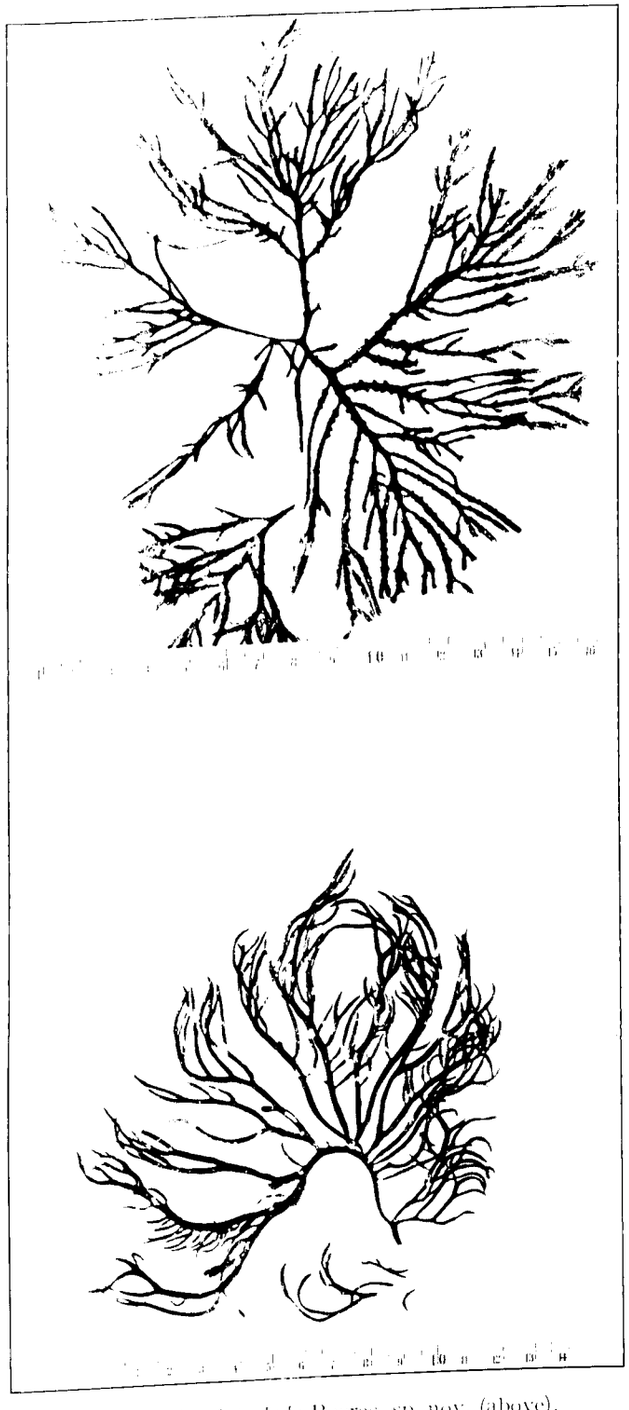
INDIA: Manora, near Karachi, *Miss L. Frere* (Herb. Kew).

Distr. South and West Australia.

To this species I refer a fine well-prepared specimen in *Miss L. Frere's* collection. The specimen has a rosy-red colour. It reaches a height of about 14 cm. (the base is missing) and is of an even thickness from base to top. The ramification is rather irregular; in the lower part the branches issue on all sides or alternatingly, in the upper part they have a tendency to become secund. Regarding the anatomy the surface cells are not protruding, being about as long as broad with a rather thick cuticle; lenticular thickenings are not found. This description shows that the Indian plant agrees well with the description of the species, and a comparison with specimens from West Australia, determined by J. Agardh and preserved in the Botanical Museum, Copenhagen, confirms this.

Laurencia hypnoides *Boergs.* A revision of Forsskåls Algae . . . , in Dansk. Bot. Arkiv, **8**, no. 2, p. 3 (1932).—*Chondria seticulosa* C. Agardh, Spec. Alg. 345. *Laurencia seticulosa* Grev. Alg. Brit. Synop. p. lii. J. Agardh, Spec. Alg. **2**, 758; Yamada, Notes on

PLATE III



Laurencia platyclada Boergs. sp. nov. (above).
Gracilaria arcuata Zan. (below).

Laurencia, 217. According to a specimen in Forsskål's Herbarium, bearing his original label, this species is not the same as *Conferva seticulosa* Forssk. Flora Aegypt.-Arab. 188 (=*Hypnea musciformis* (Wulf.) Lamour).

INDIA: Karachi, *A. B. Kotwall* (Herb. N. York Bot. Gard.). Tuticorin: Hare Island.

Distr. Red Sea.

In the collection of algae from Karachi belonging to the New York Botanical Garden, two specimens are present which are referable to this species. I have compared them with specimens in J. Agardh's Herbarium in Lund collected by Forsskål in the Red Sea and found that they agree very well with these, as well as with Kützing's figure (Tab. Phyc. **15**, 52). The specimens have a yellowish-green to brown-red colour and adhere strongly to paper. Short fructiferous almost cylindrical or subclavate branchlets are given out from the branches on all sides, as shown in Kützing's figure. A transverse section shows oblong-roundish peripheral cells and no lenticular thickenings.

To this species I refer too some specimens from South India. These specimens have the same appearance being densely set with short nearly cylindrical fructiferous ramuli.

Laurencia virgata *J. Agardh*, Spec. Alg. **2**, 752; Epicrisis, 653; Yamada, Notes on Laurencia, 208 (1931). For synonyms see De Toni, Syll. **4**, 793.

INDIA: Karachi, June 1883, *J. A. Murray* (Herb. Kew); *A. B. Kotwall* (Herb. N. York Bot. Gard.). Karvar, Bengi Bay.

Distr. Cape.

In the collection belonging to Kew some tetrasporic specimens are present determined as *Laurencia* near *L. virgata*. Two specimens of this species are found too in the collection belonging to the New York Botanical Garden. Finally I have a few specimens in my own collection. According to Yamada this species has "a good number of the lenticular thickenings in the walls of the medullary cells in the branchlets." I have not been able to find these in the specimens examined, perhaps because they have been unduly pressed. Otherwise the specimens agree well with Yamada's description. I have also compared them with specimens of this species found in J. Agardh's Herbarium in Lund with which they agree quite well.

Laurencia platyclada *Boergs.* sp. nov.; *L. elatae* formae *flexuosae* Kütz. proxima mihi videtur sed nostra species ramificatione magis irregulari, thallo latiore et cystocarpiis per totum thallum sparsis dispositis inter alia differt.

Thallus circiter 10 cm. altus, complanatus, 1·5–2·5 mm. latus, irregulariter ramosus. *Rami* e margine, rarius e superficie plana, thalli exeuntes, secundi, alterni vel suboppositi apicibus late rotundati; rami secundarii et ipsis eodem modo ramosi. *Cellulae* in sectione transversali aequilongae, partibus incrassatis lenticulatis

ad parietes cellularum medullae non praesentibus. *Cystocarpia* in superficie thalli irregulariter dispersa, verrucas semiglobosas permagnas formantia. *Ramuli tetrasporiferi* breves, irregulariter cymosi.

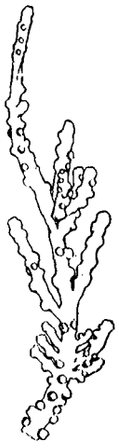


Fig. 13. *Laurencia platyclada* Boergs. Part of thallus (natural size).

INDIA: Karachi, *A. B. Kotwall* (Herb. New York bot. Garden); Sind coast, *N. M. Paul* (Herb. Kew).

This species (Plate III) seems to show some likeness to *Laurencia flexuosa*, Kütz. (Tab. Phyc. **15**, 68) but is easily separated from it by means of its somewhat broader thallus and more irregular ramification and its large sessile cystocarps spread over the thallus (Fig. 13). Furthermore I have not succeeded in finding lenticular thickenings in the walls of the medullary cells of the Indian plant. *L. platyclada*, too, may show some likeness to *L. ceylanica* J. Agardh, the North Indian plant having now and then some short tuberculate branchlets; but these are very numerous and characteristic in *L. ceylanica*, the thallus of which is also much broader. Besides it differs from our species on account of its radially elongate somewhat palisade-like surface cells.

The thallus of *L. platyclada* is flat, about twice as broad as thick. The peripheral cells in transverse section are about as long as broad, their free walls being a little convex. A small piece of a plant in the specimens from the Kew Herbarium is tetrasporic; the stichidial branchlets are very short and irregularly cymose.

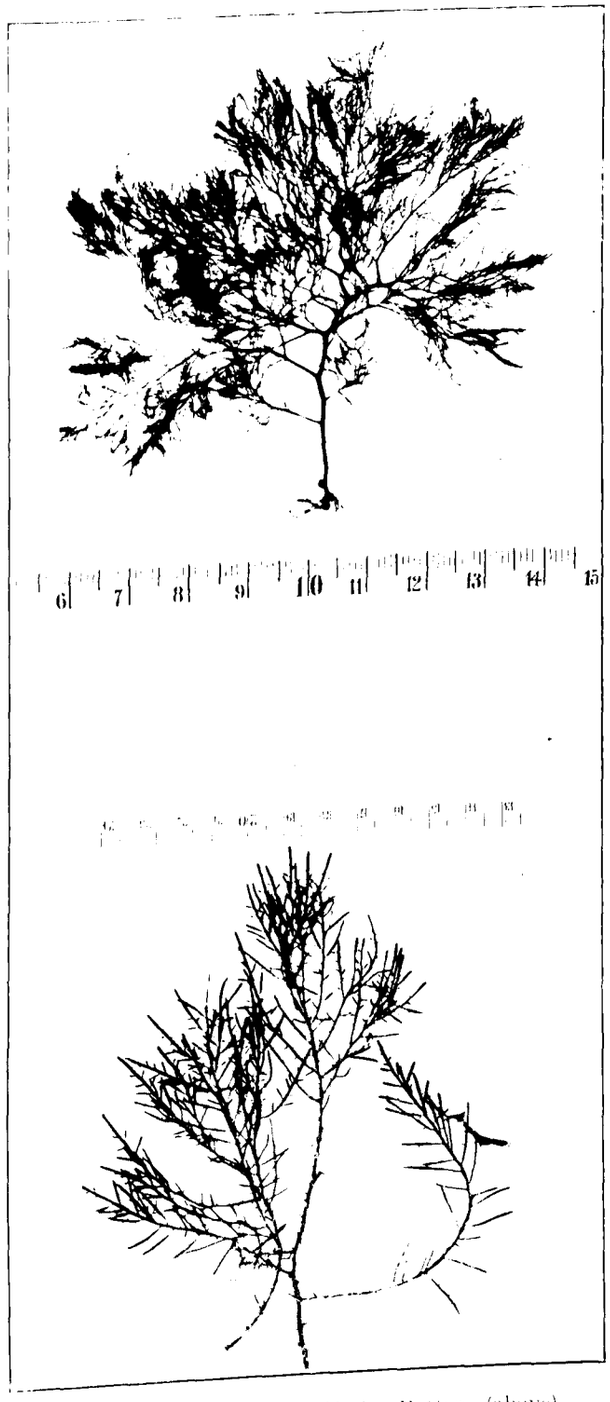
Acanthophora dendroides *Harv.* in Transact. Irish Academy **22**, 538; J. Agardh, Spec. Alg. **2**, 818.

INDIA: Dwarka; Karachi, June 1883, *J. A. Murray* (Herb. Kew).

Distr. Ceylon, Malay Archipelago, Australia.

The Indian specimens form tufts up to about 18 cm. high. The main filaments are up to about 2 mm. thick. They are pyramidally

PLATE IV



Cystoclonium purpureum (Huds.) Batters. (above).
Acanthophora dendroides Harv. (below).

ramified to all sides, the branches being bent upwards and getting gradually shorter (Plate IV). The branches carry other shorter branchlets. All branches and branchlets are narrowed at their base, but soon attain their normal thickness remaining so almost until they end in the broadly rounded apex, from the cavity of which the trichoblasts protrude (Fig. 14). Here and there, especially near the upper ends of the branches and branchlets, a short spine is present. The spines are about 400μ long and at their base nearly quite as broad. The number of spines is rather variable, in some specimens many are present in others very few, and these specimens recall *Chondria* very much in appearance.



Fig. 14. *Acanthophora dendroides* Harv. Upper ends of branches (×3).

Polysiphonia platycarpa *Boergs.* sp. *nov.*; *P. macrocarpae* Harv. proxima videtur, sed nostra species thallo majore et crassiore, cystocarpiis latioribus et brevioribus collo destitutis inter alia distincta est.

Thallus caespitosus, usque ad 7 cm. altus, ecorticatus, tetrasiphonius, articulatus, e filamentis decumbentibus rhizoideis substrato adfixis et filis erectis compositus. *Filamenta basalia* circiter 200μ lata, articulis duplo fere longioribus, ad geniculas leviter incrassatis, parietibus externis crassioribus. *Filamenta erecta* in media parte thalli circiter 70–80μ lata, articulis 3–4-plo longioribus, sursum leniter attenuata. *Ramificatio* irregularis, sparsa, ramis extra-axillaribus trichoblastorum locum tenentibus erectis, angulis acutis. *Tetrasporangia* ovalia, circiter 65–77μ lata et 85–100μ longa, in superiore parte ramorum et ramulorum orta et in serie longa spiraliter ordinata. *Antheridia* subcylindrica, 200μ longa et 38μ lata, superne sine cellula sterili. *Cystocarpia* sphaerico-urceolata, ostiolo lato non protracto munita.

INDIA: Bombay, *Boergesen* 5024 (type): Back Bay, Colaba, Bandra. Tuticorin (Hare Island).

After I had examined the Indian plant it was clear that in several respects it resembled the plant which in my West Indian algal flora I had referred to *P. macrocarpa*, though at that time I was unable to compare it with authentic material. In order to do this now, and to try to find out whether or not the branches of the true *P. macrocarpa* are axial, like those of *P. sertularioides* (a species for which *P. macrocarpa* is often mistaken), I wrote to the Kew Herbarium and asked permission to see some authentic specimens of *P. macrocarpa*. The permission was granted, and the Director kindly sent me several specimens, and in a letter Mr. Cotton was so kind as to let me know that, for want of a specimen which could be said with certainty to be the type, two specimens from Portrush near the border of Co. Antrim and close to the type locality (Portstewart) gathered by the same

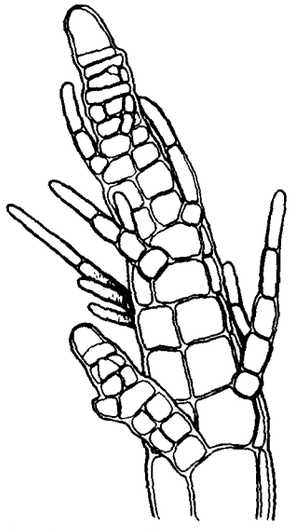


Fig. 15. *Polysiphonia platycarpa* Boergs. Apex of a filament (×350).

collector, D. Moore, might be regarded certainly as true specimens of *P. macrocarpa*. Having now examined these specimens, I am able to state, from the cystocarpic specimens which had well developed trichoblasts, that the branches appear in the places of the trichoblasts, and therefore, are not axial (Fig. 15). In this respect *P. macrocarpa* agrees with the Indian plant, but otherwise the latter seems to me both as regards the size* and the shape of the cystocarps to differ so much from the Atlantic plant that I have preferred to describe it as a new species.

*As the size of *P. macrocarpa* does not seem to be given, I may here mention that the main filaments near the base were up to about 80μ thick, and higher up, where the cystocarps occurred, about 45μ. A cystocarp was 363μ long and 308μ broad, and the long neck 60μ long. The two specimens from Co. Antrim were 2 cm. high.

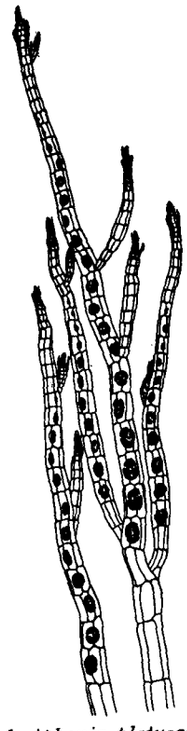


Fig. 16. *Polysiphonia platycarpa* Boergs. Filaments with tetrasporangia (×55).

To the description given above I wish also to add that the plant forms dense, soft, very much ramified tufts of a dark purple-red colour when dry. The branches and branchlets are directed upwards (Fig. 16), not recurved as in *P. macrocarpa*. The trichoblasts (hairs) are as a rule well developed; they are arranged in a left handed spiral with a 1/4 divergency, a trichoblast, or rarely, a branch, being given out as a rule from every segment (Fig. 15). The cystocarps (Fig. 17) are large and of somewhat variable size; for instance the cystocarp shown in Fig 17*a* is 250μ long and 280μ broad; in Fig. 17*b* 320μ long and 340μ broad. The antheridial bodies were found only once in a collection from Tuticorin; they agreed with my figure 32*a*, p. 83 in "Mar. Alg. from the Canary Islands" (Biologiske Meddelelser **9**, 1, 1930), as they had no sterile cell at their summits.

Polysiphonia elongata (*Huds.*) *Harv.* in Hooker, Brit. Flora, 333 (1833); J. Agardh, Spec. Alg. **2**, 1004.—*Conferva elongata* Huds. Fl. Angl. ed. 2, **2**, 599 (1778). *Polysiphonia Ruchingeri* (Ag.) J. Agardh, Alg. Mediterr, 136. For more literature see De Toni, Syll. Alg. **4**, 903.

INDIA : Karachi, 1883, *J. A. Murray* (Herb. Kew).

Distr. Atlantic Ocean, Mediterranean Sea, Black Sea.

The Indian specimens belong to J. Agardh's subgroup II. *Ruchingeri*. The virgate arrangement of the branches and branchlets and the fact that the branchlets are elongated, spindle-shaped, tapering towards the base and summit are characteristic of this group. This is clearly seen in the Indian plant. Their appearance agrees very well with Harvey's pl. 293 in " Phycol. Brit," but the Indian specimens are coarser and dark-brown, almost blackish. The specimens adhere strongly to paper with the exception of the big main stems. The cortical layer is very much developed and found from near the tips of the filaments ; in the main stems the central and the four pericentral thick-walled cells are surrounded by 3–5 layers of cortical cells which become gradually smaller towards the periphery and are covered by a thick cuticula. In this species the

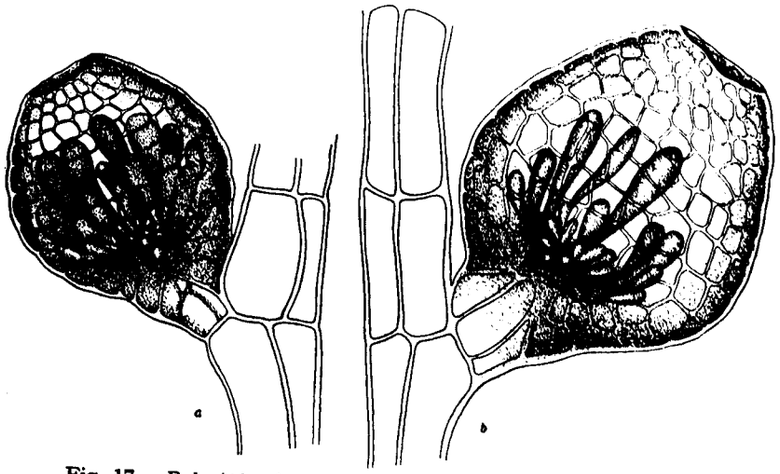


Fig. 17. *Polysiphonia platycarpa* Boergs. Cystocarps (× 125).

branches occur in the place of trichoblasts and in spite of the maturity of the branchlets (with ripe or nearly ripe tetrasporangia) I have been able to observe this fairly well. Furthermore I have succeeded in observing the secondary large pits found in the thick main stems. In agreement with Rosenvinge's description and figures (Marine Algae of Denmark, part 3, Rhodophyceae III, 415, fig. 357) these pits traverse the transversal walls and the pericental cells and are about ten in number. The articulations in the upper thin filaments have a length of about 130–160μ, being as a rule shorter than thick. The cortical cells have generally the same length as the siphons.

The specimens being tetrasporiferous were gathered in June.

Polysiphonia variegata (*C. Ag.*) *Zan.*, Synops. Alg. 60 ; J. Agardh, Spec. Alg. **2**, 1030 ; Falkenberg, Rhodomelaceae, 119,

t. 21, fig. 30 ; Boergesen, Mar. Alg. D.W.I. **2**, 269–71, figs. 263–66. —*Hutchinsia variegata* Ag. Systema, 153.

INDIA : Karachi, 1882, 3, *J. A. Murray* (Herb. Kew). Okha Port.

Distr. Mediterranean Sea, warmer Atlantic, European and North American coasts, West Indies.

The Indian specimens agree well with Falkenberg's description. The specimens form dense bushes the colour of which is a dark purple-red. The inferior decumbent filaments are fastened to the substratum by means of short rhizoids ; they are about 450μ thick and have thick walls. The length of the cells is about $\frac{3}{4}$ of the breadth. In the middle of the thallus the filaments have a breadth of about 200μ and about twice, in some specimens, up to 4 times, as long. The filaments taper gradually upwards to about 20–25μ. The branches in the lower parts emerge at almost right angles, but in the upper part of the filaments the angles are acute, and branches and branchlets therefore erect and nearly parallel. The filaments near the base are rather rigid, whereas the thallus in the upper part is soft and when dried adheres strongly to paper. In the ample material gathered at Okha Port I found that the number of pericentral cells varies greatly. According to Falkenberg the number of



Fig. 18. *Polysiphonia variegata* (C.Ag.) Zan. Apex of filament (×350).

pericentral cells is 7–6 in the lower filaments, 6–5 in the upper ones. De Toni, Sylloge, says 5–8. In some of my specimens I have found only 7 from base to top, in some 7–8 or 7–9. In one filament I have found even 10. In a few specimens of this species from Karachi belonging to Kew I observed in one specimen 6–7 and in another 6–9. The Indian specimens thus generally have a higher number of pericentral cells than the Atlantic-Mediterranean specimens, and it is the same with the West Indian ones (Boergesen, Mar. Alg. D. W. I. **2**, 270). I have not found any cortical layer in the Indian specimens. As described by Falkenberg the branches

are formed at the base of the trichoblasts, being pushed to the left side of the latter (Fig. 20). Whereas in the Indian plant the number of the pericentral cells, as mentioned above, showed a tendency to be a little greater than that of the Atlantic specimens, the Indian specimens as regards the equally essential character of this genus, viz. the mutual placing of the trichoblasts and the branches, appeared to agree perfectly with the Atlantic plant. The trichoblasts are placed in a spiral, but at intervals there are several bare segments.

I have only found tetrasporic specimens. The tetrasporangia form almost straight rows in the upper ends of the filaments and branchlets. The tetrasporic filaments were gathered in January.

Lophocladia Lallemandi (*Mont.*) *Schmitz*, Die Gattung Lophothalia J. Ag. in Ber. d. deutsch. bot. Ges. **11**, 223; Falkenberg, Rhodomelaceen, 552.—*Dasya Lallemandi* Mont. in Ann. Sci. Nat. Bot. **12**, 289 (1849).

INDIA: Okha Port, cast ashore.

Distr. Mediterranean Sea, Red Sea, Indian Ocean, etc.

In "The Marine Algae of the Danish West Indies" (**2**, 302) I have described not only the stichidia, but also the antheridial bodies and the cystocarps of *L. trichoclados* at that time not known in the genus. In the Indian material I have found specimens with tetraspores and cystocarps. Although the structures of the vegetative thalli in both species on the whole agree quite well, they differ essentially in one respect, namely, as pointed out by Schmitz and later by Falkenberg, in *L. Lallemandi* branches are formed exogenously at the summit of the thallus in place of trichoblasts, entering into the spiral of these, whereas in *L. trichoclados* the ramification takes place only by means of adventitious, endogenous branches The formation of the cortex in *L. Lallemandi* is, as with *L. trichoclados*, limited to rhizoids running downwards in the furrow between the pericentral cells; only in the basal part of the thallus the cortex is more or less broadened out over the surface of the pericentral cells. Nevertheless the middle part of these is left free in the material which I have examined. The trichoblasts are like those in *L. trichoclados* alternately ramified with all the branchlets fanlike in one plane and placed transversally against the main stem.

The tetrasporic plants are rather large, 10–11 cm. high; the stichidia were all apparently young and small, much smaller than those in *L. trichoclados*. As in that species they are generally developed from the first side branch of the trichoblast; in some cases the following branch also becomes fertile. As a rule two cells at the base of the stichidium remain undivided, the following segments becoming polysiphonous.

The female plant also agrees well with *Lophocladia trichoclados*, the procarps having the same shape as shown in my fig. 310 (l.c.). The ripe cystocarps (Fig. 19) of which I have seen only a few specimens are shorter and broader with a shorter neck than those of *L. trichoclados*. The one figured here was 400μ broad and 370μ long

with the neck. The neck alone was 66μ long. The stipe in the ripe cystocarps is thick and vigorous. The female plant was much smaller than the tetrasporic one; it seemed to be stiffer and the branches were accurately bent. Mme. Dr. Weber (Liste Alg. Siboga 363) has also found the stichidia and cystocarps of this species; but no description of the shape and size of the ripe cystocarp is given.

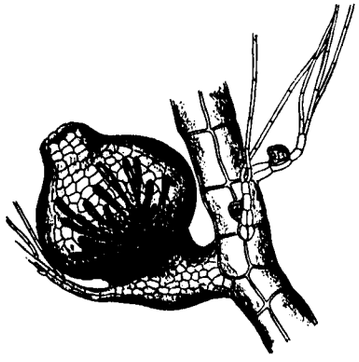


Fig. 19. *Lophocladia Lallemandi* (Mont.) Schmitz. A cystocarp (× 60)

Heterosiphonia Wurdemanni (*Bailey*) *Falkb.* Rhodemelaceen, 638; Boergesen, Mar. Alg. D.W.I. **2**, 324.—*Dasya Wurdemanni* Bailey in Harvey, Nereis Bor.-Am. **2**, 64.

Forma *laxa* Boergs, l.c. 326–7, figs. 327–8.

INDIA: Okha Port, cast ashore; Tuticorin, Hare Island.

Distr. West Indies, Key West, Canary Islands, Cadiz, Mediterranean Sea, Malay Archipelago.

The few specimens which I have found of this species all belong to forma *laxa*. As pointed out by Falkenberg and mentioned, too, by myself this form has always only 4 pericentral cells, compare my fig. 328 c. Every branch-system has 3 polysiphonous segments of which the two basal ones are incorporated in the sympodium of the main stem; all the remaining upper segments are monsiphonous. As in the West Indian plant a good deal of the branches and branchlets end in shorter or longer often hook-formed rhizoids (comp. fig. 328 b). The material was sterile.

Pterosiphonia cloiophylla (*Ag.*) *Falkb.* Rhodomelaceen, 271.—*Rhodomela cloiophylla* C. Ag. Spec. Alg. 375. *Polysiphonia cloiophylla* J. Ag. Spec. Alg. **2**, 934.

INDIA: Karachi, Dec. 1880, Sept. 1881 and March 1882, *J. A. Murray* (Herb. Kew).

Distr. Cape.

In the Kew Herbarium several specimens of this species, hitherto known only from the Cape, are present. It is very closely allied to the European *P. complanata*. Besides the geographical distribution Falkenberg points out that the most essential difference between the

two species is that in *P. complanata* 5–6 segments of the branch grow congenitally together with the mother branch, whereas in *P. cloiophylla* this growing together as a rule is reduced to two segments; the last mentioned feature is also met with in the Indian plant. J. Agardh distinguishes between several forms of this variable species; these forms which most probably are due to environment or fertile or vegetative conditions of the plant are also present in the specimens belonging to the Kew Herbarium. Specimens collected in March have tetraspores.

II—BOTANY OF THE CAMBRIDGE EXPEDITION TO EDGE ISLAND, S.E. SPITSBERGEN, IN 1927. Part I.*

A. P. G. MICHELMORE.

ITINERARY.

In the summer of 1927 I accompanied the late Mr. H. G. Watkins' expedition from Cambridge to Edge Island as one of the biologists. Some notes on the vegetation and a collection of vascular plants were made. The information gained is by no means exhaustive, for less than a month was spent in Spitsbergen, most of the weather was inclement, and my main interest was in collecting animals. It is hoped, however, that as this part of Spitsbergen is so little known these notes may have some value.

Watkins (3) gave an account of the expedition before the Royal Geographical Society, and appendixes by other members of the party were printed with the account of his lecture. Watkins dealt mainly with the travels of the inland exploring party and did not describe in detail the itinerary of the shore party, which is therefore given here.

On July 31st, a party of us landed at Keilhau Bay and camped by an old wooden hut near the shore. At this point the high cliffs of Whales Point, the south-western corner of Edge Island, give way to a sloping shore with a series of terraces each bounded by a steep slope twenty or thirty feet high. These slopes looked as though they might have been old cliff lines since left high and dry by the elevation of the land. On one side of the hut is a little bog, and on the other a stream runs over the stony ground. The south aspect and the plentiful supply of running water made the place one of the most botanically favourable of those visited. Nearly all the species found in the open "fjaeldmark" were seen here. The neighbourhood of the hut was like a little alpine garden full of gay flowers.

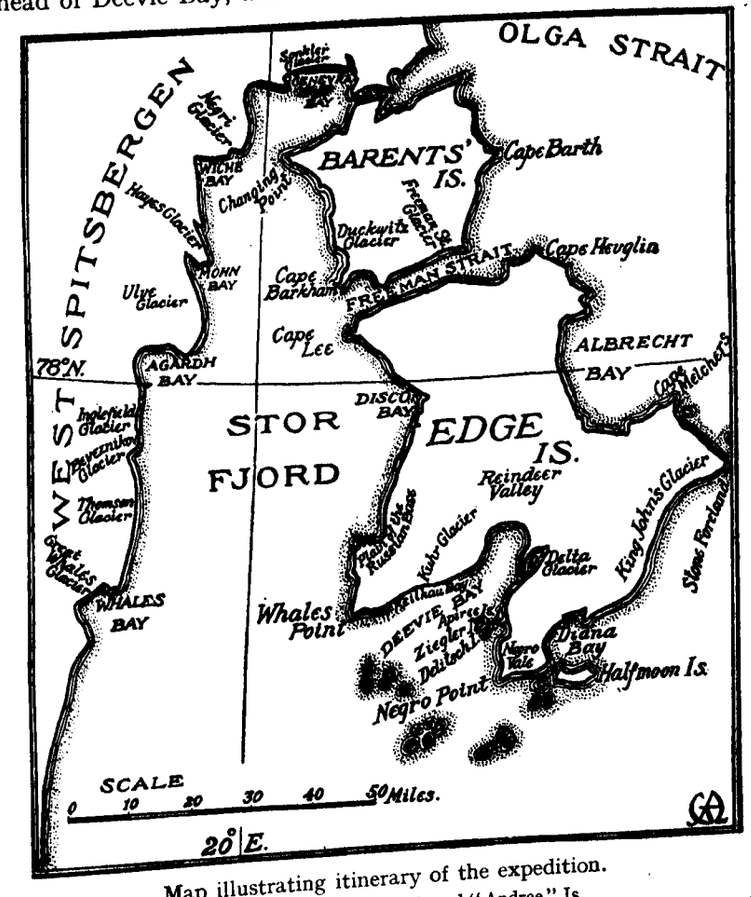
On August 4th, the boat sailed to the west coast and anchored in a sheltered cove near the southern end of the Plain of the Russian Base. Two interesting days were spent exploring this district. The plain was formed by a large dolerite sill, whose edges supported a rich vegetation. On the surface of the sill was a large expanse of moss bog in which grew a number of special bog plants. Of

*Part II, consisting of an account of the ecology of the area, is published in the Journal of Ecology, **22**, 156–76 (1934).

these *Ranunculus lapponicus* L., *R. lapponicus* L. x *R. Pallasii* Schlecht., *Cochlearia arctica* Schlecht. and *Chrysosplenium tetrandrum* (N. Lund) Th. Fries were found nowhere else. Their occurrence here only was probably due to this being the only place visited where such extensive bogs were found and does not necessarily indicate a favourable climate.

August 6th and 7th were spent at Andree Island on the south-east coast of Deevie Bay. This place is also formed by part of a dolerite sill, which is now connected to the mainland by a stretch of damp sandy ground bearing marine shells. The sill is not big enough to bear the amount of bog found at the Plain of the Russian Base, but two fjaeldmark plants, *Koenigia islandica* L. and *Carex ursina* Dew, were found here and nowhere else.

On the evening of August 7th the boat moved out to Ziegler and Delitsch Islands. The next morning a gale drove us back to the head of Deevie Bay, and we were unable to land. On the 9th we



Map illustrating itinerary of the expedition.
N.B.—"Apiree" Is. should read "Andree" Is.

landed a little to the south of an apparently previously unnamed glacier (the " Delta Glacier "), which breaks through the hills and pushes its terminal moraine into the sea. The glacier is easily recognised by the large lagoon contained between the moraine and the tip of the glacier itself. The coastal plain was not examined especially here, but Mr. N. L. Falcon, the geologist of the expedition, and I devoted the day to a climb up to the flat top of the line of hills behind the plain. The vegetation on the slopes and on top was poor, and no unusual species were found.

On the 10th we moved across to the Kuhr Glacier to pick up the sledging party, who had been camping in very uncomfortable conditions on the ice cap. The 11th, 12th and 13th were devoted to exploring the coastal plain and the great terminal moraine of the Kuhr Glacier. The plain was very barren, being largely covered with mud brought down by streams from the glacier. Even the moraine was rather barren, but *Braya purpurascens* (R. Br.) Bunge was found here for the first time.

Having said goodbye to a party of three, who set out to traverse the island, the rest of us went round on August 14th to Cape Lee, the north-western point of Edge Island. Another surveying party was dropped here, but I had only an hour or two ashore during which *Dryas octopetala* L. was found.

Immediately after this we sailed for the coast of West Spitsbergen. At 8.45 p.m. we landed by the hut on the north side of Whales Bay, and two and a half hours were spent on the sandstone platform on which the hut stands. Part of this was dry and barren, and part carried a bog, which was drained by a little stream. The most notable plants found here were *Dryas octopetala* L., *Taraxacum arcticum* Dahlst., *Salix polaris* Wahlenb. x *S. herbacea* L., *Dupontia Fisheri*, R. Br. and *Arctophila fulva* Rupr. At 11.15 p.m. we embarked again and sailed southwards, but rough weather prevented landing. We returned therefore to Whales Bay the next morning. At a height of 1000 feet or so there was a marked terrace in the hills behind the narrow coastal plain. A reddish colour suggested the presence of a belt of vegetation on the terrace and prompted a climb to the top of a hill on the west side of the valley at whose mouth we were. The red colour was found to be due to a bed of red rock, and the whole hill above the lower slopes was very barren. On returning a fresh Crucifer was seen not far inland, but it was not collected, as I was busy looking for mites and insects at the time. Unfortunately it was never found again, and so its identity is uncertain. It was not a *Braya*, *Cardamine*, *Draba* or *Cochlearia*, and the only other Crucifers given by Resvoll-Holmsen in her Flora (2) are *Arabis alpina* L., *Eutrema Edwardsii* R. Br. and *Parrya nudicaulis* (L.) Regel. Of these it is the most likely to have been the second.

Part of August 16th was spent at Agardh Bay, where there is quite a broad coastal plain of stony and very barren ground. On

returning to the boat we found that it had got aground and had only been floated again with some difficulty. We then moved north again and landed in Mohn Bay. The shingle beach here was full of curious pits, which were caused presumably by pieces of ice being stranded and melting on the shore. The effect of drifting ice is seen in the complete barrenness of the shore line everywhere in this part of the world. After some wading through mud the moraine on the southern edge of the Hayes Glacier was reached but was found to be very barren. Next a dolerite sill nearby was explored, and *Dryas octopetala* L. and *Salix polaris* Wahlenb. x *S. herbacea* L. were found.

Changing Point on Barents' Island was visited on the 17th. This place was very like Keilhau Bay, both in the terraced slopes of the ground, and in the abundance of flowers. The chief difference was that the shore consisted of a low cliff instead of a sloping beach.

On the 18th we returned to Cape Lee, where three of us camped in the hut and in tents while the ship sailed elsewhere. The actual point is formed by a dolerite sill, on which a number of the less common plants were found. To the north is a long stretch of sandy shore connecting the sill with the steep hills which here come close to the sea. Here there were enormous numbers of bones of walrus, seal, reindeer and arctic fox, but plants were not very common.

After four days of steadily deteriorating weather we were picked up again by the boat in the early morning of the 22nd, in a blizzard. We sailed eastwards through Freeman Strait to Cape Heuglin, where we picked up Watkins' party. We remained at anchor behind Cape Heuglin for the day to shelter from a gale. On August 23rd we slipped across Freeman Strait and anchored just east of the Freeman Strait Glacier on Barents' Island. Though we landed here, the cold weather discouraged collecting. The vegetation was much the same as that found elsewhere, but *Braya purpurascens* (R. Br.) Bunge was found again on the moraine of the glacier.

On the weather improving a little we sailed right round the west coast of Edge Island and landed on August 25th at the south-east end of the valley (" Negro Vale ") which cuts across the Negro Point peninsula.

Here I walked inland into the valley, noting the vegetation gradually decreasing as the coastal plain was left, and then climbed up to the plateau on the north-east side of the valley. The plants here were much like those found on the edge of the plateau near the Delta Glacier, but were more varied. The return journey was made along the coastal plain. On the 26th we left and sailed eastward into the ice, our last view of Edge Island being the magnificent ice cliffs of the great King John's Glacier.

The Flora.

The only previous account of the vegetation of Edge Island and Barents' Island of any importance seems to be that of Kükenthal (1),

who describes briefly the general aspect of the vegetation and gives lists of the plants found at the places where he landed.

In all, sixty species of vascular plants and four hybrids were found on Edge Island and Barents' Island. Three species and one hybrid were found only in West Spitsbergen. Resvoll-Holmsen in her recent book (2) enumerates one hundred and thirty-three species and one hybrid from the whole of Spitsbergen. As one or two of my specimens have been named as species not mentioned by Resvoll-Holmsen the proportion of the total flora found is not quite as high as it appears to be at first. Most of the species not found are delicate plants confined to the fjords of West Spitsbergen.

A characteristic of the vegetation of Spitsbergen is its uniformity. Most of the plants are so generally distributed in their appropriate habitats, that little is to be gained by giving a complete list of the places where the commoner plants were found. In the list of plants which follows localities are mentioned only for the more local species. The scarcity of suitable habitats is clearly responsible for the local occurrence of many of the rarer plants. This is not so evident in warmer climates, where the occurrence of rare plants often seems very capricious.

For the naming of my collection of plants I am indebted in the first place to Messrs. V. S. Summerhayes and F. Ballard of Kew. The former has also kindly given a great deal of help in other ways. Mr. E. Nelmes of Kew has confirmed the naming of the *Carex*, and Dr. Björn Floderus has identified the specimen of hybrid *Salix*. All the other critical plants have been named by Dr. J. Lid of Oslo. Dr. Lid's determinations are indicated by an asterisk in the list against the name of plants named by him. To all these gentlemen I wish to record my gratitude for their help.

The order followed in the list is that of Resvoll-Holmsen's Flora (2). Dr. Lid has most kindly revised the nomenclature.

Enumeration.

Equisetaceae.

Equisetum arvense L. Common, occasionally fruiting. Moist to wet places.

**E. variegatum* Schleich. Common, not seen in fruit. Dry to wet places.

Gramineae.

Alopecurus alpinus Sm. Abundant.

Phippsia algida (Soland.) R. Br. Common. Moist to wet places.

Trisetum spicatum (L.) Richter. Only found on the dolerite sill at Cape Lee and on the sandstone platform by the hut at Whales Bay. Flowers late.

Deschampsia alpina (L.) R. et Sch. A common viviparous tussock grass, lacking the red colour of many of the other species.

It was the tallest species of plant found and was commonly a foot high.

Dupontia Fisheri R. Br. Whales Bay, in a moss bog, and on the mossy banks of a little stream.

Arctophila fulva (Trin.) Rupr. A single plant was collected from mossy banks of the same stream at Whales Bay.

**Poa rigens* Hartm. (*P. arctica* R. Br.). Common. As in the other species of *Poa* the heads were very red.

**P. alpigena* (Fr.) Lindm. x *rigens* Hartm. Probably abundant almost everywhere, but see below under *P. alpigena* x *alpina*. Always viviparous. One specimen with a more spreading panicle than usual from Negro Vale has been labelled " f. *subrigens* " by Dr. Lid.

**P. alpigena* (Fr.) Lindm. The only specimens collected were some from the turf built up round the walls of the hut at Cape Lee. It is not certain whether this species occurred elsewhere, as it was not differentiated in the field.

**P. alpigena* (Fr.) Lindm. x *alpina* L. The specimens of viviparous *Poa* collected at Keilhau Bay have all been identified as this hybrid. The viviparous forms of *Poa* were not separated in the field, so it is not possible to say how common this species was, or whether *P. alpina* L., of which no specimens were collected, was seen.

Puccinellia Vahliana (Liebm.) Scribn. et Merr. Cape Lee. This species may also have occurred elsewhere, as it was not distinguished in the field from the common *Phippsia algida*, which it resembles in size.

**P. angustata* R. Br. Specimens were collected at Keilhau Bay, Cape Lee and from near the Freeman Strait Glacier on Barents' Island, but the species was not recognised in the field.

Festuca arenaria Osb. Widely distributed but not very common.

**F. brevifolia* R. Br. Collected at Whales Bay. A grass common on the moraine of the Hayes Glacier and occurring also in the moraine of the Kuhr Glacier was almost certainly this species.

Cyperaceae.

Carex ursina Dew. A single tuft at Andree Island.

Eriophorum Scheuchzeri Hoppe. Locally abundant in bogs. Plain of the Russian Base, Andree Island and Whales Bay.

Juncaceae.

Juncus biglumis L. Common in bogs. No specimens were collected, so it is just possible that *J. triglumis* L. also occurred.

**Luzula confusa* Lindeb. Abundant. The considerable variation in size gave rise while collecting to the suspicion that there might be two species, but all the specimens brought back are this species.

Salicaceae.

Salix polaris Wahlenb. x *herbacea* L. Abundant at Whales Bay and Mohn Bay, but not seen at Agardh Bay or on Barents' Island or

Edge Island. Only one small specimen from Whales Bay was brought back, and of this Dr. Floderus has written after the name, " the former predominating. The *polaris* indicated by almost entire leaves, the *herbacea* by there being more than four veins on either side of the midrib."

S. polaris Wahlenb. Abundant.

POLYGONACEAE.

Koenigia islandica L. Andree Island, on a rather damp, muddy part of a patch of fjaeldmark on shale between two dolerite outcrops. A minute species, red in colour.

Oxyria digyna (L.) Hill. Abundant and always red.

Polygonum viviparum L. Abundant, chiefly in dry places.

CARYOPHYLLACEAE.

Sagina intermedia Fenzl. Common. An early flowering species.

Minuartia biflora (L.) Schinz et Thell. Locally common.

M. verna (L.) Hiern. Common.

Stellaria longipes Goldie. Abundant. A late flowerer.

**Cerastium hyperboreum* Tolm. Hairy forms of *Cerastium* were collected from three different places, and Dr. Lid has named each set as different, but they were not differentiated in the field. They were amongst the hardiest plants, setting seed in plenty even on the cold hill tops. This species was collected near the Freeman Strait Glacier on Barents' Island.

**C. alpinum* L. Collected from Negro Vale.

**C. alpinum* L. x *Regelii* Ostenf. Collected from Keilhau Bay. Dr. Lid has written, " This is what Tolmatchem calls *Cerastium alpinum* L. x *Regelii* Ostenf."

C. Regelii Ostenf. This smooth-leaved species flowered much later than the hairy forms enumerated above, only being found in bloom commonly after the middle of August.

Silene acaulis L. Common on the dolerite sills on the coast, but not found elsewhere.

**Melandryum apetalum* (L.) Fenzl. One of the very few fjaeldmark plants which were local. Keilhau Bay, plain below the Kuhr Glacier, Cape Lee, Changing Point, Mohn Bay and Whales Bay. The Whales Bay specimens were taller and less tufted than the others.

RANUNCULACEAE.

Ranunculus lapponicus L. x *Pallasii* Schlecht. Common in the extensive bogs of the Plain of the Russian Base.

R. lapponicus L. A single patch in moss bog at the Plain of the Russian Base, with the hybrid with *R. Pallasii* a foot or two away.

R. hyperboreus Rottb. Abundant in bogs.

R. pygmaeus Wahlenb. Common in well watered spots other than stagnant bogs.

R. sulphureus Soland. An abundant and beautiful species, growing in situations varying from moist places to thoroughly wet moss-bogs on the coastal terraces.

PAPAVERACEAE.

Papaver radicatum Rottb. Abundant, even in the bleakest situations, setting plenty of seed. The flowers were yellow or white, intermediates being rarer than the extremes.

CRUCIFERAE.

Braya purpurascens (R. Br.) Bunge. Common on the moraines of the Freeman Strait and Kuhr Glaciers and on the silted maritime plain below the latter.

Cardamine pratensis L. Keilhau Bay, Plain of the Russian Base, Andree Island, Whales Bay, Mohn Bay and Changing Point. Frequent in bogs. Flowers late.

C. bellidifolia L. Common. Flowers early.

Draba alpina group. Yellow-flowered *Draba* plants were common, but I was unable to separate the different forms in the field. Dr. Lid has named my specimens as follows.

**D. alpina* L. Two specimens from Negro Vale, three from Cape Lee and four from Keilhau Bay.

**D. oblongata* R. Br. One fruiting specimen from Keilhau Bay.

**D. glacialis* Adams. One specimen from Negro Vale and two from the moraine of the Freeman Strait Glacier. Dr. Lid writes, " This is the *Draba* of the *alpina* group which in Svalbard was called ' *Draba glacialis* Adams,' by E. Ekman interpreted as *D. Bellii* Holm., and by others as *D. Adamsi* Ledeb. It may be identical with *D. macrocarpa* Adams."

**D. lactea* Adams (*D. Wahlenbergii* Hartm.). Frequent.

**D. subcapitata* Simm. Common.

**Cochlearia groenlandica* L. Abundant.

**C. arctica* Schlecht. One plant in moss bog on the Plain of the Russian Base.

Sp. ? Whales Bay.

SAXIFRAGACEAE.

Saxifraga comosa (Retz.) Fellm. Frequent on the coastal terraces, where not too dry nor too wet. Keilhau Bay, Plain of the Russian Base, Andree Island, Whales Bay and Changing Point.

**S. nivalis* L. Common. Brown rust pustules were found on the under sides of leaves of plants at Whales Bay and Changing Point.

**S. tenuis* (Wahlenb.) H. Sm. Probably commoner than *S. nivalis*, from small specimens of which it was not distinguished in the field.

S. hieraciifolia Waldst. et Kit. Keilhau Bay, Plain of the Russian Base, Whales Bay and Cape Lee. Another uncommon fjaeldmark plant like *Melandryum apetalum.*

S. oppositifolia L. Abundant.

S. flagellaris Willd. Frequent, being found at Keilhau Bay, Plain of the Russian Base, Andree Island, Whales Bay, Changing Point and Cape Lee. Owing to its method of vegetative reproduction by means of slender, radiating runners several plants usually occur together. The rich yellow of the one or two terminal flowers contrasting with the bright red of the rest of the plant makes this little plant one of the most charming of all those found on Edge Island.

S. Hirculus L. Common.

S. cernua L. Abundant.

S. rivularis L. Common in moist and wet places. The occasional absence of the purple streak at the base of the petals in some plants is correlated with the absence of red colour in the stem and leaves.

S. groenlandica L. (*S. caespitosa* L.). Abundant. Sets seed in plenty.

Chrysoplenium tetrandrum (N. Lund) Th. Fries. Beside a big pond with vertical, mossy banks in the moss bog on the Plain of the Russian Base.

ROSACEAE.

Potentilla pulchella R. Br. Local, mainly on rock outcrops. Plain of the Russian Base, Andree Island, moraine of the Kuhr Glacier and Cape Lee.

P. emarginata Pursh. Local, mainly on rock outcrops. Whales Bay, Changing Point and Cape Lee.

Dryas octopetala L. Two small patches at Cape Lee; abundant at Whales Bay and Mohn Bay.

SCROPHULARIACEAE.

Pedicularis hirsuta L. Abundant.

COMPOSITAE.

**Taraxacum arcticum* Dahlst. On the dolerite sill at Cape Lee and the sandstone platform at Whales Bay. A single fruiting plant of *Taraxacum* was also seen by Mr. A. G. Lowndes on the Kuhr Moraine.

FUNGI.

I am indebted to my friend Mr. E. J. H. Corner, Assistant-Director of the Singapore Botanic Garden, for naming a few fungi which I collected. Although toadstools were common in many places, lack of time prevented systematic observations on them. The following list is therefore far from exhaustive and represents only a random collection.

Scleroderma aurantium Pers.
Lycoperdon coelatum (Bull.) Fr.
Dictyolus muscigenus (Bull.) Quél.
Lepiota granulosa (Batsch) Fr.

Cortinarius sp., cf. *rigidus* (Scop.) Fr. or *brunneus* (Pers.) Fr.
Naucoria sp., possibly *N. hamadryas* Fr.
Galera hypnorum (Schrank) Fr.
G. mniophila (Lasch) Fr.
G. spartea Fr.?

The fungi usually grew amongst moss, some in drier and some in wetter places. In one spot on the Plain of the Russian Base *Dictyolus muscigenus* was found growing in rings amongst the sodden moss of a bog. Although this species was common, it was not found growing in this way anywhere else.

REFERENCES.

1. KÜKENTHAL. "Bericht über die von der geographischen Gesellschaft in Bremen im Jahre 1889 veranstaltete Reise nach Ostspitzbergen," in *Petermann's Mitteilungen* **36**, 61-75 (1890).
2. RESVOLL-HOLMSEN, H. *Svalbards Flora*. J. W. Cappelens Forlag, Oslo (1927).
3. WATKINS, H. G. "The Cambridge Expedition to Edge Island," in *Geogr. Journ.* **72**, no. 2, 117-143 (Aug. 1928).

III—MISCELLANEOUS NOTES.

Mission to Tana River, Kenya Colony.—Mr. H. C. Sampson, C.I.E., Economic Botanist, Royal Botanic Gardens, Kew, has been seconded for service under the Colonial Office in connexion with a mission to investigate the irrigation possibilities of the Tana River, Kenya Colony. Mr. Sampson left England on January 25th, accompanied by Mr. D. G. Harris, C.I.E., as Engineer, and will be away for about five months.

The Editorship of the Botanical Magazine.—The Director, at the request of the President and Council of the Royal Horticultural Society, has accepted the Editorship of the "Botanical Magazine" in succession to the late Dr. Stapf, who had held the position since the Royal Horticultural Society became the owners of the magazine.

MR. N. Y. SANDWITH.—The Minister of Agriculture and Fisheries has appointed Mr. N. Y. Sandwith, M.A., to be a Botanist in the Herbarium, Royal Botanic Gardens, Kew, in succession to Mr. S. A. Skan. Mr. Sandwith's service at Kew began in 1924 when he was appointed a Temporary Botanist.

DR. DARNELL SMITH.—We regret to record the retirement of Dr. Darnell Smith, Director of the Botanic Gardens, Sydney, New South Wales, on 15th October, 1933.

Dr. Darnell Smith has retired on reaching the age-limit, after having occupied the post of Director since 1924. We understand

that the position of Director is not being filled at present, on grounds of economy, and that Mr. Cheel, as Curator of the Herbarium, and Mr. E. N. Ward, as Curator of the Gardens, are in charge of these two departments of the Sydney Botanic Gardens.

Royal Horticultural Society Honours to Kewites.—Since the last note under the above title appeared in the Bulletin (K.B. 1932, 43), the following awards have been made :—

Victoria Medal of Honour.—Mr. D. Bliss, Superintendent of Public Parks, Swansea ; Mr. J. Coutts, Curator, Royal Botanic Gardens, Kew.

Associateship of Honour.—Mr. W. G. Baker, Curator, Botanic Garden, Oxford ; Mr. J. S. Christie, Park Superintendent for the Metropolitan Borough of Camberwell ; Mr. W. Hales, A.L.S., Curator, Physic Garden, Chelsea ; Mr. F. R. Long, Superintendent of Public Parks, Port Elizabeth, South Africa ; Mr. W. R. Mustoe, Superintendent of the Arboricultural and Horticultural Divisions, Public Works Department, Delhi.

Mr. W. J. Bean, I.S.O., V.M.H., has been awarded a Silver Medal and £25 for the supplementary volume to his " Trees and Shrubs of the British Isles."

Hermann Christ.—We have to record with deep regret the death of the famous Swiss botanist, Dr. Hermann Christ, at the advanced age of 99 years. In less than a month he would have attained his hundredth birthday, in honour of which celebrations had already been planned. An unfortunate fall in his room, however, which resulted in a fractured thigh, proved too great a tax on his strength, and, complications ensuing, he passed away during the night of November 16th–17th.

Born on December 12th, 1833, young Christ matriculated in the faculty of Law and after a stay in Berlin, completed his studies at Basel. From then onwards he practised as a lawyer and at the same time started to collect natural history objects of all kinds, botanical studies occupying much of his leisure time. Humboldt's " Ansichten der Natur " first awoke in him an interest in plant life and it is surprising to note that he never, at any time, attended a course of lectures in botany. His only botanical instruction was received on a number of excursions with Alexander Braun.

Christ's published botanical work extends over a period of 79 years and includes more than 300 papers and books. Since all this work was carried out in his spare time, it is evident that Christ was an exceptionally quick worker. The possessor of a very active brain, he had a surprisingly facile pen and it is said that he never re-wrote his manuscript, but sent it to the press exactly as it was first written.

His first work, published in 1854, was a paper entitled " Indication de quelques localités relatives à la flore suisse " and his

last in 1933, " Rosiers du Valais, IV." Plant geography interested him in his early days and a number of minor studies culminated in 1879 in "Das Pflanzenleben der Schweiz" (488 pp.), a work which made him widely known. Schröter is said to have declared more than once that his own school of botanical thought was the direct result of " Das Pflanzenleben." Other works followed in quick succession, including his work on European Coniferae (1863), " Die Rosen der Schweiz " (1873), " Nouveau Catalogue des Carex d'Europe " (1885), " Eine Frühlingsfahrt nach den canarischen Inseln " (1886), and " Über africanische Bestandteile der Schweizer Flora " (1897).

In 1890, at the age of 57, Christ started to work on ferns, and for the next twenty years devoted most of his leisure to the intensive study of this interesting group. His publications on ferns are nearly 150 in number, including the well-known " Die Farnkräuter der Erde " (1897) and the masterly study of fern distribution, " Die Geographie der Farne " (1910). A large proportion of his fern work was taxonomic, and hundreds of new species described by him resulted from the enormous number of collections sent to him from all parts of the world for determination.

He received the honorary degree of Doctor of Philosophy of Basel University in 1885 and in 1909 the degree of Docteur ès Sciences naturelles was conferred on him by the University of Geneva.

At the age of 77 years he commenced a study of the history of botany and in 1916 published " Geschichte des alten Bauerngartens," a much enlarged edition of which was issued in 1923.

Christ's other activities must not be forgotten. As a lawyer he practised as a notary and advocate until his ninetieth year and his law publications are numerous. As a philanthropist also he was well known ; he took a keen interest in foreign missions and the repression of slavery, being one of the founders, in 1908, of the Swiss League for the protection of natives in the Congo Free State.

A great man has been lost to science by the death of Christ and by none will his loss be more deeply felt than by the younger scientific workers of his own land to whom he was always a source of encouragement and inspiration. F. B.

Transport of Citrus bud-wood in Thermos Flasks.—At the suggestion of the Colonial Office, the Director of Agriculture, Nigeria, has carried out during last summer an experimental shipment in thermos flasks of Citrus bud-wood from the Department of Agriculture, Trinidad.

The bud-wood was sealed at both ends with wax and wrapped in grease-proof paper. Five flasks were received and the folllowing results reported :—

Flask No. 1. 100 Marsh Grapefruit Buds. All the bud-wood had turned brown and soft ; no viable buds.

Flask No. 2. 100 Foster Grapefruit Buds. All in excellent condition yielding 92 buds.

Flask No. 3. 100 Valencia Orange Buds. A few sticks had become mouldy—quite distinct from the brown rot of the Marsh Grapefruit ; 65 buds obtained.

Flask No. 4. 100 Parson Brown Orange Buds. In the same condition as the Marsh Grapefruit ; no viable buds.

Flask No. 5. 50 Lue Gin Gong Orange Buds. In excellent condition yielding 50 buds.

" The two flasks which were completely bad appeared to have become so through bacterial infection, judging by the smell. The success, however, of the other three flasks points to the feasibility of this method, and its low cost is, of course, a great asset."

" It is possible that if the bud-wood were properly disinfected prior to being placed in the thermos flasks, the results might have been even more satisfactory than those now reported."

Rancho Santa Ana Botanic Garden.—This institution was founded in 1927 by Mrs. Susanna Bixby Bryant in memory of her father, John W. Bixby, one of the early Californian pioneers. It is situated in Orange County, east of Los Angeles, and comprises about 200 acres of " rolling hills with deep ravines between," offering a great variety of soils and situations.

The object of the garden is to bring together a comprehensive collection of Californian plants for purposes of scientific study. There is a herbarium and library, and " field studies are made throughout the State in all seasons." It is intended to " publish reports from time to time giving scientific, horticultural and popular information in order to serve a much larger group than could ever visit the Garden." The organization and objects of the Garden are described in a brochure which we have recently received, and which can be obtained on application to Mrs. Bryant, Rancho Santa Ana Botanic Garden, Santa Ana Cañon, Orange County, California.

The Type of Ormocarpum Kirkii.—Spencer Moore (Journ. Bot. 1877, 290) based *Ormocarpum Kirkii* on (1) a fragmentary specimen collected by Kirk on the " Somali Coast " (Kenya Colony), and (2) another collected at Mombasa by Hildebrandt (No. 1935). Since the species is named in honour of Kirk, it might be assumed, prima facie, that Kirk's specimen was the nomenclatural type. Comparison of the specimens with the description leads, however, to the conclusion that the actual type—that is the specimen on which the description was principally based—was *Hildebrandt* 1935. Spencer Moore distinguished the species from *O. bibracteatum* (A. Rich.) Bak. by the number and shape of the leaflets, the purely racemose inflorescence and the nearly glabrous calyx. The diagnostic character drawn from the inflorescence was evidently taken from *Hildebrandt* 1935, as in Kirk's material the flowers are all detached. No single element of the description is taken exclusively from Kirk's specimen whereas the whole of the information contained in the following

extracts from Moore's description was drawn from *Hildebrandt* 1935 :—" caule puberulo ; cortice obscurissime aculeato ; petiolo obscurissime aculeato ; racemis paucifloris ; pedicellis gracilibus 1·2–1·7 cm. longis ; bracteis minutis deltoideis ; bracteolis ovatis vix 0·2 cm. longis ; flores lilacini."

The conclusion is irresistible, that Hildebrandt 1935 was the type of Moore's description, and therefore of the name *Ormocarpum Kirkii*. *O. Kirkii* was doubtless so named because Kirk's specimen was collected previously to that of Hildebrandt. Both sheets are written up by Spencer Moore, neither being specially designated as type.

The case of *Ormocarpum Kirkii* illustrates two important points in nomenclature :—

1. Where a species is based on material from two or more collectors, the fact that the specific epithet embodies the name of one of them does not necessarily indicate the type.

2. Botanists should avoid using a collector's name as a specific epithet unless the type-specimen was gathered by that collector.

T. A. S. & E. M.-R.

Penstemon.—The valid publication of the generic name *Penstemon* was ascribed in the " Index Kewensis " to Mitchell in Act. Phys. Med. Acad. Nat. Cur. **8** (1748) App. 214. As the year 1748 is prior to the now accepted starting-point for recognized botanical nomenclature, the name *Penstemon* has since been cited from Ait. Hort. Kew **3, 511** (1789), under the form *Pentstemon*, and from *Mitchell*, Diss. Princip. Bot. et Zool. **36** (1769), the latter being the reference adopted in Kew Bull. 1928, 359, and in Index Kewensis, Suppl. **7,** 180 (1929). *Penstemon* has, however, been attributed by Pennell in Contrib. U.S. Nat. Herb. **20,** 325 (1920) to Schmidel, Icones Plantarum, 2 (1762). But reference to Schmidel shows that he was concerned in demonstrating the inadequacy of even the best description for identifying a *species* with certainty, and the superiority of an illustration for this purpose. He gave *as an example* the plant which had been described a short time previously by the English (" ab Anglis ") under the name *Penstemon*. He supplied a new description (23 lines long) of this species, mentioning stem, leaves, indumentum, inflorescence, flowers, fruit and seeds, and stated that it would be scarcely possible for anyone to determine by comparison of descriptions, whether or not *Penstemon* was conspecific with *Chelone sine Anonymos flore pallido caeruleo* Gronovius, Flora Virginica, or even to form an accurate mental picture of it. It is, therefore, obvious that his description of *Penstemon* was specific, not generic, and so cannot validate the generic name. It is true that, under the International Rules of Botanical Nomenclature, as revised at Cambridge, the name of a *monotypic* new genus based on a *new* species is validated by the provision of a combined generic and specific description. Schmidel, however, gave no indication (1) whether he accepted the genus

Penstemon (unless the printing of the generic name in large capitals can be taken as such); or (2) whether he regarded the species as identical with *Chelone sive Anonymos flore pallido caeruleo*. As these two points are uncertain, it seems clear that the generic name *Penstemon* was not validated by the description supplied by Schmidel. T. A. S.

The Occurrence of Fraxinus Pallisae in Western Thrace.—*Fraxinus Pallisae* Wilmott was originally described (in Journ. Linn. Soc. Bot. **43**, 284: 1916) from the Danube Delta (Dobruja, Roumania). It was afterwards recorded from eastern Bulgaria but has not hitherto, so far as is known, been found far from the Black Sea littoral. Mr. H. G. Tedd, who is making a very intensive botanical survey of western Thrace and thereby greatly enriching the Kew Herbarium with valuable collections of dried specimens, has forwarded to Kew material, collected by him in the Mesta Delta, which undoubtedly belongs to this species. A full account of Mr. Tedd's interesting discovery, together with his extensive field notes, will be published at a later date.

It may be remarked that the name *Fraxinus Pallisae* is used tentatively and without prejudice to any conclusions which may result from investigations, now in progress, concerning the relationships of *F. Pallisae* and *F. oxyphylla* Willd. There is no doubt that the material from western Thrace is taxonomically identical with the type material of *F. Pallisae* from the Dobruja.—W. B. TURRILL.

The Distribution of Ipomoea Pes-caprae and Calystegia Soldanella in South Africa.—Dr. Guppy stated (Plants, Seeds and Currents, 220) that, as a rule, *Ipomoea Pes-caprae* Roth. monopolises the coasts between the 30th parallels of north and south latitudes, whilst *Calystegia Soldanella* R. Br. holds the shores of the temperate zones beyond. The former extends south to 32° in New South Wales, to 31·30° in the Kermadec Group, and north to 32° in the Bermudas. *Calystegia Soldanella* is known from Europe, Asia (West Asia, China, Japan, the Pescadores, Liukiu Is.), Africa (North Africa, Madeira, Tristan da Cunha), South America (Chile, Uruguay), North America (California), Australasia (N. S. Wales, Lord Howe Islands, Queensland, New Zealand) and the Kermadec Islands. De Candolle stated in 1855 that it did not occur on the east and west African coasts (Géographie Botanique **2**, 1050).

As far as Guppy knew, in 1917 the two species overlapped only in northern New South Wales and southern Queensland, for which Mr. Maiden was quoted as authority; but he added that it has long been known from the observations of Cheesman that they meet in the Kermadecs.

On the Riversdale coast, South Africa, seedlings of *Ipomoea Pes-caprae* from the germination of current-borne stranded seeds appear sparingly during March and April (probably also at other

times) as far as Leven Point and Cape Barracouta, south of the 34th parallel, and on April 13th, 1933, plants were found *six to nine* inches high which were not there on 15 January preceding (*Muir* 4862).

About eight plants of *Calystegia Soldanella* in perfect seeding fruit were found on December 13th, 1932 at Morris Point, near the Kafirkuils River, among *Sporobolus virginicus*; these had increased by March 29th, 1933, to twenty-three plants, or at least tufts of leaves. Since *Ipomoea carnosa* R. Br. has been confused with *Calystegia Soldanella* (Guppy, op. cit. 217), thus giving a wrong impression of the distribution of the latter, the Riversdale material (*Muir* 4857) was carefully determined by Mr. Hutchinson of the Kew Herbarium.

Calystegia Soldanella doubtless exists also to the east of Morris Point, and in any case it and *Ipomoea Pes-caprae* may be said to overlap on the South African coast at Riversdale. Both owe their occurrence there to the dispersal of seed by the sea, although the seed of the former may just possibly have arrived originally in ballast at some point on the coast to the eastwards, completing its migration to its present site by ocean transport. It will be noted that warm currents exist on the south and east African as well as on the east Australian coasts.

The sheets of the South African material of both species have been presented to the Kew herbarium.

J. MUIR, Riversdale, S. Africa.

The Cultivated Conifers in North America.*—This excellent work is an elaboration of the section on Conifers which appeared in "The Cultivated Evergreens," by L. H. Bailey, in 1923. It is divided into two parts or "books," the first botanical, the second cultural. The first part is in many respects the more important, for it is a systematic treatment of all the conifers that can be grown in North America. That it is the work of Dr. Alfred Rehder of the Arnold Arboretum is sufficient proof of its thoroughness. An introductory chapter deals with the general characters of conifers, their terminology, nomenclature and other pertinent questions. Pages 19–200 are devoted to descriptions of genera and species arranged under the family headings *Taxaceae* and *Pinaceae*. The botanical descriptions are such as can readily be understood by horticulturists who have not had a thorough training in botany. Keys to genera are given and in the larger genera there are very good keys to species. Following a description of a genus the species are passed in review, each one being described with a reference to the author and original description, with other references when necessary, and the more important synonyms. Where varieties of a species are known they also are described. The alteration in the

*The Cultivated Conifers in North America, by L. H. Bailey. The Macmillan Company, New York. Pp. ix+404. Illustrated. Price £1 17*s.* 6*d.* net.

rule regarding later homonyms at the Cambridge Congress in 1930 has necessitated several name changes that will be disturbing to many readers. For example, *Pseudotsuga taxifolia* has become *P. Douglasii* again, and *Pinus excelsa* is *P. nepalensis*. It is to be hoped that finality will eventually be reached with names that are in constant use among horticulturists.

The second part of the book suggests that it has been made up from a number of articles written by various individuals, dealing with the place of conifers in the landscape, notes on the way in which various kinds thrive under cultivation, propagation, insect pests, fungus diseases, etc. Although written primarily for the people of America the book will be found equally useful in other countries. It is well illustrated and there is a good index. W. D.

Hardy Trees and Shrubs.*—Twenty years have passed since the first two volumes of this important work were published, and in the intervening time Mr. Bean was often urged to prepare a supplementary volume. However, it was not until he retired from the position of Curator of the Royal Botanic Gardens, Kew, in 1929, that he was able to devote the necessary time to the task. In many ways this was an advantage for it enabled him to include many species about which little was known ten years ago, and to form a better opinion as to the merits of some of the newer introductions than would have been possible at an earlier date.

In an admirably written introduction, the author gives short notices of the more recent hardy plant collectors and their work, including Wilson, Farrer, Purdom, Meyer, Forrest, Kingdon Ward, and Rock, and the new volume deals very largely with their introductions. However, by the wishes of his many friends, he has not confined himself to descriptions of trees and shrubs introduced since his first two volumes were prepared, but has included many species which were omitted from his earlier work as not being generally hardy.

The descriptions in the new volume take the same form as those in the earlier ones. After a short generic description, the species are described under the heading of scientific and common name; a reference to a figure is given whenever possible, followed by two paragraphs, the first giving a description of the plant, the second discussing cultivation and other pertinent questions. *Rhododendron* takes up about one-fifth of the pages and even then the author has had to limit himself to descriptions of two hundred of the most distinct species. As the genus *Pyrus* is split up by many modern botanists into several genera, Mr. Bean has compromised by including all under *Pyrus* but giving the alternative name in brackets. This is wise for it seems possible that the division is on the eve of general acceptance. A. B. Jackson has been followed in accepting

*Trees and Shrubs Hardy in the British Isles, Vol. III, by W. J. Bean, I.S.O., V.M.H. John Murray, Albemarle Street, London, 1933. Pp. xiv+517, illustrations 64. Price 36s. net.

the name of *Juniperus Coxii* for the "Coffin Juniper," but whether it is actually distinct enough from *J. recurva* to be given specific rank is open to doubt; varietal discrimination would appear to be sufficient. With reference to *Taiwania cryptomeriodes* described on p. 475, it may be of interest to add that M. Y. Orr, in Plantae Chinenses Forrestianae, Coniferae (Notes from the Royal Botanic Garden, Edinburgh, **18**, no. 88), records that Handel-Mazzetti collected it in the Salwin-Irrawaddy watershed in N.W. Yunnan, and later Forrest found it in Yunnan in side valleys on the Yung-chang-Salwin divide, No. 17687, April 1918, and in sheltered side valleys on the Salwin-Kiu Chang divide, No. 20310, September 1921. It has also been found in Upper Burma, and is therefore not wholly Formosan as is often supposed.

The volume is well produced and there are numerous very good illustrations. There can be little doubt that everyone who possesses the earlier volumes will wish to obtain a copy of the new one, for the three volumes must remain the standard work on the subject for very many years. W. D.

Hooker's Icones Plantarum.*—Part 1 of vol. 3 of the fifth series, which has just appeared, includes plates and descriptions of fifteen new or recently described species, two of them belonging to new genera. The remaining ten plates illustrate little known species or varieties.

Myrtus communis var. *tarentina* L. (t. 3203) is a native of Dalmatia and is largely cultivated in Southern Europe; references to it can be traced back to the time of Pliny.

Amaracus amanus Bornm. (t. 3204) is a striking Labiate found in Syria; it is allied to *Origanum* and is remarkable for its elongated corolla-tube.

Gaultheria dumicola var. *petanoneuron* Airy-Shaw (t. 3206) and *G. codonantha* Airy-Shaw (t. 3207), are natives of Yunnan and Assam respectively and are both described for the first time; for these and two other species a new series, *Dumicolae*, is proposed.

Queenslandiella hyalina Ballard (t. 3208) is a widespread annual member of the *Cyperaceae* which, under the name *Mariscopsis hyalinus* Ballard, was the subject of an article in the "Kew Bulletin" for 1932.

Cleistochloa C. E. Hubbard (t. 3209) and *Calyptochloa* C. E. Hubbard (t. 3210) are two new genera of grasses from Queensland; both show cleistogamous as well as chasmogamous spikelets.

Vigna nuda N. E. Br. (t. 3213) and *Physostigma mesoponticum* Taub. (t. 3214) are herbs frequent in the burnt-grass areas of southern tropical Africa. The flowers in both are strikingly asymmetric.

*Hooker's Icones Plantarum; or figures, with descriptive characters and remarks, of new and rare plants, selected from the Kew Herbarium. Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Honorary Fellow, King's College, Cambridge, Director, Royal Botanic Gardens, Kew. Vol. 3 part 1 (London, Dulau & Co., 1933). Price 10s.

Crassula Wrightiana Bullock (t. 3218) is a recently described species from Tropical East Africa; it is more or less amphibious, and the plate shows some of the variations, which correspond with the depth of water in which it grows.

Other plants figured and described are: t. 3201, *Silene subconica* var. *Grisebachii* David. (Thrace); 3202, *Astragalus sericophyllus* Griseb. (North and South Macedonia, Greece); 3205, *Cyananthus Wardii* Marquand (S. E. Tibet); 3211, *Habenaria longirostris* Summerhayes (N. Nigeria, Uganda); 3212, *Habenaria prionocraspedon* Summerhayes (S. Nigeria); 3215, *Oxygonum pachybasis* Milne-Redhead, sp. nov. (N. Rhodesia) and 3216, *Oxygonum tenerum* Milne-Redhead, sp. nov. (N. Rhodesia), with dimorphic flowers; 3217, *Erlangea Quarrei* Hutch. et B. L. Burtt, sp. nov. (Belgian Congo); 3219, *Ceropegia filicalyx* Bullock (Tanganyika Territory); 3220, *Encephalartos kosiensis* Hutch. (Zululand); 3221, *Fockea cylindrica* R. A. Dyer, and 3222, *Fockea gracilis* R. A. Dyer, two very scarce *Asclepiadaceae* from the Albany Division of Cape Province, both with edible tubers; 3223, *Strychnos tabascana* Sprague et Sandwith (Mexico), 3224, *Strychnos aspernula* Sprague et Sandwith (Brazil) and 3225, *Strychnos pedunculata* Benth. (British Guiana, Trinidad), all belonging to the section *Longiflorae*.

Botanical Magazine.—The first part of vol. 157 was published on January 1st and contains the following plant portraits: *Rhododendron eriogynum* Balf. f. et W. W. Smith (t. 9337), a member of the *Irroratum* series from Yunnan; *Larix Potanini* Batalin (t. 9338), a widely-distributed Chinese species; *Anthemis Sancti-Johannis* Stoyanoff, Stefanoff et Turrill (t. 9339), a fine orange-flowered *Anthemis* discovered in the woods near the Rila Monastery, Bulgaria; *Callicarpa rubella* Lindley (t. 9340), a greenhouse plant allied to *C. Giraldiana* Hesse, with a distribution in China, Indo-China, Burma and Assam; *Iris histrioides* (G. F. Wilson) S. Arnott (t. 9341), native of Asia Minor and Asiatic Turkey; *Pelargonium moniliforme* E. Meyer (t. 9341), from the western area of the Karroo and Little Namaqualand, S. Africa; *Rhododendron tephropeplum* Balf. f. et Farrer (t. 9343), belonging to the *Boothii* series and distributed in S.E. Tibet and northern Burma; *Geum versipatella* Marquand (t. 9344), a new species allied to *G. sikkimensis* Prain, with white flowers, a native of Nepal; *Hypericum kouytchense* Léveillé (t. 9345), a species allied to *H. patulum* Thunb., from China; *Salvia ringens* Sibth. et Sm. var. *romanica* Prodan (t. 9346), from Balčik, Roumania, and *Catasetum maculatum* Kunth (t. 9347), a native of Nicaragua, Costa Rica and Colombia.

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ROYAL BOTANIC GARDENS, KEW

IV—SPECIMENS COLLECTED BY BRADBURY IN MISSOURI TERRITORY.

H. W. Rickett (University of Missouri).

John Bradbury travelled and collected for the Liverpool Botanic Garden* in the western parts of North America during 1810 and 1811. In 1817 he published his "Travels in the Interior of America,"† in which are included his observations on the country, on its inhabitants, and on its natural history. His botanical notes in particular are of interest in connection with certain of his specimens preserved in the Herbarium of the Royal Botanic Gardens, Kew.

Bradbury made his headquarters in St. Louis, and during the spring and summer of 1810 made "frequent excursions alone into the wilderness, but not farther than eighty or a hundred miles into the interior." The summer of 1811 was occupied by a journey up the Missouri river as far as the Mandans, of which a detailed journal is found in the "Travels."‡ On pp. 335–338 appears a "catalogue of some of the more rare or valuable plants discovered in the neighbourhood of St. Louis and on the Missouri," in which are notices of many species gathered on the Meramec river or at other points near St. Louis during 1810, and in the Missouri valley during 1811. When he returned to England, he found that his collections had been "submitted to the inspection of a person of the name of Pursh, who has published the most interesting of my plants in an appendix to the Flora Americae Septentrionalis." Nuttall also was of the party which ascended the Missouri, and many of his species were undoubtedly founded on collections made at the same time as those of Bradbury.

In spite of the vast area traversed and its wild state, it is possible to identify rather exactly most of the place-names which appear in Bradbury's catalogue of plants and on the specimens themselves. In the brief outline of his journal which follows are included the

* See Britten and Boulger, Biogr. Ind. ed. 2, 42 (1931); Hall, Naturalist, **4**, 397 (1839); True, Proc. Am. Phil. Soc. **68**, 133–150 (1929).

† A second edition appeared in 1819, with the addition of a map. This edition is reprinted, with notes, in Thwaites, Early Western Travels, **5** (1904).

‡ He accompanied the Astorian expedition led by Hunt.

modern names for the places which he visited, besides various observations of more general interest.*

March 13. " Left St. Louis at two o'clock the following morning, in company with a young Englishman of the name of Nuttall." Arrived at St. Charles [Mo. This part of the journey was made overland. Most of the party had preceded them and wintered up the river].

March 14. Embarked on the Missouri river,† " the Canadians measuring the strokes of their oars by songs." [One of the songs appears in a footnote, p. 12.]

March 17. Met with " Daniel Boond, the discoverer of Kentucky," then aged 84.

March 18. Camped on Lutre island [perhaps near the present town of Hermann, near the mouth of the Loutre river]. The bluffs were adorned with *Anemone Hepatica* [*Hepatica acutiloba DC.*].

March 20. Passed the mouth of the Gasconade river. The bluffs were crowned with cedar [*Juniperus virginiana* L.], while on the ledges appeared *Mespilus canadensis* [*Amelanchier canadensis* (L.) Medic.] in full flower.

March 21. Accompanied the boats by land. On this occasion he " was surprised to find that Mr. Nuttall could not swim." This cost them several miles of difficult walking. This is the only mention of any trip in Nuttall's company, and, since Bradbury takes pains to mention his other companions on his numerous collecting excursions, it is evident that relations were none too cordial between the two botanists.‡ From occasional mention,

* The map in the 2nd edition of the " Travels " is not very helpful, since it does not illustrate all the places mentioned. The best contemporary map is the Arrowsmith map of 1814, to be seen in Paullin, Atl. Hist. Geog. U. S. (1932). A map which illustrates all the early explorations in the Missouri valley is included in Chittenden, American Fur Trade (1902). Many notes on specific places are found in this work, also in Thwaites' edition of Bradbury's " Travels." Brackenridge, with Lisa, overtook the party on June 3, and returned with Bradbury; his narrative of the journey is found in his " Views of Louisiana " (1814), and, reprinted, in his " Journal of a Voyage up the Missouri " (1816); to this is appended a table of distances and latitudes which he says he took from Clark (the data, when compared with modern maps, prove to be accurate in respect of easily identifiable points). The journey is graphically described in Irving's " Astoria " (chapters xiv to xxii), who evidently used Bradbury as his main source.

† Harshberger (Bot. Philad. 153: 1899) apparently thought that Bradbury and Nuttall ascended the Missouri on foot. He was mistaken also in the date of departure, in the time of Bradbury's return, and in his nationality. Powers (Sci., N. S. **62**, 391: 1925) also errs in the date of embarkation.

‡ From the manner in which he refers to Pursh, and from his statement to Baldwin (quoted below), as well as from his coolness toward Nuttall, it might be inferred that Bradbury was jealous of other botanists. His tone toward Pursh, however, may have been warranted; Nuttall himself had similar complaints (Gen. **1**, 298; **2**, 92). His attitude to Nuttall, moreover, may be explained by the eccentricity of the latter—an absorption in botanical collecting which frequently endangered his own safety, besides delaying the party, and which had earned him among the Canadians the nickname of " le fou." This characterization is due to Brackenridge (Views of Louisiana, 239), who testifies also to Bradbury's personal charm; he accompanied him on many of his collecting trips.

however, we learn that Nuttall was with the party during the entire ascent.

March 22. Passed the mouth of the Osage river.

March 27. Arrived at the Manitou rocks [near the present village of Rocheport, Mo. Brackenridge wrote of them as on the south bank of the river and somewhat lower. Bradbury's description, however, is more consistent with the north bank. There may, of course, have been several places so designated]. Near here began " Boond's Lick Settlements," the last permanent habitations of white men on the river.

April 2. Passed La Grande Rivière, and saw the first true prairie. [Bradbury, however, uses the term prairie also for isolated treeless and level areas near St. Louis.]

April 8. Arrived at Fort Osage [near the present Sibley, Mo.].

April 10. Left Fort Osage.

April 17. Joined the rest of the party at the Naduet river [the modern Nodoway, which enters the Missouri near St. Joseph, Mo.].

April 21. Re-embarked.

April 28. Arrived at the Platte river [Neb.]. Since no ash grew farther north than this point, a halt was made to replenish the supply of oars.

May 2. Left on an overland trip to the Otto village, up the Platte, arriving the next day.

May 7. Left the Otto village, crossing the Corne du Cerf [Elkhorn] river and following Blackbird creek toward the Missouri.

May 11. Arrived at the Maha village on the Missouri [some 80 miles north of the present city of Omaha, Neb.; see Morris in Bull. Torr. Bot. Club **36**, 519 (1909)]. Near this place Blackbird creek entered the river and the " monument " to Blackbird, a pile of stones on a high bluff, was situated. [This is presumably the Sepulchre Bluffs of the catalogue and specimens. It is described by all the early travellers, and illustrated in Catlin, Ill. N. Amer. Ind. **2**, pl. 117 (1876).]

May 15. Left the Maha village. Passed Floyd's bluffs [near the present Sioux City, Ia.].

May 23. Encountered a party of Poncar Indians.

May 24. Arrived at L'Eau qui Court, or Rapid River [often referred to as the Quicurre; now the Niobrara].

May 27. Camped on Little Cedar Island [near the present Chamberlain, S. D.].

June 1. Arrived at Grand Detour, or Big Bend.

June 8. Passed the mouth of the Cheyenne river. [This is variously spelled Chien, Chienne and Chayenne in the Travels; and Shian on one of the specimens.]

June 12. Arrived at the Aricara village [also known as the Arikaree, Rickaree, etc. This was just north of the Grand river

and about opposite the present Campbell, S. D., very near the northern boundary of the state].*

June 19. Left overland for the fort of the Missouri Fur Company.

June 20. Crossed the Cannonball river.

June 21. Crossed the Rivière de Coeur [Heart river; the site of the present Mandan, N. D.].

June 22. Reached the Mandan village. Crossed Knife river and passed the lowest of the Minetaree villages. Arrived at the fort, about 140 miles from Cannonball river, and 40 miles above the Mandan village.†

June 25. The boats arrived at the fort.

July 6. Embarked at Fort Mandan for the return trip.

August [day not given]. Arrived at St. Louis. [Bradbury's collections were made during the ascent; he complains (Travels, vi) that Lisa, in whose boats he returned, had given orders that no stops be made on the return. Since they were travelling with a valuable load of skins, the necessity for such procedure is obvious.]

Several of Bradbury's observations are of interest in the history of the vegetation of the Middle West. He comments on the abundance of *Equisetum hyemale* on the banks and flats of the lower Missouri. This was eaten by the horses of the settlers, and, after three winters of such treatment, usually failed to reappear. (The animals then, through the indolence and improvidence of the natives, were reduced to subsisting miserably on the bark of trees.) At present, species of *Equisetum* (largely *E. robustum* A. Br.) are more or less abundant on the steep banks, and the flats are occupied by willows (see Amer. Midl. Nat. **12,** 414: 1931). Bradbury collected *Cheilanthes dealbata* (*Notholaena dealbata* Kuntze) on the Manitou rocks. This fern, which is rare in central Missouri, was found at or near the same point by Daniels in 1904 (Univ. Mo. Stud., Sci. ser. **1,** pt. 2, 222: 1907), and by recent collectors; it is recorded as "not uncommon" in Jackson County by Mackenzie and Bush (Fl. Jackson Co., 5: 1902). *Batschia longiflora* (*Lithospermum incisum* Lehm.) is described as extending northward up the Missouri from the mouth of the Platte in Nebraska; it is now abundant along the river (not in the interior) through Missouri (Univ. Mo. Stud. **6,** pt. 1, 62: 1931).

* Bradbury mentions passing the Cer-wer-cer-na (Sa-wa-carna of some of the old maps; now the Moreau), and the Ma-ra-pa (or Maripa; now Owl creek), apparently confusing the latter with its larger neighbour, the We-tar-hoo (or Waterhoo, now the Grand); these two enter the Missouri very close together (and may, of course, have had a common mouth). Brackenridge locates the village as 8 miles above the We-tar-hoo. Irving mistakenly places it between 46° and 47° N. A painting of it appears in Catlin, l.c. **1,** pl. 80.

† This is the fort often known as Fort Lisa. Another post, Fort Mandan, was on the north side of the river and below the Knife; this had been the winter quarters of Lewis and Clark.

A long footnote (pp. 159–160) is devoted to a description of the bois d'arc, bois jaune, yellow wood, or Osage orange, later described and named by Nuttall (*Maclura aurantiaca* Nutt. Gen. **2,** 233: 1818). Nuttall credits Bradbury also with having first noticed his species *Bumelia oblongifolia* and *Cacalia tuberosa* (l.c., **1,** 135; **2,** 138).

An interesting item is a description of the contents of an Indian medicine bag (p. 116); "that ingredient which was in the greatest abundance was a species of wall-flower." This he mentions in his catalogue (p. 337) as a "connecting link between *Erysimum* and *Cheiranthus*, used as medicine by the Aricaras." It was particularly interesting, therefore, to discover Bradbury's specimen of *Erysimum asperum DC.* in the herbarium at Kew. Hooker (Fl. Bor.-Am. **1,** 64: 1830) quotes Torrey as saying that "the plant is very bitter, particularly the root, and is used as a medicine by the Indians of the Platte."

Bradbury returned to St. Louis in 1817 or 1818. In 1819 Baldwin received a visit from the "venerable Mr. Bradbury"* (he was then 51), in the course of which the latter observed that "Lambert had pirated from him his former collections" (Darlington, Reliq. Baldwin, 316: 1843).

Of the plants which Bradbury collected, some are now in the herbarium of the Philadelphia Academy of Natural Sciences (see below under *Penstemon, Plantago*). These may have been carried there by Nuttall, who spent several years in Philadelphia after his return from the west, and who seems to have acquired some of Bradbury's plants (see, for instance, his references to Bradbury cited above). The rest were sent to Liverpool; in 1839 there were "a great many of his dried specimens in the Herbarium, principally in Louisiana" (Hall, Naturalist, **4,** 397: 1839). These cannot now be found. They did not include the specimens now at Kew, since these came into W. J. Hooker's hands, through Dr. Taylor,† before 1829 (see below under *Myagrum*).

Of the specimens enumerated below, fourteen represent species named by Pursh (Fl. Amer. Sept. **2,** Supplement) from Bradbury's collections. It is improbable that they are the actual specimens seen by Pursh, who states (l.c. **1,** xvii) that he obtained Bradbury's plants from Roscoe, who founded the Liverpool Botanic Garden (Hall, l.c., 395; Britten and Boulger, l.c., 261).‡ They may be regarded as isotypes.‖ This is the more likely since one specimen is a species

* Brackenridge refers to Bradbury, in speaking of their physical hardships endured together, as "poor old man." Bradbury amusingly repeats almost verbatim the same expressions of concern, substituting "poor young man." He evidently appeared older than he was.

† Thomas Taylor, M.D., a resident of the south of Ireland, correspondent of Hooker and his collaborator in the *Muscologia Brittanica* (1818); see Britten and Boulger, l.c., 297.

‡ If Bradbury's remark to Baldwin is to be trusted, Pursh may have found some of his specimens in Lambert's collection.

‖ The term isotype denotes a duplicate of the type not seen by the original describer (Torreya **19,** 13: 1919).

unknown to Pursh (*Penstemon gracilis* Nutt.). The four remaining specimens are species named by Pursh before he saw Bradbury's plants (one from a collection by Lewis previous to Bradbury's journey; the others probably from Nuttall's specimens).

My attention was directed to these specimens by Dr. T. A Sprague, who generously placed at my disposal his notes on Bradbury's itinerary and on the synonymy of the species represented. The present study has been made possible by the courtesy of the staff of the Kew herbarium; and by a leave of absence granted by the University of Missouri.

1. *Aristida pallens* Pursh, Fl. Am. Sept. **2,** 728 (1814); Bradbury Travels, 335 (1817); Nutt. Gen. **1,** 57 (1818); non Cav. Icon. **5,** 4 (1799).

Aristida longiseta *Steud.*, Syn. Pl. Glum. **1,** 420 (1854); Rydb Fl. Prairies & Plains, 83 (1932).

NORTH DAKOTA. In depressed situations near Fort Mandan on the Missouri (ex Nutt.); Mandan country, *Bradbury* (*Taylor* 11 in Herb. Hook.).

MISSOURI. Hills on the Merrimac (ex Bradbury).

Hitchcock (Contr. U. S. Nat. Herb. **22,** 586: 1924) conjectured the identity of *A. pallens* Pursh with *A. longiseta* Steud. Examination of Bradbury's specimen confirms this. The type collection of *A. longiseta* Steud. came from Mexico. Rydberg (l.c.) gave its range as from Minnesota to Illinois, Mexico and Washington.

2. *Stipa membranacea* Pursh, Fl. Am. Sept. **2,** 728 (1814); Bradbury Travels, 335 (1817); non L. Sp. Pl., 560 (1753).

Stipa hymenoides R. & S. Syst. **2,** 339, (1817).

Eriocoma cuspidata Nutt. Gen. **1,** 40 (1818).

Oryzopsis cuspidata (Nutt.) Benth. ex Vasey, Descr. Cat. Grasses U.S., 37 (1885).

Orzyopsis hymenoides (*R. & S.*) *Ricker* ex Piper in Contr. U. S. Nat. Herb. **11,** 109 (1906).

Eriocoma hymenoides (R. & S.) Rydb. in Bull. Torr. Bot. Club **39,** 102 (1912); Fl. Prairies & Plains, 86 (1932).

NORTH DAKOTA. Fort Mandan (ex Bradbury); prairie Mandan, *Bradbury* (*Taylor* 12 in Herb. Hook.); on the grassy plain of the Missouri, from the Arikaree village to the Northern Andes (ex Nutt.).

"I possess some of Mr. Bradbury's original specimens from the Missouri of this exceedingly beautiful grass, given me by Dr. Taylor." (Hook., Fl. Bor.-Am. **2,** 237: 1839). "Probably not a *Stipa*" (Bradbury, l.c.). There seem to be insufficient grounds for separating this species from *Oryzopsis*.

3. *Allionia hirsuta* Pursh, Fl. Am. Sept. **2,** 728 (1814); Bradbury Travels, 335 (1817); Standley in N. Am. Fl. **21,** 223 (1918); Rydb Fl. Prairies & Plains, 309 (1932).

Calymenia hirsuta Nutt. Gen. **1,** 26 (1818).

Calymenia pilosa Nutt. l.c. (teste Standley).

Oxybaphus hirsutus (*Pursh*) *Sweet*, Hort. Brit. ed. 1, 334 (1826).

SOUTH DAKOTA. Bluffs near the Aricara village (ex Bradbury); near the Missouri,—around the Arikaree village, &c. (*C. pilosa*, ex Nutt.); le haut Missouri, *Bradbury* (*Taylor* 35 in Herb. Hook.).

Standley unites *C. pilosa* Nutt. with *C. hirsuta*; but Nuttall proposed *C. pilosa* as a new name for *Allionia ovata* Pursh (*A. nyctaginea* Michx. var. *ovata* Morong), a nearly glabrous species. Rydberg maintained three species under these names. *Allionia* L. emend. Choisy is conserved against *Wedelia* Loefl. Hence *Allionia* Loefl. becomes *Oxybaphus* L'Hérit.

"Bradbury (from whom there is an authentic specimen in my herbarium) discovered this plant in Upper Louisiana." (Hook., Fl. Bor.-Am. **2,** 124; 1838.)

4. *Ranunculus multifidus* Pursh, Fl. Am. Sept. **2,** 736 (1814); Bradbury, Travels, 337 (1817); non Forssk. Fl. Aegypt.-Arab., 102 (1775).

Ranunculus delphinifolius *Torr.* in Eaton, Man. ed. 2, 395 (1818); Rydb. Fl. Prairies & Plains, 342 (1932).

NEBRASKA. In stagnant pools near the Sepulchre Bluffs (ex Bradbury); Otto Nation, *Bradbury* (*Taylor* 40 in Herb. Hook.).

5. *Myagrum argenteum* Pursh, Fl. Am. Sept. **2,** 434 (1814); Bradbury, Travels, 337 (1817).

Alyssum ludovicianum Nutt. Gen. **2,** 63 (1818).

Vesicaria ludoviciana (Nutt.) DC. Prod. **1,** 159 (1824).

Lesquerella ludoviciana (*Nutt.*) *Watson* in Proc. Amer. Acad. **23,** 252 (1888); Rydb. Fl. Prairies & Plains, 363 (1932).

Lesquerella argentea (Pursh) MacM., Metasp. Minn. Valley, 263 (1892); non Watson, l.c.

SOUTH DAKOTA. On limestone rocks, Missouri (ex Bradbury); on the high hills of the Missouri, and on the shelvings of rocks (ex Nutt.); 1100 up the Missouri, *Bradbury* (*Taylor* 18 in Herb. Hook.).

According to Brackenridge, Big Bend was about 1100 miles from the mouth of the Missouri. "1100 up the Missouri" would therefore be in South Dakota.

Hooker mentions "my specimens gathered by Bradbury on the hills of the Missouri" (Fl. Bor.-Am. **1,** 48: 1829).

6. *Erysimum lanceolatum* Pursh, Fl. Am. Sept. **2,** 436 (1814); Bradbury, Travels, 337 (1817); non R. Br. in Ait. Hort. Kew., ed. 2, **4,** 116 (1812).

Cheiranthus erysimoides Bradbury, Travels, 116, 337 (1817); non L. Sp. Pl., 661 (1753).

Cheiranthus asper Nutt. Gen. **2,** 436 (1818).

Erysimum asperum (*Nutt.*) *DC.* Syst. **2,** 505 (1821).

Cheirinia aspera (Nutt.) Rydb. in Bull. Torr. Bot. Club **39,** 324 (1912) ; Fl. Prairies & Plains, 371 (1932).

SOUTH DAKOTA. On the plains of the Missouri, commencing near the confluence of White river (ex Nutt.) ; 1100 miles up the Missouri, *Bradbury* (*Taylor* 33 in Herb. Hook.).

Of this species Hooker says : " It seems to have been originally detected by Mr. Bradbury on the banks of the Missouri, at a distance of 1100 miles from its mouth.—I possess that traveller's original specimen, named by Mr. Nuttall " (Fl. Bor.-Am. **1,** 64 : 1830).

For Bradbury's location, see above under *Myagrum*.

Erysimum officinale L. is usually united with *Sisymbrium* ; the name *Erysimum* may then be used for that part of the Linnaean genus to which the present species is related.

7. *Geum triflorum* Pursh, Fl. Am. Sept. **2,** 736 (1814) ; Bradbury, Travels, 336 (1817) ; Nutt. Gen. **1,** 309 (1818).

Sieversia triflora (*Pursh*) *R. Br.* ex Richardson, Bot. App. Frankl. Journ., ed. 2, 21 (1823) ; Rydb. in N. Am. Fl. **22,** 409 (1913) ; Fl. Prairies & Plains, 424 (1932).

Erythrocoma triflora (Pursh) Greene, Leafl. **1,** 175 (1906).

NORTH DAKOTA. Around Fort Mandan on the Missouri (ex Nutt.).

NEBRASKA. Headwaters of Blackbird creek (ex Bradbury) ; prairies, *Bradbury* (*Taylor* 21 in Herb. Hook.).

The type location is given by Rydberg as " Upper Louisiana (South Dakota)." Hooker (Fl. Bor.-Am. **1,** 176 : 1834) says : " The numerous specimens of this plant precisely accord with Mr. Bradbury's original ones in my Herbarium."

8. *Elaeagrus argentea* Pursh, Fl. Am. Sept. **1,** 114 (1814).

Elaeagnus argentea Bradbury, Travels, 144, 335 (1817) ; Nutt. Gen. **1,** 97 (1818) ; non Moench, Meth., 638 (1794).

Elaeagnus commutata *Bernh.* in Allg. Thuer. Gartenz. **2,** 137 (1843) ; Rydb. Fl. Prairies & Plains, 563 (1932).

NORTH DAKOTA. On the argillaceous broken banks of the Missouri, near Fort Mandan (ex Nutt.) ; bluffs near the Mandan nation (ex Bradbury) ; Missouri, *Bradbury* (*Taylor* 36 in Herb. Hook.).

On the sheet appears the following, in Hooker's hand : " '*Eleagnus*. Differs from Pursh's *E. aquatica* by its oval and obtuse leaves and by the aggregate flowers.' Tayl." The specimen is, however, characteristic *E. argentea* Pursh. Pursh described the species from specimens in Lewis' herbarium, collected several years before Bradbury's journey.

9. *Oenothera albicaulis* Pursh, Fl. Am. Sept. **2,** 733 (1814) ; Bradbury, Travels, 336 (1817) ; non Nutt. in Fraser, Cat. (1813) nomen nudum (teste Britton in Mem. Torr. Bot. Club **5,** 234 : 1894) ; Gen. **1,** 245 (1818).

Oenothera pinnatifida Nutt. Gen. **1,** 245 (1818) ; non ex Torr. & Gray, Fl. N. Am. **1,** 494 (1840).

Oenothera Purshii G. Don, Syst. **2,** 688 (1832).

Oenothera Bradburiana Nutt. ex Torr. & Gray, Fl. N. Am. **1,** 494 (1840) ; non *Anogra Bradburiana* Rydb. Fl. Prairies & Plains, 574 (1932).

Anogra albicaulis (*Pursh*) *Britton* in Mem. Torr. Bot. Club **5,** 234 (1894) ; Rydb. Fl. Prairies & Plains, 573 (1932).

SOUTH DAKOTA. Bluffs, Aricara village (ex Bradbury) ; Little Cedar island, *Bradbury* (*Taylor* 20 in Herb. Hook.) ; on the banks of the Missouri near White river, in denudated argillaceous tracts (ex Nutt.).

" Mr. Nuttall now supposes that he formerly confounded two species under this name [*Oe. pinnatifida*] and proposes the name of *Oe. Bradburiana* for our variety α from which the original description seems to have been chiefly taken " (Torr. & Gray, l.c.). *O. Bradburiana* is therefore a synonym of *O. pinnatifida* ; and both are synonyms of *O. albicaulis* Pursh. The descriptions of Torrey and Gray's var. α and of *O. pinnatifida* Nutt. and *O. albicaulis* Pursh correspond closely with each other and with Bradbury's specimen in Herb. Hook.

Torrey and Gray's var. β, to which Nuttall wished to restrict his original name, *O. pinnatifida*, differs in having somewhat smaller flowers and in being more or less strigose. This interpretation of Nuttall's proposals is confirmed by specimens in Herb. Hook. labelled in Nuttall's hand " *Oenothera Bradburiana* " and " *Oenothera pinnatifida* " ; the former is pubescent with short appressed hairs, the latter strigose.

The strigose species has been maintained by Rydberg as *Anogra Bradburiana*. This is obviously incorrect ; since the species lacks a legitimate name, the following is proposed :

Anogra confusa *Rickett*, nom. nov. *Oenothera pinnatifida* Nutt. ex Torr. & Gray, Fl. N. Am. **1,** 494 (1840) ; non Gen. **1,** 245 (1818) ; *Anogra Bradburiana* Rydb. Fl. Prairies and Plains, 574 (1932) ; non *Oenothera Bradburiana* Nutt. ex Torr. & Gray, l.c.

10. *Gaura coccinea* Pursh, Fl. Am. Sept. **2,** 733 (1814) ; Bradbury, Travels, 336 (1817) ; non Nutt. in Fraser, Cat. (1813) ; Gen. **1,** 249 (1818).

Gaura parvifolia Torr. in Ann. Lyc. N. Y. **2,** 201 (1828) ; Rydb. Fl. Prairies & Plains, 581 (1932).

Gaura coccinea *Nutt.* var. **parvifolia** (*Torr.*) *Rickett*, comb. nov.

NORTH DAKOTA. Mandan nation, *Bradbury* (*Taylor* 13 in Herb. Hook.).

SOUTH DAKOTA. Bluffs, Aricara village (ex Bradbury).

" I possess an original specimen of this from Mr. Bradbury, gathered about Fort Mandan " (Hook., Fl. Bor.-Am., **1,** 208 : 1834).

G. coccinea Pursh and *G. coccinea* Nutt. are distinct varieties. *G. coccinea* Pursh (ex descript.) and Bradbury's specimen in Herb. Hook. are appressed-pubescent or glabrate, and have a crowded inflorescence and a 4-lobed stigma. *G. coccinea* Nutt. (ex descript.) is more or less hirsute with spreading hairs, and has a lax open inflorescence and a more deeply 4-toothed stigma. Rydberg maintained *G. coccinea* Pursh as *G. parvifolia* Torr. Other very closely related varieties or species have been recognized. The situation is complicated by the existence of a specimen in Herb. Hook. exactly like that of Bradbury but labelled in Nuttall's hand "*Gaura coccinea.*" Careful examination of abundant material is necessary to determine the proper classification of these forms. Meanwhile it seems best to regard the form represented by Bradbury's specimen as a variety of *Gaura coccinea* Nutt.

11. *Seseli divaricatum* Pursh, Fl. Am. Sept. **2,** 732 (1814); Bradbury, Travels, 336 (1817); Nutt. Gen. **1,** 194 (1818).

Musenium divaricatum (Pursh) Nutt. ex Torr. & Gray, Fl. N. Am. **1,** 642 (1840).

Musineon divaricatum (*Pursh*) *Coult. & Rose* in Bot. Gaz. **20,** 259 (1895); Rydb. Fl. Prairies & Plains, 596 (1932).

SOUTH DAKOTA. On the arid and denudated plains of the Missouri, commencing about 30 miles below the confluence of the White river (ex Nutt.).

NEBRASKA. Missouri Bluffs, at the mouth of the L'Eau qui Court (ex Bradbury); bluffs of the Missouri, *Bradbury* (*Taylor* **32** in Herb. Hook.).

Musenium Nutt. was evidently a latinized form of *Musineon* Raf. (Jour. Phys. Chim. Hist. Nat. **91,** 71: 1820), with which Nuttall must have been familiar.

12. *Selinum acaule* Pursh, Fl. Am. Sept. **2,** 732 (1814); Bradbury, Travels, 336 (1817).

Thapsia glomerata Nutt. Gen. **1,** 184 (1818).

Cymopterus glomeratus (Nutt.) DC. Prod. **4,** 204 (1830).

Cymopterus acaulis (*Pursh*) *Rydb.* in Bot. Surv. Neb. **3, 38** (1894); Fl. Prairies & Plains, 600 (1932).

SOUTH DAKOTA. On the open plains of the Missouri, commencing 40 miles below the confluence of the White river (ex Nutt.).

NEBRASKA, KANSAS & MISSOURI. On the alluvion of the Missouri, from the river Naduet to the Mahas (ex Bradbury); **100** up the Missouri, *Bradbury* (*Taylor* 22 in Herb. Hook.).

The above citations extend the range of the species (at least its former range) considerably to the east of that given by Rydberg. If by "100 up the Missouri" we understand 100 miles, the specimen was collected in central Missouri. On the other hand, the two other specimens (*Erysimum*, *Myagrum*, q.v.) similarly marked are labelled "1100 [miles] up the Missouri," for which "100 up

the Missouri" might be an error of transcription; if this is so, the specimen came from South Dakota.

13. *Cynoglossum glomeratum* Pursh, Fl. Am. Sept. **2,** 729 (1814); Bradbury, Travels, 336 (1817).

Myosotis glomerata Nutt. Gen. **1,** 112 (1818).

Eritrichium glomeratum (Pursh) DC. Prod. **10,** 131 (1846).

Oreocarya glomerata (*Pursh*) *Greene*, Pittonia **1,** 58 (1887); MacBride in Contr. Gray Herb. **48,** 29 (1916); Rydb. Fl. Prairies & Plains, 669 (1932).

SOUTH DAKOTA. Big Bend, Missouri (ex Bradbury); on arid argillaceous hills around the Great Bend of the Missouri (ex Nutt.).

Taylor 30 in Herb. Hook. is almost certainly from Bradbury's collection.

14. *Batschia longiflora* Pursh, Fl. Am. Sept. **1,** 132 (1814); Bradbury, Travels, 336 (1817); Nutt. Gen. **1,** 114 (1818).

Batschia decumbens Nutt. l.c. (teste Johnston in Contr. Gray Herb. **70,** 25: 1924).

Lithospermum angustifolium Michx. Fl. Bor.-Am. **1,** 130 (1803); Johnston, l.c.; non Forssk. Fl. Aegypt.-Arab., 39 (1775).

Lithospermum incisum *Lehm.*, Asperif., 303 (1818).

Lithospermum linearifolium Goldie in Edinb. Phil. Jour. **6,** 322 (1822); Rydb. Fl. Prairies & Plains, 674 (1932).

Lithospermum longiflorum (Pursh) Spreng. Syst. **1,** 544 (1825); non Salisb. Prod. 113 (1796).

MONTANA, NORTH & SOUTH DAKOTA & NEBRASKA. On the banks of the Missouri to its sources (ex Nutt.); first occurs near the mouth of the Platte, on ascending the Missouri (ex Bradbury); le haut Missouri (*Taylor* 17 in Herb. Hook.; undoubtedly collected by Bradbury).

WISCONSIN. Around the Prairie du Chien, Mississippi (ex Nutt.).

"This species [*L. incisum*] has a most extensive range. I possess specimens gathered by Bradbury on the Missouri . . ." (Hook., Fl. Bor.-Am. **2,** 87: 1838). This undoubtedly refers to the specimen cited above, labelled "*Lith. incisum.*" Pursh described the species from specimens of Nuttall's collection; Bradbury's were probably gathered at or about the same time.

15. **Penstemon glaber** *Pursh*, Fl. Am. Sept. **2,** 738 (1814); Bradbury, Travels, 337 (1817); Pennell in Contr. U.S. Nat. Herb. **20,** 348 (1920); Rydb. Fl. Prairies & Plains, 713 (1932).

Penstemon eriantherus Nutt. in Fraser, Cat. (1813) nomen nudum (Pennell, l.c.); Gen. **2,** 52 (1818).

Penstemon Gordoni Hook. in Bot. Mag. **73,** pl. 4319 (1847).

NORTH DAKOTA. Between Aricara and Mandan nation, *Bradbury* (*Taylor* 26 in Herb. Hook.).

SOUTH DAKOTA. Alluvion of the Missouri, above the Big Bend (ex Bradbury); in arid soils near the confluence of Shian river (ex Nutt.).

Isotype seen by Pennell in the herbarium of the Academy of Natural Sciences of Philadelphia.

For the sake of simplicity, the correct spelling and gender of *Penstemon* are used in all citations.

16. *Penstemon eriantherus* Pursh, Fl. Am. Sept. **2,** 737 (1814); Bradbury, Travels, 337 (1817); Rydb. Fl. Prairies & Plains, 714 (1932); non Nutt. in Fraser, Cat. (1813); Gen. **2,** 52 (1818).

Penstemon cristatus Nutt. in Fraser, Cat. (1813) nomen nudum (teste Pennell in Contr. U.S. Nat. Herb. **20,** 342: 1920).

Penstemon eriantherus *Pursh* var. **saliens** (*Rydb.*) *Pennell*, l.c., 343.

SOUTH DAKOTA. Common on the bluffs from the big bend to the Aricara village (ex Bradbury); on arid denudated argillaceous hills from the confluence of Teeton river and the Missouri to the mountains (ex Nutt.).

NEBRASKA. Sepulchre Bluffs, *Bradbury* (*Taylor* 25 in Herb. Hook.).

A type or isotype of *P. eriantherus* Pursh is cited by Pennell, l.c. Bradbury's specimen in Herb. Hook. agrees with var. *saliens* Pennell in having leaves strongly toothed on their distal halves, and corolla about 23 mm. long. Evidently the typical form of the species and the variety were included in Bradbury's collections without distinction.

17. *Penstemon Bradburii* Pursh, Fl. Am. Sept. **2,** 738 (1814).

Penstemon grandiflorus *Nutt.* in Fraser, Cat. (1813); Gen. **2,** 53 (1818); Pennell in Contr. U.S. Nat. Herb. **20,** 357 (1920); Rydb. Fl. Prairies & Plains, 713 (1932).

SOUTH DAKOTA. Chienne rivière, *Bradbury* (*Taylor* 24 in Herb. Hook.).

NEBRASKA, &c. On the plains of the Missouri, common, from the confluence of the river Platte to the Mountains (ex Nutt.).

WISCONSIN. Near the Prairie du Chien, Mississippi (ex Nutt.).

A probable isotype is cited by Pennell.

18. **Penstemon gracilis** *Nutt.* Gen. **2,** 52 (1818); Pennell in Contr. U.S. Nat. Herb. **20,** 372 (1920); Rydb. Fl. Prairies & Plains, 715 (1932).

NORTH DAKOTA. From the Arikarees to Fort Mandan, in depressed soils (ex Nutt.); prairies, *Bradbury* (*Taylor* 23 in Herb. Hook.).

Type is cited by Pennell. According to the same author, Pursh's description of *P. angustifolius* possibly included also this species. Though collected by Bradbury, it was not recognized by him as distinct.

19. **Plantago elongata** *Pursh*, Fl. Am. Sept. **2,** 729 (1814); Bradbury, Travels, 335 (1817); Morris in Bull. Torr. Bot. Club **36,** 525 (1909); Rydb. Fl. Prairies & Plains, 738 (1932).

NEBRASKA. Near the Maha village (ex Bradbury); Sepulchre Bluffs, *Bradbury* (*Taylor* 28 in Herb. Hook.).

The specimen is undoubtedly that cited by Gray in Syn. Fl. **2,** pt. 1, 392 (1886) and identified as *P. pusilla* Nutt., with which *P. elongata* Pursh was long confused. Morris (l.c., 517) was misled by a memorandum from a former member of the Kew staff stating that the specimen in question "was collected by Dr. Taylor at Sepulchre Bluffs, Bradbury." The specimen corresponds exactly with Morris' description of *P. elongata* Pursh (Gray, as quoted by Morris, was mistaken in the number of ovules). Morris cites as type another specimen by Bradbury in the Academy of Natural Sciences of Philadelphia (perhaps more correctly regarded as an isotype).

V—THE GIANT LOBELIAS OF EAST AFRICA.

E. A. BRUCE.

The giant Lobelias of the African Mountains are remarkable plants, and bear little resemblance except in their floral structure to the small species familiar in gardens. It is singular that these "giant" plants, which often attain a height of over 20 feet, should be found in the high alpine regions, where the vegetation, with the exception of the giant Senecios, is almost uniformly dwarf. There are, however, a number of forest species, which give a clue to the origin of the alpine forms. *L. longisepala* Engl., for example, which is an annual and has a branched habit, is very different from the other giant Lobelias. This species may be regarded as a relic of the ancestral forest forms from which the giant Lobelias have been evolved. It is confined to the tropical rain forests and has the lowest altitudinal range of any of the giant forms (1500–3000 ft.). This supports the theory put forward by Prof. R. E. & Dr. Th. C. E. Fries that the ancestral form of the giant Lobelias was a branched, glabrous species with a lax inflorescence and thin, scattered leaves, which originated in the primitive forest zone. The dense inflorescence, unbranched stem, and thick, hairy leaves of the existing alpine species may be explained as adaptations due to the higher altitude and more severe climate.

Material of the African species of the genus has been gradually accumulating in the Kew Herbarium, and in view of the interest in these striking plants, it was thought advisable to make a study of them with special reference to their distribution and altitudinal range. In the following pages an attempt has been made to classify the East African members of this genus. The area dealt with includes the Abyssinian mountains and those of the eastern border of the Belgian Congo, Tanganyika Territory, Uganda Protectorate and Kenya Colony (see map, p. 72). The two species, *L. columnaris* and *L. Conraui*, from the Cameroons Mountain and the Cameroons respectively have not been included. Both these West African species, belonging to the *Columnaris* series, differ from the other

giant Lobelias in having all the anther-tips glabrous instead of the lower two bearded.

In addition to the material in the Kew Herbarium, specimens have been examined at the British Museum (Natural History), and a number of specimens have been received on loan from Berlin, Brussels, Uppsala and Amani. The writer is very grateful to the Directors of these institutions for their help. The photographs on plate V (facing p. 80) have been reproduced by the kind permission of Mr. B. D. Burtt, Dr. W. Geilinger, Mr. G. L. R. Hancock and Mr. A. S. Thomas. The drawings and diagrams are the work of Miss Ross-Craig and Mr. G. Atkinson, to whom the author is much indebted. Thanks are also due to Mr. A. D. Cotton, Keeper of the Herbarium and Library, Royal Botanic Gardens, Kew, and Mr. J. Hutchinson for their valuable advice and criticism.

Introductory.

The characters chiefly used in the key are the shape of the bracts and the nature of their indumentum, in conjunction with leaf-form. The character and occurrence of the indumentum are of more value than its relative density. The size of the anthers, a character employed by Professor R. E. and Dr. Th. C. E. Fries in their revision, has been found to vary to a certain degree within many of the species and has therefore not been utilized to any great extent.

Since the Fries' revision, "Die Riesen-Lobelien Afrikas," in Svensk Botanisk Tidskrift, **16**, 383 (1922), four new species have been described: *L. Bequaertii* De Wild., *L. lanuriensis* De Wild.,* *L. Fenniae* Th. Fries† and *L. Burttii* E. A. Bruce.‡

L. Bequaertii is a distinct species, which is confined to Mt. Ruwenzori. It belongs to the *Deckenii* series, though it also shows some affinity with the *Mildbraedii* series. *L. lanuriensis*, also described from Mt. Ruwenzori, does not appear to differ from *L. karisimbensis* R. E. Fr. et Th. Fr., which occurs on the same mountain as well as on the Virunga Range. These authors, however, consider *L. lanuriensis* to be the same as *L. Stuhlmannii*. This is scarcely the case, as the leaves of *L. lanuriensis* are quite glabrous above, whereas in the type of *L. Stuhlmannii* they are thickly puberulous. *L. Fenniae* Th. Fries is, in the opinion of the writer, synonymous with *L. Telekii* Schweinf. Five different collections from Mt. Elgon, including flowers and seeds, have been examined and compared with specimens of *L. Telekii* from Mt. Kenya and the Aberdares. The corollas appear identical, and the pedicels and calyx-tube have the same type of indumentum, though it is more prolific in the Elgon plants.

L. Burttii E. A. Bruce is an interesting species belonging to the *Deckenii* series and also shows affinity with the *Mildbraedii* series. It has been named after Mr. B. D. Burtt, who has contributed much

* De Wild. Plantae Bequaertianae, **1**, 289 and 291 (1922).
† Bot. Notiser, 1923, 295.
‡ Kew Bull. 1933, 473.

valuable material of this genus to the Kew Herbarium. *L. Burttii* has been collected on Mt. Meru at an altitude of 12,000–13,000 ft., and also on Mts. Loolmalassin and Hanang at 11,000 ft.; these mountains lie to the west and south-west of Kilimanjaro (see map, p. 72). *L. Burttii* is most nearly allied to *L. Bequaertii*, and in common with this species has the corolla split into five lobes, differing in this respect from the other members of the *Deckenii* series, and forming a definite link with the *Mildbraedii* series. The writer therefore admits only two additional new species of East African giant Lobelias since the publication of the Fries' paper in 1922. The species published in that paper are accepted as distinct with the exception of *L. ulugurensis* Engl., which, in the opinion of the writer, is synonymous with *L. giberroa* Hemsl. The type specimen of the former has been carefully examined, and as far as can be seen from the rather inadequate material, there is no specific difference.

With these adjustments there are now twenty apparently distinct species from East Africa.

The African giant Lobelias belong to the section *Rhynchopetalum* of Bentham & Hooker*, which was merged by Engler & Prantl† into the Section *Tylonium*. Section *Tylonium* Engl. et Prantl is distinguished as follows:—

(1) Tall, usually unbranched herbs, sometimes arborescent, with numerous narrow leaves.
(2) Inflorescence a terminal, many-flowered, bracteate raceme.
(3) Flowers large, generally blue, violet or purple.
(4) Anthers large, usually the three upper glabrous at the tip and the two lower bearded.

Species of this section also occur in the West Indies, Brazil, Pacific Islands and India. This type of growth in *Lobelia* has thus a much wider distribution than that of the giant Senecios with which they are associated, but which are confined to the East African mountains.

The East African members of this section of *Lobelia* may be conveniently divided into five main series, as follows:—

I. Longisepala Series: This is the most primitive of the five series, and is characterized by the branching stem and the small, generally reddish-coloured flowers, the corollas of which are split down the back to the base and then deeply lobed, see fig. 1, no. 1, p. 67. The seeds are small, ovoid, and without a winged margin. This series includes two species, *L. longisepala* and *L. lukwangulensis*. The former is of great systematic interest, as has already been pointed out; it occurs on the Usambara Mountains in the primitive rain forests, whereas *L. lukwangulensis* is found in the Uluguru Mountains at a rather higher altitude. The altitudinal range of the series is from 1600–8000 ft.

* Genera Plantarum, **2**, 552 (1876).
† Pflanzenfam. **4, 5**; 67 (1894).

SPECIES	Virunga	Ruwenzori	Mt. Elgon	Aberdares	Mt. Kenya	Kilimanjaro	Ngorongoro	Usambara	Uluguru	Utshungwe	Rungwe	Abyssinia
L. longisepala								X				
L. lukwangulensis									X			
L. Mildbraedii	X											
L. utshungwensis										X		
L. Rhynchopetalum												X
L. aberdarica			X	X	X							
L. Stuhlmannii		X									X	
L.karisimbensis	X	X										
L. bambuseti				X	X							
L. usafuensis						X						
L. Volkensii												
L. giberroa	X	X	X	X	X	X	X		X	X		X
L. Bequaertii		X										
L. Burttii							X					
L. Deckenii						X						
L. keniensis					X							
L. sattimae				X								
L. elgonensis			X									
L. Telekii			X	X	X							
L. Wollastonii	X	X										

Distribution of East African Giant Lobelias.

II. MILDBRAEDII SERIES : This is characterized by the nervation of the leaf, the veins ascending at an acute angle and running sub-parallel to the midrib. The bracts vary from linear to broadly lanceolate. The corolla is long and narrow, first splitting down the back and then dividing into 5 linear lobes, see fig. 1. nos. 3–5, p. 67. The seeds are comparatively large, flattened and with a narrowly winged margin. The species included in this series are *L. Mildbraedii*, *L. utschungwensis*, *L. Rhynchopetalum* and *L. aberdarica*. The first two species are found on the Virunga Mountains and the Utshungwe Mountains respectively ; the third is characteristic of the alpine region of the Abyssinian Mountains, and the last is common to Mt. Elgon and the Aberdares, being found in the upper half of the bamboo region. The altitudinal range of the series is from 6000–13,000 ft.

III. GIBERROA SERIES : This has the largest altitudinal range of the series, and contains *L. giberroa*, the most widely distributed species. It is characterized by the nervation of the leaf, the veins spreading almost at right angles from the midrib. The bracts are narrow, the corollas are split down the back and then divided into 5 lobes, see fig. 1, nos. 7–12, p. 67, and the seeds are similar to those of the *Mildbraedii* series, but smaller and with a narrower margin. The series may be sub-divided into two subseries on the leaf shape :—

A. Leaf broadly oblanceolate : This includes *L. usafuensis*, *L. Volkensii* and *L. giberroa*.

B. Leaf narrowly linear-lanceolate : This includes *L. bambuseti*, *L. karisimbensis*, and *L. Stuhlmannii*.

The species in subseries A are found for the most part in the mountain rain-forests, *L. giberroa* extending to the lower half of the bamboo region ; the altitudinal range of the subseries is from 5000–10,000 ft., and with the exception of the widely distributed *L. giberroa*, is confined to East Tanganyika Territory. The species in subseries B are characteristic of a higher altitude, and occur in the upper half of the bamboo forest and the lower alpine region ranging from 8000–12,000 ft.

IV. DECKENII SERIES : The members of this series are all alpine. It is characterized by the ovate bracts, dense inflorescence, and large seeds with winged margins. It includes the following species, *L. Bequaertii*, *L. Deckenii*, *L. keniensis*, *L. sattimae*, *L. elgonensis* and *L. Burttii*. These occur in the alpine region ranging from about 12,000 ft. upwards, with the exception of *L. Bequaertii* and *L. Burttii* which are found at slightly lower altitudes. As these two species show an affinity with the *Mildbraedii* series in their floral structure, it is interesting to note that they also approach to that series in their lower altitudinal range. The species, with the exception of *L.*

Burttii, are endemic to a single mountain group (see map p. 72) and have not so far been recorded from any other range.

V. TELEKII SERIES: This is characterized by the woolly and closely long-ciliate bracts and small ovoid seeds without winged margins. It includes the two species *L. Telekii* and *L. Wollastonii*, both of which are higher alpine species, ranging from 11,000–14,700 ft.

Fig. 1 (opposite) shows the inner surface of the opened-out corollas of some of the species mentioned above and illustrates the interrelationship of the groups so far as the form of the corolla is concerned. It will be noted that nos. 3, 5 and 6 are comparatively long and have short lobes whereas 7, 8 and 9 have narrow linear lobes; these belong to the *Mildbraedii* and *Giberroa* series respectively. The *Deckenii* series is characterized by a comparatively broad corolla which is generally one-lipped (nos. 13–18). The presence or absence of indumentum within the corolla is a useful character for specific determination, e.g. *L. Deckenii* (no. 15) is recognized by its lack of indumentum.

Particular attention has been paid to the distribution and altitudinal range of the various species, these points being illustrated by the diagram on p. 69, and the table on p. 64.

The map on p. 72 gives an outline sketch of the area dealt with (excluding Abyssinia). The positions of the chief mountain groups have been indicated and the species occurring on each range have been marked by numbers. By reference to the key it is possible to see at a glance which species occur on the various mountains. It will be noted that a number of species are endemic to a particular mountain, e.g. *L. Bequaertii* (no. 13) has only been recorded from Mt. Ruwenzori, whereas some are widely distributed, e.g. *L. giberroa* (no. 12), which is known from all the larger mountain groups.

The diagram on p. 69 gives a diagrammatic representation of the six more important mountain ranges in the area: Virunga Mts., Mt. Elgon, Aberdare Mts., Mt. Kenya and Mt. Ruwenzori. The altitude, in feet, is marked off on the vertical axis, and the fourteen species involved are represented by various signs on the diagram. Thus, by reference to the figure, it is possible to see the number of species occurring on any one mountain and their altitudinal range; e.g. on Mt. Elgon there are four different species, two of which are found above the 13,000 ft. contour (*L. elgonensis* and *L. Telekii*), and two below 10,000 ft. (*L. giberroa* and *L. aberdarica*).

It is therefore possible, in some cases, to name a species with reasonable certainty if the locality and altitude are known, irrespective of whether the specimen has been examined or not.

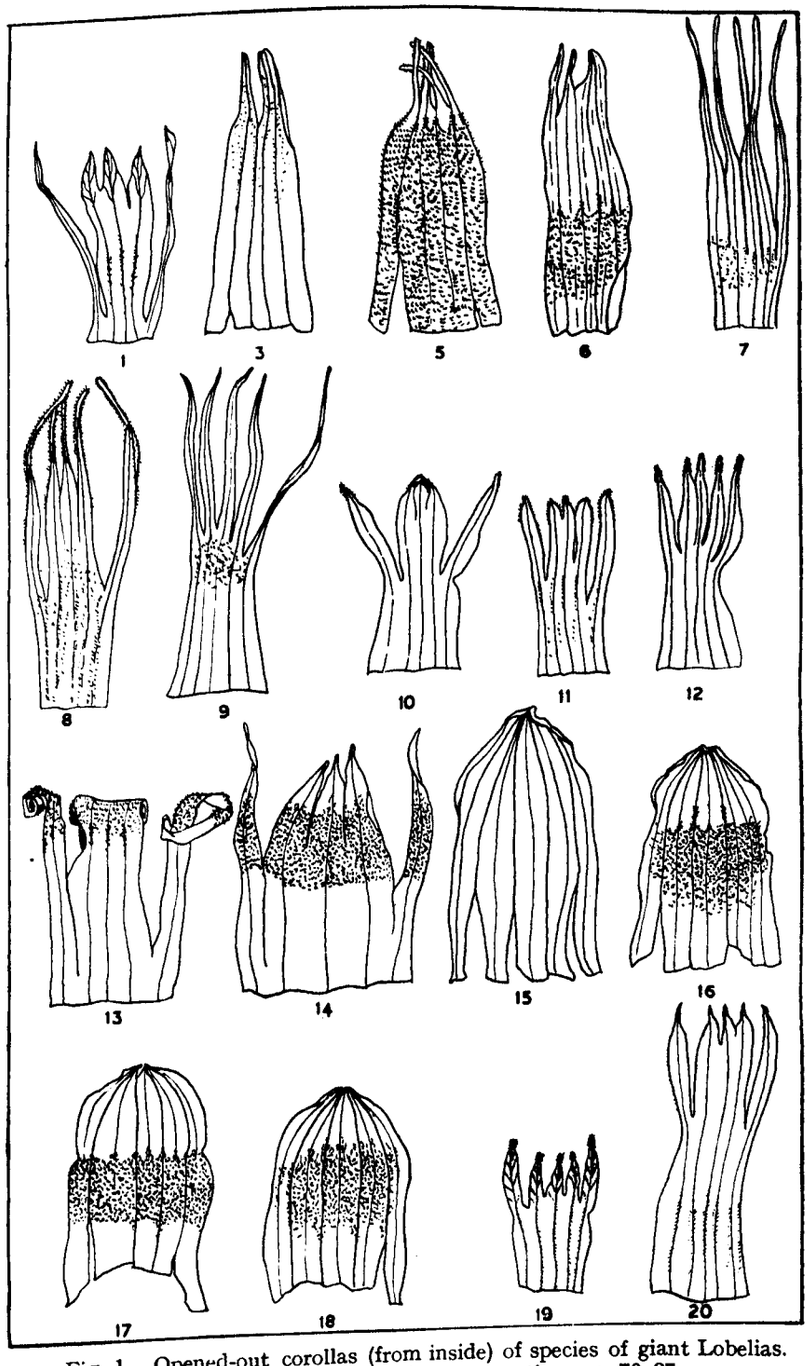


Fig. 1. Opened-out corollas (from inside) of species of giant Lobelias. The numbers correspond to those in the enumeration, pp. 70–87.

KEY TO THE SERIES.

Stem branched ; flowers reddish, seeds ovoid, not winged.....
I. Longisepala.

Stem unbranched ; flowers greenish-white or blue :

Bracts neither woolly nor densely long-ciliate ; seeds compressed, more or less winged :

Bracts linear to narrowly lanceolate, if ovate-lanceolate then shorter than the mature flowers :

Leaves with the lateral nerves ascending at an acute angle (30°–45°) from the midrib.....**II. Mildbraedii.**

Leaves with the lateral nerves spreading almost at right angles (60°–90°) from the midrib.....**III. Giberroa.**

Bracts ovate or oblong-ovate, longer than the mature flowers
IV. Deckenii.

Bracts densely woolly or long-ciliate ; seeds ovoid, neither compressed nor winged .....**V. Telekii.**

KEY TO SPECIES.

I. LONGISEPALA SERIES.

Inflorescence very lax ; bracts lanceolate, leaf-like ; pedicels long, subequal to or longer than the flowers ; leaves herbaceous, undulate-serrate.....1. **L. longisepala.**

Inflorescence dense ; pedicels definitely shorter than the flowers ; bracteoles conspicuous, over 5 mm. long ; leaves narrowly oblong-oblanceolate, distantly serrate near the top.....
2. **L. lukwangulensis.**

II. MILDBRAEDII SERIES.

Bracts broadly linear to narrowly lanceolate (4–8 mm. broad) :

Basal leaves 2–5 cm. broad :

Bracts broadly linear (about 4 mm. broad) ; leaves subacute, mucronate at the apex.....3. **L. Mildbraedii.**

Bracts linear-lanceolate (about 6 mm. broad) ; leaves gradually acuminate .....4. **L. utshungwensis.**

Basal leaves 6–10 cm. broad, gradually acuminate ; bracts narrowly lanceolate, about 8 mm. broad ; corolla densely pubescent outside and closely crisped-pubescent within.....
5. **L. Rhynchopetalum.**

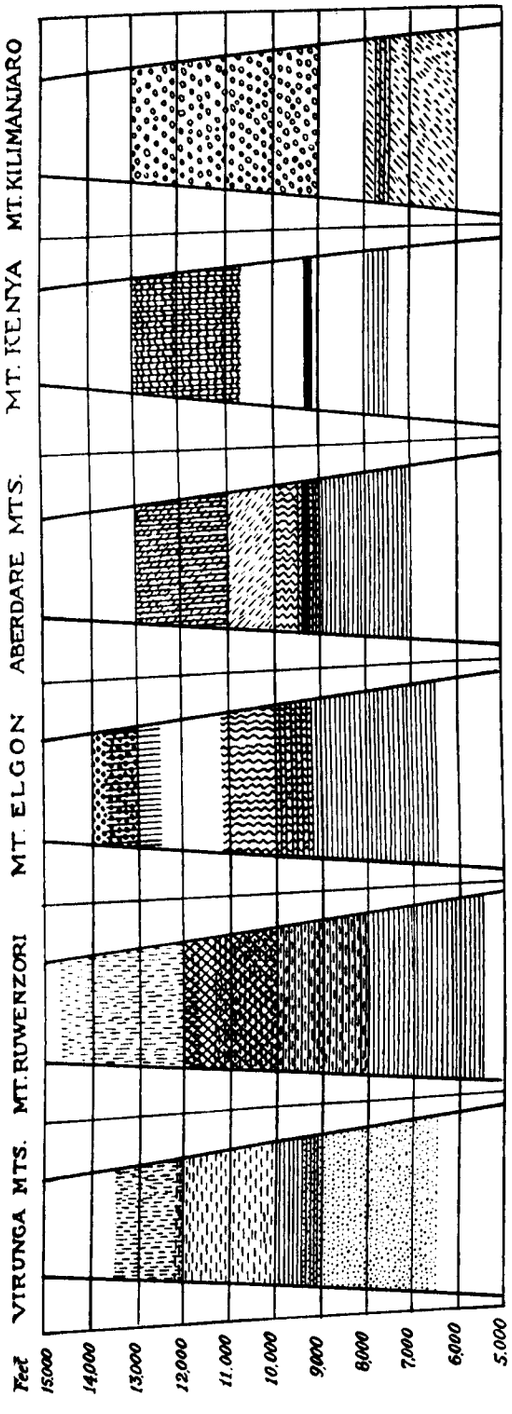
Bracts lanceolate to ovate-lanceolate, shorter than the mature flowers ; leaves oblong-lanceolate, conspicuously reticulate on the lower surface.....6. **L. aberdarica.**

III. GIBERROA SERIES.

Lower stem-leaves lanceolate to linear-lanceolate (including oblong and oblong-lanceolate) :

Leaves distinctly repand denticulate ; corolla, in bud, produced into a long beak (1 cm. or more) beyond the anthers ; bracts subequal to the flowers :

Leaves densely puberulous above ; anthers about 1·4 cm. long
7. **L. Stuhlmannii.**



ALTITUDINAL RANGE OF EAST AFRICAN GIANT LOBELIAS

(Since this diagram was prepared, *L. aberdarica* has been recorded from Mt. Kenya, at 7000 ft.).

Leaves glabrous above ; anthers between 0·9 and 1·3 cm. long
8. **L. karisimbensis.**

Leaves entire or subentire ; corolla, in bud, produced into a short beak (5 mm. or less) beyond the anthers ; bracts linear-filiform, well overtopping the flowers.....9. **L. bambuseti.**

Lower stem-leaves oblanceolate ; corolla, in bud, not or scarcely produced into a beak beyond the anthers :

Leaves generally more or less toothed, the lower ones often doubly serrate :

Bracts much shorter than the mature flowers.....
10. **L. usafuensis.**

Bracts subequal to or longer than the mature flowers :

Corolla and calyx-tube densely woolly tomentose.....
11. **L. Volkensii.**

Corolla and calyx-tube at most pubescent...12. **L. giberroa.**

Leaves entire, oblanceolate to narrowly oblong-oblanceolate ; bracts linear-filiform.....9. **L. bambuseti.**

IV. Deckenii Series.

Corolla splitting into 5 lobes :

Corolla-lobes reflexed, densely crisped-puberulous within ; bracts broadly ovate, abruptly acuminate.....13. **L. Bequaertii.**

Corolla lobes not reflexed, glabrous within at the top, crisped-pubescent in the centre third ; bracts narrowly ovate, acute or shortly acuminate .....14. **L. Burttii.**

Corolla one-lipped :

Corolla glabrous within ; bracts glabrous on both surfaces, sparingly ciliate on the margin.....15. **L. Deckenii.**

Corolla crisped-puberulous within :

Anthers pubescent at the base ; bracts pubescent along the midrib on the upper surface, otherwise glabrous.....
16. **L. keniensis.**

Anthers glabrous at the base :

Bracts thinly pubescent on both surfaces ; stamens longer than the split corolla.....17. **L. sattimae.**

Bracts glabrous on both surfaces, only ciliate on the margin ; stamens shorter than the split corolla...18. **L. elgonensis.**

V. Telekii Series.

Bracts at least 5 times as long as the flowers, linear, conspicuously long-ciliate on the margin ; leaves thin not shining, with ascending nerves .....19. **L. Telekii.**

Bracts up to twice as long as the flowers, linear to linear-lanceolate, villous on both surfaces, margin densely so ; leaves coriaceous, shining, with spreading reticulate nerves...20. **L. Wollastonii.**

Enumeration.

1. **Lobelia longisepala** *Engl.* Bot. Jahrb. **32,** 117 (1902).

A tall much-branched annual herb, 9–15 ft. high, with a loose branched inflorescence about 1½ ft. long. *Leaves* pale green, herbaceous, shortly petiolate, oblanceolate, 20–35 cm. long and 4–7 cm.

broad, membranous, glabrous on both surfaces, acuminate at the apex, decurrent and narrowly cuneate at the base, margin undulate-dentate ; lateral nerves arcuate, ascending at an angle of about 45°, looped within the margin, impressed above, prominent below, tertiary nerves indistinct. *Inflorescence* branched, lax, flowers generally more than 1 cm. apart, rhachis slender, glabrous, about 0·5 cm. in diameter at the base ; pedicels glabrous, 2–3 cm. long, bearing 2 linear bracteoles just below the middle. *Bracts* foliaceous, lanceolate, shortly petiolate, from 2·5–6·6 cm. long, and 0·8–2·3 cm. broad, cuneate at the base, acuminate at the apex with a fine mucro, glabrous on both surfaces, serrate on the margin, venation as in the leaves. *Calyx-tube* narrowly campanulate, about 1 cm. long and 0·7 cm. broad at the top, glabrous ; lobes broadly linear to narrowly triangular, about 1·5 cm. long and 0·3 cm. broad, glabrous, mucronulate at the apex. *Corolla* lilac, narrowly cylindric in bud, 1·5–2·5 cm. long and about 0·4 cm. broad, thinly and shortly puberulous towards the base, glabrescent in the upper half, splitting down the back and then dividing into 5 lanceolate lobes, the 2 lateral ones free half-way down, the 3 central ones in the upper third. *Filaments* about 1·3 cm. long, puberulous at the base and with short lines of hairs at the apex under the anthers, free in the lowest quarter ; *anthers* very small, about 5 mm. long. *Fruit* obovoid, 2–2·5 cm. long, calyx lobes deciduous. *Seeds* very small, ovoid, less than 1 mm. long.—Fries in Svensk Bot. Tidsk. **16,** 396 (1922).

Type specimen *Scheffler* 99 in Herb. Berlin.

Tanganyika Territory : Usambara Mountains ; in the tropical rain forests, in damp and shady places 2600 ft., *Scheffler* 99 ! Near Amani, *Braun* 793 ! *Soleman* G6253 ! In forest below Kwamkoro Road, *Zimmerman* G6254 ! Open forest 3000 ft., *Groote* G6255 ! *Groote* 6257 ! *Warnecke* 448 ! East Usambara Mts. ; Amani, Kwamkoro Road, 3000 ft., in damp rocky places in open parts of evergreen rain forest, *Greenway* 2983 !

2. **Lobelia lukwangulensis** *Engl.* in Notizbl. Bot. Gart. Berlin **1,** 107 (1895).

A large plant 6–12 ft. high with a branched stem and red flowers. *Leaves* narrowly oblong to oblong-oblanceolate, 30–40 cm. long and 2–3 cm. broad, glabrous on both surfaces, rounded at the apex, mucronate ; margin entire in the lower half and distantly serrate towards the apex ; lateral nerves arcuate, ascending, anastomosing and forming an impressed reticulum above. *Inflorescence* dense. *Bracts* lanceolate, from 2·5–5·5 cm. long and 0·7–1·6 cm. broad, acute at the apex, glabrous on both surfaces, margin entire. *Flowers* shortly pedicellate, pedicels up to 1 cm. long, puberulous ; bracteoles linear-lanceolate, about 8 mm. long and 1·5 mm. broad. *Calyx-tube* broadly campanulate, about 5 mm. long, thinly puberulous ; lobes broadly linear, about 2–4 cm. long and 0·3 cm. broad, acute or subacute at the apex, glabrescent on both surfaces, with a



DISTRIBUTION OF EAST AFRICAN GIANT LOBELIAS

(Since this map was prepared *L. aberdarica* has been recorded from Mt. Kenya).

conspicuous midrib. *Corolla* red, in bud shorter than the calyx lobes, glabrescent, mature flower not seen, but according to Stuhlmann about 2·5 cm. long.—Engl. Bot. Jahrb. **28,** 501 (1900); Goetze and Engl. Vegetationsansicht Deutschostafr. tab. 47 (1902) (Hab.); Fries in Svensk Bot. Tidsk. **16,** 396 (1922).

Type specimen *Stuhlmann* 9142 in Herb. Berlin.

TANGANYIKA TERRITORY: Uluguru Mountains; Lukwangulu district, about 8000 ft., in rain forests, flowering and fruiting in October, *Stuhlmann* 9142!

3. **Lobelia Mildbraedii** *Engl.* in Wissensch. Ergebn. der deutsch. Zentral-Afrika-Exp. 1907–1908 Bd. **2,** (Botanik) 344 (1911).

Plant 3–10 ft. high, with an inflorescence 2–3 ft. long, bearing a flat rosette of bracts at the apex, frequently found in marshy places. *Leaves* pale green, narrowly oblong to oblong-lanceolate, from 20–30 cm. long and 2–5 cm. broad, sessile, not narrowed to the base, rounded or shortly acute at the apex, mucronate, from glabrous to thinly and shortly pubescent on the lower surface and very sparingly pubescent on the upper, margin entire or subentire; lateral nerves arising at an angle of about 30° from the midrib, ascending, anastomosing. *Rhachis* of the inflorescence thinly pubescent to glabrescent. *Bracts* subequal to the flowers, broadly linear, acute at the apex, 4–5 cm. long and 0·3–0·4 cm. broad, pubescent on both sides, margin entire. *Pedicels* 0·3–0·5 cm. long, pubescent. *Calyx-tube* shortly campanulate, about 0·3 cm. long, pubescent to glabrescent, enlarging in fruit; lobes narrowly triangular, about 1 cm. long and 0·3 cm. broad at the base, acute at the apex, as a rule pubescent on both sides but occasionally glabrescent. *Corolla* pale blue, thinly pubescent, 2·7–3·6 cm. long, 0·3–0·4 cm. broad, produced at the apex into a short point beyond the anthers, splitting into 5 broadly linear lobes, glabrous within. *Filaments* 2–2·6 cm. long, free in the lower quarter. *Anthers* about 1 cm. long. *Seeds* flattened, 1·5–2 mm. long, more or less crescent-shaped with a broad wing.—Fries in Svensk Bot. Tidsk. **16,** 405 (1922).

Type specimen *Mildbraed* 953 in Herb. Berlin.

BELGIAN CONGO: Virunga Mountains; Muhavura Volcano, Gahinga Pass, 9000–9500 ft., locally common on large open marsh, *Burtt* 2860! Ninagongo Volcano, the great south extinct crater, about 9000 ft., in open grass areas and among arborescent Senecios, *Burtt* 3188!

UGANDA: Behungi Swamp; 8000 ft., *Burtt* 2939! Kigezi, near Behungi, 6500–7500 ft., common in boggy land in the valleys, *Snowden* 1512! Between Lake Bunyonyi and Behungi, 7800 ft., in upland water meadow or semi-swamp, *Eggeling* 957!

4. **Lobelia utshungwensis** *R. E. Fr. & Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 405 (1922).

A large plant with a dense inflorescence about 12 ft. long. *Leaves* 25–35 cm. long, 2·5–3·2 cm. broad, narrowly lanceolate, gradually acuminate, thinly puberulous on both surfaces; margin entire, glabrous; lateral nerves ascending at angles between 30° and 45°, conspicuously reticulate below, indistinctly so above. *Bracts* overtopping the flowers, about 5·5 cm. long and 0·6 cm. broad at the base, narrowly lanceolate to linear-lanceolate, obscurely mucronate at the apex, shortly pubescent on both surfaces, ciliate on the margin. *Pedicels* about 6 mm. long, pubescent. *Calyx-tube* campanulate, shortly pubescent; lobes triangular, about 1·5 cm. long and 0·5 cm. broad at the base, acute at the apex, shortly pubescent on both surfaces, ciliate on the margin. *Flowers* not seen.—*Lobelia sp.* in Engl. Bot. Jahrb. **28,** 501 (1900).

Type specimen *Goetze* 583 in Herb. Berlin.

TANGANYIKA TERRITORY: Utshungwe Mts.; Uhehe, Kissinga about 6600 ft. *Goetze* 583!

According to Fries the corolla is about 3 cm. long and hirsute without; the filaments glabrous and free at the base. This species is allied to *L. Mildbraedii* Engl. from which it is distinguished by the broader bracts.

5. **Lobelia Rhynchopetalum** * (*Hochst.*) *Hemsl.* in Oliv. Fl. Trop. Africa **3,** 465 (1877).

A plant up to 20 ft. high with a leaf rosette up to 12 ft. long. *Upper leaves* narrowly lanceolate, sessile, gradually acuminate, 20–25 cm. long and about 4 cm. broad, both surfaces thinly adpressed-pubescent, margin entire; lateral nerves ascending at an angle of about 30° from the midrib. *Lower leaves* broadly lanceolate, up to 45 cm. long and 10 cm. broad, margin entire, ciliate, both surfaces glabrous or nearly so; lateral nerves prominent ascending at an angle of about 45°. *Bracts* narrowly lanceolate, one-and-a-half times or twice the length of the flower, about 11 cm. long and 0·8 cm. broad, gradually acuminate at the apex, thinly pubescent on both surfaces, ciliate on the margin. *Pedicels* about 0·8 cm. long, pubescent, with 2 linear-filiform bracteoles towards the base. *Calyx-tube* campanulate, about 1·2 cm. long and 0·9 cm. broad, closely pubescent, lobes narrowly linear-triangular about 3 cm. long and 0·7 cm. broad at the base, acute at the apex, pubescent on both sides, ciliate on the margin. *Corolla* bluish-green, up to 5·5 cm. long, produced at the apex into a point about 0·8 cm. long beyond the anthers, pubescent without, densely crisped-puberulous within, splitting down the back and then dividing into 5 linear lobes. *Filaments* about 2·5 cm. long, with 5 lines of pubescence, free in the lower half. *Anthers* about 1·3 cm. long.—Baker fil. in Journ. Bot. **32,** 70 (1894); Karsten and Schenck Veg.-Bild. **7,** t. 30 (1909) (Hab.); Engl. and Drude Veg. Erde **9,** 1, i; 110 (1910) (Hab.); Fries in Svensk Bot. Tidsk. **16,** 407 and fig. 6 g-h (1922). *Rhynchopetalum montanum* Fres. in Flora **21, 2,** 603 (1838); Mus. Senckenberg **3,** 66 tab. 4 (1839); DC. Prodr. **7,** 396 (1839). *Tupa Rhynchopetalum* Hochst. in A. Rich. Fl. Abyssin. **2,** 9 (1851).

Type *Rüppell* s.n.; Abyssinia; Simen, 11,000–12,000 ft. in Herb. Berlin.

ABYSSINIA: Simen, Mt. Backit, 11,000–13,000 ft., *Schimper* 169! 1263! 1554! *Petit*! 9000–11,000 ft. *Steudner* 1376! Garamulata Mt., 9300–10,700 ft., in Erica formation, stem dies to the ground after flowering but other shoots from the same root do not die, *Gillett* 5317!

* Misspelt "Rhyncopetalum" on map, p. 72.

6. **Lobelia aberdarica** *R. E. Fr. & Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 403 and tabs. 5 & 6, a-d. (1922).

Plant about 3–9 ft. high with a flower spike up to 6 ft., though generally less, often found growing in swampy places. *Leaves* pale green, narrowly oblong to oblong-lanceolate, former about 23 cm. long and 2·5 cm. broad, latter about 36 cm. long and 4·5 cm. broad, sessile, not narrowed to the base, apex rounded or subacute, shortly mucronate, thinly pubescent on both surfaces, margin entire or subentire; midrib thick and fleshy, up to 0·4 cm. in diameter at the base, lateral nerves ascending at angles between 30° and 45° from the midrib, numerous, anastomosing and forming a conspicuous reticulum below. *Rhachis* of the inflorescence sparsely long-pubescent. *Bracts* lanceolate to ovate-lanceolate, shorter than the mature flowers, 2·5–4·5 cm. long, 1–1·5 cm. broad, shortly pubescent on both surfaces, rounded or subacute at the apex, mucronate, thinly ciliate on the margin. *Pedicels* about 0·5 cm. long, densely pubescent. *Calyx-tube* shortly campanulate, thinly to densely pubescent, about 0·4 cm. long, enlarging in fruit; lobes narrowly triangular to narrowly oblong, 1–1·5 cm. long, 0·3–0·4 cm. broad at the base (elongating in fruit), rounded or subacute at the apex, mucronate, pubescent on both sides and thinly ciliate on the margin. *Corolla* French-blue to lilac-blue and white, thinly pubescent, 2·8–3·5 cm. long, and about 0·5 cm. in diameter, produced at the apex into a short point beyond the anthers, up to 0·5 cm. long. *Filaments* 2·6–3·2 cm. long, free in the lowest third, sparingly pubescent. *Anthers* 0·9–1·1 cm. long.

Type specimen *Fries* 2414 in Herb. Upsala.

KENYA COLONY: Aberdare Mountains; in the lower alpine region, *Fries* 2414! 2414b! 10,000 ft. *Battiscombe*! Nandi Plateau, *Johnston*! Timboroa, 9000 ft., *Thorold* 1502! East Mau, Mariashoni 9000 ft., *Dale* 2671! Mt. Kenya; 7000 ft. on the south slope of the forest in a swamp, *Dale* 3020! Mt. Elgon; 9200 ft., only found near water, *Lugard* 434! *Dauglish* 69! A swamp variety at 11,500 ft. and lower altitudes, *Mrs. D. R. Tweedie* C.9!

UGANDA: Mt. Elgon; Bulambuli, stream in bamboo zone, locally abundant, 9100 ft., *Thomas* 654! *Soundy and Hancock*! Specimen raised from seeds sent from Tropical East Africa, 7000 ft., *Lady Hindlip*!

7. **Lobelia Stuhlmannii** *Schweinf.* in Emin Pascha, Im Herz von Afrika. 291, tab. 11 (1893), *nomen nudum.*

Upper leaves linear-lanceolate, about 20 cm. long and 2 cm. broad, closely repand-denticulate, lateral nerves spreading from the midrib at an angle of about 60°, conspicuously reticulate on the lower surface; upper third of leaf subglabrous below except for the shortly pubescent midrib, lower part covered with a number of long hairs, particularly towards the midrib; upper surface of leaf densely puberulous, lateral nerves invisible. *Bracts* about 4 cm. long and 0·4 cm. broad, narrowly linear-lanceolate, acute at the apex, glabrous on both sides with a few long hairs on the margin near the base. *Calyx-tube* narrowly campanulate, glabrescent; lobes narrowly linear-triangular, about 1·8 cm. long and 0·2 cm. broad at the base, acute at the apex, glabrous on both sides, ciliate on the margin in the lower part, glabrous at the top. *Corolla* glabrous, 5–5·5 cm. long, produced into a beak at the apex beyond the anthers, beak about 1·5 cm. long. *Filaments* about 2·3 cm. long, shortly pubescent at the top. *Anthers* about 1·4 cm. long. *Fruit* not seen.—H. H. Johnston, Uganda: 161, 167, 317 (1902); Baker fil. in Journ. Linn. Soc. Bot. **38,** 266, and tab. 16 (1908); Fries in Svensk Bot. Tidsk. **16,** 400 (1922).

Type specimen *Stuhlmann* 2406 in Herb. Berlin.

Uganda: Ruwenzori; between 10,000 and 12,000 ft., *Stuhlmann* 2406! According to Stuhlmann's label the leaves are pale green with a purple apex and there is a conspicuous leaf-rosette; yellowish-white latex is also present.

This species has been confused with *Lobelia karisimbensis* R. E. & Th. Fries, but can be distinguished from it by the densely puberulous upper surface of the leaves.

8. **Lobelia karisimbensis** *R. E. Fr. & Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 400 (1922).

A plant 4–14 ft. high with a long bare stem, crowned by a rosette of leaves from which the inflorescence arises. *Leaves* up to 45 cm. long and 3·5 cm. broad, narrowly linear-lanceolate, gradually tapering to the sessile base, acute at the apex, glabrous above, sparsely covered with long hairs beneath especially at the base and on each side of the midrib, margin closely repand-denticulate; lateral nerves spreading at an angle of about 60° from the midrib, anastomosing to form a conspicuous reticulum below. *Bracts* adpressed to the spike, about 4 cm. long and 0·5 cm. broad, shorter than the flowers, narrowly lanceolate, gradually tapering to the acute apex, glabrescent on the lower surface, thinly hairy to glabrescent above, thinly ciliate on the margin towards the base, glabrous at the apex. *Pedicels* about 0·4 cm. long, glabrous to pubescent. *Calyx-tube* campanulate, about 0·4 cm. long, glabrescent to pubescent; lobes narrowly triangular, acute at the apex, 1·5–2·3 cm. long, about 0·3 cm. broad at the base, glabrous to thinly

pubescent above, glabrous below, margin ciliate. *Corolla* purplish-chocolate, up to 5 cm. long, produced into a beak about 1·8 cm. long in front of the anthers, puberulous to glabrescent without, puberulous within. *Filaments* about 2·3 cm. long, thinly pubescent, free at the base. *Anthers* 0·9–1·2 cm. long.—*Lobelia Stuhlmannii* Engl. in Wissensch. Ergebn. d. deutsch. Zentral-Afrika-Exp. **2,** 344 (1911), non Schweinf. *Lobelia lanuriensis* De Wild. in Rev. Zool. Afr. **8,** Suppl. Bot. 29 (1920), and Plant. Bequaert. **1,** 291 (1922).

Type specimen *Mildbraed* 1603 in Herb. Berlin.

Belgian Congo: Virunga Mountains; Karisimbi Volcano, 10,000–10,700 ft., *Mildbraed* 1603! Vissoke Volcano, 11,000–12,100 ft. near summit of volcano, *Burtt* 3020! Mgahinga Volcano, 11,000–11,400 ft., on the crater-rim *Burtt* 2830! Mt. Mgahinga, 11,400 ft. in the crater, *Eggeling* 1058! Mt. Ruwenzori; Lanuri Valley, 10,400–11,400 ft., *Bequaert* 4518!

Uganda: Mt. Ruwenzori; 8000–10,000 ft., *Johnston*! 9000–11,000 ft., *Dawe* 563! Kigo, 11,000 ft., *Fishlock and Hancock* 122! Butaqu Valley, about 11,000 ft., *Scott-Elliot* 7868! 10,000 ft., *Oliver* 17!

This species is very near to *L. Stuhlmannii* and only appears to differ in the glabrous upper surface of the leaf and the smaller flowers. As the type specimen of *L. Stuhlmannii* consists of inadequate material it may, when further material has been examined, prove to be the same as *L. karisimbensis*. Fries separated the two species on the size of the anthers and the smaller pubescent flowers. According to him *L. Stuhlmannii* has only been recorded from Ruwenzori and *L. karisimbensis* from the Virunga Mountains.

I have been able to examine five different collectings from the Virunga Mountains and found the corollas to be pubescent in all cases and the size of the anthers to vary from 0·9–1·1 cm. These two characters fit Fries's description of *L. karisimbensis* except for the slightly larger anthers. Four different collectings have been examined from Mt. Ruwenzori; in two cases the corolla was subglabrous and in two it was definitely pubescent, whilst the size of the anthers varied from 1–1·3 cm. These facts seem to show that the original conception of the species *L. karisimbensis* must be slightly enlarged so as to include those specimens with larger anthers and subglabrous flowers.

The distribution is also widened so as to include Mt. Ruwenzori.

9. **Lobelia bambuseti** *R. E. Fr. & Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 401 and tabs. 4, 6, i-1 (1922).

Plant about 12 ft. high. *Leaves* sessile, narrowly lanceolate to oblong-lanceolate, acute at the apex, basal ones 30 cm. long and 5 cm. broad, upper ones about 25 cm. long and 2 cm. broad, slightly pubescent on the upper surface particularly on the midrib, becoming glabrescent; lower surface thinly hirsute on the nerves and margin; margin entire or subentire; midrib prominent on the lower surface,

about 3 cm. thick at the base, lateral nerves spreading at an angle of about 60° from the midrib. *Rhachis* of the inflorescence pubescent. *Bracts* linear-filiform, longer than the flowers, about 8 cm. long and 0·2–0·3 cm. broad at the base, gradually tapering to a fine point at the apex, thinly ciliate on the margin, otherwise glabrescent. *Pedicels* about 0·5 cm., long, glabrescent. *Calyx-tube* campanulate, glabrous or glabrescent; sepals linear to narrowly triangular, tapering to the acute apex, about 2·5 cm. long and 0·2 cm. broad at the base, ciliate on the margin, otherwise glabrescent. *Corolla* greenish-white, glabrous, about 4 cm. long and 0·4 cm. in diameter, produced at the apex into a short point (about 0·5 cm.) beyond the anthers, splitting into 5 linear lobes. *Filaments* about 3 cm. long, free in the lower third. *Anthers* 0·9–1 cm. long.

Type specimen *Fries* 2257 in Herb. Upsala.

KENYA COLONY: Aberdare Mountains; the Upper bamboo zone, *Fries* 2257! Kinangop, Loreko, in the bamboo region, *Napier* 1261! *Evan James*! Mt. Kenya; in the upper part of the bamboo region, *Fries* 919!

10. **Lobelia usafuensis** *Engl.* Bot. Jahrb. **30,** 420 (1901).

Plant 9–20 ft. high. *Rosette-leaves* subsessile, oblanceolate, up to 75 cm. long and 13 cm. broad, gradually narrowed to the base, apex shortly acuminate, margin doubly serrate, teeth deltoid with upcurved mucro; lower portion of leaf indistinctly serrate; lateral nerves spreading at angles between 60° and 90° from the midrib; upper surface glabrous, lower surface glabrescent; midrib about 1 cm. thick at the base. *Cauline leaves* sessile, lanceolate, gradually narrowed to the apex, serrate on the margin, glabrous above, slightly pubescent below. *Rhachis* of the inflorescence pubescent, flowers forming a dense raceme. *Bracts* shorter than the flowers, linear-lanceolate, about 1·5 cm. long and 0·4 cm. broad at the base, gradually tapering to the apex; margin indistinctly serrate, both surfaces pubescent. *Pedicels* about 0·4 cm. long, pubescent. *Calyx-tube* campanulate, about 0·4 cm. long, shortly and closely pubescent; lobes oblong-lanceolate, acute at the apex, 1·1·5 cm. long, 0·2–0·3 cm. broad, shortly pubescent without, glabrescent within. *Corolla* cylindric in bud, about 2·5 cm. long and 0·3 cm. broad, apex produced to a short point beyond the anthers (about 1 mm. long), pubescent outside, more densely so towards the apex, becoming glabrescent at the base. *Filaments* about 2 cm. long, free in their lowest quarter. *Anthers* 1–1·1 cm. long.—Goetze and Engl. Vegetationsansicht Deutsch. Ost-Afr. tab. 51 (1902) (Hab.); Fries in Svensk Bot. Tidsk. **16,** 399 and tab. 3 f-g (1922).

Type specimen *Goetze* 113 in Herb. Berlin.

TANGANYIKA TERRITORY: North of Lake Nyasa; Kyimbila district, about 4400 ft., *Stolz* 1662! Usafua Mts. (Rungwe) about 7500 ft., *Goetze* 1133! Livingstone Mts., Njombe, about 6000 ft., *Lynes* Fr. 72a! Fr. 72b! Fr. 72c! Rungwe District, about 5500 ft. *Geilinger* 1999! 2159! 2314! 2352!

11. **Lobelia Volkensii** *Engl.* Bot. Jahrb. **19,** Beibl. 47, 49 **(1894).**

A shrubby plant up to 18 ft. high, the inflorescence up to 6 ft. long. *Basal leaves* oblanceolate, 40–80 cm. long and 8–14 cm. broad, glabrous above, pubescent on the nerves below, midrib pale red; margin doubly serrate, the teeth ascending: lateral nerves spreading at an angle of about 90° from the midrib, prominent below, impressed above, anastomosing. *Cauline leaves* sessile, oblanceolate, narrowed to the base, acute at the apex, margin finely serrate, teeth inconspicuous, very short, erect: lateral nerves spreading at angles between 60° and 90° from the midrib, not distinctly looped within the margin; lower surface pubescent, particularly on the midrib, upper surface glabrescent. Leaves just beneath the inflorescence linear-lanceolate, closely pubescent on the lower surface, thinly so on the upper. *Rhachis* of the inflorescence pubescent. *Bracts* linear to linear-lanceolate, longer than the flowers, about 6 cm. long and 0·3 cm. broad at the base, gradually tapering to a fine point at the apex, margin indistinctly and distantly serrate, teeth short, erect; both surfaces pubescent, lower more densely so. *Pedicels* about 0·5 cm. long, pubescent, bearing 2 small linear, ciliate, bracteoles about half-way down. *Calyx-tube* campanulate about 0·5 cm. long, densely tomentose, forming a thick mat on the surface; lobes narrowly oblong-lanceolate, 1·4–1·8 cm. long, and about 0·3 cm. broad, densely pubescent without, thinly so within. *Corolla* bluish-violet above, greenish below, cylindric in bud, 2·2–2·6 cm. long, and about 0·4 cm. broad, rounded at the apex, densely woolly-tomentose near the apex, glabrescent below, splitting into 5 narrowly oblong lobes. *Filaments* 1·5–2 cm. long, free in the lowest quarter. *Anthers* 0·9–1 cm. long.—Volkens, Kilimandscharo, 301 (1897) (Hab.).

Type specimen *Volkens* 1501 in Herb. Berlin.

TANGANYIKA TERRITORY: Mt. Kilimanjaro; found especially alongside streams and in the forest, in Marangu district about 7600 ft., also fairly common between 6000 and 8000 ft., *Volkens* 1501! Near Marangu, 6500 ft., *Groote* 4007!

According to Fries specimens have also been collected from West Usambara at an altitude of about 5000 ft.

This species is very close to *L. giberroa* and resembles it in habit as well as floral characters. It is only separated from it by the woolly indumentum on the calyx-tube and the smaller anthers. On examination of further material from the district it may prove to be only a form of *L. giberroa*, which is a very variable species. This view is strengthened by the fact that a specimen of *Haarer's* (No. 1758) from Useri, Kilimanjaro, has the smaller anthers of *L. Volkensii* but the indumentum of *L. giberroa*, into which species it has been placed. *Burtt* 2376 from Mt. Ufiume also appears intermediate.

12. **Lobelia giberroa** *Hemsl.* in Oliv. Fl. Trop. Afr. **3,** 465 (1877).

Plant 10–20 ft. high, with an inflorescence 3–6 ft. long. *Basal leaves* sessile, broadly oblanceolate, up to 60 cm. long and 16 cm. broad, narrowed to the base, acuminate at the apex; margin generally doubly serrate, with the teeth spreading outward or slightly upcurved; lateral nerves spreading at angles between 60° and 90° from the midrib, looped within the margin; lower surface thinly pubescent to glabrescent, upper surface glabrous, or slightly pubescent on the midrib. *Upper leaves* narrowly oblanceolate, becoming linear-lanceolate just below the inflorescence, apex long-acuminate, lateral nerves ascending at a more acute angle than in the basal leaves. *Rhachis* pubescent, flowers forming a dense raceme. *Bracts* linear, longer than the flowers, up to 7 cm. long and 0·3 cm. broad, shortly pubescent on both surfaces; margin indistinctly serrate with upcurved teeth. *Pedicels* 0·4–0·8 cm. long, pubescent, with 2 small, linear bracteoles towards the base. *Calyx-lobes* 5, oblong to linear-lanceolate from a deltoid base, acute at the apex, 1·5–2 cm. long and 0·2 0·3 cm. broad, pubescent on both sides; tube shorter than the lobes, campanulate, about 0·5 cm. long, thinly to densely pubescent. *Corolla* greenish-white, 2·5–3 cm. long and about 0·5 cm. broad, cylindric in bud, generally rounded at the apex, but sometimes produced to a small point beyond the anthers, thinly pubescent at the base to densely crisped-pubescent at the apex, splitting into 5 linear-lanceolate lobes, glabrescent within. *Filaments* about 2 cm. long slightly pubescent, free in their lowest quarter. *Anthers* 0·9–1·2 cm. long.—Rendle, Bak. f. & S. Moore in Journ. Linn. Soc. **38,** tab. 17 (1908) (Hab.); Fiori in Bull. Soc. Bot. Ital. 1910, 60; 1911, 127, 128. Fries in Svensk Bot. Tidsk. **16,** 397 (1922). *Tupa Schimperi* Hochst. in A. Rich. Fl. Abyssin. **2,** 10 (1851). *Lobelia ulugurensis* Engl. in Pflanzenl. Ost-Afr. **3A,** 92 (1895). *Lobelia Volkensii* Engl. var. *ulugurensis* Engl. in Notizbl. bot. Gart. Berlin **1,** 106 (1895). *Lobelia squarrosa* Bak. in Kew Bull. 1898, 157.

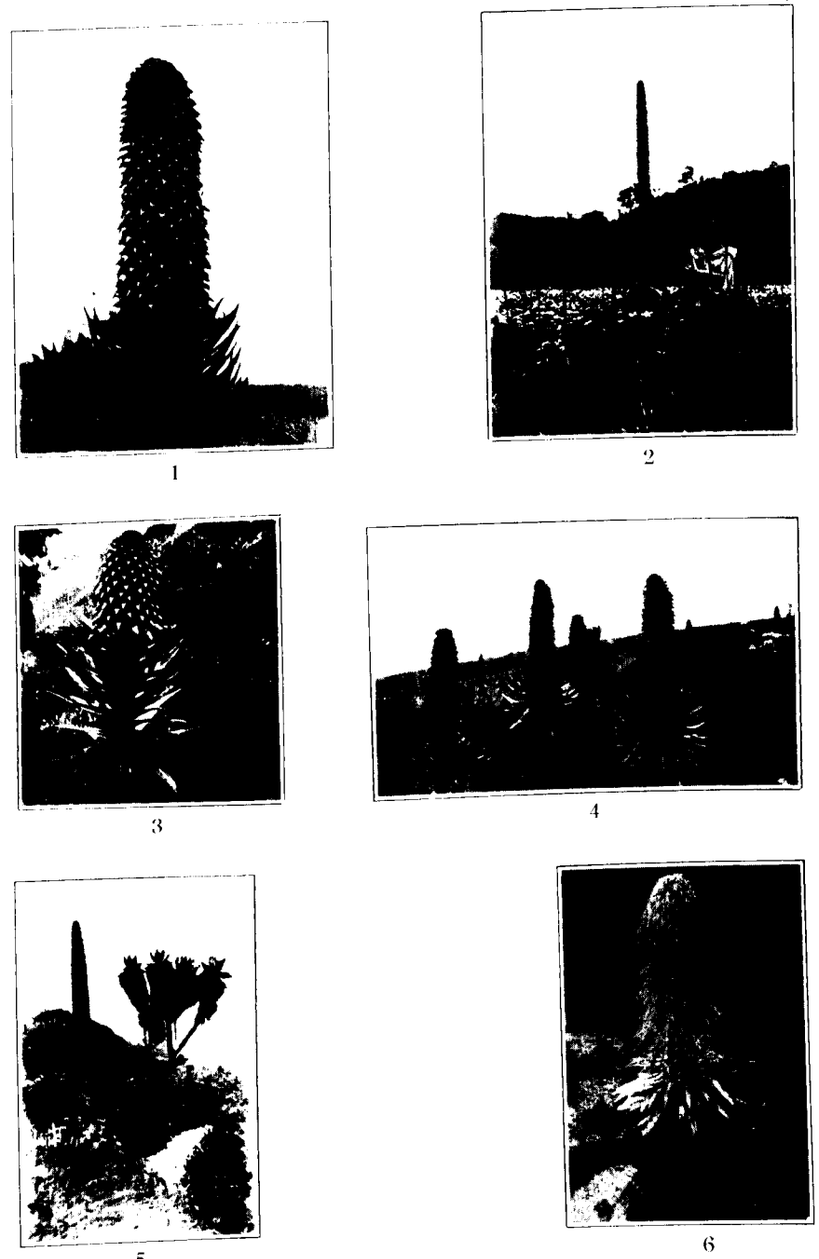
Type specimen *Schimper* 908 in Herb. Kew.

UGANDA: Western Ankole; 5000–7000 ft., *Doggett*! 5000 ft., *Dawe* 341! Ruchiga, 7100–7200 ft., *Bagshawe* 436! Ruwenzori, 6000–7500 ft., *Dawe* 565! Mihuya, 5500 8000 ft., *Fishlock and Hancock* 211! *Humphreys* 551! 8000 10,000 ft., *Fyffe* 41! Mt. Elgon; open forest above Bulambuli, 10,000 ft., *Liebenberg* 1677! Near Sipi, in dry country near the end of the forest, 6000 ft., *Wallace*!

EASTERN SUDAN: Imatong Mts. near Agoro, 6500 ft., in a wet gulley, *Brasnett* 1181! 5500 ft., in a sheltered ravine, *Chipp* 56!

KENYA COLONY: Mt. Elgon; 8200 ft., *Lugard* 519! Mt. Kenya; 7600 ft., *Fries* 719! Aberdare Mts.; common in forest clearings, 7000–9500 ft., *Battiscombe* 531! Limoru, 7000 ft., in a wooded ravine, *Dummer* 1665! Above Nakuru, by a swamp near Bahati Forest Station, 7800 ft., *Dale* 2670!

Plate V



Giant Lobelias in their natural habitats. 1, *L. Deckenii*; 2, *L. Mildbraedii*; 3 and 4, *L. Burttii*; 5, *L. Bequaertii*; 6, *L. Telekii*.

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BELGIAN CONGO: Virunga Mountains; Namlagira Volcano, 9000–10,000 ft., *Burtt* 3140! Vissoke Volcano, in *Hagenia-Hypericum* wood, 9000 ft., *Burtt* 3018!

TANGANYIKA TERRITORY: Utshungwe Mts., 5900 ft., *Goetze* 626! Ufiume Mts., 7000 ft., *Burtt* 2376! Mt. Kilimanjaro, Useri, 7500 ft., *Haarer* 1758! 7150 ft., *Geilinger* 4694! Mt. Meru, 5800 ft., *Geilinger* 3769!

ABYSSINIA: Mt. Aber, between Addesselam and Maizacholo, 8000–8300 ft., *Schimper* 908! Mt. Zuquala 9000–9665 ft., *Hugh Scott* s.n.!

13. **Lobelia Bequaertii** *De Wild.* in Rev. Zool. Afr. **8,** Suppl. Bot. 31 (1920).

Plant 6–16 ft. high with a large hollow stem 6–8 ins. diameter. *Leaves* sessile, broadly lanceolate, broadest below the middle, gradually narrowed to the rounded apex, 23–32 cm. long, 5·5–7 cm. broad, margin entire or obscurely crenulate at the apex, sparsely ciliate to glabrous; under surface glabrous, upper surface sparsely covered with long hairs, more densely so towards the base: midrib fleshy, prominent below, about 1·4 cm. broad at the base; lateral nerves conspicuous on the lower surface, ascending at an angle of about 45° from the midrib. *Bracts* longer than the flowers, ovate, broadest about or slightly above the middle, sessile at the base, 6·5–9·5 cm. long, 3·5–6 cm. broad, rather abruptly long-acuminate at the apex, acumen 1–2 cm. long; margin obscurely undulate and thinly ciliate, otherwise glabrous. *Pedicels* about 0·7 cm. long, glabrous, with 2 fleshy bracteoles towards the base. *Calyx-tube* hemispherical, 0·6–0·8 cm. long, enlarging in fruit, glabrescent; lobes triangular, glabrous, 1–1·3 cm. long and about 0·4 cm. broad at the base, rounded or subacute at the apex, very sparsely ciliate on the margin to glabrous. *Corolla* violet, splitting into 5 strap-shaped lobes about 2·5 cm. long and 0·2 cm. broad, reflexed at the apex, glabrous without, densely crisped-pubescent within at the apex; stamens well exserted from the corolla. *Filaments* 2·4–3 cm. long, free in the lower half. *Anthers* about 1·1 cm. long.—De Wild. Plantae Bequaert. **1,** 289 (1922). *Lobelia Deckenii* Hemsl. partly; H. H. Johnston Uganda **1,** 162, 163, 172, 173 (1902) (Hab.); Rendle, Bak, f. & S. Moore in Journ. Linn. Soc. Bot. **38** t. 17, fig. 4 (1908); Chiovenda and Cortesi in Il. Ruwenzori Angiosp. t. 15–18 (1909).

Type specimen *Bequaert* 4519 in Herb. Brussels.

UGANDA: W. Ruwenzori; Kigo, 11,000 ft., *Fishlock* and *Hancock* 123! E. Ruwenzori; 10,000–11,000 ft., *Dawe* 561! *Humphreys* 519! 10,000–12,000 ft. *Doggett*!

14. **Lobelia Burttii** *E. A. Bruce* in Kew Bull. 1933, 473.

Erect plant with an inflorescence 1½–4 ft. long; the young plants have their leaf-rosettes borne on an axis 1–1½ ft. high. *Lower leaves* lettuce-green, sessile, linear-lanceolate to narrowly

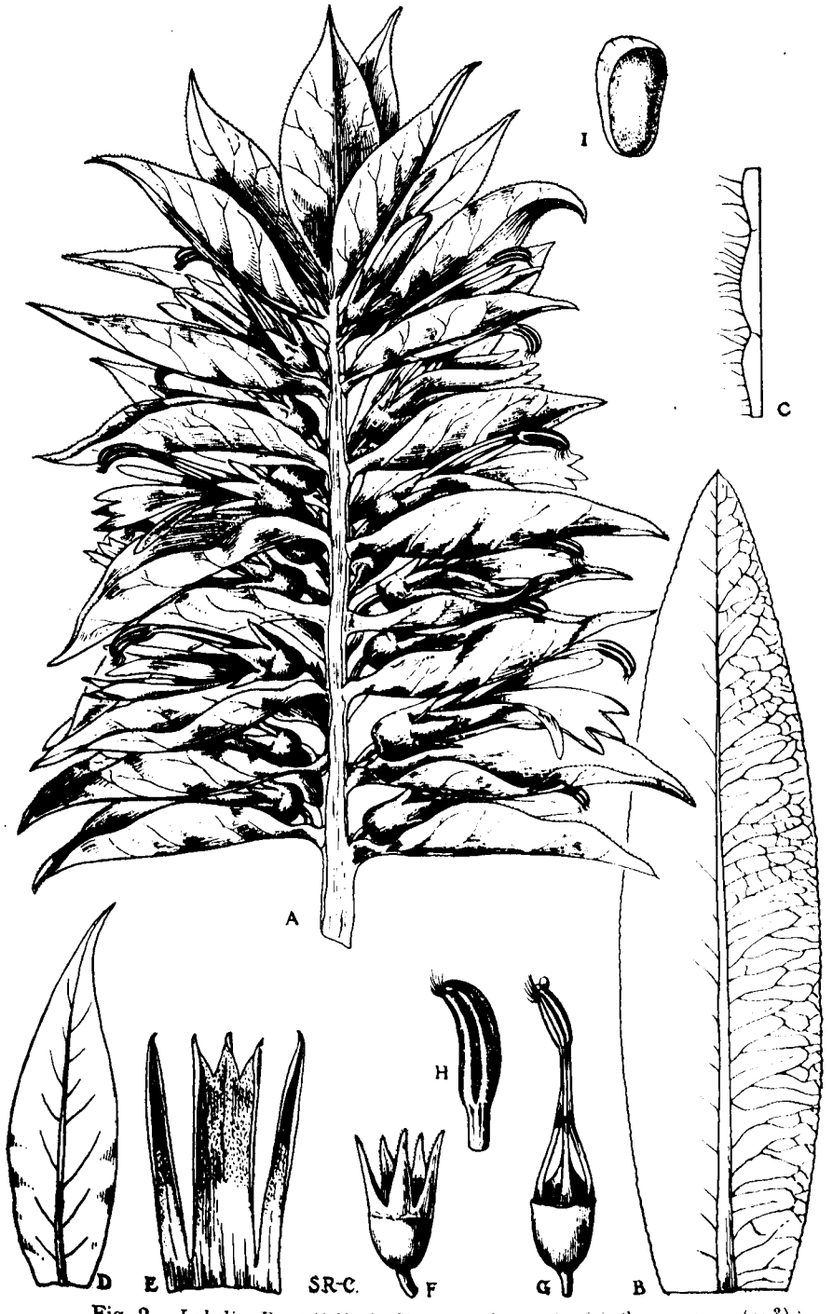


Fig. 2. *Lobelia Burttii* E. A. Bruce. A, part of inflorescence (× ⅔); B, leaf (× ⅓); C, leaf margin (× 12); D, bract (× ⅔); E, corolla (× 1); F, calyx (× 1); G, androecium and gynoecium (× 1); H, anther (× 2); I, seed (× 8).

ovate-lanceolate, 14–25 cm. long, 3–5 cm. broad, broadest just below the middle, gradually narrowed to the rounded or subacute apex, which is sometimes minutely apiculate; margin entire, ciliate, both surfaces dull, glabrous; lateral nerves ascending at an angle of about 45° from the midrib, inconspicuous on the upper surface, visible below. *Upper leaves* lanceolate to linear-lanceolate, narrowed to the acute apex, 14–17 cm. long, 2·5–3 cm. broad, otherwise as above. *Bracts* about twice as long as the flowers, ovate to ovate-lanceolate, 6–9 cm. long, 2·5–3·5 cm. broad, broadest just below the middle, gradually narrowed to the shortly acuminate apex; margin entire, thinly ciliate, otherwise glabrous. *Pedicels* glabrous, about 1 cm. long or less, bearing just below the middle two small, fleshy, triangular bracteoles about 1·5 mm. long. *Calyx-tube* campanulate, glabrous, in bud 4–9 mm. long, 4–6 mm. broad, in fruit 0·8–1·5 cm. long and about 1 cm. broad; lobes narrowly lanceolate to triangular, rounded to acute at the apex, minutely apiculate, glabrous on both sides, sparingly ciliate on the margin, in bud 0·7–1·2 mm. long, 2–4 mm. broad at the base, in fruit up to 1·5 cm. long and 0·5 cm. broad at the base. *Corolla* indigo-blue, lilac or violet, glabrous without, about 3 cm. long, splitting down the back and then dividing into 5 lobes; lobes erect, the 2 lateral ones free to the middle, the 3 central ones free at the apex, united in the lower three-quarters, broadly linear, acuminate, crisped-pubescent in the middle-third within, otherwise glabrous. *Filaments* about 2 cm. long, glabrous, free in the lower half. *Anthers* about 0·9 cm. long.

Type specimen *Burtt* 4049 in Herb. Kew.

TANGANYIKA TERRITORY: Mbulu district; Mt. Hanang, 11,000 ft., in the mossy shade of lava cliffs on the west face of the crater, just below the summit of the mountain, *Burtt* 4049! Arusha district; Mt. Meru, on the south side of the cone, 12,000–13,000 ft., among *Helichrysum Newii* and spp., also *Erica*, *Phillipia* and *Alchemilla*, most prevalent in ravines, *Burtt* 4128! Mbulu district; Ngorongoro, Mt. Loolmalassin, 11,000 ft., in a small marsh on the south side of the mountain in a valley among *Erica arborea*, *Philippia*, *Stoebe*, *Adenocarpus* and *Artemisia*, *Burtt* 4214!

15. **Lobelia Deckenii** *Hemsl.* in Oliv. Fl. Trop. Afr. **3**, 466 (1877).

Plant 3–12 ft. high. *Leaves* lanceolate to linear-lanceolate, sessile, broadest just above the base, gradually narrowed to the acute apex, 16–24 cm. long, 2·5–3·5 cm. broad, margin entire or slightly undulate towards the apex, both surfaces bearing a few scattered hairs or glabrescent; lateral nerves ascending at an angle of about 30° from the midrib, anastomosing, impressed above, slightly raised beneath. *Bracts* longer than the flowers, ovate or oblong-ovate, broadest about the middle, slightly narrowed to the sessile base, 7·5–10 cm. long, 2·8–4 cm. broad, acute or acuminate at the apex, with a distinct midrib and anastomosing lateral veins, glabrous on both sides, margin entire or slightly crenulate-undulate,

very sparingly ciliate. *Pedicels* glabrous, about 0·7 cm. long, bearing 2 small triangular bracteoles halfway up. *Calyx-tube* campanulate, about 0·5 cm. long, glabrous, lobes narrowly triangular, 1–1·3 cm. long, 0·3–0·5 cm. broad at the base, acute or subacute at the apex, mucronate, enlarging in fruit, glabrous on both sides, ciliate on the margin. *Corolla* vivid blue, one-lipped, not splitting into lobes, 3·5–4·5 cm. long, lip about 1·5 cm. across when spread out, glabrous within and without, stamens exserted from the corolla when split. *Filaments* 4–4·5 cm. long, free in the lowest third. *Anthers* about 1 cm. long, or more.—Karsten and Schenck, Veg. Bild. **12,** tab. 9, 10 (1919); Fries in Svensk Bot. Tidsk. **16,** 408 (1922). *Tupa* (*Rhynchopetalum*) *Deckenii* Aschers. in Sitzungsber. d. Gesellsch. Naturf. Freunde 1868, 23 (1869); Bot. Zeit. 1869, 71; C. C. von der Decken, Reisen in Ost-Afrika, **3,** 3, p. 74, tab. 5 (1879). *Tupa Kerstenii* Vatke in Linnaea, **38,** 725 (1874). *Lobelia Tayloriana* Bak. f. in Journ. Bot. **32,** 67, tab. 341 (1894).

Type specimen *Kersten* in Herb. Berlin.

TANGANYIKA TERRITORY: Kilimanjaro, above Mamba 8500 ft., *Volkens* 773! 12,000–13,000 ft., *Johnston* 115! Between Peter's Hut and the Saddle, associated with *Senecio Cottonii*, 13,000 ft., *Burtt* 2331! *Milne* 10/7! Between Umbwe and Weru Weru rivers, 11,000 ft., in Giant Heath-*Brayera-Podocarpus* forest, *Greenway* 3143! Grassy slope above Moschi, 10,000 ft., *Uhlig* 87! *Uhlig* 103! On a stony slope by stream at Garanga 12,000 ft., *Uhlig* 109! Bismarkhugel 10,000 ft., *Groote* G.6256! Above Machanve, 12,500 ft., *Moreau* 58a!

16. **Lobelia keniensis** *R. E. Fr.* et *Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 413, tab. 2 and 7 c–g (1922).

Leaves lanceolate, sessile, broadest just below the middle, gradually narrowed to the subacute apex, 19–24 cm. long, 5–5·5 cm. broad, margin entire, ciliate towards the base; upper surface of leaf densely matted-pubescent in lower third, glabrous towards the apex; lower surface glabrous; midrib fleshy, lateral nerves ascending at an angle of about 30°, anastomosing, conspicuous on both surfaces. *Bracts* longer than the flowers, ovate, broadest about the middle, sessile at the base, gradually acuminate at the apex, 6·5–10 cm. long, 3–4 cm. broad, margin entire in the lower half, obscurely crenulate near the apex, midrib and lateral nerves distinct; lower surface glabrous or with a few hairs near the base, upper surface with long hairs on the midrib, otherwise glabrous; margin ciliate, more densely so towards the base. *Pedicels* glabrous, about 0·8 cm. long with 2 small ovate-lanceolate, pubescent bracteoles near the centre, 0·2–0·3 cm. long. *Calyx-tube* campanulate, glabrous, 1–1·3 cm. long, enlarging in fruit; lobes triangular, 1·2–1·8 cm. long, 0·5–0·7 cm. broad at the base, acute or subacute at the apex, mucronate, glabrous on both sides, ciliate on the margin. *Corolla* one-lipped, not splitting into lobes, 2·5–3·0 cm. long, about 1·5 cm. broad across the lip, glabrous without,

densely crisped-pubescent within at the base, stamens just exserted from the corolla when split. *Filaments* 1·3–1·8 cm. long, free in the lower half. *Anthers* about 1 cm. long, densely pubescent at the base and between the anther cells.—*Lobelia Gregoriana* Bak. fil. in Journ. Bot. **32,** 66 (1894) quoad inflorescentiam; folia *Senecionis Brassicae* R. E. Fr. et Th. Fr. jr.

Type specimen *Fries* 1303 in Herb. Upsala.

KENYA COLONY: Mt. Kenya; Western Slopes in the lower alpine region 10,800 ft., *Fries* 1303! 12,000–13,000 ft., *Lyne Watt* 1139! On moorlands 11,000 ft., *Rammell* 2669! 11,800 ft., in the "giant heath" zone, *Mearns* 1492!

17. **Lobelia sattimae** *R. E. Fr.* et *Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 414 (1922).

Plant with stem about 3–4 ft. high, crowned with a dense leafy rosette, and bearing an inflorescence about 6 ft. long. *Leaves* lanceolate, sessile, broadest below the middle, gradually narrowed to the subacute apex, 16–30 cm. long, 5–7 cm. broad, margin entire or obscurely crenulate towards the apex, sparsely ciliate or glabrous; under surface of leaf glabrous, upper surface long-matted-pubescent near the base, becoming glabrous towards the apex; midrib fleshy, lateral nerves ascending at an angle of about 30°. *Bracts* longer than the flowers, ovate, broadest below the middle, sessile at the base, long-acuminate at the apex, 6–9 cm. long, 3·5–5 cm. broad, margin entire or obscurely crenulate above, closely ciliate in the lower half, becoming glabrous towards the apex, shortly pubescent on both surfaces. *Pedicels* about 0·8 cm. long, glabrous, with 2 small triangular bracteoles towards the base about 0·3 cm. long. *Calyx-tube* campanulate, about 0·7 cm. long, pubescent to glabrescent; lobes triangular 1·2–1·7 cm. long, 0·4–0·5 cm. broad, pubescent on both sides, densely ciliate on the margin. *Corolla* deep purple, one-lipped, not splitting into lobes, 2·5–3 cm. long, and about 1·4 cm. across the lip when spread out, slightly pubescent without, densely crisped-pubescent within at the base, stamens just exserted from the corolla when split. *Filaments* about 2 cm. long or less, free in lowest third. *Anthers* about 1 cm. or more.

Type specimen *Fries* 2468 in Herb Upsala.

KENYA COLONY: Aberdare Mts.: Mt. Sattima, alpine Region, 11,400 ft., *Fries* 2468! 12,500 ft., *Dale* 2864! Kinangop Mt., on grassy slopes above the forest limit, 10,000–12,700 ft., *Galpin* 7903! 11,000–13,000 ft., *Dale* 2682!

18. **Lobelia elgonensis** *R. E. Fr.* et *Th. Fr. jr.* in Svensk Bot. Tidsk. **16,** 411 tab. 7a (1922).

Leaves broadly lanceolate, entire, about 25 cm. long and 7 cm. broad, rounded at the apex, glabrous below, upper surface thickly pubescent in the lower third, glabrous in upper two-thirds; lateral nerves closely ascending at an angle of about 30°, slightly outcurved, conspicuous below, indistinct above. *Bracts* longer than the

flowers, ovate (smaller ones near the apex of the inflorescence ovate-lanceolate), broadest just above the middle, slightly narrowed to the sessile base, rather abruptly acuminate at the apex, about 8·5 cm. long and 4 cm. broad (acumen about 1 cm. long), glabrous on both sides, thinly ciliate on the margin, which is entire at the base and crenulate towards the top. *Pedicels* about 0·8 cm. long, glabrous, bearing 2 fleshy, ovate-lanceolate bracteoles about 0·4 cm. long. *Calyx-tube* campanulate, glabrous, lobes narrowly triangular, about 1·4 cm. long and 0·5 cm. broad at the base, acute at the apex, glabrous on both sides but ciliate on the margin. *Corolla* one-lipped, 2·5–3 cm. long, the lip about 1·5 cm. broad when spread out, thickly crisped-pubescent within, glabrescent without; stamens shorter than the split corolla. *Filaments* 1·5–2 cm. long, free in the lower half. *Anthers* about 0·8 cm. long.

Type specimen *Lindblom* s.n. in Herb. Holm.

UGANDA: Mt. Elgon; 13,000 ft., *Lindblom*. From just below Madangi to the foot of Jackson's Summit, about 13,000 ft., *Liebenberg* 1674! A higher swamp *Lobelia* from 13,000 ft. to the summit, *Tweedie* 111! 102!

19. **Lobelia Telekii** *Schweinf.* in von Höhnel, Zum Rudolph-See und Stephanie-See 861, tab. 863 (1892).

Plant 2–6 ft. high, often leafless, with a long flower spike arising straight out of the ground; the non-flowering form is cabbage-like, consisting of a rosette of leaves about 9 ins. long. *Upper leaves* linear-lanceolate, sessile, gradually narrowed to the acute apex, 14–23 cm. long and 1·4–3 cm. broad, margin entire, shortly ciliate, upper and lower surfaces thinly puberulous, more densely so at the base; midrib prominent below, lateral nerves ascending at an angle of about 30°, anastomosing. *Basal leaves* linear-lanceolate, about 2 cm. long and 2·5 cm. broad at the base, gradually narrowed to the acute apex, margin entire, long-ciliate, under surface thinly pubescent more densely so towards the base and on the midrib, upper surface puberulous with long hairs at the base; lateral nerves ascending at an angle of about 30° from the midrib, anastomosing. *Bracts* at least 5 times as long as the flowers, linear, sessile at the base, gradually long-acuminate at the apex, 9–16 cm. long, 0·2–0·4 cm. broad, closely long-ciliate on the margin, thinly long-pubescent on the upper surface, subglabrous below. *Pedicels* about 0·5 cm. long, glabrous or thinly long-pubescent. *Calyx-tube* narrowly campanulate, from 0·4–0·8 cm. long, thinly to densely long-pubescent, lobes narrowly triangular, 0·8–1·3 cm. long and 0·1–0·2 cm. broad at the base, acute at the apex, long-ciliate on the margin, otherwise glabrescent. *Corolla* small, greenish-blue, pale mauve or dark purple, sometimes with white on the throat, 1·2–1·8 cm. long, pubescent without and bearing a long tuft of hairs at the apex, splitting half way down into 5 linear-lanceolate lobes, acute at the apex. *Filaments* about 1·2 cm. long, free at the base. *Anthers* about 0·5 cm. long. *Seeds* narrowly ovoid, about 0·6 mm. long,

margin not winged.—Bak. fil. in Journ. Bot. **32, 68** (1894); Gard. Chron. Ser. III, **59,** 126 (1916) (Hab.); Fries in Svensk Bot. Tidsk. **16,** 415 and tabs. 1 and 8 a–c. *L. Fenniae* Th. Fr. in Bot. Notiser 1923, 296, tab. 1–2.

Type *Höhnel*, W. Slopes of Mt. Kenya, Herb. Berlin.

UGANDA: Mt. Elgon; 13,800 ft., *Dummer* 3385! 13,500 ft., *Lugard* 435! 436! From below Madangi to foot of Jackson's Summit, *Liebenberg* 1617! Alpine grassland 12,600 ft., *Thomas* 629!

KENYA COLONY: Mt. Elgon; above the 13,000 ft. contour, *Honoré* 2519! 13,000 ft. and over in open country Mrs. *D. R. Tweedie* C.8! Mt. Kenya; lower alpine region about 10,700 ft., *Fries* 1255! 12,000–13,000 ft., *Lyne Watt* 1140! 11,000 ft., *Rammell* 2668! W. slopes, about 11,800 ft., *Mearns* 1467! 11,400–13,000 ft., *Gregory*! Aberdare Mountains; Alpine region, *Fries* 2415! Summit of Mt. Kinangop, 12,500–12,700 ft., *Galpin* 7903! 11,000–13,000 ft., *Dale* 2672! Mt. Sattima, 11,000–12,800 ft., *Dale* 2847!

20. **Lobelia Wollastonii** *Bak. f.* in Journ. Linn. Soc. **38,** 265 and tab. 19 (1908).

Plant 4–20 ft. high with an inflorescence up to 10 ft. long. *Leaves* narrowly oblong-lanceolate, sessile at the base, rounded to acute at the apex, with nearly parallel sides, 25–50 cm. long, 3–4·5 cm. broad, shining, coriaceous; glabrous on both surfaces except for the midrib, which is furnished with a few long fine hairs in the lower part; midrib fleshy, prominent, lateral nerves numerous, reticulate, spreading from the midrib at an angle of about 60°, impressed above, prominent below. *Bracts* drooping, up to twice as long as the flowers, linear to linear-lanceolate, broadest at or just above the base, gradually long-acuminate at the apex, about 6–8 cm. long, and 0·5 cm. broad at the base, both surfaces villous, margin densely so. *Pedicels* about 0·5 cm. long, villous. *Calyx-tube* campanulate, 0·4–0·6 cm. long, covered with long villous hairs; lobes linear, 1·5–2·3 cm. long, 0·3–0·5 cm. broad at the base, finely acuminate at the apex, covered on both sides and on the margin with long villous hairs. *Corolla* indigo to greenish blue, long-pubescent, splitting into 5 linear lobes; in bud 3–4 cm. long, 0·4–0·5 cm. broad, produced into a short point beyond the anthers. *Filaments* 2·8–3·5 cm. long, free at the base. *Anthers* 0·9–1 cm. long. *Seeds* broadly ovoid, about 0·6 mm. long, margin not winged.—Cortesi in Luigi Amadeo di Savoia, El Ruwenzori, Parte Scient. **1,** 445, tab. 44–46 (1909); Nat. Geogr. Mag. Washington **27,** 197 (1915) (Hab.). Fries in Svensk Bot. Tidsk. **16,** 416, tab. 8d (1922).

Type *Wollaston* in Brit. Mus.

UGANDA: East side of Mt. Ruwenzori; 12,000 ft. to the glaciers, *Dawe* 562! 12,500 ft. in swamps and on the sides of valleys, *Fishlock and Hancock* 80! *Humphreys* 550! Bujongolo 12,500–14,000 ft. *Godman*! 12,800–14,700 ft., *Humphreys*! 12,500–14,500 ft., *Wollaston*!

BELGIAN CONGO: Ruwenzori West; Butagu-Tal, 11,700–13,000 ft.; Virunga Mountains; Mt. Mikeno south slope of summit 12,000 ft., common in *Senecio* belt, *Burtt* 3066! Muhavura Mt., 12,000–13,500 ft., *Burtt* 2813! 12,500 ft., in profusion on N.E. slopes near summit, *Eggeling* 1006!

VI—OCHROCARPOS MADAGASCARIENSIS.

T. A. SPRAGUE.

The genus *Ochrocarpos* (*Guttiferae*) was described by Aubert du Petit Thouars in his Genera Nova Madagascariensia, 15 (1806) the generic name being attributed to Noronha. The description was as follows :—

" **Ochrocarpos** *Nor.* Calix diphyllus. Corolla. . . . Stamina numerosa, simplici ordine basi coalita ; antherae ovatae. Ovarium oblongum ; stylus subnullus ; stigma planum, 4-5-6-lobum. Bacca corticosa, multilocularis secundum numerum loborum stigmatis ; loculi monospermi, aliquot abortientes. Semina carnosa, arillata, pseudo-monocotyledonea ; radicula in apice (sic in plerisque Guttiferis).—Arbor ; folia verticillato-ternata, integerrima, coriacea ; flores axillares ; pedunculi pauciflori. Οχρος luteus, Καρπος fructus, a succo luteo abundans, praecipue in fructu."

This description was reproduced verbatim in Roem. Coll. 207 (1809), and a French translation of it by Poiret appeared in Dict. Sc. Nat. **35,** 332 (1825). A. P. De Candolle supplied a slightly modified generic description in DC. Prodr. **1,** 560 (1824) :—

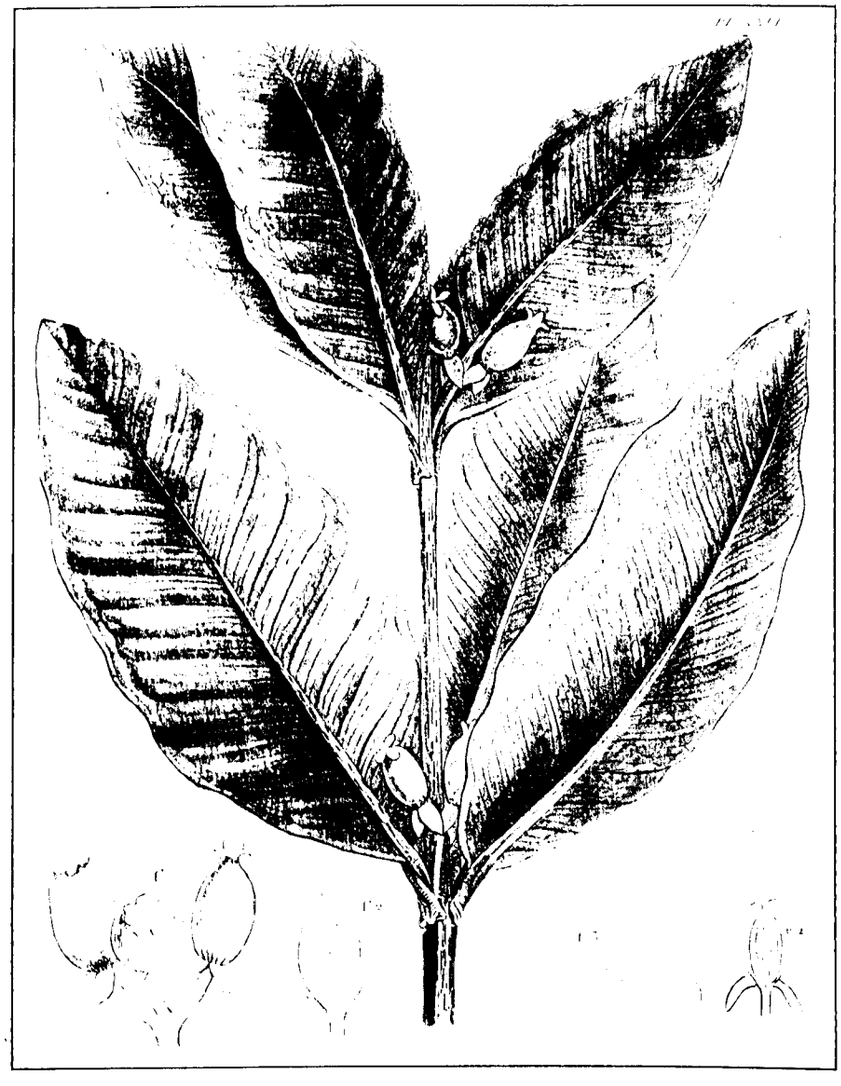
" Calyx 2-sepalus. Stamina numerosa, in triplici ordine disposita, basi coalita. Stylus nullus. Stigma planum, sessile, peltatum, 4–6-lobum. Bacca olivaeformis, 4–6-locularis. Semina arillata, pseudomonocotyledonea.—Arbor. Folia opposita, saepe approximata et quasi verticillato-ternata ; flores axillares ; pedunculi pauciflori."

It will be observed that De Candolle, who had seen a specimen, described the stamens as triseriate (instead of uniseriate), the stigma as sessile and peltate, and the fruit as olive-shaped. He supplied the name of the species, *O. madagascariensis* Thou., erroneously citing this, however, from Thouars, Gen. Nov. Madag., but gave no specific description.

Planchon and Triana (Ann. Sc. Nat. ser 4, **14,** 364 : 1860) supplied a specific diagnosis of *O. madagascariensis*, based on fragmentary material consisting of detached leaves and a piece of stem from herb. Du Petit-Thouars, which they accepted as the type : – " Foliis ternatis v. oppositis lineari-lanceolatis, acutiusculis, nervo medio valido, lateralibus crebris patentibus, venulis reticulatis." Vesque in DC. Monogr. **8,** 521 (1893) added nothing to our knowledge of the species.

A revision of the Madagascan species of *Ochrocarpos* was published by R. Viguier and H. Humbert in Revue générale de Botanique **25 bis,** 630–636 (1914), 16 species being recognized. These authors

Plate VI



Ochrocarpus madagascariensis Thou. Reproduction of plate 26 in Thouars, Hist. Vég. Isles Austr. Afr. ed. 2 (1805).

[*To face page* 88

included the following characters of *O. madagascariensis* in their key :—Leaves elongate-lanceolate, 12 cm. long, 2–2·5 cm. broad ; secondary nerves very close together, ending in a marginal nerve.

At the present day *O. madagascariensis* is perhaps the least known of the various species of *Ochrocarpos*, although it is the type of the generic name. It does not appear to have been rediscovered since the time of Thouars, and is not even mentioned in Nat. Pflanzenfam. ed. 2, **21**, 192 (1925).

The fact that a fairly good plate with analyses of *Ochrocarpos madagascariensis* was published in 1805 by Thouars seems to have been entirely overlooked by all subsequent workers on the genus. This plate appeared in Thouars, Hist. Vég. Isles Austr. Afr. ed. 2, t. 26* (1805). This second edition of Thouars' work is not mentioned in Pritzel's Thesaurus, ed. 2, 95, nn. 2521, 2522 (1872), where only the first edition (1804) and the third (1806) are included. As stated in the Catalogue of the Library of the British Museum (Nat. Hist.), there is a copy of it in the Library of the Kew Herbarium. The plate bears merely the generic name *Ochrocarpos*. The following description of the species (subsequently named *O. madagascariensis* DC.) has been drawn up from the plate.

Caulis angulatus, circiter 8 mm. diametro 15 cm. infra apicem. *Folia* ternatim verticillata, lanceolato-oblonga, apice obtusa vel subacuta, 12–15·5 cm. longa, 4·5–7 cm. lata, margine undulata, nervo medio valido subtus prominente ; nervi laterales principales utrinque circiter 16, patuli, paralleli, juxta medium folii circiter 1 cm. distantes, 3–4 mm. intra marginem arcuatim anastomosantes, nervis subsidiariis circiter 3 inter principales et eis parallelis in quaque areola interjectis ; petioli crassi, 1–1·5 cm. longi. *Cymae* axillares, 3-florae ; pedunculus circiter 2 cm. longus ; pedicelli 1 cm. longi. *Sepala* 2, sub fructu descendenti-reflexa, ovato-oblonga, vix 1 cm. longa. *Bacca* oblongo-ellipsoidea, oliviformis, cum stigmate 2 cm longa, 0·8–1 cm. diametro. *Semina* leviter longitudinaliter curvata, vix 1 cm. longa.

It seems clear that the type of *Ochrocarpos madagascariensis* Thou., as well as that of the generic name *Ochrocarpos* Thou., was the specimen figured by Thouars in Hist. Veg. Isles Austr. Afr. ed. 2, t. 26 (1805). As this has apparently disappeared, Thouars' plate must be accepted as type. A reproduction ($\times \frac{8}{9}$) of it is now given (Plate VI), as the work in which it appeared is very rare.

The attached leaves and piece of stem in herb. Du Petit Thouars, which Planchon and Triana accepted as the type of *O. madagascariensis*, may or may not represent the same species. Planchon and Triana admitted that their adoption of this material as type was a little arbitrary :—" Nous prenons un peu arbitrairement cet exemplaire, reduits à quelques feuilles et à un fragment de rameau (anguleux, à epiderme jaunâtre), comme type de l'*Ochrocarpos*

*The roman numerals of the plate number at the top right hand corner of Pl. VI are unfortunately very faint, giving the impression that the number is xxii instead of xxvi.

madagascariensis de Du Petit Thouars." The leaves, as described by Planchon and Triana, and by Viguier and Humbert, are linear-lanceolate or elongate-lanceolate, 2–2·5 cm. broad, whereas those figured in Thouars' plate are lanceolate-oblong, 4·5–7 cm. broad.

The principal references to the generic name *Ochrocarpos*, and its type-species, *O. madagascariensis*, are given below.

Ochrocarpos *Thou.* Hist. Vég. Isles Austr. Afr. ed. 2, t. 26, cum anal. (1805); Gen. Nov. Madag. 15 (1806); DC. in DC. Prodr. **1,** 560 (1824). *Ochrocarpus*, Juss. Dict. **20,** 104 (1821); Planch. et Triana in Ann. Sc. Nat. ser. 4, **14,** 364 (1860); Vesque in DC. Monogr. Phan. **8,** 519 (1893); Viguier et Humbert in Rev. Gén. Bot. **25 bis,** 630 (1914); Engl. in Engl. et Prantl, Nat. Pflanzenfam. ed. 2, **21,** 192 (1925).

O. madagascariensis *DC.* in DC. Prodr. **1,** 560 (1824); Planch. et Triana, l.c.; Vesque, l.c. 521; Viguier et Humbert, l.c. 632. *Ochrocarpos* Thou. Hist. Vég. Isles Austr. Afr. ed. 2, t. 26, cum anal. (1805).

MADAGASCAR. Without locality, *Thouars.*

Thouars' plate of *Ochrocarpos* was mentioned in a bibliographical note by Hiern (Journ. Bot. 1900, 493), who identified it as "apparently *Ochrocarpos Goudotianus* Planch. et Triana." *O. Goudotianus*, however, differs in the shape of the leaves, which are narrowly obovate or oblanceolate, rounded or emarginate at the apex, cuneate into the base, and in the longer petioles (2–3 cm. long). It is represented in the British Museum Herbarium by two sheets from Madagascar (Tamatave *Hilsenberg*; sine loc., *J. V. Thompson*), both named *Ochrocarpos madagascariensis.*

In accordance with Art. 57 of the International Rules of Botanical Nomenclature, ed. 2, the original spelling *Ochrocarpos* must be retained, the latinized form *Ochrocarpus* being rejected. Botanists are recommended, when proposing *new* names, to adopt latinized endings, but they must not alter the spelling of validly published names, unless it can be shown that there was a typographical error or unintentional orthographic error in the original place of publication.

VII—PLANTS NEW TO ASSAM: VI.*

C. E. C. FISCHER.

The previously known distribution of each plant is given between its name and its distribution in Assam.

Deutzia purpurascens *Rehd.* [Saxifragaceae].

W. China.

Delei Valley, 28° 21′ N., 96° 37′ E., 9000–10,000 ft., fls. pale-pink, June, *Kingdon Ward* 8323: "A long-limbed bushy shrub growing in shady gullies in the Tsuga-Rhododendron forest." A colour form.

*Continued from *K.B.* 1932, 349.

Saxifraga brachypoda *Don* [Saxifragaceae].

Kumaon to Bhutan.

Delei Valley, 28° 15′ N., 96° 40′ E., 12,000–13,000 ft., fls. golden-yellow, Oct., *Kingdon Ward* 8683: "On rocks on open alpine slopes."

Saxifraga diversifolia *Wall.* [Saxifragaceae].

Kashmir to Bhutan and W. China.

Delei Valley, 28° 15′ N., 96° 35′ E., 11,000–12,000 ft., fls. bright yellow, almost orange, Sept.-Oct., *Kingdon Ward* 8621: "Stem, leaves and inflorescence covered with crimson glandular hairs; on earth-screes amongst scrub Rhododendron"; *Kingdon Ward* 8676: "Leaves hard and brittle, fls. orange, on rocks and cliffs within the forest belt"; *Kingdon Ward* 8684: "Flowers bright-yellow closely spotted with ochre, on open alpine slopes in clumps."

Saxifraga hispidula *Don* var. **Doniana** *Engl.* [Saxifragaceae].

S. Tibet.

Delei Valley, 11,000–12,000 ft., fls. bright-yellow, Sept., *Kingdon Ward* 8670: "In clumps on ledges of cliffs in a steep narrow gully."

Saxifraga sarmentosa *Linn.* [Saxifragaceae].

W. China to Japan.

Delei Valley, 28° 21′ N., 96° 37′ E., 6000–7000 ft., fls. April, *Kingdon Ward* 8137: "On shaded wet cliffs."

Bergenia purpurascens (*Hook. f. et T.*) *Engl.* [Saxifragaceae].

Sikkim.

Delei Valley, 28° 21′ N., 96° 37′ E., 13,000 ft., fls. June, *Kingdon* Ward, 8333: "In colonies or scattered on slopes covered with dwarf Rhododendron, along the ridge."

Sanicula hacquetioides *Franch.* [Umbelliferae].

Yunnan.

Delei Valley, 11,000–13,000 ft., fls. white or mauve, June, *Kingdon Ward* 8357: "On earth slopes in gullies. Abundant in the alpine region on S. slopes from which the snow has just gone—almost the only plant yet in flower."

Schefflera shweliensis *W. W. Smith* [Araliaceae].

Yunnan.

Manipur: ascent to Seriphai, frt. Jan., *G. Watt* 5974; Sirohi-furar, 6000 ft., frt. April, *G. Watt* 6462, 6469. Naga Hills: Japoo, 7000–8000 ft., frt. May, *Kingdon Ward* 7718: "40 ft. high, common in the upper temperate or oak forest, fruit black"; Delei Valley, 6000–8000 ft., fls. green, fragrant, Sept., *Kingdon Ward* 8172, 8652: "Medium sized or small repeatedly branched tree having the appearance of a clump of palms, common in the lower rain forest, chiefly in open places along the ridges or in clearings."

Hoeckia Aschersoniana *Engl. et Graebn.* [Valerianaceae].

W. China.

Delei Valley, 28° 15′ N., 96° 35′ E., 8000–10,000 ft., fls. white, Aug., *Kingdon Ward* 8590 : " In open gullies on the N. face or under trees on the S. face of the ridge."

Patrinia speciosa *Hand.-Mazz.* [Valerianaceae].
S.E. Tibet and Yunnan.
Delei Valley, 28° 21′ N., 96° 37′ E., 12,000 ft., fls. bright-yellow, fragrant, July, *Kingdon Ward* 8429 : " On alpine turf slopes and earth slides or amongst shrubs."

Dipsacus inermis *Wall.* [Dipsacaceae].
Kashmir to Bhutan in the Himalayas.
Delei Valley, 28° 15–20′ N., 96° 35′ E., 5000–9000 ft., fls. cream with dark-purple anthers, fragrant, Aug.-Oct., *Kingdon Ward* 8529, 8691 : " On open grassy slopes along the ridge, S. face."

Morina betonicoides *Benth.* [Dipsacaceae].
The Sikkim Himalayas.
Delei Valley : Kaso, 13,000–14,000 ft., fls. purplish-crimson, July, *Kingdon Ward* 8412 : " On the rocky ridge and on turfy ledges of cliffs, S. aspect."

Blainvillea rhomboidea *Cass.* [Compositae].
The upper Gangetic Plain westwards (see Fl. Brit. Ind.).
N. Cachar Hills at Haflong, 2500 ft., fls. Aug., *Craib* without number.

Cremanthodium rhodocephalum *Diels* [Compositae].
Yunnan.
Delei Valley, 28° 15′ N., 96° 35′ E., 11,000–12,000 ft., fls. nodding, pale pinkish-purple, Sept., *Kingdon Ward* 8622 : " Leaves purple, on bare-looking earth slopes in very steep gullies."

Cremanthodium Thomsoni *C. B. Clarke* [Compositae].
Sikkim.
Delei Valley : Kaso, 13,000 ft., fls. nodding, ray bright-yellow, disc purple, July, *Kingdon Ward* 8439 : " On alpine meadow slopes, facing S."

Prenanthes yakoensis *Jeffr.* [Compositae].
Yunnan.
Delei Valley, 28° 15′ N., 96° 35′ E., 4000–6000 ft., fls. dark wine-purple, Oct., *Kingdon Ward* 8694 : " A scrambling plant common in thickets along the open-wooded ridge and on the edge of the forest."

Androsace Gagnepainiana *Hand.-Mazz.* [Primulaceae].
Yunnan.
Delei Valley, 28° 21′ N., 96° 37′ E., 12,000 ft., fls. white with a green eye, June, *Kingdon Ward* 8286 : " On the lee side of a granite outcrop, N. facing slope below ridge."

Omphalogramma Forrestii *Balf. f.* [Primulaceae].
Yunnan.
Delei Valley, 28° 21′ N., 96° 37′ E., 10,000–11,000 ft., fls. bright-violet, throat cream within, May, *Kingdon Ward* 8234 : " On steep muddy slopes under bamboos, singly or in clumps, only on the ridge where the soil is more or less water-logged as in peaty hollows ; scape pubescent, hairs mostly white, sometimes crimson, calyx-lobes green or dull-crimson."

Hoya Lobbii *Hook. f.* [Asclepiadaceae].
The fruit of this species appears not to have been described. It has been received from Sugiri in the Garo Hills, *Mrs. N. E. Parry* 1307, in fruit in Feb., from which specimen the following description has been made : *Follicle* pendent, bluntly acuminate, 13·7 cm. long, 5 mm. diam., brownish, quite glabrous. *Seeds* (not quite ripe) linear, flattened, apex truncate, base bluntly attenuate, 2·5–3 mm. long, *coma* up to 4 cm. long, cream or pale-brown.

Hoya polyneura *Hook. f.* [Asclepiadaceae].
The Sikkim Himalayas.
Delei Valley, 28° 20′ N., 96° 37′ E., 6000 ft., frt. April-May, *Kingdon Ward* 8139.

Brandisia rosea *W. W. Smith* var. **flava** *C. E. C. Fischer*, var. nov. [Scrophulariaceae] ; corolla flava a typo speciei distincta.
W. China and E. Tibet.
Delei Valley, 28° 15′ N., 96° 35′ E., fls. pale-yellow, Oct., *Kingdon Ward* 8699 : " A scraggy bushy shrub growing on rocks along the open ridge."
Griffith's specimen [*Kew Dist.* 3748) from Bhutan, referred to in the Gen. Pl. and in the Fl. Brit. Ind., and a sheet collected by Nuttall also in Bhutan (both in the Kew Herb.) are this species, but being in fruit only it cannot be determined whether they represent the typical species or the colour variety.

Lindenbergia Hookeri *C. B. Clarke ex Hook. f.* [Scrophulariaceae].
Sikkim.
Lohit Valley Road : Denning, 28° 0′ N., 96° 15′ E., 2200 ft., fls. March, *Kingdon Ward* 7901 : " A loose bushy shrub with long arching branches flopping over. Fls. numerous, not very showy, lower lip of corolla bright-yellow, upper dull, with a brown flush. In shady places along jungle paths and on sheltered grassy banks in the open. Occurs all up the Lohit as far as the Delei Valley at least."

Pedicularis Gammieana *Prain* [Scrophulariaceae].
Sikkim.
Delei Valley, 28° 21′ N., 96° 37′ E., 12,000 ft., fls. purple, July, *Kingdon Ward* 8397 : " Open places, cliffs and turf slopes along the ridge."

Pedicularis gibbera *Prain* [Scrophulariaceae].
Sikkim.

Delei Valley, 28° 15′ N., 96° 35′ E., 11,000–12,000 ft., fls. purple, Aug., *Kingdon Ward* 8603 : " On earth and rubble screes amongst scrub Rhododendrons."

Pedicularis gracilis *Wall.* [Scrophulariaceae].

Kashmir to Sikkim.

Delei Valley, 28° 15′ N., 96° 35′ E., 9000 ft., fls. purple, Sept., *Kingdon Ward* 8637 : " On rocky outcrops in natural clearings amongst the scrub forest clothing the steep S. face of the ridge."

Pedicularis Pantlingii *Prain* [Scrophulariaceae].

Sikkim, E. Nepal and Chumbi.

Delei Valley, 28° 21′ N., 96° 37′ E., 11,000–12,000 ft., fls. purplish-pink, July, *Kingdon Ward* 8398 : " Along the ridge under bamboos on grass slopes."

VIII—LILIUM, NOTHOLIRION AND FRITILLARIA.

The short paper which follows embodies the substance of a letter written some time ago by the late Dr. O. Stapf, F.R.S., to a private correspondent. A slight modification in the nomenclature has been introduced in order to conform with the decisions of the International Botanical Congress held at Cambridge in 1930 : the authority cited for the combination *Notholirion macrophyllum* being " (D. Don) Boiss." instead of merely " Boiss." The citation of the name D. Don in brackets indicates that the specific epithet *macrophyllum* goes back to D. Don, who originally described the species under the name *Fritillaria macrophylla*. It also indicates that the type of the species is the specimen described by D. Don. Hence, if this method of citation is adopted, no confusion can arise from the fact that Boissier, when he transferred *Fritillaria macrophylla* to *Notholirion*, included another species under the name *Notholirion macrophyllum*, and gave a description based on that second species. T. A. S.

The diagnostic characters used by Linnaeus for distinguishing *Lilium* and *Fritillaria* are these :—

LILIUM.	FRITILLARIA.
Corolla e basi angusta campanulata	campanulata, basi patens (*i.e.* gibbosa)
Petala erecta, sensim patentiora, apicibus reflexis	parallela
Nectarium linea longitudinalis insculpta	fovea excavata
Antherae incumbentes (*i.e.*, versatiles)	erectae
Stigma triangulare	triplex, patens
Germen cylindraceum	trigonum

These characters still hold good in most cases ; but in the course of time plants became known which combined characters supposed

to be peculiar to one or the other of the two genera. They were therefore referred by some botanists to *Lilium*, by others to *Fritillaria* (placed under *Fritillaria* by D. Don, 1825, 1840 ; Kunth, 1843 ; Baker, 1874, 1878 ; and under *Lilium* by Wallich, 1831–32 ; Lindley, 1845 ; W. J. Hooker, 1853 ; Baker, 1871 ; Duchartre, 1872 ; Engler, 1888 ; J. D. Hooker, 1892 ; E. H. Wilson, 1925 ; and K. Krause, 1930). From a note in Voigt, Hort. Calcutt. (1845) and from a letter by Wallich to Sir W. J. Hooker (1853), it appears that Wallich at some time gave this group a distinctive generic name *Notholirion*, with *N. roseum* as the only species, without, however, publishing it ; nor did Voigt more than record this fact. Subsequently, Wallich's concept of the group was taken up by Baker with the rank of a subgenus or section, and maintained by all later writers except Boissier (1882), who accorded it the status of a genus, mainly on account of the very peculiar structure of the bulb, which is unique in *Lilium* (sensu lato) and had been studied and explained by Duchartre in an excellent paper (1872). It is to this group that *Lilium Thomsonianum*, *L. roseum*, and *Fritillaria macrophylla* belong, and I do not hesitate to say that Boissier was right. The three genera may be diagnosed thus :—

LILIUM (excl. *Notholirion* and *Cardiocrinum*)	FRITILLARIA (excl. *Rhizolirion*)	NOTHOLIRION
Mature bulb of many fleshy imbricate, ovate to lanceolate store-scales without scarious or membraneous outer coats (leaf-bases)	usually small, of 1, 2, or more (never many) free or more or less fused depressed store-scales without outer coats (leaf-bases)	of a varying number of fleshy ovate to lanceolate store-scales surrounded by scarious or membranous outer coats (old leaf-bases)
Perigone funnel-shaped to campanulate or campanulate-rotate	campanulate	campanulate
Tepals more or less diverging with recurved tips, to revolute	subparallel or diverging, but then tips not recurved	obliquely erect with more or less recurved tips
Nectary a narrow linear longitudinal groove	an oblong to circular pit	none or a basal circular pit
Anthers versatile	erect	versatile

The area of *Notholirion* extends from Kansu and Shensi to Yunnan and through the Himalaya to Afghanistan. The genus comprises a small number of closely allied species with a much confused nomenclature.

(1) **Notholirion macrophyllum** (*D. Don*) *Boiss.* Fl. Or. **5,** 190 (1882), quoad syn. *Fritillaria macrophylla*.
Fritillaria macrophylla D. Don, Prodr. Fl. Nepal. 51 (1825).
Lilium roseum Wall.Cat. 5077/A (1831–32), nomen, et in Herb. ; Hook. f. Fl. Brit. Ind. **6,** 352 (1892), partim.
Lilium Hookeri Baker in Gard. Chron. 1871, 201.
Fritillaria Hookeri Baker in Journ. Linn. Soc., Bot. **14,** 269 (1874).

(2) **Notholirion Thomsonianum** (*Royle*) *Stapf*, comb. nov.
Lilium roseum Wall. Cat. 5077/B (1831–32), nomen, et in Herb.

Lilium Thomsonianum Royle, Ill. t. 92 (1839).
Lilium (No. 87) Griff. Itin. Not. 345 (1848); *L. longifolium* Griff. Notul. **3**, 241 (1851); Ic. Pl. Asiat. t. 277 (1851).
Fritillaria Thomsoniana D. Don apud Royle, l.c. 388 (1840).
Notholirion macrophyllum Boiss. Fl. Or. **5**, 190 (1882), quoad descr. et synon. nonnull., non *Fritillaria macrophylla* D. Don.

(3) **Notholirion hyacinthinum** (*E. H. Wils.*) *Stapf*, comb. nov.
Fritillaria Hookeri Baker in Bot. Mag. t. 6385 (1878), non Baker (1871).
Lilium Thomsonianum Franchet in Journ. de Bot. **6**, 320 (1892), non Royle (1839).
Lilium roseum C. H. Wright in Journ. Linn. Soc., Bot. **36**, 133 (1903), partim, non Wall.
Lilium sp. Farrer in Gard. Chron. ser. 3, **67**, 6, fig. 4 (1920).
Lilium hyacinthinum E. H. Wilson, Lil. East. Asia, 100 (1925).
This last species may be found to have been taken in too wide a sense, the Szechuan and Kansu specimens having small flowers.

IX—MISCELLANEOUS NOTES.

DUKINFIELD HENRY SCOTT.—We have to record with deep regret the death on January 29th of Dr. D. H. Scott, F.R.S. An appreciation of Dr. Scott's work will appear in the next number of the Bulletin.

MR. D. STEVENSON.—Mr. D. Stevenson, who was formerly Senior Assistant Conservator of Forests, Northern Rhodesia, and who has recently been employed temporarily in the Herbarium for work on Asiatic and West African plants, has been appointed Assistant Conservator of Forests, Gold Coast.

Flora of Tropical Africa.—Vol. 9, part 6, of this work was published on Jan. 1st, 1934. This part, together with part 5, published on Aug. 12th, 1930, contains an account of the family *Gramineae*, as far as the end of the tribe *Paniceae*, by the late Dr. O. Stapf and Mr. C. E. Hubbard.

Corrigendum.—The words "sp. nov." occurring after the name "*Semecarpus lanceolatus* Ridley" in K.B. 1933, 491, should be deleted, that species having been previously published in K.B. 1933, 199.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1934
ROYAL BOTANIC GARDENS, KEW

X—NOTES ON ORTHOTHYLAX.

C. SKOTTSBERG (GÖTEBORG).

Some time ago I revised the *Philydraceae* in the Berlin Herbarium and found that *Helmholtzia glaberrima*, described by J. D. Hooker under *Philydrum* (Bot. Mag. **99**, t. 6056 : 1873) and later transferred to *Helmholtzia* by Bentham in Fl. Austral. 7 (1878) and by Caruel in DeCandolle, Mon. Phan. **3** (1881), ought to form a separate genus, for which I used J. D. Hooker's section name *Orthothylax* (see Engler's Jahrb. **66**, 261–265, figs. 29–48). My material consisted of cultivated plants exactly matching those used by J. D. Hooker for his description and plate. Regarding the home of *Orthothylax* I had only Bailey's statement (Queensland Flora, 1646 : 1902) that it had been found "in Southern localities," but there did not seem to exist any material from Queensland in European collections.

Taking up the matter again lately I was able, by courtesy of the Director, to examine the specimens in the Kew Herbarium. Besides two cultivated specimens there is one from Queensland (*Hubbard* 4276. "Moreton District, Macpherson Range, Springbrook, on bank of stream in rain forest on brown loam, 29.9.1930") ; and three from New South Wales, two fine flowering and fruiting inflorescences labelled "Tumbulgum W. B. Jan. 1897" and communicated by Mr. R. T. Baker, Technological Museum, Sydney (Mr. Summerhayes suggests that "W. B." means W. Bauerlen), and one fruiting panicle labelled "Nightcab [-cap?] Mt., Tweed, de la Camara 1882," sent by F. von Mueller. Both the last-mentioned places are in the extreme N.E. corner of New South Wales, not far from the Queensland border and probably not far from each other, for Tumbulgum is situated on the river Tweed. In the local Floras the species is stated to occur on the upper Richmond River which is just to the west of the other localities. The Macpherson Range forms the boundary between Queensland and New South Wales.

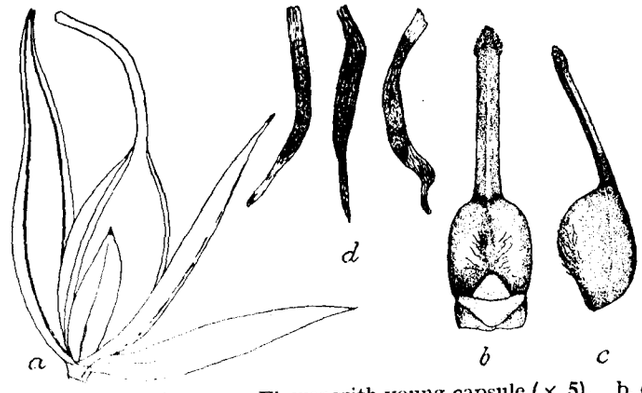
The cultivated plants in the Kew Herbarium agree in every detail with the Berlin specimens. To my description I should add that the bract is adnate to the flower axis and that the very base of the filament is concrescent with the anterior tepal. The Springbrook specimen is very robust. The single leaf present measures 118 cm. in length (a few centimetres at the base missing) and 4 cm. in width. The difference in colour between the two surfaces is obvious. The scape + panicle is 79 cm. long and must have been over 80, as the lowermost part is missing ; the distance from the base to the lowest branch-bearing spathe is at least 28 cm. The trigonous scape is

6–7 mm. thick, or perhaps more. The length of the floral branches of the 1st order is up to 19 cm.—that of the 2nd order up to 7 cm., but the panicle is not fully developed and only a few flowers are expanded. The tepals differ slightly in shape and size from those examined before (see table). The Tumbulgum plant is less robust yet still larger than the cultivated specimens examined before; its panicle is fully 40 cm. long, the branches of the 1st order as much as 20, those of the 2nd and 3rd about 10 and 4 cm. respectively. The conspicuously trigonous scape is at least 5 mm. thick and bears a few long, fugaceous hairs. In flower size Baker's specimens fall between the cultivated ones and *Hubbard* 4276 (see table below).

All measurements in millimetres.

	Cult.	*Baker.*	*Id. in fruit.*	*Hubbard.*
Bract:	3·7 6·5 × 1·6—3·0	4·1 7·0 × 1·2 2·0	8 × 2·8	6·8 × 1·5 2·8
Tepals:				
posterior ...	5·1 9·0 × 2·5 3·5	6·0 9·5 × 1·9 3·0	10 × 4	10 11 × 3 3·5
anterior ...	4·0 7·5 × 2·1 3·4	5·2 8·0 × 1·2 2·8	9·5 × 3·3	7·5 9 × 3·0 3·9
lateral ...	2·0 3·5 × 1·3 2·5	2·2 4·2 × 0·8 1·7	4·5 × 1·9	4·5 5 × 2·0 2·2
Stamen:				
filament ...	1·0 2·6	1·0 1·1		1·3 1·4
anther ...	2·2 3·3	2·0 2·4		2·5 2·6
Pistil:				
ovary ...	1·7 2·6 × 1·4 2·0	1·3 2·7 × 1·0 1·8		2·0 2·1 × 1·6 1·7
style	3·0 4·3	3·1 4·5		5·3 5·5

Fig. a (Tumbulgum), compared with the figures I have published before, shows these differences. One of the important characteristics of *Orthothylax* is the zygomorphic pistil (figs. b, c). These figures were drawn from a cultivated specimen (J. D. Hooker's type). The ovary is quite glabrous in the Australian specimens seen. Ripe fruit is plentiful in the plants from New South Wales. The capsule splits like that of *Philydrum*. It is trigonous, with flat sides, glabrous, and measures 6·5–7·5 × 3 4 mm. The seeds are of the same general shape as in *Helmholtzia*, but considerably longer and narrower, about 3 mm. long including the funicle, and 0·20 0·25 mm. wide. The surface layer of the testa is hyaline and produced at both ends (fig. d).



Orthothylax glaberrimus. a, Flower with young capsule (× 5). b, c, pistil of a young flower, ventral and lateral views (× 17). d, seeds (× 10).

Orthothylax is an interesting local endemic. It differs from *Helmholtzia* in the free perianth segments, the zygomorphic pistil, partly unilocular ovary, and dry, loculicidally dehiscent capsule. *Helmholtzia* has a conspicuous perianth tube, lateral tepals united with the filament for half their length, actinomorphic pistil, and completely trilocular ovary; the leathery pericarp does not seem to split, and there is no sign of the lines of dehiscence so conspicuous in *Orthothylax* (figs. a, c).

XI—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXX.

1291. Hoffmanseggia miranda *Sandwith* [Leguminosae-Eucaesalpinieae]; species foliolis prominenter venosis, forma stipularum bractearumque fimbriato-glandulosa, praecipue processibus petalorum insignibus quam in ceteris speciebus multo longioribus eglandulosis distinctissima.

Fruticulus humilis, ramis vetustis lignosis glabris apice ramulis coronatis; ramuli summi annotini graciles, haud conspicue angulati, vulgo brunnescentes, plus minusve incano-pubescentes glandulis stipitatis raris interspersis; ramuli novelli foliati breves, incano-pilosuli atque glandulis stipitatis numerosis praediti. *Stipulae* lanceolato-subulatae, dorso costatae, pilosulae, 3–5 mm. longae, circiter 1·3 mm. latae, apice marginibusque glandulis longe stipitatis insigniter fimbriatae. *Folia passim incano-pilosa*, petiolo insuper saepe glandulis stipitatis hic illic praedito; petiolus 2–4 cm. longus; pinnae imparipinnatae, 3–5-jugae (vulgo 4-jugae), divaricatae, saepius 1–1·7 cm. longae, internodiis rhacheos 3·5–10 mm. longis, pinna terminali adjecta ad 2·2 cm. longa; foliola paripinnata, 3–5-juga, subsessilia petiolulis brevissimis, oblonga vel obovato-oblonga, apice late rotundata, basi obliqua rotundata brevissime cordata, 2–6·5 mm. longa, 1·5–4 mm. lata, rigida, fere subcoriacea,

utrinque pilosula, eglandulosa, subtus saepe glaucescentia, palmatinervia, nervis utrinque praesertim subtus valde prominentibus *Inflorescentia* racemosa, terminalis, 5·5–14 cm. longa, pilosula atque dense stipitato-glutinoso-glandulosa, glandulis atropurpureis ; pars florifera vulgo 2–6 cm. longa ; bracteae insignes, stipulis perfecte similes, sed angustiores, circiter 4–5 mm. longae, caducae ; pedicelli flexuoso-recurvati, 3–4 mm. longi, densissime stipitato-glandulosi *Calycis* lobi lanceolato-oblongi vel lobus maximus ovato-oblongus obtusi, subaequales, 6–8 mm. longi, 1·6–3·8 mm. lati, extra pilos atque longe ciliati necnon glandulis stipitatis hic illic praediti *Petala* siccitate flava usque rubra, fere aequalia, 1·1–1·3 cm. longa glabra, lamina obovata 5–6·5 mm. lata, ungue 3 6 mm. longo marginibus superne (laminaque inferne) processibus filiformibus tenuibus eglandulosis nigrescentibus ad 2 mm. longis ornato *Stamina* 10, ad 1·2 cm. longa, filamentis inferne dilatatis trientibus duobus inferioribus praesertim prope basim conspicue pilosulis eglandulosis apicem versus glabris ; antherae oblongae, 1·3 mm longae, 1 mm. latae. *Ovarium* sessile, glabrum, lineari-oblongum 2·5–3 mm. longum, 0·7 mm. latum ; stylus glaber, 6 11 mm. longus ovula in ovario unico dissecto 6. *Legumen* immaturum tantum visum, divaricato-subfalcatum, dense tomentosum, 1 cm. longum 2 mm. latum, glandulis nullis obviis.

PERU. Dept. Arequipa ; Mollendo, sea-level to 170 m., August 1932, *D. Stafford* no. K.53 (type).

1292. **Gochnatia arequipensis** *Sandwith* [Compositae-Mutisieae] ; *G. bolivianae* Blake atque *G. curviflorae* (Griseb.) O. Hoffm. affinis ab ambabus foliis parvis, praeterea ab illa capitulis paucifloris tubo corollae longiore sed lobis brevioribus, ab hac involucri bracteis extra haud incano-tomentosis angustioribus intimis oblanceolato-linearibus attenuato-acutis differt.

Frutex inermis, ramis intricatis nodosis tomentosis, vetustis nigrescentibus demum glabrescentibus ; ramuli laterales in globos lanatos apice foliatos insigniter redacti ; globi demum in ramulos novellos hornotinos incano-tomentosos elongati ; internodia saepius 0·7–1·5 cm. longa. *Folia* in ramulis hornotinis vel alterna vel apice ramulorum novellorum axillarium globosorum conferta, ovata usque elliptica vel oblonga vel etiam obovata, apice acuta vel obtusa, vix mucronulata, basi cuneata usque (in majoribus) obtusa vel rotundata, 0·5–1·8 cm. longa, 0·25–1·2 cm. lata, firme chartacea vel subcoriacea, integra vel raro obscure sinuato-crenulata, juventute utrinque incano-tomentosa, senectute supra pubescentia tantum sed glandulis sessilibus punctata, plus minusve quintuplinervia, nervis primariis vel lateralibus utrinque praesertim subtus prominentibus, supra cum venulis senectute prominulo-reticulatis ; petioli incano-tomentosi, 1–4 mm. longi. *Capitula* axillaria et terminalia, solitaria sed saepe (in planta Lechleriana) apice ramulorum 2–3 aggregata, sessilia, discoidea, 10–12-flora tantum, adulta 1·2–2 cm. longa, infundibuliformia. *Involucrum* pluri- (circiter 7) seriatum, 1 1·5 cm. longum ;

bracteae exteriores ovatae, acuminatae, marginibus ac apice ciliatis sublanatisque ceterum glabrescentes vel glabrae, sensim in intimas oblanceolato-lineares vulgo 1–1·3 cm. longas, 1–1·2 mm. latas apice conspicue attenuato-acuminatas omnino glabras sed glandulis sessilibus praeditas transeuntes. *Corolla* flava, glabra, circiter 1·3 cm. longa ; tubus 8·5–9 mm. longus ; lobi aequales, 4–4·5 mm. longi, versus apicem valde revoluti. *Antherae* 4·5 mm. longae ; caudae ciliatae, 2·2 mm. longae. *Stylus* 1·3–1·5 cm. longus, ramis erectis 0·8–1·2 mm. longis. *Achaenia* 5 mm. longa, dense sericeo-pilosa ; pappus 10–11 mm. longus, paleis sordide albis prorsus hispidulis.

PERU. Volcán de Arequipa, in collibus aridis, Sept. 1854, *Lechler* 2751 (typus in Herb. Kew.). Arequipa, 2500–3300 m., fl. Aug.–Sept. 1932, *D. Stafford* no. D.44 : "flowers just after the rain in dry sand."

Miss Stafford's plant differs from Lechler's in having the heads solitary instead of 2 3 together at the apex of the branchlets, and in certain small differences of measurement which seem of little importance, at any rate in the absence of further material collected at all stages and seasons.

1293. **Lobostemon inconspicuus** *Levyns* [Boraginaceae] ; affinis *L. capitato* Buek, habitu minore, foliis minoribus et angustioribus supra glabris vel fere glabris differt.

Suffrutex usque 20 cm. altus, satis ramosus ; rami pilis brevibus numerosis et setosis paucis induti. *Folia* patentia, linearia, 8–18 mm. longa, circiter 2 mm. lata, supra leviter canaliculata, glabra vel setis paucis, infra et margine setis rigidis armata. *Inflorescentia* cymarum compactarum plurium composita ; bracteae foliis similes sed minores. *Calyx* corollae tubi parte attenuata aequilongus vel paulo longior ; sepala aequalia vel subaequalia, linearia, extra setis tenuibus et crassis intermixtis induta. *Corolla* odorifera, tubo angusto cylindrico longitudine tota dimidio breviore, regularis, circiter 6 mm. longa, extra glabra, alba, lobis oblongis demum marginibus brunneis. *Squamae* prope tubi apicem insertae, faucem fere claudentes, obtuse triangulares, lobis lateralibus conspicuis. *Stamina* aequalia vel fere aequalia, exserta, supra insertionem squamarum leviter adnata. *Stylus* glaber. *Fructus* non visus.

SOUTH AFRICA. Bredasdorp Div. ; flats between Elim and Bredasdorp, in sandy places, 30 m. alt., Sept.–Oct., 1933, *Levyns* 4524.

1294. **Martinella insculpta** *Sprague et Sandwith* [Bignoniaceae] ; a *M. obovata* (H. B. K.) Bur. et K. Schum. foliolis basi haud cordatis rete venularum utrinque inscripto, rhachi florescentiae brevi incrassata deflexa internodiis brevioribus, calyce accessiore recedit.

Frutex scandens ; ramuli annotini teretes vel tetragoni, nigrescentes, striati, glabri, nodis inter bases foliorum consociebus glandularum ellipticarum immersarum ornatis, glandulis pro rata

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paucis magnis. *Pseudostipulae* minutae. *Folia* bifoliolata cirrho trifido vel simplici (an vere?) ; petioli 1·5–5 cm. longi, ut petioluli glabrati ; foliola ovata usque elliptica vel lanceolato-elliptica, plerumque conspicue acute acuminata, basi rotundata vel obtusa vel cuneata, 6–17·5 cm. longa, 2·5–8 cm. lata, coriacea, glabra, utrinque rugosula, nervis lateralibus arcuato-ascendentibus utrinsecus 5–7 supra ut costa impressis subtus leviter elevatis, rete venularum utrinque impresso. *Racemi* breves, singuli vel bini pro axilla ; rhachis usque 6 cm. longa, decurva, demum incrassata, glandulis magnis impressis ornata, juventute minute puberula, floribus crebre dispositis internodiis 3–5 mm. longis ; bracteae late subulatae, sursum curvatae, paullo ultra 1 mm. longae ; pedicelli 0·5–1 cm. longi. *Calyx* tubuloso-campanulatus, circiter 1·5–2 cm. longus, crassiusculus, glaber, glandulis paucis impressis, siccitate nigrescens, irregulariter 2–3-lobatus, lobis usque 6 mm. longis mucronatis. *Corolla* campanulato-infundibularis, rosea, prorsum curvata, 5–6 cm. longa, limbo 3–4 cm. diametro siccitate nigro-purpurascente, tubo extra glabro (statu vivo albo), limbo utrinque praesertim intus puberulo, intus infra bases filamentorum cingulo vix 1 cm. lato breviter villoso ornata. *Filamenta* circiter 1·7–1·8 cm. supra basin inserta ; thecae divaricatae, elliptico-oblongae, 4–4·5 mm. longae. *Discus* patelliformis. *Ovarium* oblongum, inferne ovoideo-incrassatum, basi ipsa in discum dilatatum, 4 mm. longum, minutissime sparse lepidotum ; stylus inferne dilatatus, glaber ; ovula pro loculo numerosa, 4-seriata. *Fructus* ignotus.

BRITISH GUIANA. Without locality, *Drake* (type in Kew Herb.). Essequibo and Rupununi Rivers, *Rob. Schomburgk* (Kew Herb.). Without locality, *Anna H. Taylor* (New York Bot. Gard.). Akarabice Creek, Cuyuni River, fl. July, *Tutin* 424 (Brit. Mus. ; Kew Herb.) ; corolla tube white, limb magenta.

VENEZUELA. San Carlos, Rio Negro, *Spruce*, sine numero (Kew Herb.).

Spruce's specimen, being sterile, cannot be assigned with complete certainty to *M. insculpta*.

1295. Pleonotoma echitidea *Sprague et Sandwith* [Bignoniaceae] ; *P. chondrogonae* (Miq.) Miers affinis, indumento ramulorum ac inflorescentiae, forma calycis longioris, ovario styloque pubescente, praesertim corolla hypocrateriformi differt.

Frutex scandens ; ramuli generis typici, satis dense minute albo-furfuraceo-lepidoti atque pubescentes. *Pseudostipulae* spathulatae, circiter 5–6 mm. longae, lamina 2–3·5 mm. lata supra dense minute pubescente subtus nervosa glabrata sed glandulis patelliformibus immersis praedita. *Folia* varie bipinnato- vel tripinnato-ternata ; cirrhus non visus ; petiolus indumento ramulorum, vulgo 2–5 cm. longus ; internodia rhacheos petiolulique similiter induti, petioluli 2–8 mm. longi ; foliola ovata vel ovato-oblonga, apice breviter saepe obtuse acuminata, basi obliqua rotundata vel obtusa, vel superiora atque terminalia pinnae cuiusque basi cuneata, 1·5–8·5 cm.

longa, 0·8–5 cm. lata, adulta chartacea vel subcoriacea, supra nitida, glabra vel costa subtus minute puberula, epunctata, utrinque valde intricate reticulata, nervis lateralibus 6–8 subhorizontalibus vel plus minusve ascendentibus primo rectis tum laete arcuato-anastomosantibus. *Inflorescentiae* racemosae, apice ramulorum vulgo 3, quarum media terminalis, duae laterales ex axillis foliorum summorum exsurgunt, 2–12 cm. longae, dimidio inferiore vulgo nudae, superiore corymbiformes, ubique dense minute pubescentes necnon lepidotae ; bracteae anguste ovato-lanceolatae usque lineari-lanceolatae, circiter 1·5–2·5 cm. longae ; bracteolae basi pedicellorum positae, bracteis breviores ac angustiores ; pedicelli inferiores usque 1·8 cm. longi, superiores sensim breviores. *Calyx* tubulari-campanulatus, 5–7 mm. longus, 3–4 mm. latus, apice truncatus minute denticulatus, costis de dentibus per calycem decurrentibus, extra dense minute pubescens, infra apicem seriebus glandularum immersarum patelliformium juxta costas notatus. *Corolla* teste lectore purpurea, hypocrateriformis ; tubus perangustus, 2·5–3·2 cm. longus, versus apicem sensim ad 3·5–5·5 mm. latitudinis tantum ampliatus, extra dimidio superiore dense cinereo-furfuraceo-pubescens et glandulis brunneis sessilibus praeditus, inferne glaber, intus infra staminum insertionem aliquantum glandulosus atque lepidotus ; limbus circiter 3–4·5 cm. diametro, lobis inaequalibus ut videtur 1·3–2 cm. longis ad 1·2 cm. latis, utrinque dense furfuraceo-pubescentibus et conspicue brunneo-glandulosis praeterea sparse albo-lepidotis et dimidio inferiore extra glandulis patelliformibus immersis praeditis. *Stamina* dimidio superiore corollae tubi inserta, filamentis glabris 8–9 mm. longis ; antherae infra faucem absconditae, thecis divergentibus 3·75 mm. longis, connectivo vix producto. *Discus* pulvinari-cupularis, 1·3 mm. altus. *Ovarium* lineari-oblongum, circiter 4 mm. longum, dense pubescens ; stylus ubique praesertim inferne pubescens ; ovula biseriata, in quaque serie circiter 14–16. *Capsula* linearis, in rostrum breve attenuata, circiter 36 cm. longa, 1 cm. lata, obscure lepidota, hic illic glandulis parvis patelliformibus immersis praedita. *Semina* anguste transverse oblonga, 6–8 mm. longa, 2·8–4 cm. lata, alis membranaceis latis velut nucleo brunneis.

BRITISH GUIANA. Upper Demerara River, fl. Sept. 1887, *Jenman* 4124 (type in Kew Herb.) ; a bush-rope. Amakura River, North-west District, fl. March 1923, *Cruz* 3483 (New York) ; climbing 12 ft., fl. purple. Without locality, *Abraham* 262 (type of fruit, New York).

1296. Pleonotoma pavettiflora *Sandwith* [Bignoniaceae] ; *P. echitideae* Sprague et Sandwith forma foliolorum necnon corollae affinis, sed foliolis utrinque conspicue punctatis, corolla parva multo minore, calycibus alabastris totis tuboque maturo oculo nudo glabris, antheris e fauce protrudentibus, ovario lepidoto, stylo glabro differt.

Frutex scandens ; ramuli generis typici, indumento eorum *P. echitideae*. *Pseudostipulae* spathulatae, apice nonnunquam breviter

acuminatae, 4–5 mm. longae, lamina ad 2 mm. lata, ceterum ut in *P. echitidea*. *Folia* vulgo 9–17 cm. longa, simpliciter imparipinnata 5-foliolata, vel biternata cum cirrho gracili tenui apice trifurcato terminata; petiolus indumento ramulorum, 1·5–3·5 cm. longus; petioluli similiter induti, 3–7 mm. longi; foliola ovata vel oblonga, terminalia nonnunquam obovato-oblonga, apice breviter obtuse acuminata vel cuspidata, inferiora basi rotundato-obtusa et abrupte in petiolulum contracta, superiora et minora basi cuneata, haud vel rarò obliqua, 3·5–9·7 cm. longa, 1·4–4·7 cm. lata, coriacea, supra nitida, costa minute puberula ceterum glabra sed conspicue punctata, subtus costa nervisque minute pubescentibus atque lepidotis, pagina ubique dense minutissime lepidota atque minus dense sed conspicue punctata, supra intricate subtus laxius sed prominentius reticulata, nervis lateralibus 7–8 ascendentibus ac arcuato-anastomosantibus. *Inflorescentiae* ut videtur axillares et terminales, racemosae, floribus nonnunquam apice congesto-corymbosis, 4–9 cm. longae, glabratae sed sparse lepidotae; bracteae ovatae, pubescenti-ciliatae, circiter 0·75–1·2 mm. longae, ad 0·75 mm. latae; bracteolae basi pedicellorum similes sed minores; pedicelli subvernicoso-nitiduli, glabri sed sparse lepidoti, imi ad 1·5 cm. longi, superiores sensim breviores. *Calyx* tubulari-campanulatus, 3·5–5 mm. longus, post florem lapsum vix ad 4 mm. latus, apice truncatus ciliolatus vix denticulatus, extra subvernicoso-nitidulus rugulosus, glaber vel sparse lepidotus, infra apicem seriebus glandularum immersarum patelliformium praeditus. *Corolla* teste lectore alba, odorem *Jasmini* specierum proprium reddens, hypocrateriformis, parva; tubus perangustus, 1·6 cm. longus vel brevior, apice vix ampliatus, extra glaber vel sparsissime obscure lepidotus; limbus 1·3 cm. tantum diametro, lobis ad 7 mm. longis ad 3·2 mm. latis maturis sub lente forti utrinque dense glandulosis atque sparsius lepidotis. *Stamina* 4·5 mm. supra tubi basin inserta, filamentis glabris in unico flore immaturo dissecto 5 mm. longis; antherae e fauce corollae protrudentes, thecis divergentibus vix 2 mm. excedentibus, connectivo conspicue ad 0·75 mm. producto. *Discus* pulvinaris, 1 mm. altus. *Ovarium* linearioblongum, circiter 2 mm. longum, minute lepidotum; stylus glaber, in flore nondum expanso 3 mm. longus; ovula biseriata. *Capsula* (vix matura) linearis, apice breviter attenuata obtusa, 21 cm. longa, 1 cm. lata, lepidota.

BRAZIL. Matto Grosso: at the edge of forest, Burity, N.E. of Cuyaba, 2250 ft., June 1927, *Miss Gwen Dorrien Smith* 294 (type in Kew Herb.): " a vigorous climber; fl. white, with scent of jasmine."

This species is immediately distinguished from all other tropical American *Bignoniaceae* by the combination of the branchlets and leaves characteristic of the genus *Pleonotoma* with peculiarly small hypocrateriform corollas.

1297. Protea stipitata *Phillips* [Proteaceae]; affinis *P. rhodanthae* Hook. f. sed foliis et capitulis majoribus, involucri bracteis numerosioribus inferne dense et molliter tomentosis differt.

Rami glabri. *Folia* 9·5–20 cm. longa, 2·7–4·3 cm. lata, lanceolata, apice obtusa, basi angustata, plus minusve distincte venosa. *Capitula* solitaria vel apice ramorum conferta, pedunculata, 6–7 cm. longa; pedunculus circiter 1 cm. longus. *Receptaculum* convexum. *Involucri bracteae* 12–13-seriatae; exteriores ovatae, apice obtusae, inferne molliter tomentosae; interiores oblongae, calyce subaequales. *Calycis tubus* 3·2 cm. longus, membranaceus, basi dilatatus, 7-nervosus, nervis 3 prominentibus, intus dense pilosus; laminae 1·4 cm. longae, subpilosae; laminae connatae apice tridentatae, ciliatae. *Stamina* 9·5 mm. longa, linearia, apice glandibus ovatis instructa. *Ovarium* 3·5 mm. longum, pilis longis vestitum; stylus 4 cm. longus, glaber; stigma 1 cm. longum.

SOUTH AFRICA. Transvaal: Pietersburg distr.; Farm " Mountain Home," 45 miles east of Pietersburg, on the steep grassy slopes of mountains, *Murray in National Herbarium* 14510.

1298. Epidendrum (§ Amphiglottium) Hombersleyi *Summerhayes* [*Orchidaceae*]; affine *E. orchidifloro* Salzm. et *E. smaragdino* Lindl., a quibus labello obovato integro facile distinguendum.

Caules erecti e basi breviter repente radicante, radicibus flexuosis glabris, fere usque apicem foliati, circiter 30 cm. alti, 2–3 mm. diametro, basi cataphyllis paucis membranaceis vaginantibus obtecti. *Folia* e basi valde striata arcte vaginante exorientia, lanceolata vel elliptico-lanceolata, acuta, 2·5–8 cm. longa, 6–16 mm. lata, carnosa, siccitate subnitentia. *Inflorescentia* simpliciter racemosa, 2–8 cm. longa, dimidio inferiore vaginis imbricantibus acutis vel acuminatis vestita, superne usque ad 7-flora; bracteae lanceolatae, acuminatae, ovario pedicellato multo breviores. *Flores* patentes, virides, purpureo-maculati, glabri, pedicello (cum ovario) 1–2 cm. longo. *Sepalum* intermedium elliptico-oblanceolatum, subacutum, 7 mm. longum, 2·2 mm. latum; sepala lateralia oblique oblanceolata, breviter acuminata, 7·5 mm. longa, 3 mm. lata. *Petala* lanceolato-ligulata, acuta, 7·5 mm. longa, circiter 1 mm. lata. *Labellum* dimidio inferiore columnae adnatum, parte libera obovata obtusa, totum labellum 9 mm. longum, 4·5 mm. latum, ante columnam callis tribus intermedio humili lineari fere usque apicem labelli procurrente lateralibus erectis lateraliter compressis suborbicularibus intermedio multo brevioribus instructum. *Columna* 5 mm. longa, apice dilatata; androclinii margo in alam angustam truncatum integram productus.

TRINIDAD: Arena forests via San Rafaeil, Aug. 1927, *Hombersley in Herb. W.E. Broadway* 6659 (type); Arena Road, March 1928, *Hombersley in Herb. Roy. Hort. Trinit.* 11949; St. Clair Experimental Station, on *Pithecellobium Saman*, Sept. 1918, *R. O. Williams in Herb. Roy. Hort. Trinit.* 8702.

This interesting species resembles *E. orchidiflorum* Salzm. in habit, particularly the rigid fleshy lanceolate leaves which dry pale brown. It also resembles *E. smaragdinum* Lindl. but has broader leaves. From these species, both of which are natives of British

Guiana, it differs in the entire lip. The name is given in compliment to Archdeacon Hombersley, who has for many years been a keen student of the Trinidad flora.

1299. **Dendrobium (§ Rhizobium) Grimesii** *White et Summerhayes* [Orchidaceae]; affine *D. teretifolio* R. Br., a quo sepalis petalisque brevioribus, sepalis 3-nerviis nec 5-nerviis, labelli lobis lateralibus magis evolutis, lobo intermedio breviore venis 5 parallelis instructo venis lateralibus divergentibus ramosis nullis distinguitur.

Herba epiphytica. *Caules* erecti, ramosi, multi-articulati, internodiis circiter 3 cm. longis et 3 mm. diametro. *Folia* singula in apicibus ramulorum, teretia, leviter 2–4-sulcata, recta vel leviter curvata, subacuta, 8–15 cm. longa, 5–6 mm. diametro. *Racemi* laterales, erecti, 6–10-flori; bracteae albo-hyalinae, parvae; pedicelli cum ovariis tenues, curvati, circiter 1 cm. longi. *Flores* luteo-albi. *Sepalum* intermedium lanceolato-lineare, acutum, 2·5 cm. longum; sepala lateralia 2·8 cm. longa, trinervia, mentum brevem subacutum formantia. *Petala* linearia, quam sepala angustiora, iis aequilonga. *Labellum* totum 1·8 cm. longum, ex ungue brevi cuneatim dilatatum, medio distincte trilobatum; lobi laterales rotundati, integri, 2 mm. lati; lobus intermedius longe acuminato-lanceolatus, apice reflexus, crenulato-crispatus, 1 cm. longus, supra basin 3 mm. latus; labellum carinis tribus inaequalibus intermedia quam lateralibus paulo longiore inferne strictis parallelis basi lobi intermedii undulatis superne venis 5 subparallelis instructum. *Gynostemii* pars libera brevis, purpurascens.

Queensland. Lake Barrine, near Atherton, Aug. 1932, *B. D. Grimes*.

An interesting species agreeing with *D. teretifolium* R. Br. in many features, but with thicker leaves and different floral characters, especially in the lip. The absence in the front lobe of lateral veins at right angles to the longitudinal ones is particularly noteworthy.

1300. **Diplachne malayana** *C. E. Hubbard* [Gramineae-Eragrosteae]; affinis *D. fuscae* Beauv., sed culmis gracilioribus et rigidioribus, laminis rigidiusculis fere laevibus, ligulis ad seriem ciliorum minutorum redactis, spiculis latioribus differt.

Gramen perenne caespitosum, 20–80 cm. altum; innovationes extravaginales. *Culmi* erecti, e rhizomate brevi orti, graciles, rigidi, compressi, simplices, glabri laevesque, 2–4-nodes, internodio supremo usque ad 50 cm. longo. *Foliorum vaginae* compressae, carinatae, persistentes, glabrae laevesque, inferiores internodiis longiores; ligulae ad seriem ciliorum minutorum redactae; laminae anguste lineares, tenuiter acutae, erectae, usque ad 25 cm. longae, convolutae vel planae et usque ad 4·5 mm. latae, rigidiusculae, glabrae, apice et marginibus apicem versus scaberulae. *Panicula* sublaxa, erecta vel nutans, 7–20 cm. longa; rhachis gracilis, scaberula; rami 4–12, solitarii, erecti vel paulo patentes, gracillimi,

3·5–10 cm. longi, laxe spiculati, subtriquetri, angulis scaberulis; pedicelli usque ad 1·5 mm. longi. *Spiculae* appressae, 5–8 mm. distantes, anguste oblongae, obtusae, compressae, 5–8 mm. longae, 1·8–2 mm. latae, arcte 5–8-florae, stramineae vel purpurascentes. *Glumae* ambitu anguste lanceolatae, acutae, firme membranaceae, uninerves, carinatae, carinis scaberulae; inferior 2–2·5 mm. longa; superior 2·5–3·5 mm. longa. *Lemmata* ambitu oblique ovato-lanceolata vel ovata, explanata ovata vel late ovata, obtuse et breviter biloba, mucronata, 2·5–3 mm. longa, coriacea, prominenter trinervia, laevia, callo minuto piloso; paleae anguste ellipticae, obtusae, lemmati aequilongae vel paulo breviores, carinis angustissime altis et ciliolatis. *Antherae* anguste oblongae, 0·5–0·75 mm. longae. *Caryopsis* anguste oblonga, subtriquetra, c. 1·3 mm. longa.

Siam: Nakawn Sritamarat, Songkla, Kampengpet, in savannah, under 50 m. alt., 28-vii-1928, *Kerr* 15978; Surat, Kanchanadit, edge of evergreen forest, c. 5 m. alt., 1-viii-1927, *Kerr* 13075; Puket, Kantang, 30-v-1919, *Haniff & Nur* 4701 (type).

Malay Peninsula: North Kedah, Changloo, 20-iii-1932, *Jacob in Herb. Singap.* 25883.

Borneo: Banjermassin (Bangarmassing), 1857–58, *Motley* 731.

XII—NOTES ON AFRICAN GRASSES: XV.

Ischaemum juncifolium *F. Ballard et C. E. Hubbard*, sp. nov.; affine *I. Franksae* Wood, sed rhachi glabra, spiculis paullo minoribus, gluma inferiore dorso laevi differt.

Gramen perenne, dense caespitosum, 30–60 cm. altum. *Culmi* erecti, teretes, graciles, simplices, 1–2-nodes, glabri laevesque. *Folia* plerumque basalia; vaginae basales persistentes, basim culmorum dense obtegentes, compressae, latiusculae, usque ad 10 cm. (vel ultra) longae, pallide fuscae, marginibus ciliatae, ore dense lanato-barbatae, superiores teretes, internodiis demum breviores, glabrae laevesque, plerumque auriculatae, auriculis minutis obtusis; ligulae truncatae, usque ad 1 mm. longae, membranaceae; laminae junciformes, erectae, angustissimae, rigidae, usque ad 35 cm. (vel ultra) longae, 1–1·25 mm. latae, leviter compressae vel subteretes, basim versus leviter canaliculatae, in canaliculo sericeo-pilosae, ceterum glabrae laevesque, virides. *Inflorescentia* angusta, erecta, 4·5–8 cm. longa; axis primarius compressus, gracilis, fere laevis; racemi 2–3, erecti, usque ad 5 cm. longi, solitarii; articuli rhachis et pedicelli leviter compressi vel subtriquetri, superne leviter incrassati, fere laeves; articuli 5–10 mm. longi, serie basali pilorum minutorum excepta glabri; pedicelli 4–6 mm. longi. *Spiculae sessiles* lanceolatae vel anguste ovatae vel ovato-oblongae, acutae vel subacuminatae, 6–8 mm. longae (callo incluso), earistatae, glabrae, pallide virides et purpureo-tinctae. *Gluma* inferior dorso plana, bicarinata, marginibus angustissimis inflexis, coriacea, 7–11-nervis, carinis minute scaberula; gluma superior carinata, explanata ovato-oblonga, acuta, firme membranacea, 3-nervis. *Anthoecium inferum*

sterile : lemma explanatum lanceolato-oblongum, acutum vel obtusum, usque ad 6 mm. longum, hyalinum, 3-nerve, marginibus ciliolatum ; palea lineari-lanceolata, usque ad 5 mm. longa, bicarinata, carinis scaberula. *Anthoecium superum* ♀ : lemma explanatum ovato-oblongum, subacuminatum, usque ad 5·5 mm. longum, hyalinum, 3–nerve, marginibus ciliolatum ; palea explanata lanceolato-oblonga, usque ad 5 mm. longa, ciliolata ; antherae 3 3·5 mm. longae. *Spiculae pedicellatae* spiculis sessilibus subsimiles, circiter 6 mm. longae, glabrae. *Gluma* inferior dorso plerumque convexa vel superne carinata, explanata anguste ovata vel ovata, acuta, 7–9-nervis ; gluma superior carinata, explanata ovato-oblonga, acuta, 3-nervis. *Anthoecium inferum* sterile : lemma circiter 5 mm. longum; palea 4 mm. longa. *Anthoecium superum* ♂ : lemma circiter 4·5 mm. longum ; palea 3·5 mm. longa.

NORTHERN RHODESIA : Mwinilunga District ; near Matonchi Farm, in damp dambo by Dobekka stream, Sept. 1930, *Milne-Redhead* 1004.

Rhytachne pilosa *F. Ballard et C. E. Hubbard*, sp. nov. ; affinis *R. robustae* Stapf, sed nodis vaginarum glabris, racemis brevioribus argenteo-pilosis differt.

Gramen perenne, caespitosum, usque ad 80 cm. altum ; innovationes extravaginales. *Culmi* e rhizomate brevi erecti, teretes, simplices, 1–2-nodes, racemum versus pilis albis appressis dense pilosi, ceterum glabri laevesque. *Foliorum vaginae* glabrae vel basales pilis albis paucis minutae, ore barbatae, tenuiter striatae, basales persistentes, superiores internodiis breviores ; ligulae rotundato-truncatae, usque ad 1·5 mm. longae, membranaceae, glabrae ; laminae lineares, in acumen tenue attenuatae, usque ad 20 cm. longae, 2–5 mm. latae, planae vel siccitate arcte convolutae, rigidiusculae, pilis albis nitentibus brevibus appressis dense pilosae, demum glabrescentes vel superiores glabrae, supra prominenter nervosae et minute asperulae, subtus laeves. *Racemi* spiciformes, cylindrici, rigide erecti, 6–9 cm. longi, 3–4 mm. lati, atropurpurei, argenteo-pilosi ; articuli lineares, 5–10 mm. longi, apice plus minusve oblique cupulati, latere exteriore convexi et appresse pilosi, latere interiore leviter concavi et glabri, basi dense barbati ; pedicelli lineares, 6–7·5 mm. longi, dorso compressi, marginibus ciliati, dorso laxe pilosi. *Spiculae sessiles* lanceolato-oblongae, vel oblongae, 6·5–10 mm. longae. *Gluma* inferior subacuta, dorso leviter convexa, marginibus anguste inflexis, coriacea, erugosa, 7-nervis, minute asperula, nervis superne breviter pilosis, carinis ciliatis ; gluma superior inferiore paullo brevior, navicularis, acuta, membranacea, 3-nervis, carinata, carina inferne scaberula superne ciliata, marginibus ciliatis. *Anthoecium inferum* ♂ : lemma glumis paullo brevius, explanatum ovato-oblongum, truncatum, hyalinum, 2-nerve, ciliolatum ; palea lemmati similis sed oblonga. *Anthoecium superum* ♀ : lemma explanatum oblongum, subacutum, hyalinum, 3-nerve, ciliolatum ; palea lemmati aequilonga, oblonga, 2-nervis. *Spiculae pedicellatae*

ad glumas duas redactae ; gluma inferior ovata, in setam ciliolatum attenuata, seta inclusa usque ad 6 mm. longa ; gluma superior minuta.

NORTHERN RHODESIA : Mwinilunga District ; between Mwinilunga and Matonchi Farm, early burnt dambo, in sandy peaty damp acid soil, August 1930, *Milne-Redhead* 987.

Hemarthria altissima (*Poir.*) *Stapf et C. E. Hubbard*, comb. nov. *Rottboellia altissima* Poir. Voy. Barb. **2,** 105 (1789). *R. fasciculata* Lamk. Illustr. Gen. **1,** 204 (1791) ; Desf. Fl. Atl. **1,** 110, tab. **36** ; Poir. in Lam. Encycl. Meth. Bot. **6,** 311 (1804), Suppl. **4,** 718 (1816), et Hist. Plant. **2,** 455 (1825). *R. compressa* var. *fascculata* Hack. in DC. Monogr. Phan. **6,** 286 (1889). *Lodicularia fasciculata* Beauv. Agrost. 166 (1812). *Lepturus fasciculatus* Trin. Fund. Agrost. 123 (1820). *Andropogon altissimus* Raspail in Ann. Sc. Nat. Ser. 1, **5,** 307 (1825). *A. fasciculatus* Raspail, l.c. *Hemarthria fasciculata* Kunth, Rév. Gram. **1,** 153 (1829) ; Stapf in Prain, Fl. Trop. Afr. **9,** 55.

Distrib. North, tropical and South Africa.

Rottboellia fasciculata Lamk. is apparently based on *R. altissima* Poir. which Lamarck cites as a synonym. Poiret, although using Lamarck's name, repeatedly states that he considers *R. fasciculata* to be the same as his species (see Poiret, Hist. Plant. **2,** 455 and in Lamk. Encycl. Meth. Bot. Suppl. **4,** 718).

Bothriochloa intermedia (*R. Br.*) *A. Camus* var. **acidula** (*Stapf*) *C. E. Hubbard*, comb. nov. *Amphilophis intermedia* var. *acidula* Stapf in Prain, Fl. Trop. Af. **9,** 174 (1917).

Distrib. Cape Verde Islands, Gold Coast, Angola, West Indies.

Mdlle. A. Camus in Ann. Soc. Linn. Lyon, **76,** 162 (1931) has pointed out that *Amphilophis* Nash (in Britt. Man. Fl. North. States & Canada, ed. 1, 71 : 1901) is synonymous with *Bothriochloa* O. Kuntze (Rev. Gen. Pl. **2,** 762 : 1891). She has made the following new combinations for the species of *Bothriochloa* which occur in Africa :—*B. radicans* A. Camus (*Amphilophis radicans* Stapf) ; *B. intermedia* A. Camus (*Andropogon intermedius* R.Br., *Amphilophis intermedia* Stapf) ; *B. glabra* A. Camus (*Andropogon glaber* Roxb., *Amphilophis glabra* Stapf) ; *B. pertusa* A. Camus (*Andropogon pertusus* Willd., *Amphilophis pertusa* Stapf) ; *B. insculpta* A. Camus (*Andropogon insculptus* Hochst., *Amphilophis insculpta* Stapf).

Bothriochloa insculpta (*Hochst.*) *A. Camus* var. **vegetior** (*Hack.*) *C. E. Hubbard*, comb. nov. *Andropogon pertusus* var. *vegetior* Hack. in DC. Monogr. Phan. **6,** 481 (1889). *Amphilophis insculpta* Stapf var. *vegetior* Stapf in Prain, Fl. Trop. Afr. **9,** 177 (1917).

Distrib. Eritrea, Sudan and Uganda.

Sorghum Friesii (*Pilger*) *C. E. Hubbard*, comb. nov. *S. micratherum* Stapf in Prain, Fl. Trop. Afr. **9,** 142 (1917). *Andropogon Friesii* Pilger in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.–Kongo–Exped. 1911–12, **1,** 195 (1916).

Distrib. Northern and Southern Rhodesia, Portuguese East Africa and Angola.

Rhynchelytrum repens (*Willd.*) *C. E. Hubbard*, comb. nov. *R. roseum* Stapf et C. E. Hubbard ex Bews, The World's Grasses, 223 (1929) and in Prain, Fl. Trop. Afr. **9,** 880 (1930). *Saccharum repens* Willd. Sp. Pl. **1,** 322 (1798). *Tricholaena rosea* Nees, Cat. Sem. Hort. Vratisl. 1835 and in Linnaea, **11,** Lit. Ber. 129 (1837).

Distrib. Tropical and South Africa, Arabia; introduced into many parts of the world.

Saccolepis squamigera (*Pilger*) *C. E. Hubbard*, comb. nov. *Panicum squamigerum* Pilger in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.–Kongo–Exped. 1911–12, **1,** 203, t. 15, figs. 1–3 (1916).

Distrib. Northern Rhodesia.

Saccolepis cinereo-vestita (*Pilger*) *C. E. Hubbard*, comb. nov. *Panicum cinereo-vestitum* Pilger in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.–Kongo–Exped. 1911–12, **1,** 201, t. 14, fig. 2 (1916).

Distrib. Northern Rhodesia.

Digitaria albomarginata *Stent*, sp. nov.; affinis *D. diversinervi* Stapf, sed spiculis angustioribus acutissimis, laminis rigidis hirsutis, marginibus laminarum albis cartilagineis, racemis laxis paucis differt.

An erect or semi-postrate perennial sending out leafy stolons with very short internodes. *Culms* slender, up to about 25 cm. high, leafy and several-noded in the lower half, glabrous, smooth, branched or occasionally simple; lower internodes short and like the uppermost not or only shortly exceeding the sheaths. *Leaf-sheaths* rather tight, the lower softly hairy, the upper often glabrescent; ligule reduced to a membranous rim; blades linear-lanceolate, acute, up to 4 cm. long by 3 mm. broad, rather firm, hairy all over, with conspicuous white cartilaginous margins. *Racemes* 2 at the tips of the culms, rarely 1 or 3, up to 7 cm. long; rhachis about 0·7 mm. broad, flexuous, trigonous, with narrowly winged scabrid margins; pedicels paired, the longer up to 3 mm. long, angular and scabrid, the other very short, sometimes suppressed. *Spikelets* not imbricating, narrowly lanceolate, acute, up to 3·5 mm. long by 1 mm. wide, appearing glabrous. *Lower glume* a thin whitish broadly obtuse membranous scale about 0·7 mm. long; upper narrowly ovate, acuminate, equalling about half the length of the spikelet, thin, 3-nerved, with a few short soft acute hairs between the nerves and on the margins. *Lower lemma* equalling the spikelet, prominently 9-nerved, with lines of short fine obtuse appressed hairs between the middle pair of lateral nerves and on the margins, nerves smooth. *Upper lemma* and palea chartaceous, pallid, the flaps of the former rather broad but not overlapping.

NATAL: Umbogintwini; African Explosives Experiment Station, *D. Moses in Govt. Herb. Salisbury*, 3767, 4041.

Very near to *Digitaria diversinervis* Stapf, from which it differs in the very hairy and firmer leaf-blades with their conspicuous white margins, fewer and laxer racemes and less closely ribbed lower lemma. This grass is growing in the experiment area at Umbogintwini side by side with *Digitaria diversinervis* and the difference in the texture of the foliage is most noticeable.

Digitaria phaeotricha *Robyns* var. **paucipilosa** *F. Ballard et C. E. Hubbard*, var. nov.; a typo differt culmis erectis, nodis glabris, foliorum vaginis haud auriculatis, laminis usque ad 36 cm. longis et 3 mm. latis, lemmate anthoecii superi inter nervos laterales et ad margines pilorum brevium seriebus quattuor nec sex praedito.

NORTHERN RHODESIA: Mwinilunga District; near Matonchi Farm, in damp dambo by Dobekka stream, burnt early, Sept. 1930, *Milne-Redhead* 1003.

We are indebted to Prof. W. Robyns, Director of the Brussels Botanic Garden, for comparing our specimen with the type of *Digitaria phaeotricha* which he had on loan from the herbarium at Turin.

Digitaria scalarum *Chiov.* var. **elgonensis** *C. E. Hubbard et J. D. Snowden*, var. nov.; a typo differt culmis 7·5–15 cm. longis, foliorum laminis 1–3 cm. longis 2·3 mm. latis, racemis 2–3, 1–3·5 cm. longis, spiculis acutis 2·5 mm. longis.

UGANDA: Bugishu, Bulago, 1800–2400 m., Aug. 1927, *Snowden* 1180; Butandiga, 2100 m., Dec. 1927, *Snowden* 1233 (type), 1234A; 2400 m., *Thomas* 487.

This dwarf variety of *D. scalarum* is abundant in pastures on the slopes of Mt. Elgon where it is associated with *Pennisetum clandestinum* Hochst. or at higher altitudes replaces that species.

Vern. Name: *Nanzigi* (Lugishu).

Eriochloa parvispiculata *C. E. Hubbard*, sp. nov.; affinis *E. procerae* C. E. Hubbard, sed racemis brevioribus, spiculis multo minoribus differt.

Gramen perenne, laxe caespitosum. *Culmi* geniculato-adscendentes, 50 cm. (vel ultra) alti, graciles, paullo compressi, simplices vel ramosi, 3-nodes, glabri laevesque. *Folia* glabra; vaginae demum internodiis breviores, compressae, carinatae, tenuiter striatae, laeves, basales persistentes; ligulae ad seriem pilorum minutorum redactae; laminae lineares, basi leviter contractae, apice acutae, usque ad 13 cm. longae et 4·5 mm. latae, planae, virides, marginibus apicem versus scaberulae, ceterum laeves. *Panicula* angusta, erecta, contracta, 9 cm. longa, 1·5 cm. lata, pallide viridis; axis primarius gracilis, subteres, scaberulus; racemi 17, erecti vel paullo patentes, simplices vel inferne ramis brevibus 3–4-spiculatis ramosi, dense spiculati, sessiles vel inferne breviter pedunculati, inferiores usque ad 3 cm. longi, superiores breviores; rhachis dorso plana, usque ad 0·6 mm. lata, triquetra, scaberula; pedicelli bini vel racemorum apicem versus solitarii, usque ad 1 mm. longi,

tenuiter scaberuli, apice subdiscoidei. *Spiculae* dense imbricatae, 4–2-seriatae, elliptio- vel ovato-oblongae, acutae, plerumque mucronulatae, 2–2·3 mm. longae. *Gluma* inferior cupuliformis, usque ad 0·2 mm. longa, viridis vel atropurpurea, glabra; gluma superior tenuiter acuta, plerumque mucronulata, spiculae aequilonga et ambitu similis, tenuiter membranacea, obscure 5-nervis. *Anthoecium inferum* ad lemma *redactum*; *lemma glumae superiori* simile. *Anthoecium superum* ♀, elliptico-oblongum, usque ad 1·7 mm. longum; lemma tenuiter [illegible], glabrum, mucrone usque ad 0·25 mm. longo scaberulo praeditum.

ZANZIBAR; *Without* precise locality, *Vaughan* 1607.

Urochloa platyrrhachis *C. E. Hubbard*, sp. nov.; a ceteris speciebus rhachi complanata herbacea usque 5 mm. lata differt.

Gramen annum (?), basi ignota. *Culmi* geniculato-adscendentes, usque ad 40 cm. longi, gracillimi, ramosi, usque ad 6-nodes, nodis pubescentibus, ceterum glabri laevesque. *Foliorum vaginae* laxae, teretes, plerumque internodiis breviores, tenuiter nervosae, glabrae vel sparse pubescentes; ligulae ad seriem ciliorum redactae; laminae lineares vel lineari-lanceolatae, basi leviter contractae, acutae, 2·5–7 cm. longae, 2·5–6 mm. latae, planae, virides, flaccidae, puberulae et plerumque pilis paucis longioribus laxe adspersae, marginibus ciliatis. *Racemi* 1–2, sessiles, secundi, spiciformes, 3·3–4 cm. longi; rhachis multo complanata, tenuis, herbacea, usque ad 5 mm. lata, minute puberula vel glabra, marginibus scaberulis, costa media tortuosa, gracillima, internodiis brevissimis; pedicelli minutissimi. *Spiculae* biseriatae, alternatae, leviter imbricatae, late oblongae vel elliptico-oblongae, obtusae, 3·5–3·8 mm. longae, albido-virides, fere glabrae. *Glumae* inaequales; inferior oblata, usque ad 0·5 mm. longa, enervis; superior explanata late elliptica, obtusissima, spiculae aequilonga, membranacea, tenuiter 7-nervis, glabra. *Anthoecium inferum* ♂ vel sterile: lemma explanatum late ellipticum, obtusum, spiculae aequilongum, in dorso sulco mediano angusto tenuissimo facile scisso percursum, ceterum firme membranaceum, 5-nerve, pilis paucis minutis e tuberculis ortis sparse adspersum; palea lemmati aequilonga, inter carinas hyalina, carinis anguste alatis. *Anthoecium superum* ♀: lemma late ellipticum, obtusum, mucronulatum, 2·5 mm. longum, dorso valde compressum, tenuiter crustaceum, apice minute puberulum, fere laeve, 5-nerve; palea lemmati aequilonga. *Antherae* 2 mm. longae. *Caryopsis* orbicularis, 1 mm. longa.

BELGIAN CONGO: Sakania, June 1931, *Mundy in Govt. Herb. Salisbury* 5038.

Urochloa lata (*Schum.*) *C. E. Hubbard*, comb. nov. *U. insculpta* Stapf in Prain, Fl. Trop. Afr. **9**, 599 (1920). *Panicum latum* Schum. Beskr. Guin. Pl. 61 (1827). *P. insculptum* Steud. Syn. Pl. Glum. **1**, 49 (1854). *P. hamadense* Mez in Notizbl. Bot. Gart. Mus. Berlin, **7**, 66 (1917).

Distrib. French Guinea to Nigeria, French Equatorial Africa, Sudan, Eritrea and Abyssinia.

Panicum Pole-Evansii *C. E. Hubbard*, sp. nov.; affine *P. adenophoro* K. Schum., sed spiculis minoribus, gluma inferiore uninervi, gluma superiore et lemmate inferiore 7-nervibus differt.

Gramen perenne (?). *Culmi* scandentes, geniculati, plus minusve graciles, teretes, multinodes, ramosi, pilis patentibus aliis e tuberculis ortis aliis glandulosis admixtis breviter pilosi; internodia inferiora 1·5–6 cm. longa, internodium supremum (pedunculus) usque ad 18 cm. longum. *Foliorum vaginae* plerumque internodiis breviores, teretes, tenuiter striatae, demum solutae, dense pilosae, nodos versus laxe barbatae; ligulae ad seriem ciliorum redactae; laminae lineari-lanceolatae vel lanceolatae, basi leviter rotundatae, acutae, 1–5 cm. longae, 2–7 mm. latae, planae, patentes vel demum reflexae, virides, dense pubescentes vel supra glabrescentes, pilis tenuibus nonnullis glandulosis, marginibus scaberulis. *Panicula* ambitu ovata vel oblonga, tripinnata, laxa, 4–9 cm. longa; rhachis, rami et ramuli pilis patentibus nonnullis glandulosis admixtis breviter pilosi; rhachis filiformis; rami laxe divisi, flexuosi, inferiores usque ad 5 cm. longi; pedicelli valde inaequales, 1–6 mm. longi. *Spiculae* oblongae vel elliptico-oblongae, obtusae, 2 mm. longae, turgidulae, glabrae, albidae vel purpureo-suffusae. *Glumae* inaequales, membranaceae, concavae, tenuinerves; inferior explanata lanceolato-ovata, obtusa, 1 mm. longa, 1-nervis; superior explanata late elliptico-oblonga, obtusissima, spiculae subaequilonga, 7-nervis. *Anthoecium inferum* ♂: lemma glumae superiori valde simile, spiculae aequilongum; palea 2 mm. longa, carinis laevibus. *Anthoecium superum* ♀, elliptico-oblongum, subobtusum, 2 mm. longum: lemma atque palea tenuiter crustacea, laevis vel obscure granulosa.

NORTHERN RHODESIA: at river 9 miles south of Lake Tanganyika, creeping over rocks, July 1930, *Pole Evans* 3039 (46).

Melinis Gosswelleri *C. E. Hubbard*, sp. nov.; affinis *M. macrochaetae* Stapf et C. E. Hubbard, sed gluma superiore leviter gibbosa 9-nervi, anthoecio infero ♂, lemmate infero angustiore, pedicellis hirsutis differt.

Gramen annuum. *Culmi* geniculato-adscendentes, usque ad 80 cm. alti, graciles, ramosi, teretes, 8–10-nodes, laeves, glabri vel paniculam versus pubescentes. *Foliorum vaginae* solutae, internodiis breviores, tenues, pallidae, laeves, glabrae vel ore puberulae; ligulae ad seriem brevem ciliorum redactae; laminae lineari-lanceolatae, tenuiter acutae, 4–10 cm. longae, 4–7 mm. latae, planae, tenues, virides, laeves, glabrae vel sparse hirsutae. *Panicula* linearis vel lineari-lanceolata, contracta, pallide viridis, 9–10 cm. longa, 1–1·5 cm. lata; rhachis et rami pilis patentibus mollibus albis dense hirsuti; rhachis gracilis, leviter flexuosa; rami erecti vel adscendentes, tenuiter filiformes, solitarii, laxe ramosi, usque ad

5 cm. longi; pedicelli 0·3–1·5 mm. longi, infra apicem leviter incrassatum pilis ad 1·5 mm. longis argenteo-nitentibus muniti. *Spiculae* lanceolatae vel lanceolato-oblongae, 2·3–2·5 mm. longae, pallide virides, superne pilosae. *Gluma inferior* ad marginem minutam hyalinam angustam redacta; gluma superior spiculae aequilonga, dorso leviter gibbosa, explanata elliptica vel elliptico-oblonga, tenuiter membranacea, 9-nervis, superne marginibus ciliata, supra medium dorsum fasciculis pilorum erectorum in unam seriem transversam dispositis, minute biloba, arista gracili scaberula usque ad 4·5 mm. longa e sinu exoriente instructa. *Anthoecium inferum* ♂: lemma anguste oblongum, obtusum, 2 mm. longum, tenuiter membranaceum, 3-nerve, marginibus et nervo medio ciliatum; palea anguste oblonga, lemmati aequilonga, bicarinata, carinis longe ciliatis. *Anthoecium superum* ♀, lanceolatum vel anguste ovatum, subacutum, glabrum atque laeve, 1·8–2 mm. longum; lemma obscure 3-nerve. *Antherae* 1·5 mm. longae.

ANGOLA: Mossamedes; Huilla, 1500 m., 1931, *Gossweiler* 9408.

A very distinct species, differing from all other members of the genus in having a 9-nerved and slightly gibbous upper glume.

Dignathia ciliata *C. E. Hubbard*, sp. nov.; a ceteris speciebus differt panicula majore, spiculis ramulisque pilis longis dense ciliatis, glumis lineari-lanceolatis.

Gramen perenne. *Culmi* erecti vel geniculati, graciles, usque ad 30 cm. alti, teretes, multinodes, ramosi, ramis erectis, glabri laevesque. *Foliorum vaginae* internodiis longiores, teretes, arcte appressae, glaucae, minutissime scaberulae, ore laxe barbatae, ceterum glabrae; ligulae truncatae vel rotundatae, usque ad 1 mm. longae, membranaceae, ciliolatae; laminae lineares, basi leviter contractae, tenuissime acutae, 6–11 cm. longae, usque ad 4 mm. latae, planae vel arcte convolutae, rigidulae, supra virides, subtus glaucae vel glauco-purpureae, glabrae laevesque. *Racemus* spiciformis, densiusculus, cylindricus, erectus, 2·5–6 cm. longus, 10–12 mm. latus, viridis, sericeo-pilosus; rhachis gracillima, angulata, scaberula; ramuli oblique patentes, basi disarticulati, triquetri, superne paullo incrassati, angulis pilis albis patentibus usque ad 1·5 mm. longis dense ciliati, parte nuda (pedunculo) usque ad 2·5 mm. longa, spiculas duas gerentes. *Spicula fertilis* ovata vel ovato-oblonga et hians, 5–6 mm. longa, lateraliter compressa, viridis et purpureo-tincta; rhachilla producta, usque ad 1 mm. longa. *Glumae* a latere visae oblique lineari-lanceolatae, acute acuminatae, in cuspidem brevem erectam vel leviter recurvam terminantes, dorso late cartilagineo-incrassatae, marginibus angustis hyalinis, carinatae, carina purpurea pilis albis patentibus e tuberculis ortis usque ad 2 mm. longis dense ciliatae; gluma inferior 4–4·5 mm. longa, marginibus ciliolatis; superior spiculae aequilonga. *Lemma* a latere visum semi-ovatum, acutum, seta usque ad 1 mm. longa scaberula terminatum, 3·5–4 mm. longum, firme membranaceum, 3-nerve, nervis lateralibus marginibus approximatis, carinatum, carina ciliolata. *Palea* lanceolata,

3–3·5 mm. longa. *Caryopsis* oblique oblongo-ovoidea, lateraliter compressa, 2 mm. longa. *Spicula sterilis* ad glumas redacta, pedicellata, pedicello triquetro usque ad 1·5 mm. longo dense ciliato. *Glumae* aequales, lineari-lanceolatae, acuminatae, 3·5–4 mm. longae, apice erectae vel leviter recurvae, cartilagineo-incrassatae, carina dense ciliatae.

BRITISH SOMALILAND: Haud, 570 m., common, May 1930, *B. Godfrey Fausset* 46.

Vern. Name: *Fodarder*.

Eragrostis pseudopoa *C. E. Hubbard*, sp. nov.; affinis *E. keniensi* Pilger, sed spiculis laxe 5–8-floris purpureo et flavido-fusco-variegatis, lemmatibus longioribus ambitu lanceolato-oblongis obtusis differt.

Gramen perenne; rhizoma durum validiusculum, cataphyllis brevibus glabris obtectum; innovationes extravaginales. *Culmi* erecti vel basi leviter geniculati, circiter 50 cm. alti, graciles, simplices, 2–3-nodes, glabri laevesque, internodio summo (pedunculo) longe exserto. *Foliorum vaginae* striatae, laxae, ore breviter barbatae et marginibus ciliatae vel glabrae, basales persistentes; ligulae ad seriem ciliorum brevissimorum redactae; laminae lineares, in apicem callosum obtusum attenuatae, planae vel siccitate involutae, adscendentes, usque ad 10 cm. longae et 3 mm. latae, firmae, glabrae laevesque. *Panicula* laxa, flexuosa, nutans, 7–11 cm. longa; rhachis filiformis, flexuosa, glabra laevisque; rami distantes, solitarii, basin versus espiculati, subcapillares, flexuosi, glabri, laeves vel glandulis paucis patelliformibus sessilibus praediti, inferiores usque ad 4 cm. longi, 2–5-spiculati, superiores breviores, 2–1-spiculati; pedicelli ut rami glanduliferi, laterales 4–12 mm. longi, terminales usque ad 20 mm. longi. *Spiculae* ovatae vel late ovatae, acutae, 6–9 mm. longae, 4–6 mm. latae, lateraliter compressae, purpureo- et flavido-fusco-variegatae, laxe 5–8-florae, glabrae; rhachilla persistens. *Glumae* subaequales, ambitu lineari-lanceolatae, acutae vel subobtusae, 4·5–5 mm. longae, membranaceae, uni- vel subtri-nerves, carina supra medium leviter scaberulae. *Lemmata* laxe imbricata, ambitu lanceolato-oblonga, obtusa, explanata ovata vel ovato-oblonga et obtusa vel subtruncata, 4–5 mm. longa, membranacea, apice flavido-fusco excepto purpurea, nervis lateralibus prominentibus, marginibus inflexis, carina apicem versus minute scaberula. *Paleae* deciduae, lemmati subaequilongae, explanatae oblongae vel elliptico-oblongae, truncatae vel obtusissimae, carinis fere laevibus. *Antherae* 3, lineares, circiter 2·5 mm. longae.

TANGANYIKA TERRITORY: Iringa Province, Ifunda, c. 1800 m., Nov. 1928, *Haarer* 1659.

Eragrostis Rogersii *C. E. Hubbard*, sp. nov.; affinis *E. Dinteri* Stapf, sed panicula laxa ovata vel oblonga, lemmatibus ambitu ovato-oblongis acutis vel subobtusis haud acuminatis differt.

Gramen annuum. *Culmi* suberecti vel geniculato-adscendentes, 30–45 cm. alti, graciles, teretes, glabri laevesque, 3–10-nodes, infra nodos glandulis paucis sessilibus patelliformibus praediti, simplices vel infra medium ramosi, internodiis inferioribus usque ad 3·5 cm. longis, internodio summo (pedunculo) usque ad 16 cm. longo. *Foliorum vaginae* internodiis paullo breviores vel paullo longiores, striatae, superne obscure carinatae, ore barbatae, marginibus ciliatae, carina et plerumque nervis prominentibus glandulosae; ligulae ad seriem ciliorum redactae; laminae lineares, in apicem tenuem scaberulum attenuatae, 3–10 cm. longae, 2·5–4·5 mm. latae, planae vel siccitate convolutae, virides vel subglaucae, glabrae vel supra sparse pilosae, subtus laeves, supra et marginibus glanduliferis scaberulae. *Panicula* ovata vel oblonga, suberecta, laxa, 8–14 cm. longa, 3–8 mm. lata; rhachis et rami angulati, glandulosi, angulis scaberuli, axillis breviter barbati, ceterum glabri; rami plerumque simplices, solitarii, gracillimi, 6–1-spiculati, usque ad 5 cm. longi; pedicelli patentes, glandulosi, 2–6 mm. longi. *Spiculae* ovatae, ellipticae vel oblongae, lateraliter valde compressae, 6–14 mm. longae, 3–4 mm. latae, dense 10–25-florae, pallide viridi- et purpureo-variegatae; rhachilla disarticulata. *Glumae* aequales, ambitu lanceolatae, tenuiter acutae, 3–4 mm. longae, chartaceae, acute carinatae, carina supra medium spinoso-ciliolatae, marginibus ciliolatae vel glabrae; inferior uninervis; superior uni- vel tri-nervis. *Lemmata* ambitu ovato-oblonga, acuta vel subobtusa, plerumque mucronulata, explanata late elliptico-oblonga et obtusa, 3·5 mm. longa, acute carinata, carina supra medium scaberula, chartacea, trinervia. *Paleae* cum lemmatibus deciduae, 2·5 mm. longae, carinis curvatis rigide ciliolatae. *Antherae* 3, lineares, 1 mm. longae. *Caryopsis* subglobosa, 0·6 mm. longa.

NORTHERN RHODESIA: Livingstone, in sand, 900 m., April 1909, *Rogers* 7027 (type); July 1909, *Rogers* 7200.

SOUTHERN RHODESIA: Victoria Falls, 900 m., April 1930, *Harrison in Herb. Brain*, 1318; Wankie District, near Fuller Siding, March 1929, *Pardy in S. Rhod. Govt. Herb.* 4854; March 1930, *Pardy in S. Rhod. Govt. Herb.* 4815; Chababonda, Feb. 1929, *Pardy in S. Rhod. Govt. Herb.* 4521; Nyamandhlovu District, March 1929, *Pardy in S. Rhod. Govt. Herb.* 4880.

Eragrostis plurigluma *C. E. Hubbard*, sp. nov.; affinis *E. invalidae* Pilger, sed culmis et foliis validioribus, panicula majore, spiculis late ellipticis vel late elliptico-oblongis, glumis vacuis 5–6 differt.

Gramen perenne. *Culmi* erecti, usque ad 1·2 m. alti, validiusculi, teretes, simplices, glabri laevesque, 2-nodes, internodio summo (pedunculo) usque ad 36 cm. longo. *Folia* plerumque basalia, glabra acque laevia; vaginae basales usque ad 12 cm. longae, pallidae, striatae, superiores arcte appressae, teretes, internodiis breviores; ligulae ad seriem obscuram pilorum brevissimorum redactae; laminae apice obtusae et callosae, usque ad 45 cm. longae, convolutae vel

involutae, explanatae usque ad 2·5 mm. latae, rigidae, pallide virides. *Panicula* oblonga, laxissima, leviter nutans, 27 cm. longa, 9 cm. lata; rhachis glabra, inferne laevis, superne minute scaberula; rami solitarii, adscendentes, tenuiter filiformes vel capillares, glabri, minute scaberuli, laxe divisi, superne flexuosi, usque ad 10 cm. longi; ramuli et pedicelli capillares, flexuosi; pedicelli usque ad 2 cm. longi, apice leviter incrassati. *Spiculae* late ellipticae vel late elliptico-oblongae, obtusae, 6–7·5 mm. longae, 3·8–4·5 mm. latae, lateraliter valde compressae, arcte 8–14-florae, glabrae, pallide virides et purpureae; rhachilla persistens. *Glumae vacuae* 5–6, acute carinatae, carina tenuiter scaberulae, chartaceae; I ambitu lanceolata, acuta, 1·2–1·6 mm. longa, uninervis; II primae similis sed paullo latior et 2 mm. longa; III ambitu lanceolato-oblonga, acuta, 2·3 mm. longa, uni- vel subtri-nervis; IV tertiae similis sed minus acuta, 2·5–2·7 mm. longa, trinervis; V (et VI) ambitu oblonga, subacuta, 3 mm. longa, trinervis. *Lemmata* arcte imbricata, ambitu oblonga vel ovato-oblonga, subobtusa, acute carinata, 3 mm. longa, chartacea, laevia, trinervia. *Paleae* deciduae, oblanceolato-oblongae, 2·3 mm. longae, carinis dense ciliolatis. *Antherae* 3, lineares, 1·4 mm. longae. *Caryopsis* anguste oblonga, subteres, 1 mm. longa.

SIERRA LEONE: Northern Province; in swampy fields at Materboi, Oct. 1928, *Glanville* 79.

Bracteola orientalis *C. E. Hubbard*, sp. nov.; affinis *B. subaequiglumae* C. E. Hubbard, comb. nov. (*Chloris subaequigluma* Rendle), sed culmis valde compressis, ligulis brevioribus, spicis plerumque longioribus, gluma superiore prope carinam 4–7-nervi mucronulata haud aristata, paleae carinis superne ciliolatis differt.

Gramen perenne, stolonibus compressis repentibus glabris e nodis radicantibus. *Culmi* erecti, usque ad 70 cm. alti, graciles, valde compressi, rigidi, flavescentes, 2–3-nodes, circiter medium culmum ramosi, glabri, nitentes. *Foliorum vaginae* valde compressae, acute carinatae, firmae, laeves, ore pilis minutis exceptis glabrae, basales persistentes, latae, dense imbricatae, superiores internodiis multo breviores; ligulae truncatae, circiter 0·3 mm. longae, ciliolatae; laminae lineares, arcte conduplicatae et carinatae, basi leviter constrictae, explanatae apice obtusae vel rotundatae vel emarginatae et apiculatae, usque ad 12·5 cm. longae, explanatae usque ad 8 mm. latae, strictae vel curvatae, rigidae, glaucae, marginibus et costa media superne scaberulae. *Spicae* binae, usque ad 14·5 cm. longae, suberectae, graciles, flavidae; rhachis triquetra, gracillima, 0·5 mm. lata, minute scaberula. *Spiculae* dense imbricatae, lanceolatae vel oblongo-lanceolatae vel oblongae, acutae, 4·3–5 mm. longae, valde compressae. *Glumae* spiculae aequilongae, firme membranaceae; inferior ambitu oblique lanceolato-linearis, acuta, carinata, carina scaberula, 1-nervis; superior ambitu oblique lanceolata, obtusa, mucronulata, dorso subrotundata, 4–7-nervis, nervis lateralibus prope carinam scaberulam. *Anthoecium inferum*: lemma ambitu

late lanceolatum, acutum, explanatum ovatum, carinatum, 4–4·3 mm. longum, breviter aristatum, arista erecta scaberula usque ad 1 mm. longa, firme chartaceum vel coriaceum, 3-nerve, carina et nervis lateralibus dense longiciliatum; palea anguste lanceolata, 3–3·8 mm. longa, carina superne ciliolata vel scaberula; antherae 1–1·3 mm. longae. *Anthoecium superum* ad lemma redactum, angustum, 3–3·5 mm. longum, muticum, glabrum.

TANGANYIKA TERRITORY: without precise locality, 1932, *Staples* 407 (type).

KENYA COLONY: Kavirondo, Nyando, 1260 m., very common, Feb. 1930, *Lyne Watt* 1411.

Tripogon Snowdenii *C. E. Hubbard*, sp. nov., affinis *T. Mannii* Hook. f., sed laminis pubescentibus, spiculis plerumque longioribus usque ad 15-floris, lemmatibus aristatis, paleis bifidis differt.

Gramen perenne, dense caespitosum, 15–60 cm. altum. *Culmi* erecti, teretes, gracillimi, simplices, 1–2-nodes, glabri laevesque; internodium supremum usque ad 23 cm. longum. *Folia* plerumque basalia; vaginae laeves, teretes, ore molliter barbatae, basales persistentes, usque ad 10 cm. longae, pallidae; ligulae ad seriem ciliorum minutorum redactae; laminae filiformes vel angustissime lineares, obtusae, erectae, 6–25 cm. longae, arcte convolutae vel explanatae et 1–2·5 mm. latae, rigidae, virides, supra prominenter nervosae et glabrae, subtus sparse pubescentes demum glabrescentes. *Spica* solitaria, gracilis, 5–18 cm. longa; rhachis angulis minute scaberulis, internodiis plerumque 8–15 mm. longis. *Spiculae* subsessiles, alternatae, laxe dispositae, oblongae vel anguste oblongae, 10–20 mm. longae, 2·5–3·5 mm. latae, 6–16-florae, griseo-olivaceae. *Glumae* lanceolatae, acutae, uninerves, membranaceae; inferior 5–6 mm. longa; superior 6·5–8 mm. longa. *Lemmata* laxe imbricata, ovata, 4–6 mm. longa, firme membranacea, trinervia, minute bifida, e sinu aristam rectam scaberulam usque ad 4 mm. longam gerentia; callus brevis, pilis albis usque ad 1·5 mm. longis dense barbatus. *Paleae* anguste ellipticae, acute bifidae, 4·5 mm. longae, carinis anguste alatis.

UGANDA: Bugishu; Mt. Elgon, near Bulambuli, in short grass on rocks, 2400 m., *Snowden* 1187.

Tripogon Liebenbergii *C. E. Hubbard*, sp. nov., affinis *T. Mannii* Hook. f., sed glumis longioribus, lemmatibus longioribus acuminatis apice integris vel subintegris breviter aristatis differt.

Gramen perenne, dense caespitosum, usque ad 45 cm. altum. *Culmi* erecti vel leviter geniculati, teretes, gracillimi, simplices, 1–2-nodes, glabri laevesque. *Folia* plerumque basalia; vaginae laeves, teretes, ore molliter barbatae, ceterum glabrae, basales persistentes, latae, pallidae; ligulae ad seriem ciliorum minutorum redactae; laminae angustissime lineares vel filiformes, subobtusae, erectae, usque ad 25 cm. longae, arcte convolutae vel explanatae et usque ad 2 mm. latae, marginibus scaberulis, ceterum glabrae

laevesque, rigidiusculae, virides, supra prominenter nervosae. *Spica* olitaria, gracilis, 12–17 cm. longa; rhachis laevis, internodiis 5–15 mm. longis. *Spiculae* subsessiles, alternatae, oblongae, 9–12 mm. longae, 3 mm. latae, usque ad 8-florae, pallide virides. *Glumae* lanceolatae, acuminatae, uninerves, firme membranaceae; nferior 6–8 mm. longa, carina scaberula; superior 9 mm. longa, aevis. *Lemmata* arcte imbricata, ovata, acuminata, 6·5–7·5 mm. longa, firme membranacea, trinervia, carina apicem versus minute scaberula, apice hyalina integra vel subintegra in aristam scaberulam rectam gracillimam usque ad 4 mm. longam abeuntia; callus brevis, pilis albis usque 2 mm. longis dense barbatus. *Paleae* elliptico-oblongae, obtusae, 4–4·5 mm. longae, tenuiter membranaceae, carinis late alatis.

UGANDA: Karamoja District; from a moist spot near the top of Moroto Mtn., 2100 m., June 1930, *Liebenberg* 1805.

Enneapogon cenchroides (*Licht.*) *C. E. Hubbard*, comb. nov. *E. mollis* Lehm. Pugill. **3**, 40 (1831). *Pappophorum cenchroides* Licht. ex Roem. et Schult. Syst. Veg. **2**, 616 (1817).

Distrib. Tropical East Africa, Angola, South Africa, tropical Arabia, Punjab.

XIII—CONTRIBUTIONS TOWARDS A FLORA OF BRITISH NORTH BORNEO: IV.*

Ixora fulgida *Ridley*, sp. nov. [Rubiaceae]; ab *I. fulgente* Roxb., cui affinis, foliorum nervis pluribus parallelis, corollae lobis ellipticis apice obtusis differt.

A *shrub*. *Leaves* linear-oblong to elliptic, rather abruptly acuminate, base narrowed, thinly coriaceous, polished, drying yellowish, 10–14 cm. long, 3–4 cm. wide, midrib raised on both sides, nerves 12 pairs, slender, horizontal, parallel, inarching at the tips; petioles 5 mm. long; stipules elongate-triangular, cuspidate, 4 mm. long. *Cyme* shortly peduncled, with short branches; flowers about 20, crowded, sessile or subsessile. *Bracts* lanceolate, acute, 1 mm. long. *Calyx* urceolate, 2 mm. long, lobes 4, ovate, acute. *Corolla* red, tube slender, 4 cm. long, lobes 4, elliptic, obtuse, tips rounded, pubescent at the base, 12 mm. long, 5 mm. wide. *Anthers* linear, with long appendages, bases divaricate. *Style* exserted for 3 mm.; stigmas short, bases thickened, not recurved, hardly 1 mm. long. *Berry* bilobed, 6 mm. in diameter. *Seeds* 2.

Sandakan, Port Myburgh, East Coast, Tanjong Batu, *Creagh* (type in Kew Herb.); Salinan, *Burbidge*; Banguey, *Fraser* 221.

This is allied to *I. fulgens* Roxb., which also occurs in North Borneo, but the leaves in that species are considerably larger, with ascending, not parallel, nerves, and the petals are lanceolate, acute. In some specimens of *I. fulgida* Ridl. the leaves are broadly oblong or even ovate, but the nervation is similar to that of the narrow-leaved form.

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*Continued from *K.B.* 1933, 495.

Psychotria Fraseri *Ridley*, sp. nov. [Rubiaceae]; a *P. crispipila* Merrill, cui affinis, foliis floribusque multo hirtioribus, floribus fructubusque multo minoribus differt.

A branching *shrub*, young parts densely red-hairy. *Leaves* subcoriaceous, glabrous except the midrib and nerves, elliptic, subacute, base obtuse, 5 to 7 cm. long, 1·5 to 2·5 cm. wide, midrib elevate above, densely red-hairy, nerves 8 pairs, elevate beneath, slender, hairy, secondary nerves few and very inconspicuous; petioles 2 mm. long, densely hairy, stipules hairy, oblong, blunt, 3 mm. long. *Flowers* six, subumbellate on a densely hairy peduncle 2–3 mm. long; pedicels 3 mm. long, densely hairy. *Calyx* saucer-shaped, lobes 4, ovate. *Corolla* 3 mm. long, tube thick, short, hairy, lobes 4, as long as tube, ovate. *Stamens* exserted, anthers small, elliptic. *Style* cylindric with a thickened stigma. *Drupe* obovoid-globose, glabrous, 5 mm. long. *Seeds* 2, inner surface flat, smooth, outer rounded; albumen ruminate.

Sandakan, Kudat, *Fraser* 54.

The only species I can find at all near this is *P. crispipila* Merrill of the Philippines, but that is altogether larger and much less hairy.

Lasianthus sepalinus *Ridley*, sp. nov. [Rubiaceae]; a *L. tomentoso* Bl., cui affinis, sepalis magnis oblongis obtusis, corolla parva differt.

Shrub; branches pale, velvety. *Leaves* coriaceous, elliptic-lanceolate, cuspidate-acuminate, above glabrous, shining, beneath minutely papillose, bases cuneate, 13 to 16 cm. long, 4·5 to 6 cm. wide, midrib above slender, beneath thickened, elevate, hairy, nerves 5–6 pairs, elevate beneath, hairy, secondary nerves transverse, parallel and anastomosing, elevate beneath, hairy; petioles 1 cm. long, hairy; stipules short, ovate, hairy. *Flowers* sessile in dense axillary clusters, 9 mm. long. *Bracts* ovate, acute, hairy, 2 mm. long. *Calyx* campanulate, lobes 5, oblong, blunt, rounded at tip, 4 mm. long. *Corolla-tube* very short; lobes 5, oblong, blunt, hairy outside, 5 mm. long. *Stamens* 5; anthers linear-oblong. *Style* rather short, stigmas linear, thick.

Bongaya, Labuk Bay, *Ridley* 9073 (type); Sandakan, *Mrs. M. S. Clemens* 9467; *Creagh*.

This species is very distinct from any of this group known to me in its unusually large blunt sepals and corolla with very short tube.

Ardisia Creaghii *Ridley*, sp. nov. [Myrsinaceae]; ab *A. lanceolata* Roxb., cui affinis, foliis oblongo-ellipticis nervis parallelis, sepalis glabris brevioribus, stylo breviore, drupa majore differt.

A *shrub* or small tree; branches terete. *Leaves* subcoriaceous, glabrous, drying red, oblong-elliptic, cuspidate, base shortly narrowed, decurrent halfway down the petiole, 9 to 13 cm. long, 4 to 5 cm. wide, beneath punctate, midrib strongly elevate beneath, nerves about 30 pairs, horizontal, parallel, secondary nerves few and indistinct; petioles rather thick, winged halfway or nearly to base, 5 to 8 mm. long. *Panicle* terminal, dense-flowered, 7 cm. long, branches 3 cm. long; peduncles 2 to 3 cm. long. *Flowers* in short dense racemes, pedicels 5 mm. long. *Bracts* minute, amplexicaul, with a short point, caducous. *Sepals* oblong, rounded, coriaceous, glabrous, densely gland-dotted outside, 3 mm. long, 2 mm. wide. *Petals* ovate, acute, densely gland-dotted, 6 mm. long, 2 mm. wide. *Stamens* slightly shorter; anthers lanceolate, acute, subcuspidate, with glands on the backs. *Style* short and thick. *Drupe* globose smooth, densely gland-dotted, 1 cm. long.

East Coast, Sandakan, Kabun China, *Creagh*.

Madhuca pubicalyx *Ridley*, sp. nov. [Sapotaceae]; a *M. Kingiana* Ridl., cui affinis, foliis multo tenuioribus, pedicellis longis, floribus minus hirtis differt.

Tree. *Leaves* glabrous, branches glabrous, thinly coriaceous, oblanceolate, acuminate, base long and narrowed, 18–21 cm. long, 5·5–8·5 cm. wide, midrib sunk above, elevate beneath, nerves 18 pairs, elevate beneath, rather slender, inarching within the margin, secondary nerves few, transverse nervules few, anastomosing to form large reticulations: petioles 4 cm. long, bases thickened. *Flowers* numerous, 5 or 6 clustered together in the axils of fallen leaves. *Bracts* lanceolate, acute, pubescent, 2 mm. long. *Pedicels* slender, 3 cm. long, scabrid-pubescent. *Sepals* 4, oblong-ovate, outer pair coriaceous, pubescent, 9 mm. long, inner pair thinner, silky. *Corolla*: tube short, 2 mm. long, mouth hairy; lobes 9, much longer, elliptic, blunt, 5 mm. long. *Stamens* 18; anthers lanceolate, acuminate, shorter than the corolla, apiculate, with long hairs on the tips. *Ovary* small, conic, hairy; style glabrous, cylindric, 1·5 cm. long.

Sandakan, July 1896, *Creagh*.

Jasminum Gibbsiae *Ridley*, sp. nov. [Oleaceae]; a *J. bifario* Wall., cui affine, caule scandente glabro, foliis rotundatis, calycis lobis longioribus subglabris, petalis multo longioribus et latioribus differt.

A woody *climber* with glabrous branches. *Leaves* glabrous, subcoriaceous, rotundate to ovate, blunt, base round, sometimes retuse, 4·5–6·5 cm. long, 4–6 cm. wide, nerves 2 or 3 pairs, elevate beneath, secondary nerves and reticulations invisible; petioles 2 to 3 mm. long. *Flowers* in terminal dense cymes of about 12, with a few spathulate leaflike bracts 4 mm. long. *Bracteoles* linear, 2 mm. long, caducous. *Pedicels* puberulous, thick, 4 mm. long. *Calyx* campanulate, 2 mm. long, glabrous, lobes 6, setaceous, sparsely puberulous, 2 mm. long. *Corolla*: tube cylindric, 2·1 cm. long; lobes 6, oblong, subacute, 1·4 cm. long, 4 mm. wide. *Stamens* 2; anthers linear, apiculate; filaments short. *Style* longer, with a fusiform stigma.

Dent Province, Tenom. Liane, very general in secondary forest, with handsome white flowers, no scent, *Miss L. S. Gibbs* 2684.

This was referred to *J. bifarium* Wall. in Miss Gibbs's account, but that species is usually a bush, hardly scrambling, is much more pubescent on the twigs and calyx, and has flowers about half the size of the present plant.

Jasminum melastomifolium *Ridley*, sp. nov. [Oleaceae]; a *J. dolichophyllo* Merrill, cui affine, foliis multo majoribus ellipticis, caule angulato, corollae lobis multo brevioribus differt.

A slender, climbing *shrub*, with glabrous, four angled branches. *Leaves* glabrous, chartaceous, elliptic, acute, cuspidate, the cusp 1 to 1·5 cm. long, base obtuse or rounded, 13 to 14 cm. long, 5 cm. wide, primary nerves 2, running from the base to the apex 4 to 6 mm. from the margin, secondary nerves running from the midrib to the lateral nerves, slender, elevate beneath; petioles twisted, 6 mm. long. *Panicle* terminal, few-flowered, with a slender peduncle 1·6 cm. long, branches few, very slender, four-angled, puberulous, 2 cm. long. *Flowers* 5, crowded at the apex of a branch; pedicels very slender, 1·6 cm. long. *Calyx* campanulate, puberulous, 1 mm. long; lobes 4, setaceous, pubescent, 3 mm. long. *Corolla*: tube 4 mm. long; lobes lanceolate, acute, 5 mm. long.

Banguey Island, *Fraser* 225.

I have only seen one bud of the inflorescence of this remarkable species, notable for its very slender peduncle and pedicels.

Jasminum spectabile *Ridley*, sp. nov. [Oleaceae]; a *J. crassifolio* Bl., cui affine, foliis chartaceis oblongo-lanceolatis, floribus multo majoribus, corollae lobis latioribus obtusis differt.

A scandent *shrub*, branches glabrous, terete, warted. Leaves glabrous, chartaceous, oblong-lanceolate, long-acuminate, base narrowed blunt, 18 cm. long, 6 cm. wide, nerves 8 pairs, very slender ascending, basal pair 9 cm. long, laterals shorter, secondary nerves few, undulate, forming large reticulations, midrib elevate beneath sunk above; petioles 2 cm. long. *Panicle* 15 cm. long; peduncle 9·5 cm. long, terete; branches few, 3 cm. long; bracts very narrow lanceolate, acuminate, 0·2 mm. long. *Calyx* campanulate, puberulous, 7 mm. long, teeth setiform, 1 mm. long. *Corolla*: tube slender, 1·5 cm. long; lobes 5, broadly oblong, obovate, tips rounded, 2 cm. long, 1 cm. wide. *Stamens* 2; anthers large, oblong-linear, apiculate; filaments linear, shorter. *Style* as long as stamen filaments; stigma oblong-linear.

Without precise locality, *D. D. Wood* 1319.

This beautiful plant is noticeable for its large flowers with rounded corolla lobes. It appears to belong to the group of *J. crassifolium* Bl., from which it differs in its large thin lanceolate leaves.

Linociera pubicalyx *Ridley*, sp. nov. [Oleaceae]; a *L. paludosa* King et Gamble, cui affinis, foliis minoribus laevibus, nervis inconspicuis, paniculis brevibus, floribus minoribus in capitulis sessilibus, petalis brevioribus crassis differt.

Tree or shrub, glabrous except the inflorescence. *Leaves* coriaceous, smooth, grey when dry, lanceolate or elliptic, cuspidate-acuminate, base narrowed, 8 to 13 cm. long, 3·5 to 4·7 cm. wide, nerves 6 pairs, very inconspicuous, midrib sunk above; petioles channelled above,

0·5–1 cm. long. *Panicles* axillary and terminal, 1 to 3 together in an axil, pubescent, dense-flowered, 2 cm. long; peduncles 0·3–1 cm. long, rather thick; branches 3 or 4, bracts lanceolate-ovate, acute, pubescent, 1 mm. long. *Flowers* sessile, crowded at the tips. *Calyx* pubescent, 1 mm. long, lobes short, ovate, blunt. *Corolla-tube* as long as the calyx; lobes linear, fleshy, blunt, edges involute, bases dilated, 2 mm. long. *Stamens*: anthers elliptic, connective rather broad, not prolonged. *Ovary* conic; *style* short; stigma capitate, obscurely lobed.

Gaya island, sea shore, *Haviland* 1442.

Melodinus lancifolius *Ridley*, sp. nov. [Apocynaceae]; a *M. micrantha* Hook. fil., cui affinis, foliis tenuioribus lanceolatis, paniculis laxis longioribus, corollae lobis integris differt.

Climbing glabrous *shrub*; branchlets rather slender, terete. *Leaves* thinly-coriaceous, shining above, lanceolate, acuminate, base shortly narrowed, 8·5–9·5 cm. long, 3–3·5 cm. wide, nerves 8 pairs, irregular, slender, anastomosing near the edge, midrib elevate beneath; petioles 3–5 mm. long. *Panicles* axillary, 1·5–2 cm. long, lax, few-flowered; branchlets distant, 5 mm. long, bracts ovate, acute, 1 mm. long. *Sepals* 4, ovate, blunt, edges ciliate. *Corolla-tube* dilate in the middle, with thick scales in the mouth, 2 mm. long; lobes rounded, entire, 1 mm. long. *Stamens* 4, inserted below the mouth; anthers lanceolate, acute, filaments short. *Ovary* 2-celled, conic; style slender, stigma conical.

Kudat, *Fraser* 70.

Leoconotis Maingayi *Dyer* [Apocynaceae].

Sandakan, Myburgh Province, *Elmer* 20295. Also in Sarawak: Kuching, *Haviland* 909.

Parabarium micranthum *Pierre* [Apocynaceae].

Sandakan, East coast, *Creagh*.

Kopsia dasyrachis *Ridley*, sp. nov. [Apocynaceae]; a *K. macrophylla* Hook. fil., cui affinis, foliorum nervis pluribus, petiolis longioribus, pedunculis multo longioribus, corollae tubo longiore, lobis minoribus differt.

A *tree*, 20 feet tall, with stem 6 inches through; branchlets angled above. *Leaves* coriaceous, elliptic, acuminate, base narrowed, 16–21 cm. long, 7–9 cm. wide, midrib stout, flattened above, nerves 10 to 12 pairs, slender, elevate beneath, inarching within the margins; petioles 1 cm. long, channelled. *Peduncle* terminal, 4–7 cm. long. *Racemes* 4, pubescent, growing to 9 cm. long. *Bracts* ovate, acute, keeled, pubescent, 1 mm. long. *Flowers* white, sessile or shortly pedicelled. *Sepals* lanceolate-oblong, subobtuse, pubescent, 1 mm. long. *Corolla-tube* slender, 2·5 cm. long, dilated for 3 mm. below the mouth; lobes rotundate-ovate, 1·5 cm. long, 5 mm. wide. *Stamens* 5; anthers subsessile, narrowly sagitate, acuminate,

2 mm. long. *Glands* 2, linear, as long as the ovary. *Carpels* hairy above; style slender; stigma cylindric.

D. D. Wood **1315**, without precise locality. Batu Putih, Tambisan, *Creagh*. Forests, Lukan, *Arsat* 1211 (type).

Gaertnera brevistylis *Ridley*, sp. nov. [Loganiaceae]; a *G. acuminatae* Hook. fil., cui affinis, foliis coriaceis majoribus, floribus multo minoribus, stylo brevissime differt.

A stout woody *shrub* with glabrous branches. *Leaves* glabrous, coriaceous, greenish when dry, lanceolate-oblong or oblong, cuspidate-acuminate, base shortly cuneate, 15–17 cm. long, 4–7·2 cm. wide, nerves 7–10 pairs, slender, secondary nerves slender, inconspicuous; petioles 0·4–1 cm. long; stipules connate in a cylindric tube, 0·5–1 cm. long, teeth 2, setiform. *Panicle* shorter than the leaves, mealy-pubescent, 6–7 cm. long, dense, many-flowered, main branches 3, spreading, 5 cm. long; bracts foliaceous, lanceolate, acuminate, 3–5 cm. long, 5 mm. wide; ultimate branchlets 5–7 mm. long. *Flowers* sessile, small; lower bracteoles lanceolate, acuminate, with a few processes on the margin, upper ones ovate. *Calyx* campanulate, puberulous, 1 mm. long; teeth 5. *Corolla* 3 mm. long, tube very short, white hairy inside at the base of the stamens; lobes 5, much longer, oblong, blunt. *Stamens* 5; anthers oblong, blunt fuscous. *Style* 1 mm. long; stigmas longer, lanceolate, blunt, pubescent.

Sandakan, *Creagh* (type); Balambangan island, *Wood* 7651.

Very distinct in its stout woody stems, large leaves and dense panicles of small flowers. The corolla tube is very short and the stigmatic lobes actually longer than the style. This is apparently the plant to which Merrill (Journ. S. S. Br. Roy. As. Soc. Special Number, 580) gives the name *Gaertnera vaginans* nov. comb. (*G. Koenigii* Wt., *Psychotria vaginans* DC.), but DeCandolle's plant is the Ceylon one, endemic there.

XIV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XIX.*

N. Y. Sandwith.

EUGENIA AERUGINEA DC., A MISIDENTIFIED TYPE SPECIMEN.

"*Eugenia*? *aeruginea*" DC. belongs to a group of West Indian species with a well-developed racemose inflorescence. It was described by de Candolle, Prodr. **3**, 283 (1828), from a specimen labelled *Myrtus aeruginea* which had been in Herb. Forsyth and had reached Herb. L'Héritier. Apart from the word "Forsyth" there was no indication of the collector or origin of the specimen and de Candolle accordingly described the locality as "in America calid." When Berg monographed the American *Myrtaceae* he merely repeated this evidence without either transcribing or elaborating the description, see Linnaea, **27**, 290 (1855). Grisebach, Fl. Brit. W. Indies, 237 (1860), gave an original description based on material from Dominica, collected by Imray, and from Cuba; and he definitely assigned the type locality to Jamaica, although he apparently did not see the type specimen, or at any rate did not use it in making up his description. The bracteoles of *E. aeruginea* were described by Grisebach as roundish, and it is clear from this and from the evidence of the Imray specimen at Kew that he was applying the name *E. aeruginea* to a species with conspicuous, roundish, connate bracteoles which occurs plentifully in Cuba, Porto Rico and Santo Domingo, and extends to Dominica and to Trinidad. This plant had been described as *E. domingensis* by Berg in Linnaea, **27**, 296 (1855) and divided by him into two varieties in Linnaea, **29**, 244–245 (1857).

*Continued from K.B. 1933, 497.

The next mention of *E. aeruginea* is in a paper on West Indian *Myrtaceae* by Kiaerskou in Bot. Tidsskr. **17**, 257 (1890) in which the author identified a Porto Rico specimen, collected by Stahl, as this species. In this paper *E. domingensis* is also mentioned, and several specimens are cited from Porto Rico, Santo Domingo and Dominica. Finally we come to Urban's valuable monograph of the West Indian *Myrtaceae* in Engl. Bot. Jahrb. **19**, (1895). Urban accepted Grisebach's interpretation of *E. aeruginea* and applied the name to the common species with roundish, connate bracteoles which had been described by Berg as *E. domingensis*. It was clear from his note of exclamation that Urban had seen de Candolle's type, and his interpretation of the species has therefore naturally been accepted by subsequent writers on the West Indian Flora (Fawcett and Rendle, Fl. Jam. **5**, pt. 3, p. 337; Britton and Wilson, Sci. Survey of Porto Rico and the Virgin Islands, **6**, pt. 1, p. 34) and by himself in his Floras of Porto Rico and Santo Domingo (Symb. Antill. **4**, 446; **8**, 484). The Jamaican locality, given by Grisebach, has always been repeated with doubt, and Fawcett and Rendle excluded the species. Meanwhile Urban described a new species, *E. Fadyenii* Krug et Urb., from Jamaica and Cuba, which was easily distinguished from his *E. aeruginea* (*E. domingensis*) by the narrow, inconspicuous, free bracteoles, and by the number of ovules in each loculus. This plant was the *E. chrysophylloides* Macfadyen, Jam. **2**, 124 (1850) non DC., and the *E. Gregii* Griseb. Fl. 238, non DC., as to the Jamaican material, identifications which were verified and accepted by Fawcett and Rendle who accordingly adopted the name *E. Fadyenii* for the Jamaican plant with narrow free bracteoles.

Recent work on the *Myrtaceae* of Trinidad and Tobago has necessitated an examination of the type specimen of *E. aeruginea* DC., which has been kindly lent from the de Candolle Herbarium at Geneva. It came as a surprise to discover that the specimen has the bracteoles of *E. Fadyenii* Krug et Urb. and agrees perfectly with the Jamaican and Cuban material of that species. Urban may probably be excused for his misidentification since his ticket marked "vidit I. Urban, iv. 1894" is placed in a separate paper

packet containing only two leaves and some detached buds; the inference is that this is all that Urban saw, and that the rest of the material (which is in good condition) was not lent to him. On returning to the Kew material of *E. Fadyenii* from Jamaica, an old sheet from Herb. Benth. was discovered labelled: "Myrtus aeruginosa" (in Bentham's handwriting); Jamaica, Dr. Wright; Herb. Forsyth, purchased 1835. This had been correctly determined as *E. Fadyenii* by Fawcett and Rendle. The specimen agrees so completely with de Candolle's type of *E. aeruginea* that there can be no doubt that it is part of the type collection. The mystery of the origin of the type specimen is thus solved: it was collected in Jamaica by Dr. Wright. It may be assumed that it was this Kew sheet which was seen by Grisebach and which led him to record *E. aeruginea* from Jamaica, although, as has been already mentioned, his description was based on material of *E. domingensis* Berg. The latter name should now be used, pending a revision of the whole genus, for the species with roundish, connate bracteoles which has been known for so long as *E. aeruginea*; while *E. Fadyenii* Krug et Urb. should disappear into synonymy.

It may be mentioned, finally, that Urban cited under *E. domingensis* (*E. aeruginea* Urb.) a specimen collected by Anderson on St. Vincent which proves to represent a quite distinct species occurring also in Trinidad. This differs from *E. domingensis* in its leaves, which have elevated dots on the upper surface and the lateral nerves anastomosing far from the margin, in the reticulation which is prominulous and intricate on the upper surface, and in the free bracteoles which are otherwise similar in shape. This species will be described as new in the account of *Myrtaceae* in a future part of the "Flora of Trinidad and Tobago."

XV—GRAMINEAE AUSTRALIENSES: I. C. E. Hubbard. A New Genus from Southern Queensland.

Homopholis *C. E. Hubbard*, gen. nov.; affinis *Leptolomati* Chase, sed gluma inferiore spiculae aequilonga vel paulo breviore arcte 7-nervi, anthoecio supero infero multo breviore, lemmate superiore apice calloso differt.

Spiculae similes, dorso anguste lanceolatae vel lineari-lanceolatae, acutae, muticae, dorso compressae, abaxiales, solitariae, longe pedicellatae, demum totae a pedicellis persistentibus disarticulatae, in ramis longis gracillimis paniculae ortae. *Anthoecia* duo; inferum sterile, ad lemma et paleam minutam redactum; superum ♀, infero multo brevius. *Glumae* similes, spiculae aequilongae vel inferior vel ambae paulo breviores, explanatae lineari- vel anguste oblongo-lanceolatae, obtusae, crebre et prominenter 7-nerves, herbaceae, marginibus angustis hyalinis; inferior dorso plana; superior leviter convexa. *Anthoecium inferum*: lemma spiculae aequilongum vel paulo brevius, ambitu anguste lanceolatum, subacuminatum, marginibus superne involutis, apice obtusum, dorso

planum, explanatum gluma superiori simile; palea minuta, biloba, hyalina. *Anthoecium superum* anguste elliptico-oblongum, subapiculatum: lemma explanatum late ellipticum, apice callosum, tenuiter 5–7-nerve, laeve, chartaceum, marginibus latis tenuibus planis; palea lemmati aequilonga, acuta, dorso plana, 2-nervis, marginibus latis inflexis. *Lodiculae* duae, minutissimae. *Stamina* tria; antherae lineares. *Ovarium* glabrum; styli distincti, terminales; stigmata plumosa, ex apice anthoecii exserta. *Caryopsis* anguste ellipsoidea, inter lemma et paleam arcte inclusa; scutellum circiter dimidiam partem caryopsis aequans; hilum basale.—Gramen perenne, laxe caespitosum; culmi multinodes; laminae lineares, planae; ligulae tenuiter membranaceae; panicula laxissima; rami longi, plerumque applanati, superne 3–1-spiculati; pedicelli solitarii; spiculae fere glabrae.

Species unica, Queenslandiae incola.

H. Belsonii *C. E. Hubbard*, sp. nov. *Culmi* erecti vel plerumque geniculato-adscendentes, nonnunquam e basi prostrata et e nodis inferioribus radicantes, usque ad 40 cm. alti, gracillimi, teretes, basin versus laxe ramosi, rigidiusculi, usque ad 9-nodes, straminei, glabri laevesque. *Folia* glabra; vaginae plerumque internodiis longiores, teretes, arcte appressae vel demum laxae, laeves; ligulae truncatae, usque ad 1·5 mm. longae; laminae basi leviter contractae, acutae, usque ad 8 cm. longae, plerumque 2–2·5 mm. latae, subglaucae, minute scaberulae. *Panicula* valde effusa, ambitu latissime obovata vel demum latissime elliptica, demum a culmo disarticulata, usque ad 25 cm. longa et 20 cm. lata; axis primarius gracillimus, strictus, angulatus et leviter sulcatus, minute scaberulus; rami numerosi, stricti, rigidiusculi, oblique patentes, demum horizontaliter patentes vel leviter deflexi, solitarii vel 2–3-approximati, applanati vel subtriquetri, marginibus scabridis, basi in axillis minute pubescentes, inferiores usque ad 15 cm. longi, superiores gradatim breviores; pedicelli ramis similes, 1·3–6 cm. longi, apice subdiscoidei. *Spiculae* 4·5–6 mm. longae, atrovirides. *Gluma* inferior basi serie pilorum minutissimorum praedita, nervis scaberulis; gluma superior inter nervos pilis minutissimis rigidis instructa; internodium rhachillae inter glumas usque ad 0·5 mm. longum. *Lemma* anthoecii inferi fere glabrum; palea circiter 0·5 mm. longa. *Lemma* anthoecii superi usque ad 3 mm. longum. *Antherae* 1·5 mm. longae. *Caryopsis* 2 mm. longa.

Queensland: Darling Downs District; head of Dogwood Creek, east of Gurulmundi, Nov. 1930, *Belson*.

This new genus belongs to the section of Panicoid genera which Stapf has grouped together as the *Digitariastrae*. They are characterised by the relatively thin wide flattened margins of the lemma of the upper floret, which in the young floret almost meet across the back of the palea; the lemma and palea are also thinner in texture than in the *Panicastrae*. The much-reduced palea of the lower floret frequently remains attached to the base of the upper floret as

in *Digitaria*. There seems no doubt that *Homopholis* is most closely allied to *Leptoloma* Chase, a genus represented in North America by *L. cognatum* Chase and in Northern Australia by *L. papposum* Hughes. *Leptoloma cognatum* and *Homopholis Belsonii* are very similar in general appearance but the well-developed lower glume and comparatively small fertile floret of the latter enable them to be readily distinguished. The same characters serve to separate *Homopholis* from *Digitaria* Hall. and *Chloridion* Stapf; whilst from these and other members of the *Digitariastrae* it also differs in its paniculate inflorescence.

XVI—MISCELLANEOUS NOTES.

THE DIRECTOR.—The Director has been elected a Corresponding Member of the Botanical Society of New York, and an Honorary Member of the Pennsylvania Horticultural Society. The latter society is the oldest of its kind in America, having been founded in 1827.

MR. R. O. WILLIAMS.—Mr. Williams, who was a student at Kew until 1916, and has been Economic Botanist at Trinidad since 1932, has been appointed Assistant Director of Agriculture in that colony.

DUKINFIELD HENRY SCOTT.—The late Dr. D. H. Scott, M.A., Ph.D., D.Sc., F.R.S., Hon. Keeper of the Jodrell Laboratory from 1892 to 1906, whose death on January 29th, 1934, was recorded in the last number of the "Kew Bulletin," was closely associated with Kew from early in the year 1882 until he moved his home from The Old Palace, Richmond, to East Oakley House, Basingstoke, in the autumn of 1906.

Scott was educated privately and went up to Christ Church, Oxford, taking his degree in 1876. One of his achievements while at Oxford was the catching of a very large pike, which was for a long time preserved and hung in his rooms! He then studied engineering until the end of the year 1879, working at the King's Cross Engine Works, but he continued to keep up his interest in botany which he had commenced to study on his mother's advice in 1868. His love of locomotives never left him and the sight of a fine express train always gave him pleasure. Characteristically he deplored the advent of the electric train and the disappearance of the engine, he, himself, on one occasion at least, having driven one. In the autumn of 1879 he began to think seriously of returning to botany and was given an introduction to Sir Joseph Hooker from Fletcher Moulton. This brought him in contact with Thiselton-Dyer, who advised him to go and work in Germany, and also with S. H. Vines who was then a nascent influence at Cambridge. Thus came about his visit to Sach's Laboratory at Würzburg. For this he then made active preparation by learning German—which he accomplished in three months—and in February 1880 he went to Würzburg.

Sach's Laboratory at that time was the Mecca to which so many young British botanists were attracted and in which they so greatly benefited from the inspiration and guidance of the famous professor. Here Scott commenced his work on articulated laticiferous vessels, working under Sachs and also under Goebel, who was then his assistant, and gained the degree of Ph.D. in the university on these studies.

During July and August 1882 Scott returned to Würzburg, where Walter Gardiner was working on the continuity of protoplasm.

On his return to England, he came to work in the Jodrell Laboratory where F. O. Bower and Walter Gardiner were then engaged in botanical research, and all three worked in the room now occupied by the Assistant Keeper of the Laboratory. Scott continued his researches on laticiferous tissues on which he had been engaged at Würzburg, and the results were published in three papers dealing with the laticiferous vessels in *Hevea* (1) *Manihot Glaziovii* (2) and in the leaf (3). He used to ride to Kew from Wimbledon every morning and go back in the afternoon, riding across the Common and Richmond Park and then along "Sandy Lane," now Sandycombe Road, to Kew, stabling his horse close to Newens' shop in the Kew Road. It was during this and the following year that Scott co-operated with Bower in completing the translation of De Bary's "Comparative Anatomy of the Phanerogams and Ferns"—already partly accomplished by Bower—which was published by the Clarendon Press in 1884. Shortly after his return home in 1882, he succeeded Bower at University College, London, as Assistant Professor of Botany under Professor Daniel Oliver, and then, in 1885, when Bower was appointed Regius Professor of Botany in Glasgow University, Scott followed Bower and took his place as Assistant Professor of Botany at the Royal College of Science, Huxley being at first still Professor of Biology (including both botany and zoology). This post he held until 1892, but feeling a desire for freedom to devote more time to botanical research than was possible with his professorial duties, he resigned his professorship at the college and accepted the post of Honorary Keeper of the Jodrell Laboratory—a post which was specially created for him and one to which he quickly brought great distinction.

While he was at the Royal College of Science, during the year 1886, he was working from time to time in the Jodrell Laboratory as he had obtained permission from the Director for a few of his students at the college to carry on botanical investigations in the laboratory under his supervision. One of these students, Miss H V. Klaassen, was working under his direction on the blue-green algae, and his paper "On Nuclei in *Oscillaria* and *Tolypothrix*" (4 was one of the results of the investigation. The other was hi engagement to Miss Klaassen during the progress of the work in th Jodrell, followed by their marriage in 1887, a very happy unio which was so sadly terminated by Mrs. Scott's death in 1929.

From 1892 until 1906 he was Honorary Keeper of the Laboratory and his time during these fruitful years was mainly devoted to his palaeobotanical researches which have made his name famous throughout the world.

Almost simultaneously with Scott's assumption of the Keepership of the Jodrell Laboratory he became associated with the late Professor Williamson, of the then "Owen's College," Manchester, in the study of the fossil plants of the coal measures. Williamson was then the leading authority on this subject and Scott worked in close collaboration with him until the former's death in 1895.

During his time at Kew he carried out the official duties connected with the post and was always ready to give advice and offer friendly criticisms to other research workers in the Laboratory whenever his help might be sought.

Scott for a time employed his own private assistant, the first at Kew being Mr. W. C. Worsdell, who was one of his students at the Royal College. Mr. G. T. Gwilliam followed Worsdell and many of his drawings are to be found in Scott's books and papers on fossil botany. Mr. L. A. Boodle, also a former student and a demonstrator at the college, was another of his assistants and eventually succeeded him as Assistant Keeper of the Laboratory.

The time of Scott's keepership was remarkable for the output of original work both by himself and by other visiting botanists. Among these may be mentioned Gwynne Vaughan (*Nymphacaceae* and Ferns), Lang (Cycads), Brebner, who was formerly Scott's assistant (Ferns, etc.), Worsdell (Cycads & Conifers), while at the same time Horace Brown and Escombe were carrying out their important research in plant physiology in the Laboratory. It was a period of great activity and thanks to Scott's work and presence the Jodrell became a centre to which many eminent British and foreign botanists were constantly attracted.

The numerous important papers published by Scott while he was at Kew are enumerated below (p. 132). The earlier ones deal mainly with the anatomical structure of living plants, but as time went on his interest turned to the structure of fossil plants and more especially those of the carboniferous period, on which he became the chief authority. It was his studies of sections of coal balls, it will be remembered, which yielded results of so great importance with regard to the Pteridosperms. His well-known book on fossil plants was published while he was working at the Laboratory and also his two admirable text books, "An Introduction to Structural Botany (Parts I and II)," perhaps the best books of their kind which have been written for British students.

Scott was elected a Fellow of the Royal Society in 1894 and was Foreign Secretary from 1912–1916. In 1906 he was awarded a Royal Medal, and in 1926 the Darwin Medal was most appropriately conferred upon him by the society.

He was elected a Fellow of the Linnean Society in 1880 and served on the Council on many occasions. From 1902 to 1908 he filled the

office of Botanical Secretary and was President of the Society from 1908 to 1912. In 1921 he was awarded the Linnean Medal. Scott was also a past President of the Royal Microscopical Society, from which he received the Wollaston Medal in 1928. On two occasions, in 1896 and again in 1921, he was President of the Botanical Section of the British Association. These are only some of his many scientific activities; nor have we enumerated the many distinctions conferred upon him by universities and scientific academies both at home and abroad, all of which were as greatly honoured by the inclusion of Scott's name in their list of membership as was he by their recognition of his outstanding merits.

On February 29th, 1908, Scott's portrait, which had been painted by Mr. R. Kerr-Lawson, was handed over to the Director by Prof. F. W. Oliver and now hangs in the room in the Laboratory where he carried out his researches. The presentation formed the occasion of a very pleasant gathering of Scott's former colleagues and his many botanical friends.

Scott continued his palaeobotanical researches after his retirement from Kew with unabated vigour for many years, and latterly more especially he extended his already wide knowledge of field botany, using his walks and excursions as a means of becoming familiar with the flora of his county, Hampshire.

Scott, alas, has passed from us, but has left behind him a goodly heritage, abiding work so that others may truly enter into his labours. His logical mind, combined with his habits of painstaking thoroughness, his caution and scientific procedure, made him a pre-eminent research-worker, and his lucid style of writing added to the value of his published work.

His interest in all kinds of botanical research, his unfailing kindness to younger research-workers, and his readiness to give them help in the way of discussion and advice, were widely appreciated by those who worked in the Laboratory during his keepership.

Scott's long connection with "The Annals of Botany" from 1893 deserves honourable mention in any record of his valuable services to botany. Not only was he Chairman of the Committee for many years until his death, but his extensive knowledge of plant anatomy and especially of palaeobotany was always placed at the service of his colleagues.

We cannot better conclude this note than by quoting what his old colleague, Sir John Farmer, wrote to "The Times" on February 3rd:

"Scott was not only a scientific man of universally recognised eminence, but he was also an 'influence.' Very tenacious of well-considered views, he was nevertheless by no means an obstructive critic, and there are many of his colleagues who will recall discussions, never acrimonious but always well informed and helpful, on those branches of the science which he had made specially his own. His name is assured of a permanent and honoured position in the

literature of his subject, and his memory as a man will ever be affectionately cherished by those who enjoyed the privilege of his friendship."

A. W. H.

LIST OF THE MORE IMPORTANT PAPERS BY DR. D. H. SCOTT BETWEEN THE YEARS 1884 AND 1907.

1. On the Laticiferous Tissue of *Manihot Glaziovii* (the Ceara Rubber). *Quart. Journ. Microsc. Sc.* **24,** new series, 193–206, 1 pl. (1884).

2. On the Occurrence of Articulated Laticiferous Vessels in *Hevea*. *Journ. Linn. Soc., Bot.* **21,** 566–573 (1885).

3. On Nuclei in *Oscillaria* and *Tolypothrix*. *Journ. Linn. Soc Bot.* **24,** 188–192, 1 pl., 4 figs. (1887).

4. (with H. W. T. WAGER) On the Floating Roots of *Sesbania aculeata* Pers. *Ann. Bot.* **1,** 307–314 (1888).

5. Distribution of Laticiferous Tissue in the Leaf. *Ann. Bot.* **3,** 445–446 (1889).

6. (with G. BREBNER) On the Secondary Tissues in certain Monocotyledons. *Ann. Bot.* **7,** 21–62, 3 pls. (1893).

7. (with E. SARGANT) On the Pitchers of *Dischidia Rafflesiana* Wall. *Ann. Bot.* **7,** 243–269, 2 pls. (1893).

8. On *Cheirostrobus*, a New Type of Fossil Cone from the Calciferous Sandstone. *Proc. Roy. Soc.* **60,** 416–424 (1896).

9. On Two New Instances of Spinous Roots. *Ann. Bot.* **11,** 327–332, 2 pls. (1897).

10. The Anatomical Characters presented by the Peduncle of *Cycadaceae*. *Ann. Bot.* **11,** 399–419, 2 pls. (1897).

11. The Structure and Affinities of Fossil Plants from the Palaeozoic Rocks.

I. On *Cheirostrobus*, a New Type of Fossil Cone from the Lower Carboniferous Strata (Calciferous Sandstone Series). *Phil. Trans. Roy. Soc.* ser. B. **189,** 1–34, pls. 1–6 (1897).

II. On *Spencerites*, a New Genus of Lycopodiaceous Cone from the Coal Measures, founded on the *Lepidodendron Spenceri* of Williamson. *Phil. Trans. Roy. Soc.* series B. **189,** 83–106, pls. 12–15 (1897).

III. On *Medulosa anglica*, a New Representative of the Cycadofilices. *Phil. Trans. Roy. Soc.* series B. **191,** 81–126 (1899).

12. Note on the Occurrence of a Seed-like Fructification in certain Palaeozoic Lycopods. *Proc. Roy. Soc.* **67,** 306–309 (1900).

13. (with T. G. HILL) The Structure of *Isoetes hystrix*. *Ann. Bot.* **14,** 413–454, 2 pls., 2 figs. (1900).

14. On a Primitive Type of Structure in *Calamites*. *Ann. Bot.* **15,** 773–774 (1901).

15. The Structure and Affinities of Fossil Plants from the Palaeozoic Rocks. IV. The Seed-like Fructification of *Lepidocarpon*, a Genus of Lycopodiaceous Cones from the Carboniferous Formation. *Phil. Trans. Roy. Soc.* ser. B. **194,** 291–333, pls. 38–43 (1901).

16. On the Primary Structure of certain Palaeozoic Stems, with the *Dadoxylon* Type of Wood. *Trans. Roy Soc. Edinb.* **40, 331–365,** pls. 1–6, 5 figs. (1902).

17. The Origin of Seed-Bearing Plants. Lecture delivered at Royal Institution of Great Britain. Evening Meeting, Friday, May 15th, 1903.

18. Germinating Spores in a Fossil Fern Sporangium. *New Phyt.* **3,** 18–23 (1904).

19. (with F. W. OLIVER) On the Structure of the Palaeozoic Seed *Lagenostoma Lomaxi*, with a Statement of the Evidence on which it is referred to *Lyginodendron*. *Phil. Trans. Roy. Soc.* ser. B. **197,** 193–247, pls. 4–10 (1904).

20. What were the Carboniferous Ferns? *Journ. Roy. Micro. Soc.* 1905, 137–149, pls. 1–3, 2 figs. (Presidential Address for 1905.)

21. The Early History of Seed-bearing Plants, as recorded in the Carboniferous Flora. (The Wilde Lecture.) *Mem. and Proc. Manchester Lit. and Phil. Soc.* **49,** 1–32, 3 pls. (1905).

22. The Sporangia of *Stauropteris Oldhamia* Binney (*Rachiopteris Oldhamia* Will.). *New Phyt.* **4,** 114–120 (1905).

23. The Structure and Affinities of Plants from Palaeozoic Rocks. V. On a New Type of Sphenophyllaceous Cone (*Sphenophyllum fertile*) from the lower coal measures. *Phil. Trans. Roy. Soc.* ser. B. **198,** 17–39, pl. 3–5 (1905).

24. (with A. J. MASLEN) Note on the Structure of *Trigonocarpon olivaeforme*. *Ann. Bot.* **20,** 109–112 (1906).

25. The Structure of *Lepidodendron obovatum* Sternb. *Ann. Bot.* **20,** 317–319 (1906).

26. The Occurrence of Germinating Spores in *Stauropteris oldhamia*. *New. Phyt.* **5,** 170–172, 2 figs. (1906).

27. The Present Position of Palaeozoic Botany. *Progressus Rei Botanicae,* **1,** 139–217 (1906).

28. The Fern-like Seed Plants of the Carboniferous Flora. Ueber die wichtigsten neueren Ergebnisse der Phytopaläontologie. Resultats scientific. du Congrès internat. de Bot. Wien, 1905. Jena, 1906. Pp. 279–296, 17 figs.

29. On *Sutcliffia insignis*, a New Type of *Medulloseae* from the Lower Coal Measures. *Trans. Linn. Soc. Bot.* **7,** 45–68, pls. 7–10 (1906).

30. (with A. J. MASLEN) The Structure of Palaeozoic Seeds, *Trigonocarpus Parkinsoni* Brongniart, and *Trigonocarpus Oliveri* sp. nov. Part I. *Ann. Bot.* **21,** 89–134, 4 pls. (1907).

It may be of interest to mention that the last written record concerning Dr. Scott in the manuscript list of workers at the Jodrell reads as follows :—" November 1909. Dr. Scott worked in the laboratory for a fortnight, getting drawings made of some Devonian plants ; also two days on *Poroxylon* with Maslen."

SIDNEY HOWARD VINES.—On Wednesday, April 8, there died at Exmouth, aged 84, Dr. S. H. Vines, F.R.S., Emeritus Professor of Botany at Oxford from 1888 to 1919. He never worked continuously at Kew, and the younger generation hardly knew him: but his early contact with Kew was bound up with the initial steps in that revolution in the teaching of botany in Great Britain which led to the better conditions as we now enjoy. Though in an earlier period plant-anatomy and physiology were pursued with conspicuous success in Britain, at the middle of the 19th century interest had drifted almost exclusively into systematic channels, probably as a consequence of the development of the Empire, and a need for ascertainmg its resources. In the universities the more vital studies were virtually dead: but in their revival 60 years ago Vines took a very notable share. The initiative came from Huxley, who with Burden Sanderson, Michael Foster, and Thiselton-Dyer started the first practical courses in elementary biology at South Kensington, extending from 1871 onwards. This led later to separate courses of instruction in zoology and in botany. The latter fell into the hands of Thiselton-Dyer, and his first course was held in the summer of 1875. Vines, who had already entered as a medical student at Guy's Hospital, had attracted the attention of Dyer as a competent physiologist, and he was asked to co-operate with him. They stayed together at Kew, carrying out preparatory work for the course; and thus indirectly the first laboratory teaching in the subject was organised at Kew.

The stimulus towards a biological rather than a merely systematic teaching of the science thus emanated from Kew. It was through Vines that the method and spirit of the movement was conveyed to Cambridge where he had already entered Christ's College as a scholar. The writer of these lines, who entered at Trinity in 1874, can witness to the sterility that reigned there botanically. It is true that Henslow, who held the chair till 1860, had stimulated observation and experiment in his pupils. But under Babington, who followed him, the work in the Department of Botany, as specified in the Calendar of 1876, consisted only in "An elementary course of Lectures, chiefly on Descriptive Botany, given during the Easter Term": while "the Professor makes herborizing excursions with his class, should circumstances permit." This was all that was offered. With the countenance and aid of Michael Foster, Vines initiated practical courses in Botany, of the South Kensington type, held in the physiological laboratory. An enthusiastic group of undergraduates at once gathered round him: we endeavoured to verify for ourselves the developmental details embodied in the text-book of Sachs, an English edition of which had appeared in 1875. There may have been similar efforts elsewhere: perhaps at Oxford under Lawson, and particularly in Edinburgh under Hutton Balfour. But it was in Cambridge and at South Kensington that what was then called "the New Botany" caught hold: and it was largely due to the influence of Dyer and of Vines.

There is no need here to recite again the further course of Vines' career, for it has been fully described elsewhere. We shall remember how he laboured as Reader in Botany in Cambridge till 1888, when he was appointed to the chair in Oxford, and held it for over 30 years. How as a co-editor from 1887 to 1899 he bore a full share in raising the Annals of Botany to the position of a leading scientific journal: and how he presided over the Linnaean Society in 1904, and the usual term of following years. For all this he deserves our gratitude. The special point of this note is rather to show how he shared in the revival in Britain of botany as a living cult: taking his initiative from South Kensington and from Kew: and particularly how he established it firmly in the early years of the movement at Cambridge. F. O. BOWER.

ERWIN BAUR.—We learn with regret of the death of Professor Erwin Baur at the relatively early age of 58.

Baur took his degree of doctor of medicine in 1900 and in 1903 received the degree of Doctor of Philosophy for a thesis on the development of the apothecia in lichens. He became Professor and Director of the Botanical Institute of the Königliche Landwirtschaftliche Hochschule, Berlin, in 1911. From that date he specialized in plant genetics and its applications, and founded an Institut für Vererbungslehre in Berlin-Dahlem in 1922 and the Kaiser Wilhelm Institut fur Züchtungsforschung at Müncheberg in 1929.

Baur's most extensive research was in the genus *Antirrhinum*. He studied genetically the large series of colours and other mutational characters in the garden snapdragons. Later he collected wild species of the genus in Spain and other countries and with the help of colleagues investigated their behaviour under controlled crossing and selfing and with varying laboratory conditions (X-ray, light, and chemical treatments). A set of his specimens was presented to Kew and is preserved in the Herbarium, and a very interesting series of mutational forms has been grown in the Gardens and sets of herbarium specimens made from them. Other investigations were carried out under Baur's direction on cereals, lupins, tobacco, vines, potatoes, and other important economic plants.

Amongst his many other activities he founded the "Zeitschrift für induktive Abstammungs- und Vererbungslehre," "Bibliotheca Genetica," and "Der Züchter."

Baur gave the Masters Lectures in 1931 (see Journ. Roy. Hort. Soc. **56**, 176, 183: 1931). He was elected a foreign member of the Linnean Society in 1933. W. B. TURRILL.

Wild Birds.—A short time ago a snipe was observed at the southern end of the Gardens. As far as we can ascertain this is the first record for this bird at Kew. About the same time a woodcock was noted on several occasions, and kingfishers are fairly regularly to be seen, both by the islands on the lake and more rarely near the

pond and water garden. Another interesting bird at present in the Gardens is a silvery-white hen blackbird, which can be seen any day in the grounds of the Queen's Cottage.

An account of the wild flora and fauna of Kew (Birds by W. H. Hudson) was published in 1906 (Kew Bulletin, Additional Series V. Price 2*s.*, obtainable from the Director), and additional records have been recorded from time to time in subsequent numbers of the Bulletin. The Director is always glad to receive new records of the wild life of the Gardens for publication in subsequent lists.

The validation of new combinations by indirect citation of the synonyms concerned.—Six new combinations under *Cymbopogon* for species placed under *Andropogon* in Steudel, Syn. Pl. Glum. **1**, 387, 388 (1855), were published by the late Dr. W. Watson in Atkinson's Gazetteer of the North-Western Provinces of India, 392 (1882). Being unaccompanied by their respective synonyms, they were overlooked during the preparation of the "Index Kewensis," and have just come to light. Consequently some of them have been published again independently by later authors. The combinations concerned are the following:—*Cymbopogon distans*, *C. flexuosus*, *C. Martini*, *C. pachnodes*, *C. pendulus* and *C. versicolor*. At first sight they might be taken for *nomina nuda*, but each is followed by its running number under *Andropogon* in Steudel's Syn. Pl. Glum., which gives the name on which it is based. Thus "*Cymbopogon distans* 298" means *Andropogon* No. 298 of Steudel, *i.e.*, *A. distans* Nees ex Steud. Syn. Pl. Glum. **1**, 387 (1855).

Eight new combinations under *Chrysopogon*, two each under *Batratherum* and *Ischaemum*, and one each under *Apocopis* and *Spodiopogon* also occur in the same list. The new names with their synonyms are given below. They will be included in "Index Kewensis, Suppl. IX."

Apocopis himalayensis: *Andropogon himalayensis* Steud.
Batratherum lancifolium; *Andropogon lancifolius* Trin.
B. submuticum: *Andropogon submuticus* Steud.
Chrysopogon coeruleus: *Andropogon coeruleus* Steud.
C. echinulatus: *Andropogon echinulatus* Steud.
C. glaucopsis: *Andropogon glaucopsis* Steud.
C. parvispica: *Andropogon parvispica* Steud.
C. Royleanus: *Andropogon Royleanus* Steud.
C. subrepens: *Andropogon subrepens* Steud.
C. Trinii: *Andropogon Trinii* Steud.
C. villosulus: *Andropogon villosulus* Steud.
Cymbopogon distans: *Andropogon distans* Nees ex Steud.
C. flexuosus: *Andropogon flexuosus* Nees ex Steud.
C. Martini: *Andropogon Martini* Roxb.
C. pachnodes: *Andropogon pachnodes* Trin.
C. pendulus: *Andropogon pendulus* Nees ex Steud.

C. versicolor: *Andropogon versicolor* Nees ex Steud.
Ischaemum corollatum: *Andropogon corollatus* Steud.
I. speciosum: *Andropogon speciosus* Steud.
Spodiopogon involutus: *Andropogon involutus* Steud.

T. A. S. & C. E. C. F.

Early Introduction of Sisal to East Africa.—The first introduction of sisal to East Africa is recorded as having taken place in 1893 when the Deutsche Ostafrikanische Gessellschaft in East Usambara imported 1000 bulbils from Florida on the recommendation of Dr. Hindorf. These bulbils arrived in poor condition and less than 100 were found to have survived the journey. They were carefully tended in the plantation at Kikogwe and new plants were propagated from them. (*K.B.* 1908, 300.)

It has been generally believed that all the sisal plants cultivated in East Africa originated from this particular consignment. This belief is to be found expressed in various publications relating to sisal in East Africa, but it would appear that it may be incorrect and that other early introductions of sisal bulbils to East Africa were subsequently made. In a communication recently received by Mr. William Nowell, Director of the East African Research Station at Amani, from Mr. Johann Franz, Managing Director of Amboni Estates Ltd., Mr. Franz states that some 5000 sisal bulbils were intoduced independently by him in 1900 or 1901 for the West-deutsche Handels und Plantagen Gessellschaft, who were then owners of the Amboni Estate. Regarding these bulbils Mr. Franz states—"All these bulbils arrived in good condition and were planted in Amboni in order to substitute the Mauritius Agave* which was then cultivated (with success) on Amboni Estate. I purchased these bulbils personally (together with the General Manager of the Estates of the said Company) from the "Horticole Coloniale" in Bruxelles and, as far as I am informed, they received them from some of the Bahama Islands, but this I cannot warrant, nor can I trace the botanical name under which they have been invoiced to us, because all papers, invoices, etc., relating to that period have in the meantime been destoyed in Tanga through War actions, and in Düsseldorf because they had become useless."

It would be of interest if more light could be thrown on the origin of the bulbils that Mr. Franz states were procured from the "Horticole Coloniale" in Brussels in 1900 or 1901. Unfortunately, this establishment has been for many years defunct. F. N. H.

The Botanical Society of South Africa.—In the Annual Report for 1933 of this Society, which has just been issued, it is recorded that the Constitution has been altered so that general recognition and support can be given, not only to the National Botanic Gardens at Kirstenbosch, but also to the Karoo Garden,

*Mauritius Hemp (*Furcraea gigantea* Vent.) probably intended.

Whitehill, and to any other garden that may be established by the Trustees of the National Botanic Gardens. This should provide a stimulus to the development of the Karoo Garden and encourage the establishment of similar gardens in other parts of the Union.

We regret to learn of the deaths of Sir Drummond Chaplin, C.B.E., K.C.M.G., and Sir Lionel Phillips, Bart., both of whom were Vice-Presidents of the Society and had done much good work for the flora of the Union.

Flora of the Clyde Area.*—This handy little volume will be warmly welcomed by naturalists in the Clyde district. Particularly so as it is a self-contained work, provided with keys to families, genera and species, and short, well composed descriptions of each, and not a mere list of species like many British county and district Floras.

In another respect this book differs in a marked degree from any British Flora previously published in that it has broken away from the two main systems of classification in general use. In regard to this question Professor J. R. Matthews writes in his review in the " Journal of Botany," July 1933, p. 203 :—

" The general arrangement of the Flora shows a noteworthy departure from that of previous British Floras. The author has been impressed with the need for showing the student some sort of phyletic sequence in the arrangement of families, and has made a praiseworthy attempt to meet this requirement. While it is obviously impossible to illustrate fully plant relationships in any linear sequence, the system which is here adopted brings the classification of families more into line with modern ideas. The "Apetalae " as a separate group disappears, and the families formerly placed therein are distributed through the Archichlamydeae according to their possible affinities. The arrangement is, in fact, a compromise between the system of De Candolle and the scheme suggested by Hutchinson. It may be argued that the main purpose of a Flora, particularly one which is concerned only with a restricted area, is to afford a ready means of identification, yet the reviewer feels that no opportunity should be lost in bringing before the student the evolutionary concepts that underlie modern taxonomy. In this respect Mr. Lee's handbook is a step in the right direction. With regard to terminology the author might have adopted ' Family,' now generally used, in place of ' Natural Order '."

As the author of the system mentioned, I regret that Mr. Lee has not followed it in its entirety. Instead he has mixed it up rather badly with that of De Candolle (Bentham & Hooker) and Engler & Prantl, in order as he says " to avoid too sudden a departure from the familiar." Here the scientific and the popular are as usual at war one with the other, and a compromise between the two is rarely satisfactory. The result is that in some of the

*By John R. Lee. John Smith & Son (Glasgow) Ltd., 1933. Pp. xvi + 391. Price 7*s.* 6*d.* net.

groups the families are arranged quite contrary to the general principles upon which the system is based. For example Mr. Lee states (p. x) that in his arrangement the *Euphorbiaceae* follow the *Geraniales* and are followed in turn by the *Urticales* and *Amentales*, which immediately precede the perigynous *Rosales*. Unfortunately the student of the British flora only cannot judge as to the most suitable position for the *Euphorbiaceae*. But an examination of the world species would probably soon convince him that the family is heterogenous and that no part of it had anything particularly in common with the *Geraniaceae*. Again the *Malvalves* and *Geraniales*, although rather superficially similar, are not really related, but the result of parallel development. The *Geraniales* as shown in this book may well puzzle the student of phylogeny. A group which contains a flax plant, Geranium, maple, horse-chestnut, and a holly is evidently held together by a very slender thread. In addition the *Leguminosae* are placed in front of the *Rosaceae*, whence most botanists are agreed they have been derived.

The book is very clearly printed and the different types used to the best advantage. But the space saved by the abbreviations seems to be rather wasted by the indention of the descriptions instead of the first line of each. A reversal of this arrangement would have brought it into line with general practice and reduced the number of abbreviations to a minimum. J. H.

Report of the Botanical Society and Exchange Club of the British Isles for 1932.—This report is the first edited by the new Secretary, Mr. W. H. Pearsall. In format and in certain familiar features of the contents it is similar to the reports issued by the late Dr. G. C. Druce. It consists of 457 pages (including the report edited by the distributor, Dr. W. A. Sledge), with 55 plates, and many useful and interesting papers, and members of the Society and Club may well feel that they " have their money's worth."

Of familiar features, in part with modifications which are decided improvements, may be noted : " Plant Notes," " Notes on Publications," " New Books," etc., " Abstracts of Papers bearing on the Study of the British Flora " (by A. J. Wilmott and J. S. L. Gilmour), " Obituaries," and " New County and Other Records." Thirty-seven pages are taken up by " Corrections and Additions to Previous Reports," by P. M. Hall. Amongst the original papers of special interest may be noted : " The British Species of *Carex* " by the Secretary ; " *Cardamine pratensis* L.," a peculiarly constructed paper by G. E. Scott Elliott ; " *Zannichellia* " by the Secretary ; " *Valeriana officinalis* L. and its Allies in Great Britain " by the late E. Drabble ; " Annals of the B.E.C." by G. & T. J. Foggitt ; "Plant Nomenclature " by T. A. Sprague, a valuable and clearly written account of the rules of botanical nomenclature as amended at Cambridge in 1930 ; the " Adventive Flora of the Port of Bristol " by C. I. Sandwith ; " Revised Nomenclature of *Salix* " by J. Fraser ;

" Some Native Primula Hybrids " by R. Melville ; the " Taxonomy of Plants intermediate between *Medicago sativa* L. and *M. falcata* L. and their History in East Anglia " by J. S. L. Gilmour ; and " Local Floras " by the late G. C. Druce.

Special mention must be made of F. R. Elliston Wright's account of " Alterations in Vegetative Growth due to Environmental Adaptation in Braunton Burrows," partly because of the intrinsic interest of the subject and partly because of the series of habit and habitat photographic plates with which the paper is illustrated. Many of these are both botanically very instructive and excellent examples of photography. It is, however, unfortunate that they are not dated with the month and year. W. B. TURRILL.

Myrrh.—An interesting publication on myrrh,* which illustrates well the importance of this substance in past ages, has recently appeared. In addition to its use in medicine, myrrh has from a remote period entered into the composition of incense. The " kyphi " of the Egyptians, used for fumigating and embalming, is believed to have been made from it. Myrrh of commerce of the present day is produced chiefly in Somaliland, the powdery sorts from the hinterland, known as " ogo," being considered superior to the coastal or " guban " sorts which are more oily. The produce is shipped from Somaliland mostly to Bombay, where it is sorted, the best qualities going to western markets and the lower grades to the Chinese trade. The author devotes the first pages of his dissertation to a discussion on the botanical origin of myrrh, and is familiar with the work of Drake-Brockman in helping to clear up the difficulties that existed regarding the identity of the Somaliland bdelliums. This is followed by a consideration of the chemistry of the product. The most important passages are those dealing with the use of myrrh by the ancient Egyptians and by the Arabs and Greeks. F. N. H.

Forest Trees and Timbers of the British Empire.†—The second part of this series has been written on exactly the same lines as the first, which was noticed in K.B. 1932, 256. The high standard of the work has been maintained, the descriptions and microphotographs of the timbers being especially clear and easy to follow. The species described in this number were selected primarily on account of their commercial importance, although some less known species, which the authors believe may acquire greater commercial value in the future, have also been included. Certain of the most important species, including the mahoganies, have been omitted since they are still under investigation at the Forest Products Research Laboratory, Princes Risborough. Some minor changes of terminology in the wood descriptions have been made in order to incorporate suggestions put forward by the terminology committee of the International Association of Wood Anatomists. Two of the species described, *i.e.*, *Afzelia africana* Smith and *A. bipindensis* Harms, have already been mentioned in part 1 of this series, but their descriptions in part 2 have been considerably amplified. C. R. M.

The Sutlej Deodar, its Ecology and Timber Production.*—This work is a thesis submitted by the author, Mr. R. Maclagan Gorrie, D.Sc., for the degree of Doctor of Science of Edinburgh University in May, 1930, and it is the outcome of a careful survey of the vegetation of the Himalayan deodar forests within the boundaries of Spiti in the north, the Nari Khorsum Province of Chinese and Western Tibet in the east, Tehri Garwhal State in the south, and the Lower Bashahr Forest Division in British India in the west. Some of the principal trees associated with deodar in this region appear to be silver fir, *Abies pindrow* ; blue pine, *Pinus excelsa* ; chil pine, *Pinus longifolia* ; neoza pine, *Pinus Gerardiana* ; spruce, *Picea Smithiana* ; several oaks, particularly *Quercus Ilex*, *Q. dilatata*, *Q. semecarpifolia*, and *Q. incana* ; and at lower elevations various tropical and subtropical trees such as *Dalbergia Sissoo*, *Cedrela Toona*, *Albizzia Julibrissin*, and *Mallotus philippinensis*. Many kinds of small trees and shrubs are prominent in the several well defined areas, their individual distribution being determined by climate, altitude, aspect and soil conditions. A generally rich ground vegetation of herbaceous species appears to prevail.

In dealing with this subject the author first describes the situation and topography of the region. He then discusses the geology and climatic conditions, and passes to the population and employments of the people, the history of forest development, fire danger, and a general description of the three zones, moist, dry and arid, wherein the forests are distributed. From this he proceeds to detailed descriptions of the three zones, describing the various types of forest occurring in each, with the plant associations found in different sections of each type. In this way the author describes 14 forest types, and afterwards devotes nearly 60 pages to an analysis of the plants, in botanical sequence, found throughout the whole area. Reference is made to 91 families and the index includes 360 genera. A short chapter at the end of the work is devoted to deodar timber production and there are six pages of plates, each page giving two photographs of forest types. W. D.

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* "Myrrhe und Stakte," von Dr. Robert O. Steuer. pp. 48. O. Höfels, Wien 1, Walfischgasse 14. 1933. RM. 5.

†Edited by L. Chalk and J. Burtt Davy, Imperial Forestry Institute, Oxford. II: Twenty West African Timber Trees, by L. Chalk, M.A., D.Phil., J. Burtt Davy, M.A., Ph.D., H. E. Desch, B.Sc., M.A., and A. C. Hoyle, B.Sc., M.A. Pp. 1–108, 20 figs., 20 plates. Oxford, at the Clarendon Press, 1933. Price 7*s*. 6*d*. net.

* By R. Maclagan Gorrie, D.Sc., Indian Forest Service. Indian Forest Records (Silviculture Series), vol. xvii, part iv, pp. 1–140, plates 12. Published by the Government of India, Central Publication Branch, Calcutta, 1933. Price 5s. 6d.

An Introduction to Tropical Soils.*—Dr. Vageler, in his preface to the English translation so ably carried out by Dr. Greene, states that the objects of this book are firstly to assist the planter to solve his own problems and secondly to provide a handbook for students of tropical agriculture. These intentions are admirably fulfilled; those with long experience of the tropics will be able to find numerous examples which recall mistakes made by themselves in the past, and newcomers will be saved from falling into similar errors.

More than half the book is devoted to chapters on soil formation and soil selection which give much practical advice based on personal experience drawn from many parts of the tropics and sub-tropics. Such subjects as soil erosion and soil improvement by green manuring and other means are also dealt with.

The book fills a real want and should be warmly received by those concerned with all aspects of tropical agriculture. H. C. S.

The Birds of Tropical West Africa.†—The third volume of this work, which has recently appeared, continues the systematic description and deals with the remaining orders except the *Passeriformes* (Perching Birds). There is a useful illustrated key to the orders, sub-orders and families at the beginning, and the description of each bird is followed by notes on field identification, distribution and habits, as in the previous volumes. The book is well illustrated by twelve coloured plates and numerous text figures of a high standard: in addition there is a useful orographic map of Sierra Leone.

Ten Orders are treated:—*Strigiformes* (Owls); *Musophagiformes* (Plantain-eaters and Turacos), here removed from their generally accepted position in the following order, *Cuculiformes* (Cuckoos and Coucals), and placed in a separate order restricted to the single Family *Musophagidae*; *Caprimulgiformes* (Nightjars); *Cypseliformes* (Swifts) and *Bucerotiformes* (Hornbills) which are both treated as separate orders, being removed from their previous association with the *Coraciiformes* (Rollers, Hoopoes, Kingfishers and Bee-eaters); *Piciformes*, which includes the Woodpeckers, Wrynecks, Barbets and Honey-Guides. At least one of the latter, well named *Indicator indicator*, has been proved to have the habit of leading human beings to the nests of bees, on the larvae and honey of which it feeds almost exclusively: it has an exceedingly tough skin as a protection against bee-stings. The remaining orders dealt with are the *Coliiformes* (Mousebirds), restricted to the single genus *Colius*, the species of which spend much of their time in creeping about, using their bills as well as their feet for this purpose, and the *Trogoniformes*, represented in West Africa by two genera of Trogons, which are the most difficult of all birds to preserve, owing to their extremely delicate skin and the loose attachment of the plumage.

The previous volumes were noticed in K.B. 1930, 334, and 1932, 416.

The Indian Forester.*—With the issue of a double number for January 1934, this publication enters upon its sixtieth volume. Starting as a quarterly in July 1875, for most of its existence it has been issued monthly and has been a potent factor in the progress of forestry in all its branches in the Indian Empire. Its value beyond the limits of India is testified to by letters published in this issue, received from various parts of the British Empire.

Its scope has not been restricted, however, to forest science, but has embraced many others, and has included important botanical communications. Sport and general natural history have also been a feature, and a leaven of humour has not been forgotten. It is to be hoped that whatever changes in the constitution of the Indian Forest Service may take place its members will see that this periodical shall retain its present high standard.

Botanical Magazine.—The second part of vol. 157 was published on April 3rd and contains the following plant portraits:—

Meconopsis regia G. Taylor (t. 9348), a fine yellow-flowered species from Nepal; *Campanula propinqua* Fischer & Meyer var. *grandiflora* Milne-Redhead (t. 9349), raised by Lady Rockley from seeds collected by the Hon. R. W. E. Cecil in Iraq and originally described under the name *C. Cecillii*; *Habenaria splendens* Rendle (t. 9350), from high altitudes in East Africa; *Jasminum Farreri* Gilmour (t. 9351) a new species, which has been confused in gardens with *J. Giraldii*, raised from seeds collected by Farrer in Upper Burma; *Lonicera nitida* E. H. Wilson (t. 9352), from Western China; *Fritillaria recurva* Benth. (t. 9353), a native of dry hillsides in open evergreen woods in Southern Oregon and California; *Gazania longiscapa* DC. (t. 9354), found along the coastal districts of South Africa from Humansdorp to Natal; *Notholirion macrophyllum* (D. Don) Boissier (t. 9355), formerly placed under *Lilium* but considered to belong to a distinct genus *Notholirion* by the late Dr. Stapf just before his death, native of the Central Himalaya; *Tulipa Stapfii* Turrill (t. 9356), a native of Iraq and Persia, newly named in honour of Dr. Stapf who gave it originally the name *T. cuspidata* which had already been used; *Pelargonium almoneum* R. A. Dyer (t. 9357), an interesting new species from the vicinity of Port Elizabeth, South Africa, and *Rhododendron charitopes* Balf. f. et Farrer from Upper Burma and Yunan.

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*By Dr. P. Vageler. Translated by Dr. H. Greene. Macmillan & Co., Ltd., London, 1933. Pp. xvi+240. 13 figs+12 plates. Price 15*s.* net.

†By D. A. Bannerman. The Crown Agents for the Colonies, 4, Millbank, Westminster, 1933, pp. xxxv + 487, full page plates 12, text figs. 144, coloured map. Price 22*s.* 6*d.*

*The Indian Forester, vol. 60, no. 1, January 1934, 106 pages.

Alcide d'Orbigny Commemoration Volume.*—The centenary of Alcide d'Orbigny's celebrated expedition to South America (1826–33) has been marked by the issue of a commemorative work containing essays by various zoologists and one botanist. It begins with a biographical notice of d'Orbigny (pp. 8–13), whose portrait forms the frontispiece, followed by accounts of his work as an entomologist (pp. 15–26), his ideas on the geographical distribution of the marine mollusca of the South American coasts (pp. 27–41), an account of the terrestrial and fluviatile mollusca published in his works (pp. 43–58), and a similar study on the cephalopods (pp. 59–66). An essay on d'Orbigny as an ornithologist (pp. 66–74) is accompanied by a coloured plate of two Bolivian *Trochilidae*, namely, *Oreotrochilus Adela* and *Eriocnemis glaucopoides*. The remaining zoological papers deal with the *Procyonidae* (pp. 81–93) and the affinities of the fossil mammal *Issiodoromys* (pp. 95–108) respectively.

The one botanical paper (pp. 75–79) by R. Benoist, Professor of Botany at the University of Quito during 1930–31, includes taxonomic descriptions of the following new species and varieties of Phanerogams from Ecuador: *Berberis farinosa, B. papillosa, Cardamine ovata* Benth. var. *glabrata, Draba Riveti, Viola scandens* H. B. K. var. *integristipula* and *Naucleopsis chiguila*. The latex of the last species is used by the Colorados Indians as an arrow poison. According to the author, the flora of Ecuador is so rich and varied that it is still possible to discover new species even in the immediate neighbourhood of the capital.

Some Indian Rhodophyceae.—The legend under figure 10, p. 14, in K.B. 1934, should read "*Meristotheca papulosa* (Mont.) J. Ag." instead of *M. japonica* Kylin.

Dr. H. Christ.—The death of Dr. H. Christ took place on November 23rd, 1933, and not during the night of November 16th–17th, as erroneously stated in K.B. 1934, 40.

*Commémoration du voyage d'Alcide d'Orbigny en Amérique de Sud 1826–1833. Publications du Museum National d'Histoire Naturelle no. 3. Paris. Masson et Cie. 1933, pp. 108, portrait, 1 col. pl. of birds, figs. 15. Price 20 francs.

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ROYAL BOTANIC GARDENS, KEW

XVII—A BOTANICAL RECONNAISSANCE IN THE VIRUNGA VOLCANOES OF KIGEZI RUANDA, KIVU.

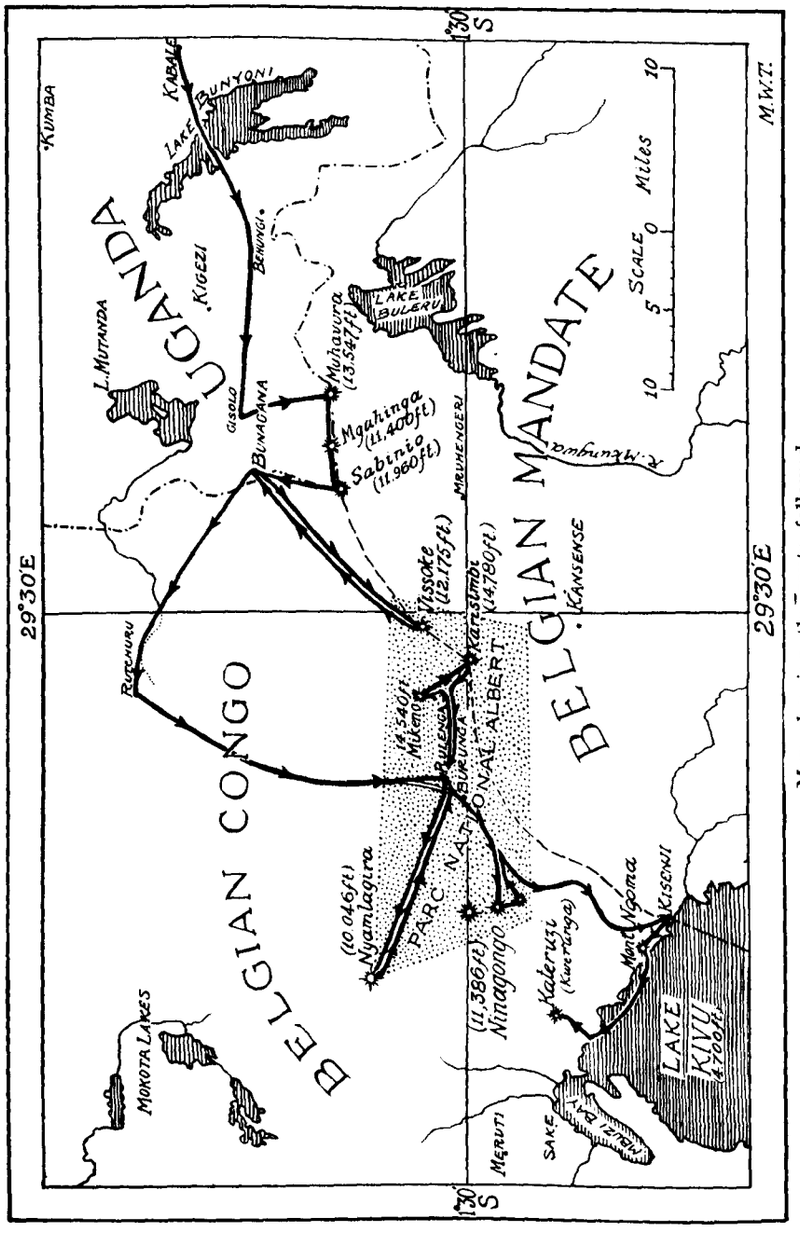
B. D. Burtt.

The present paper is an attempt to give a floristic picture of the country traversed during a plant-collecting expedition in November and December 1930 among the Virunga or Mufumbiro Volcanoes, a particularly isolated range of peaks that lies about 120 miles south of the Ruwenzori ice cap, in the great divide between the East Tropical African savannahs and the forests of the Congo Basin. The nearest mountain of any size to the east which bears a well developed alpine vegetation is Mt. Elgon (14,140 ft.), about 400 miles distant, while Kilimanjaro and Mt. Kenya both lie approximately 550 miles away.

A comprehensive description of the mountains has been given by the Duke of Mecklenburg,* and, more recently, an excellent account of their inhabitants has been published by Capt. J. E. T. Phillips.† The largest botanical collections are those made in 1907 by Dr. J. Mildbraed, Botanist to the Mecklenburg expedition; and recently Mr. J. D. Snowden, late of the Uganda Agricultural Department, and Dr. H. Humbert, Director of the Museum d'Histoire Naturelle, Paris, have collected very considerably in this region. A comprehensive account by Mr. Snowden of the vegetation of the South Kigezi area from an ecological standpoint has recently appeared.‡

The Virunga Volcanoes consist of eight principal peaks, forming a range approximately 40 miles long across the floor of the Western Rift Valley, north of Lake Kivu, between 1° and 2° S. latitude and 29° and 30° E. longitude. At the east end of the range are situated the extinct volcanoes of Muhavura, Mgahinga and Sabinio, forming a chain of three peaks lying east and west, their slopes uniting into a common base approximately 10 miles across. In the centre of the Virunga Range lie the extinct peaks of Karisimbi, Mikeno and Vissoke forming a triangular group lying south-west of Sabinio and connected to it by a chain of explosion craters known as the Mashiga Range. Approximately ten miles west of Mikeno lies the whale-backed mountain of Nyamlagira with Ninagongo ten miles south-south-east of it; these two mountains

*"In the Heart of Africa." Duke Adolphus Frederick of Mecklenburg. Trans. G. E. Maberley-Oppler. Cassell & Co., Ltd. 1910.
†Geographical Journal, **61**, no. 4 (1923).
‡Journal of Ecology, **21**, no. 1 (1933).



Map showing the route followed.

are in a perpetually active state, resembling the cauldron craters of Kilawea and Mona Loe in the Sandwich Islands. Karisimbi, 14,780 ft. high, is the highest peak in the range and is capped with snow or hail after the violent storms which are frequent on the central mountain group. A feature of the Virunga peaks is the frequency of cloud and mist, which obscure their summits during a greater part of the year and result in the heavy growth of saturated moss in the alpine zone.

Journey to Muhavura.

We left Tanganyika Territory by lake steamer from the port of Mwanza on Lake Victoria, and, after calling, among other places, at Bukatata, where the pink-flowered *Honckenya ficifolia* Willd. and *Urena lobata* L. are abundant behind the fringing Papyrus belt, we landed at Port Bell. Thence a railway journey of 7 miles brought us to Kampala, where stores were procured for a two-months' safari. From Kampala the loads were transported 280 miles by car, via Masaka (4200 ft.) and Mbarara (4800 ft.), to Kabale (6200 ft.). Near Masaka the lake forest belt is replaced by *Themeda triandra* Forssk. grass savannahs (with *Acacia hebecladoides* Harms the dominant tree) which extend over undulating plains to the western border of the Ankole District, where the road enters the rolling, grass-covered, parallel mountain ranges, devoid of forest, that are a feature of the Kigezi-Ruanda plateau. At Kabale we commenced porter safari and followed the road which climbs over a 7000 ft. range and descends to Rutinda Camp on the eastern shore of Lake Bunyoni (6470 ft.). Crossing the lake by canoes we reached Bufundi Rest Camp on the western shore.

Mr. Snowden has, in the following words (*ined.*), described the long and steep ascent of the 8000 ft. range which flanks the western shore of Lake Bunyoni.

" From the landing place the path trails steeply upwards through a pretty wooded valley, alongside a swift-flowing mountain stream which runs into the lake. In wet soils buttercups (*Ranunculus pinnatus* Poir.), forget-me-not-like plants (*Cynoglossum lanceolatum* Forssk.), and the fern-leaved *Thalictrum rhynchocarpum* Dill et A. Rich., are very common, while, in addition to the trees and shrubs already recorded, the following were noticed: *Ericinella Mannii* Hook., *Triumfetta* sp. (no. 1622), *Barleria ventricosa* Nees., *Pentas* sp. (no. 1546), *Dodonaea viscosa* Lam., large tree-Dracaenas (*Dracaena fragrans* Ker), tree-Euphorbias (*Euphorbia antiquorum* L.), tree-Lobelias (*Lobelia gibberoa* Hemsl.), *Odina Schimperi* Hochst., *Albizzia* sp., and *Hagenia abyssinica* J. F. Gmel.

" About half way up this steep hill the woodland ceases and much cultivation and population are met with for a time. On the higher slopes and summit of the ridge, which rises to an altitude of over 8000 feet, the country gradually merges into short grass grazing lands, which are composed of most of the pasture grasses

occurring near Kabale and also *Cymbopogon afronardus* Stapf, *Hyparrhenia cymbaria* Stapf forma *macra*, *Eleusine Jaegeri* Pilger, and a variety of *Calamagrostis epigeios* Roth."

We climbed through the remnants of forest left by the natives to secondary *Vernonia* thicket, and bracken-covered slopes, dotted with *Erica arborea* L. 4–6 ft. in height. Near the summit was a clump of ragged shrubs of a species of *Smithia* (no. 2951), about 10 ft. high, with viscid foliage and pale pink flowers.

From the ridge we looked across a deep, narrow valley towards the bamboo-clad Behungi range, beyond which towered the cone of Muhavura and the jagged summits of Sabinio. We descended 800 ft. to the floor of the valley, which suggests the former presence of a lake and consists of a flat marsh, varying from a quarter to half a mile in width and extending many miles north and south and up tributary valleys.

The marsh is crossed by a 20-ft. grassy path, with a dyke on either side, and is covered with a wealth of vegetation of great beauty. The following list includes some of the more striking species:—*Ranunculus pubescens* Thunb., with yellow flowers; *Uebelenia kigesiensis* R. Good, a white-flowered herb dominant in the dyke; *Hypericum lanceolatum* Lam., fringing the swamp and forming small island-thickets near its margin; *H. peplidifolium* A. Rich., a creeping herb on the path; *Alchemilla kiwuensis* Engl.; *Crassula Wrightiana* Bullock, locally dominant where the dyke is shallow and muddy; *Lythrum rotundifolium* Hochst. ex A. Rich., with pink flowers; *Epilobium fissipetalum* Steud., frequently seen later in the marsh between Muhavura and Mgahinga; *Dipsacus pinnatifidus* Steud., at the edge of the marsh; *Helichrysum formosissimum* Sch. Bip., its white flowers covering the swamp like new-fallen snow; *H. setosum* Harv., *H. foetidum* Cass. and *Senecio* spp. fringing the swamp; *Lobelia Mildbraedii* Engl., with pale lilac flowers on stems 4–6 ft. high rising from finely pubescent leaves arranged in sessile rosettes, resembling, when young, those of *L. Deckenii* Schweinf. in the alpine marshes of Kilimanjaro; the small herbaceous species *L. minutula* Engl. and *L. stellarioides* Benth. et Hook. fil.; *Anagallis ruandensis* Knuth et Mildbr.; *Swertia calycina* N. E. Br.; *Veronica abyssinica* Fresen., these last three growing along the path; *Thunbergia alata* Boj.; *Stachys aculeolata* Hook. fil.; *Disa Stairsii* Kraenzl., with purplish inflorescences, forming thick tussocks throughout the marsh; *Kniphofia zombensis* Baker, with red and yellow flowers; *Eriocaulon mesanthemoides* Ruhl., occasional in saturated ground; small Cyperaceous herbs and the grass *Digitaria scalarum* Chiov. along the path, and the bamboo *Arundinaria alpina* K. Schum. forming impenetrable forest on the surrounding hills.

Having crossed the marsh we passed along its margin for two miles over rich humus with bamboo thicket on our left. Here occurs the striking orange fungus *Engleromyces Goetzei*, growing

from the thin branches near the apex of the canes. The fungus is from 6–12 inches in diameter, soft and white when cut, its outer surface ribbed like convolutions of the brain. Along the path occur *Plantago palmata* Hook. fil., *Trifolium usambarense* Taub. and *Viola abyssinica* Steud.

We then left the marsh and made the ascent to the ridge, over 8000 ft., through bamboo thicket, replaced at 7500 ft. by bracken slopes with *Erica arborea* shrubs 6–8 ft. high. Among the plants noted on the way were: *Parochetus communis* Hamilt., with bright-blue flowers and trifoliolate leaves, *Brillantaisia nyanzarum* Burk., 4–6 ft. high, with purple flowers, frequent on either side of the path, and *Thunbergia* sp., a climbing plant, with a white corolla and purple centre, all in the bamboo zone; and in the *Erica* zone, *Polygala Elliotii* Chodat, with carmine flowers; *Hibiscus diversifolius* Jacq. a shrub 4–6 ft. high, with a large, deep-purple inflorescence; *Sebaea oreophila* Gilg, with yellow flowers and *Micromeria biflora* Benth., with pink flowers, both in the sandy soil of the bank overhanging the road, and young *Lobelia giberroa* Hemsl., in small ravines near the summit, with tall stems raising a crown of long, purple-veined leaves above the thicket of *Vernonia* sp.

The rocks are crystalline, but half-way down the steep 2000 ft. descent to the West Rift Valley the path wound round and over a turmoil of cinder cones and explosion craters, clothed with pasture grasses and dotted with native cultivation, to Nyakabande in the flat Mufumbira lava-plains. From here a motor road, metalled with lava and cinders and flanked by tall wattle trees (*Acacia decurrens* Willd.), leads through Gisolo village, about 6 miles distant, to Bunagana on the Belgian Congo frontier.

The lava blocks, worn smooth by weathering, are frequently clothed with the fern *Nephrolepis cordifolia* Pr., the orange-flowered *Gynura vitellina* Benth., and small clumps of *Lantana salviifolia* Jacq., and *Rumex maderensis* Lowe. In places the lava blocks have been piled into heaps by the natives to form small pans for the cultivation of their crops. When cultivation has been abandoned a rich pasture has developed, dominated by *Pennisetum clandestinum* Hochst., and *Digitaria scalarum* Chiov. (see Snowden, op. cit. 16, 17).

The lava plains north of Muhavura and Mgahinga, and especially those near the eastern wall of the Rift Valley north-east of Muhavura, are studded with steep-sided cinder cones. We visited one called Sajitive, two miles north of Gisolo. It is perfectly symmetrical, about 300 ft. high, its lower slopes cultivated in the native patchwork manner with crops of peas, beans, simsim, sweet potatoes and maize. The deep crater and summit are covered with short grass, in which the orchids *Satyrium sacculatum* Rolfe and *Habenaria praestans* Rendle are frequent.

Our route from Nyakabande lay southward through Gisolo and Mabunda Rest Camp to Lembwe village (about 7000 ft.) at the base of Muhavura. The following is a list of some of the plants

seen during this part of the journey : a single large tree of *Erythrina tomentosa* R. Br. at Mabunda, 40 ft. in height, and 2 ft. in diameter at 4 ft. from the ground ; *Brachycorythis Kassneriana* Kraenzl., *Satyrium sacculatum* Rolfe, both abundant for the first two miles ; *Lissochilus Wakefieldii* Rchb. f. et S. Moore ; *Eulophia stachyodes* Reichb. f. ; *Habenaria praestans* Rendle ; *Pteroglossaspis Engleriana* Kraenzl. ; *Habenaria calva* Rolfe with two opposite fleshy leaves firmly pressed to the ground and a spike of greenish-yellow flowers ; *Digitaria scalarum* Chiov., *Cynodon transvaalensis* Burtt Davy, *C. dactylon* Pers., *Pennisetum clandestinum* Hochst., all occurring on a well-made, grassy road.

Lembwe, like many other native villages at the foot of the mountain, is surrounded by a rough palisade of cuttings of *Erythrina tomentosa*, 6–10 ft. high and mostly flowering. These palisades are strengthened with the thorny shrub, *Solanum aculeastrum* Dun., and in places are festooned with an orange-flowered succulent, *Gynura ruwenzoriensis* S. Moore, and *Galium* sp. Shade is provided by groups of black-wattle trees and saplings which the natives are encouraged to plant annually in the otherwise treeless lava plains.

Ascent of Muhavura.

From Lembwe we started to climb the regular cone of Muhavura and soon passed two lava caves, festooned with *Phytolacca dodecandra* L'Hérit., a maidenhair fern (*Adiantum* sp.) and *Rumex maderensis* Lowe, the latter bearing an abundance of the yellow cocoons of a Lasiocampid moth. At 7500 ft. we reached a comparatively flat ridge, clothed with normal pasture, and 1000 ft. higher was a second shelf about 400 yards wide, covered with dense secondary thicket, 7 ft. in height, dominated by *Rumex maderensis* and with *Lantana salviifolia* Jacq., *Conyza Newii* Oliv. et Hiern, *Cluytia abyssinica* Jaub. et Spach., *Vernonia* spp., *Pentas purpurea* Oliv. and *Gynura ruwenzoriensis* S. Moore frequent. We next ascended a steep slope, on which were widely scattered bushy shrubs of *Erica arborea*, to a third shelf at about 11,000 ft. This was clothed with a tussocky grass, *Andropogon* sp., while *Helichrysum fruticosum* Vatke occurred in tufts on exposed lava. Between 11,500 and 12,000 ft. in the three parallel ravines on the north of the mountain, *Senecio Erici-Rosenii* R. E. et Th. C. E. Fries formed a densely canopied and much branched shrub 15 ft. high. Crossing a spur to the north-east, we came to a forest of the same *Senecio*, in which were many greenish-purple inflorescences of *Lobelia Wollastonii* Bak. f., forming cylindrical spikes 6–10 ft. high. The very young plants form dark-green sessile rosettes, but with age they become raised upon hollow, club-shaped axes, 4–6 ft. in height and 5–10 inches in diameter at the widest part, just below the dark-green foliage. Sunbirds (*Nectorinidae*) with irridescent, indigo plumage and long, pointed tails were commonly seen feeding at the *Lobelia* inflorescences.

From 13,000 ft. upwards the path leads through dense thickets of an arborescent *Senecio* with a much-branched canopy 6–7 ft. high and leaves covered with a slight, woolly tomentum on the lower surface. Passing out of the *Senecio* community into stony ground clothed with *Alchemilla Johnstonii* Oliv., we reached the summit. Here we found a small crater filled with greenish water, whilst large lava boulders clothed with the black lichen, *Gyrophora cylindrica* Asch., were scattered here and there. Small plants of *Senecio alticola* Mildbr. were in flower. The heavy, white-woolly tomentum covering the undersides of the leaves and the axis of the inflorescence and the distinctive pale-yellow flowers with purplish involucral bracts of this species contrast strongly with other members of the genus. Looking down the south and south-west faces of the mountain the *Senecio* was seen more frequently as a shrub 6 ft. high and the *Senecio-Lobelia* forest seemed to be more developed and at a lower altitude than we had noted on the north and north-east slopes. The following is a list of some of the more interesting plants noticed during the ascent of the mountain : *Cardamine obliqua* Hochst., growing in saturated moss on the branches of Senecios ; *Arabis alpina* L. at 13,000 ft. ; *Geranium angustisectum* Knuth ; *Adenocarpus Mannii* Hook. fil. ; *Alchemilla geranioides* Rolfe, dominant in the herb layer about 12,000 ft. ; *Peucedanum Kerstenii* Engl., in a hollow at 12,000 ft. ; *Dipsacus pinnatifidus* Steud. ; *Helichrysum Newii* Oliv. et Hiern, on moss at the summit ; *Agauria salicifolia* Hook. fil. ; *Philippia Johnstonii* Engl. ; *Swertia Volkensii* Gilg, at the summit ; *Myrica* sp. ; *Aristea alata* Baker ; *Gladiolus Quartinianus* A. Rich. ; *Kniphofia* sp. ; and *Calamagrostis epigeios* Roth.

Mgahinga.

Our next expedition was an ascent of Mgahinga (11,400 ft.). From Lembwe we skirted the foot of Muhavura through undulating pasture and climbed through secondary thicket towards the pass (9000 ft.) between that mountain and Mgahinga by a path leading into Belgian Ruanda. The lower slopes of the mountain, between 7000 and 8000 ft., are clothed with secondary thicket similar to that at the foot of the mountain and previously described on Muhavura, but in which immature plants of *Lobelia giberroa* Hemsl., *Maesa lanceolata* Forssk., and *Rhamnus prinoides* L'Hérit are frequent. At 8,000 ft. we passed through a thin belt of sub-tropical, evergreen forest and entered dense bamboo composed of canes averaging 2 inches in diameter. Crossing a glade above a thicket of *Erica arborea* at 8500 ft., we reached the pass, which is clothed with *Hypericum lanceolatum* thicket, 6–12 ft. high, extending up Muhavura to the Senecio zone and also far up the slopes of Mgahinga. There are extensive, saturated moorland glades in the pass—dominated by *Helichrysum fruticosum* and *Anthoxanthum nivale* K. Schum.—and an exceedingly spongy marsh, over a quarter of a mile wide, occurs at the summit.

From the pass we commenced the actual ascent of Mgahinga by cutting a path through bamboo and secondary thicket, 6 ft. high, composed of *Senecio denticulatus* Engl. and *Cineraria kilimanscharica* Engl. We frequently saw the spoor and nests of gorilla, and piles of bamboo bracts where a succulent young shoot had been stripped and eaten. At 10,000 ft. we reached a rocky glade, bordered by *Hypericum lanceolatum*, which, at this altitude, becomes more bushy and is intersected with belts of *Philippia Johnstonii* Engl., a densely canopied shrub 8–10 ft. high extending to the summit of the mountain. At 10,500 ft. the *Hypericum* ceased and large shrubs of *Senecio Erici-Rosenii* occurred in deep ravines. From here to the summit the ground was boggy and much trampled by elephant, which pluck the tufted crowns of immature Lobelias.

The crater at the summit is over half a mile wide, its rather steep walls being densely clothed with *Senecio Erici-Rosenii*, *Lobelia Wollastonii*, *L. karisimbensis* and *Philippia Johnstonii*. The regeneration of the Lobelias and Senecios is evident from the profusion of young plants in the herb stratum. The crater is breached at the western end, and at the eastern end, 200 ft. higher, there is a smaller crater, 100 yds. across, containing a lake whose margins are choked with *Sphagnum*.

The following is a list of the more interesting plants, besides those already mentioned, which were noticed during the ascent: in the pastures at the foot of the mountain: *Tephrosia nigrocalyx* Bak. f.; *Gynura vitellina* Benth.; *Berkheya Spekeana* Oliv. et Hiern; *Asclepias pubiseta* N. E. Br.; *Sebaea oreophila* Gilg; *Geniosporum paludosum* Bak., which has white terminal leaves adapted for the attraction of insects to the inconspicuous pink-flowered inflorescence; *Rumex maderensis* Lowe and the orchidaceous *Habenaria Rendlei* Rolfe. At 8000 ft.: *Trifolium usambarense* Taub., *Crotalaria cleomifolia* Welw. ex Baker and *Pteridium aquilinum* L. on the margin of the subtropical forest; *Impatiens* sp. (near *I. Eminii* Warb.), *Desmodium Scalpe* DC., and *Sanicula europaea* L. in the herb stratum. In the herb layer of the bamboo forest: *Viola abyssinica* Steud.; *Trifolium usambarense* Taub.; *Plantago palmata* and *Selaginella* sp. (no. 2971). At 8500 ft.: *Helichrysum nandense* S. Moore and *Satyrium crassicaule* Rendle. On the pass at 9,000 ft.: *Ranunculus Volkensii* Engl.; *R. pubescens* Thunb.; *Cardamine obliqua* Hochst.; *Cerastium africanum* Oliv.; *Alchemilla pedata* Hochst.; *Epilobium fissipetalum* Steud.; *Lobelia utshungwensis* R. E. Fries; *Swertia Adolfi-Frederici* Mildbr.; *Bartsia similis* Hemsl.; *Eriocaulon mesanthemoides* Ruhl. In secondary thicket above the bamboo: *Vernonia ruwenzoriensis* S. Moore and *Fleurya* sp. Between 10,100 ft. and the summit: *Alchemilla geranioides* Rolfe; *Peucedanum Kerstenii* Engl.; *Helichrysum fruticosum* Vatke; *Gynura crepidioides* Benth.; *Senecio Marietiae* Muschler; *S. subsessilis* Oliv. et Hiern; *Calamintha simensis* Benth.; *Carex Lycurus* K. Schum.; *Cynorchis anacamptoides* Kraenzl.; *Pteris incisa* Thunb.; *Polypodium rigescens* Bory and *Asplenium praemorsum* Sw., epiphytic on saturated moss cushions hanging from branches; *Lycopodium clavatum* L.; *L. saururus* Lam.; *Sticta tomentosa* Ach., a lichen on *Philippia* stems, and *Stereocaulon ramulosum* Ach., another on exposed rocks.

Sabinio.

After climbing Mgahinga we moved camp to the village of Muhindura, from where we planned to make a collecting trip on Sabinio, a precipitous mountain with five principal peaks, the highest being 11,990 ft. high. After studying the mountain from Muhavura and Mgahinga, we decided to attempt the summits from the north-west.

Leaving the village, we passed through thick secondary *Lantana* thicket into the dense evergreen forest that encircles the mountain. The path was flanked on either side with the yellow-flowered *Sida rhombifolia* L. and there were occasional glades carpeted with short grass, in which tufts of *Smithia Elliotii* Bak. f., *Trifolium usambarense* Taub., and *Spilanthes Acmella* L. were conspicuous.

Above this zone we entered thick bamboo forest, in which pathways had been opened up by elephant and buffalo, thereby making our passage considerably easier. After three hours' march we reached the foot of the cone and began the steep, fatiguing ascent through the bamboo which was now very close-growing.

At 9500 ft. the bamboo ceased abruptly and *Philippia Johnstonii*, 8–10 ft. high, became dominant. Climbing under the *Philippia* canopy was considerably easier, as there was little undergrowth, except mosses and an occasional evergreen, crimson-flowered shrub of *Vaccinium Stanleyi* Schweinf. As we ascended, the *Philippia* became shorter and at 11,000 ft. it formed a thick scrub 2–3 ft. high. About 200 ft. below the summit of the north-west peak *Senecio Erici-Rosenii* appeared, and cushions of a pale-green moss, *Brantelia Stuhlmannii* Brot., were common on saturated ground. Here and there, on gorilla trails, black hairs were observed caught in *Philippia* twigs.

From the first summit we looked into a vast and precipitously walled arena facing south, and a smaller one facing north, separated by a narrow saddle, 2–3 ft. wide, with precipices falling sharply on either side. On ledges of the first arena there were bushes of *Senecio Erici-Rosenii*, *Lobelia Wollastonii*, and *L. karasimbensis*.

After ascending successively two more peaks, we crossed a broad saddle, clothed with *Alchemilla geranioides* and reached, for the first time in history, the summit of the highest peak. Here there were scattered shrubs of *Philippia Johnstonii* and *Senecio Erici-Rosenii*, but no plants of *S. alticola* were seen.

During the ascent of Sabinio the following were among the more interesting species noticed: *Acanthus arboreus* Forst., *Agauria salicifolia* Hook. fil. and *Maesa lanceolata* Forssk. on the lower

slopes. In the evergreen forest: *Trichilia Volkensii* Gürke, *Xymalos monospora* Baill., its branches clothed with epiphytic species of *Polypodium*, and *Croton macrostachys* Hochst., with *Pavonia kilimandscharica* Gürke, *Vernonia podocoma* Sch. Bip. and *Piper capense* L. in the shrub layer, and *Thalictrum rhynchocarpum* Dill. ex A. Rich., *Desmodium Scalpe* DC. and *Coleus* sp. (No. 2983) bordering the path. In the thickly forested ridges extending up the side of the cone *Hypericum lanceolatum* Lam., *Loranthus kagehensis* Engl. parasitic on *Vernonia podocoma*, *Athyrium umbrosum* Pr., and *Selaginella* sp. (no. 2971); *Mikania scandens* Willd. in glades dominated by *Discopodium penninervium* Hochst. and *Girardinia bulbosa* Wedd. with violently stinging hairs; *Carduus leptacanthus* Fres. and *Helichrysum Newii* Oliv. et Hiern on lava pebbles of the second peak.

VISSOKE.

Leaving Sabinio, we crossed lava pasture with small thickets of *Rumex* and other genera, and grassy, shallow-soiled plains with *Helichrysum fruticosum* dominant, to Bunagana on the Belgian Congo border, where there is a Government Rest Camp. Bunagana hill is an extraordinary cinder ridge, 200–300 ft. high and over 1 mile long. In the evening a splendid view is obtained of the eastern and central Virunga peaks with Nyamlagira to the west and the escarpment wall behind it. On the way to Bunagana *Osbeckia abyssinica* Gilg, a pink-flowered herb in moist hollows, *Borreria Princeae* K. Schum. and *Aeolanthus repens* Oliv. on lava outcrops, and *Habenaria Keiliana* Kraenzl., growing in cyperaceous marsh, were conspicuous. On Bunagana hill our path passed through coarse grassland where *Themeda triandra*; a large *Digitaria*-like species; *Linum gallicum* var. *abyssinicum* Planch.; *Eriosema montanum* Bak., a yellow-flowered bush 2–4 ft. high, and *Orobanche minor* Sutton, common in pasture and old cultivation, were noted.

Mt. Vissoke (12,580 ft.) appears from the north as a regular truncated cone and is a most difficult mountain to approach, being guarded on all sides by subtropical evergreen and bamboo forests. We followed the line of the proposed new road from Rutchuru to Ruanda, crossing Mashiga, a high range of cinder hills and craters between Sabinio and Vissoke, and ascended the latter from the south-east. After a march of two hours through cultivated land, we came to a belt of evergreen thicket much frequented by elephant. Passing an isolated savannah-clad cone, we crossed a short-grass swamp, and re-entered the forest of bamboos, where *Croton macrostachys* Hochst. ex A. Rich. and *Neoboutonia macrocalyx* Pax were fairly frequent. As the ascent grows steeper, however, the bamboo becomes very large and quite dominant. Its stems, 4–8 inches in diameter at the base, rising in clumps 18–20 ft. apart and arching overhead, form a canopy 60 ft. or more high. The ground is covered with straw-coloured bamboo culm sheaths 3–5 ft. long and 1½ ft.

wide. In open glades *Viola abyssinica*, *Trifolium usambarense* and an *Impatiens* sp. form a carpet over which fly many of the small fritillary butterflies (*Brenthis excelsior*). At 9000 ft. we descended by an exceedingly muddy tract to an open marsh studded with shrubs of *Erica arborea*; then for six hours we hacked our way through dripping-wet bamboo forest till we came to the foot of the cone of Vissoke. Among the plants found were *Habenaria Keiliana* Kraenzl.; *Cyanotis hirsuta*; *Xyris capensis* Thunb., a delicate yellow-flowered herb; *Kniphofia Snowdenii* C. H. Wright; *Senecio pammicrocephalus* S. Moore, and *Lathyrus kilimandscharicus* Taub., common on grass tussocks; *Luzula Volkensii* Buch., occasional among shorter grasses; *Parochetus communis* and *Carduus kikuyorum* abundant in glades; and in the mud at the side of the tracks *Crassula Wrightiana* Bullock.

At the foot of the cone the bamboo ends abruptly and is replaced by *Hagenia abyssinica* forest consisting of trees with trunks 4–6 ft. in diameter, which were the largest of this species seen in Virunga. The undergrowth is at first composed chiefly of shrubs of *Discopodium penninervum* Hochst. and a species of *Vernonia* allied to *V. ruwenzoriensis*; later the ground becomes carpeted with *Anthriscus dissectus* C. H. Wright, a white-flowered umbelliferous plant 4–6 ft. high, the so-called "celery" eaten by gorilla. At the foot of the cone a gorge was discovered whose fern-covered walls are moistened by a waterfall, and here the delicate ochre-flowered *Corydalis Mildbraedii* Fedde, the white crucifer, *Cardamine africana* Hochst., *Crassula Wrightiana* Bullock and *Urtica massaica* Mildbr. were collected.

As we ascended, trees of *Hypericum lanceolatum* 40–60 ft. high became frequent, until at 9500 ft. they had almost entirely replaced the *Hagenia*. *Lobelia giberroa* Hemsl. becomes common in thickets of *Senecio denticulatus*, *Impatiens* sp. and *Fleurya* cf. *F. podocoma* (no. 2847). At 10,000 ft. are the bracken-like *Hypolepis* sp. (no. 3017) and scattered shrubs of *Senecio Erici-Rosenii*; 500 ft. higher the latter is dominant, with *Alchemilla geranioides* forming a tangled, silvery herb layer, while *Hypericum* has dwindled to a small shrub; *Lobelia karisimbensis* and *L. Wollastonii* are common up to the summit. In the large eastern crater arborescent Senecios are conspicuous and on the north wall a patch of *Senecio alticola* stood out in sharp contrast to the commoner species. The top of the mountain is covered by an extensive morass dominated by *Carex runssoroensis* K. Schum, whose spiny, glaucous tussocks grow out of the Sphagnum bog in which *Lycopodium saururus* Lam. is common. Owing to heavy cloud drift it was not possible to explore the mountain top and the reputed crater lake was not seen.

We now returned to Bunagana, marching along the motor road to Rutchuru, the Belgian administrative headquarters. For the first four miles the country consists of typical lava plains with cultivation already described, while near Rutchuru River banana

plantations become frequent. The river, which is flanked by tall Papyrus, enters a dense forest of *Albizzia gummifera* C. A. Smith and elephant grass, *Pennisetum purpureum*; the road follows the river and descends steeply for some miles to the floor of the rift valley.

The lower country in the neighbourhood of Rutchuru is dominated by elephant grass and impenetrable thickets of *Acanthus arboreus*, while *Erythrina tomentosa* occurs frequently on hillsides. Marching south towards Mt. Mikeno, camp was made at Kitale, where small forests of *Albizzia gummifera* and *Spathodea nilotica*, *Acanthus arboreus* in dense thickets on the volcanic slopes, and *Phoenix reclinata* along the banks of streams were noted. Nearing the " White Father's " mission of Rulenga (Lulenga) the road traverses the recent block lava of 1905 that will be discussed later in this paper. At Rulenga the safari was organised for a week's trip to Mikeno and Karisimbi, and Monsieur Jean de la Vallée Poussin, of the Mission Géologique du Congo Nord, Kivu, consented to be my companion in an attempt to ascend the unconquered summit of Mikeno.

Mikeno.

Leaving Rulenga we marched through cultivation on steep red-soil slopes with areas of *Pennisetum clandestinum* pasture and *Erythrina tomentosa* hedges, and, entering *Acanthus arboreus* and *Vernonia* thicket, we reached the village of Kibumba after two hours, having passed on the way a large explosion crater the cinder slopes of which were clothed with *Agauria salicifolia-Dombeya* sp. savannah and areas of high forest trees, while an orchid with grass-like foliage and pink flowers, *Polystachya vulcanica* Kraenzl., was also frequent.

We ascended through *Acanthus arboreus* thicket 12 ft. high, in which *Croton macrostachys*, *Erythrina tomentosa* and *Senecio multicorymbosus* were common, to a small circular crater filled with grassy swamp. Passing this, the path, clothed with *Sanicula europaea* and *Plantago palmata*, climbs steeply to bamboo forest at 6500 ft. On the left is a deep gorge which we followed until, after a steep ascent through a mixed bamboo-*Hagenia* belt, we emerged above a high waterfall, with a cliff rising perpendicularly some 200–300 ft. from the valley below. Here *Erica arborea* and *Lobelia giberroa* are scattered along the banks, and other plants noticed were: *Euphorbia Schimperiana* Hochst., *Helichrysum Goetzeanum* O. Hoffm., *Sibthorpia australis* Hutch., and *Dryopteris africanum* C. Chr.

Leaving the gorge we climbed steeply through bamboo-*Hagenia* forest where *Xymalos monosperma* was frequent. The boughs of the trees were covered with moss and other epiphytes including *Lycopodium Phlegmaria* L. At 8200 ft. the path passes from bamboo to pure *Hagenia* forest with *Anthriscus dissectus* dominant in the undergrowth. As we neared the saddle between Mikeno

and Karisimbi, trees of *Hypericum lanceolatum* and *Senecio Erici-Rosenii* became frequent, also the epiphytic ferns *Polypodium lineare* var. *elongatum* Takeda, *Asplenium praemorsum* Sw. and *Elaphoglossum hirtum* C. Chr. At the saddle we came to the clearing, 300 yards long and 50 yards wide, called *Kabara* by the natives. At one end is Carl Akely's grave, which, like the whole clearing, is carpeted with flowers, while at the eastern end is a small, circular swamp from which water for the camp was procured. Small trees and shrubs of *Hypericum lanceolatum* and a pink-flowered bramble (*Rubus* sp. no. 3036) grow on outcrops of lava where the rocks themselves are clothed with *Sedum epidendrum* Hochst. and *Viola abyssinica* Steud. Other plants collected were *Ranunculus pubescens* Thunb., *R. oreophytus* Del. and the white-flowered *R. stagnalis* Hochst. ex A. Rich.; *Corydalis Mildbraedii* Fedde; *Cardamine hirsuta* Hochst. and *C. obliqua* Hochst.; *Subularia monticola* A. Br.; *Arabis alpina* L.; *Montia lamprosperma* Cham.; *Trifolium* sp. (no. 3053); *Vicia angustifolia* L., on grassy banks; *Alchemilla pedata* Hochst.; *Anthriscus dissectus* C. H. Wright; *Peucedanum Kerstenii* Engl.; *Helichrysum helothamnus* Moeser; *Veronica glandulosa* Hochst., in grass tussocks; *Calamintha simensis* Benth.; *Rumex afromontanus* R. E. Fries; *Carex Petitiana* A. Rich., up to 3 ft. high; *Poa annua* L. var. dominating small areas, and the tussock-forming *P. leptoclada* Hochst.

From Kabara we cut our way up a steep slope, and by using buffalo-trails reached 10,500 ft. fairly easily. On the way we noticed that the *Anthriscus dissectus* had been pulled up over considerable areas by gorilla; the plant is stripped of its leaves exposing the white heart of the lower part of the stem, which is eaten. At this altitude the *Hagenia* becomes smaller and is interspersed with groves of *Philippia Johnstonii* 15 ft. high; at 11,000 ft. the former ceases altogether and the bush is co-dominated by the *Philippia* and *Senecio Erici-Rosenii* 8–10 ft. in height. Small glades are frequent and contain *Rubus runssorensis* Engl. var. (no. 3064), with edible, purple fruits; *Conyza gigantea* O. Hoffm. and *C. montigena* S. Moore; *Helichrysum formosissimum* Sch. Bip. and *Deschampsia ruwensorensis* Chiov. growing in patches of moss.

We then crossed a narrow saddle which plunges steeply for several hundred feet on the western slope; *Poa leptoclada*, *P. perplexa* and *Helichrysum Newii* were found here in stony soil. At 12,000 ft. *Philippia* was left behind and we entered almost pure stands of *Senecio alticola* composed of plants in all stages of development, some attaining much branched shrubs 10 ft. high; great range in the size of leaf and in the woolliness of the under-surface was noticed. On a moist slope a patch of *Carex runssoroensis* was seen, but *Alchemilla geranioides* was the dominant herbaceous plant. At 12,500 ft., however, the latter is replaced by cushions of moss, while splendid plants of *Lobelia karisimbensis* and *L. Wollastonii* become frequent, with many seedlings. As we climbed

the final peak of Mikeno with the aid of ropes, we found *Senecio alticola* confined to ledges and crevices, and becoming more scattered as we ascended. At approximately 14,000 ft. it was a shrub 6 ft. high with considerably less tomentum on the under-surface of the leaf, the midrib tending to be reddish and the margin distinctly curled inwards. We found the records left by Madame Léonard and Père Van Hoef who, in 1927, reached a point higher than any before them: we were, however, only able to ascend a few metres more before we too were beaten by the moss-covered precipice, while above us was the unconquered summit with *Senecio* shrubs scattered along its skyline.

Karisimbi.

Descending again to Kabara we prepared to climb Karisimbi, the highest peak in the Virunga Range (14,780 ft.). After an hour of *Hagenia* and *Hypericum* forest we reached the open marshy plateau called Rukumi, a mile wide and fringed with 30-ft. trees of *Philippia Johnstonii*. *Hypericum lanceolatum* Lam. and *Senecio Erici-Rosenii* R. E. & Th. C. E. Fries among shrubs, and the herbs *Ranunculus oreophytus* Del., *Cardamine obliqua* Hochst., *Subularia monticola* A. Br., *Alchemilla geranioides* Rolfe, *Luzula Volkensii* Buch., *Scirpus setaceus* L., *Carex Lycurus* K. Schum., *C. Petitiana* A. Rich. and *Agrostis* sp. (no. 3090) were the only plants in flower. From Rukumi the sharply-defined zones of *Philippia*, *Senecio* and *Alchemilla* clothing the northern slopes of the cone of Karisimbi were plainly visible. The zones commence at a distinctly lower altitude on the eastern than on the western slope, where *Lobelia karisimbensis* and *L. Wollastonii* were seen in profusion. This suggests that the south-east wind prevails and is more severe than winds from the north-west. We followed buffalo spoor through *Alchemilla* to 13,000 ft. where the scattered and stunted shrubs of *Senecio alticola* cease, and the steep slope is entirely carpeted with *Alcehmilla*, on which drifts of new-fallen snow were encountered. At 13,500 ft. scree of bare volcanic soil and ash with outcrops of lava appear, which at about 14,200 ft. become united into a barren slope which forms the summit of the peak. The black lichen *Gyrophora cylindrica* Ach. is common on exposed lava blocks.

Mushubangabo and Nyamlagira.

Having returned to Rulenga, we prepared for an expedition to the active volcano of Nyamlagira (10,046 ft.), via the extinct cone Mushubangabo. The path traverses two distinct forms of recent lava flow: one composed of sharp, angular blocks, treacherous to walk over, which have flowed from the Kaanamaharage volcano of 1905 and other older vents; the other is relatively smooth, black-coloured lava, suggestive of billowy pavement. For the first part of the march to Mushubangabo crater, the lavas are crossed alternately, but later the block lava ceases altogether.

The vegetation on the two kinds of lava is very different: the block-lava supports scattered shrubs and epiphytic herbage, while the smooth lava is covered with pioneer forest with a rich herbaceous canopy. On the block-lava *Hymenodictyon floribundum* Robinson, *Cussonia Holstii* Harms and *Myrica* sp. (cf. *M. arborea* Hutch.) are pioneer shrubs and near Rulenga *Rumex maderensis* Lowe, *Pycnostachys* sp., *Pentas longiflora* Oliv., and *Lantana salviifolia* Jacq. are frequent. The angular blocks, which vary from a few inches to several feet across, are clothed with moss and a grey lichen, *Stereocaulon denudatum* Fl., and support an epiphytic vegetation which includes *Polypodium phymatodes* L.; *Dryopteris orientalis* C. Chrj.; *Aerangis brachyceras* Summerhayes, a pale-yellow, sweet-scented species; the yellow-flowered, succulent *Polystachya cultriformis* Lindl., *P. vulcanica* Kraenzl., and a less common species with white, waxy flowers, *Aerangis* sp. (no. 3122).

The commoner plants on the smooth lava are: *Triumfetta rhomboidea* Jacq., in bare places; *Toddalia asiatica* Lam.; *Rhamnus prinoides* L'Hérit.; *Dodonaea viscosa* Jacq.; *Rhus villosa* var. *tomentosa* Schonl.; *Cussonia Holstii* Harms; *Galium* sp. (no. 3106), a common climber; *Borreria Princeae* K. Schum.; *Vernonia jugalis* Oliv. et Hiern, *Coreopsis Elliotii* S. Moore, *C. steppia* Steetz and *Senecio denticulatus* Engl. forming a yellow and lilac-flowered stratum of herbs 3–4 ft. high in open glades; *Dichrocephala chrysanthemifolia* DC.; *Mikania scandens* Willd.; *Jasminum abyssinicum* R. Br.; *Myrica* sp., and the fern *Nephrolepis cordifolia* Pr.

In moist hollows and depressions in the lava flow grow a lilac-flowered herb, *Erlangea longipes* S. Moore, the blue-flowered *Sonchus Schweinfurthii* and a tall grass *Hyparrhenia cymbaria* Stapf. Where the forest canopy is partially closed *Desmodium Scalpe* occurs in profusion, also *Eragrostis Dekindtii* Pilger, *Melinis Goetzenii* Mez, and *Sporobolus capensis* Kunth, the latter growing only in cracks in the lava along a narrow native pathway.

Mushubangabo is a regular cinder cone about 100 ft. high enclosing a circular crater pond of muddy water about one hundred yards across, which is much frequented by elephant. The crater is clothed with dense forest of *Croton macrostachys*, *Albizzia sassa*, *Mimusops* sp. and *Bersama* sp.; a single young tree of *Podocarpus milanjianus* was seen while *Pavetta ruwenzoriensis* was common in the underbrush: ferns noted included the terrestrial *Pteris dentata* Forssk. and the epiphytic *Loxogramme lanceolata* Pr.

Between the crater of Mushubangabo and Nyamlagira, a tall white-flowered tree (*Syzygium* sp. no. 3128) was commonly seen growing with *Hypericum lanceolatum* and spiny *Gymnosporia* bushes. By following elephant paths we arrived at the foot of Nyamlagira and entered a belt of very moist evergreen forest which extends along the east and north-east flanks of the mountain and is, except for a belt near Burunga on the south-west slopes of Mikeno, the largest seen among the volcanoes. The chief trees of this forest

are *Podocarpus milanjianus* and *Xymalos*; *Dracaena reflexa* was frequent. Orchids were represented by *Aerangis rhodosticta* Schltr., a very spectacular plant with tresses of large white flowers which show up strongly in the forest gloom; *Rhipidoglossum xanthopollinium* Schltr.; *Bulbophyllum gravidum* Lindl. and *Diaphananthe Burttii* Summerhayes. Ferns noticed included *Hymenophyllum ciliatum* Sw. on fallen logs, and the epiphytes *Elaphoglossum Aubertii* Moore, *E. hirtum* C. Chr., *Vittaria lineata* Sw. and *Polypodium* spp. As we worked round and began to ascend the northern slopes of the volcano we entered a forest of *Hypericum lanceolatum* with scattered trees of *Cornus Volkensii* 20–30 ft. high and large specimens of *Agauria salicifolia* up to 40 ft. in height. Ascending by a water-course, with the blue-flowered *Aristea alata* and the pink *Satyrium crassicaule* Rendle growing in the grass alongside, *Erica arborea* and carpets of *Helichrysum Hochstetteri* were frequent, until at 8500 ft. we came to long gentle slopes dominated by *Philippia Johnstonii* and *Myrica kilimandscharica* Engl.; here *Anthospermum usambarense* K. Schum., *Senecio maranguensis* O. Hoffm., *Helichrysum nandense* S. Moore and the pale-yellow *Conyza ruwenzoriensis* R. E. Fries were also common. At 9000 ft. the slopes are composed of black, billowy lava, the humus in the numerous cracks and crevices supporting *Cineraria abyssinica* and mature but stunted plants—4–6 ft. high—of *Lobelia giberroa*, the leaves of which a herd of elephant was seen plucking and devouring. Large areas of *Philippia* have been killed by a recent eruption of the volcano and the dead stems give a desolate appearance to the landscape.

At 10,000 ft. we reached the rim of the great crater which is 1½ miles across. Here we found *Lycopodium clavatum* growing in warm, steaming fissures, and on the cinder slopes scattered shrubs of *Rumex maderensis*, *Lobelia giberroa* and *Anthospermum usambarense*, but no *Senecio Erici-Rosenii*. Entering the crater from the north-west, the floor of the first terrace is seen to be composed of cinder-covered lava, clothed with a wealth of *Cineraria abyssinica*, *Helichrysum fruticosum*, tufts of grass and a few *Rumex* shrubs 6 ft. high. Towards the east and west the vegetation has been killed or is non-existent owing to the presence of sulphur dioxide fumes from the molten lava. Crossing the upper terrace for half a mile we looked into the steaming, inner terrace 400 ft. or more below, and were surprised to see a flourishing colony of *Lobelia giberroa* about half-way down a precipitous cinder-slope. The plant life in the crater appears to indicate that the prevailing winds at this season are south-east or north-west.

Ninagongo.

Having returned to Rulenga our next march was southwards to Burunga. The motor-road traverses block lava for the first part, but later winds through a number of large explosion craters

PLATE VII



Looking towards Vissoke from Lake Mutanda with Mt. Mikeno (right) and Mt. Sabinio (left). (Photo. by P. Mowbray.)



The peak of Mt. Muhavura appearing above the East Wall of the Rift Valley at Behunge. (Photo. by P. Mowbray.)

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whose cinder slopes are clothed with splendid forest in which the following large trees were noted: *Albizzia gummifera* C. A. Smith, *Antiaris usambarensis* Engl., *Croton macrostachys*, *Croton* sp., *Schefflera* sp. and a large species of *Conopharyngia*. In the undergrowth shrubs of *Piper* and *Vernonia*, a trailing pink-flowered *Begonia* and a tree fern 10 ft. high were seen.

From Burunga the road passes for some miles over block-lava, followed by smooth lava flows from Ninagongo, whose smoking cone rises on the right to 11,380 ft., and which we approached through Kibati village. The vegetation resembles that encountered below Muhavura and Mgahinga except that the scattered thickets are larger and small trees of *Erythrina tomentosa* more frequent.

In pastures the following were noted: The white-flowered rambler *Clematis inciso-dentata* A. Rich.; *Crotalaria mesopontica* Taub.; *Vernonia cistifolia* O. Hoffm. with lilac-blue flowers; *Helichrysum* (*Achyrocline*) *Hochstetteri* Hook. fil.; *Lactuca capensis* Thunb.; the pink-flowered *Sopubia ramosa* Hochst.; *Orobanche minor* Sutton; *Micromeria biflora* Benth.; *H. Rendlei* Rolfe; *H. praestans* Rendle; *H. Thomsoni* Rchb. f.; *Eulophia ochracea* Schltr., an erect plant with compact terminal inflorescence of small sienna-red flowers; *Gladiolus Quartinianus* A. Rich., and the fern, *Nephrolepis cordifolia* Pr.

Entering the margin of the forest belt at the foot of Ninagongo, at about 5500 ft., we passed through thickets of *Vernonia podocoma* into dense forest of *Croton macrostachys* and *Neoboutonia macrocalyx*, with undergrowth of *Piper capensis* and *Desmodium Scalpe*. Ascending a steep slope, *Xymalos* and large specimens of *Podocarpus milanjianus* become frequent. At 7500 ft. the trees are covered with wet moss, *Plagiochila* sp. supporting the epiphytes *Loxogramme lanceolata* Pr., *Asplenium Sandersonii* Hook., *Trichomanes pyxidiferum* L., and a small succulent-leaved *Lobelia* (no. 3216). At 8000 ft. the forest changes abruptly to thicket of *Hypericum*, *Agauria*, *Erica arborea*, *Myrica*, *Maesa lanceolata* and young trees of *Hagenia*. Between 8500 ft. and 9500 ft. *Philippia Johnstonii* is almost entirely dominant growing as a shrub 10 ft. high; further up the mountain, however, it becomes smaller, until at 10,000 ft. it is only 3–5 ft. high, and is interspersed with *Anthospermum usambarense*, *Senecio Erici-Rosenii*, and *Lobelia giberroa*. At this altitude, also, much *Philippia* has recently been killed by sulphur-dioxide fumes from the crater. Ridges of almost bare lava pebbles become frequent supporting a thin scrub of *Helichrysum Newii*. On the eastern slope of the cone 6 ft.–high shrubs of *Senecio Erici-Rosenii* and *Lobelia giberroa*, with *Senecio subsessilis* and an umbellifer, *Malabaila abyssinica*, are common and extend up to 11,000 ft.; but on the west and north-west slopes all vegetation down to 9000 ft. has been killed.

Above the *Senecio* belt a grass (*Agrostis* sp. no. 3176) is dominant in crevices on the steep and otherwise bare lava slopes. Dead

stems of *Senecio* and *Lobelia*, which are seen frequently in crevices up to the crater rim, show that, until comparatively recent times, vegetation flourished there and that the volcano is increasing in activity. The great crater, which is over a mile across, is devoid of vegetation, as it is frequently completely filled with clouds of sulphur-dioxide fumes from the lava caldrons a thousand feet below the crater floor.

Common or noteworthy plants collected on the way up include *Polygala Elliotii* Chodat ; *Peucedanum runssoricum* Engl. ; *Helichrysum nandense* S. Moore ; *Gynura crepidioides* Benth. ; *Senecio maranguensis* O. Hoffm. ; *Cynoglossum amphifolium* Hochst. ex A. Rich. ; *Lithospermum officinale* L. ; *Rumex maderensis* Lowe ; *Pilea ceratomera* var. *Mildbraedii* Engl., common up to 8000 ft. ; *Polystachya kermesina* Kraenzl., an epiphytic orchid previously seen on Mt. Mikeno ; the pink-flowered *Satyrium crassicaule* Rendle ; saplings and young trees of *Podocarpus milanjianus* Rendle, below 9000 ft. ; the tree fern, *Athyrium umbrosum* Pr., with a trunk 1 ft. high, common up to 8000 ft. ; *Lycopodium clavatum* L.

Leaving the active central cone of Ninagongo, we passed over a narrow saddle clothed with *Podocarpus* and *Xymalos* forest to the large extinct southern crater. The inner wall of this is very steep and clothed on the southern and western slopes by impenetrable bamboo thicket, and on the east and north by evergreen forest. The forest at the foot of the northern crater wall, at about 9000 ft., is dominated by *Hagenia*, with *Hypericum*, 20–30 ft. high, fringing a short-grassed, circular moorland area, about half a mile across, which covers most of the crater floor. Among the *Hypericum* and *Hagenia* is a narrow belt of *Senecio Erici-Rosenii* consisting of shrubs over 15 ft. high, and this is the lowest altitude at which this plant was seen. Large thistles and the fern *Athyrium umbrosum* Pr. dominate in the herb stratum ; other interesting plants were *Lobelia Mildbraedii* Engl. which has pale-green- and lilac-flowered inflorescences 3–6 ft. high, and of which many young plants were seen ; *Crepis carbonaria* Sch. Bip. and *Helichrysum fruticosum* Vatke in short-grass areas ; *Helichrysum formosissimum* Sch. Bip. and *Carduus kikuyorum* R. E. Fries in great profusion on the moor towards the centre of which was a colony of *Calamagrostis epigeios* Roth.

Kisenji and Lake Kivu.

Having returned to Kibati, our next journey was to the town of Kisenji on Lake Kivu at 4768 ft. The country between Kisenji and Ngoma village consists of smooth lava flows with pasture, scattered cultivation and thickets of *Acanthus arboreus*. The lake shore is fringed with a narrow belt of small-tree thicket in which were noted : *Toddalia asiatica* Lam. ; *Bersama* sp. (no. 3256) ; *Pterolobium exosum* Bak. fil. ; *Cussonia Holstii* Harms ; *Euphorbia* sp. (near *E. ingens* E. Mey.) ; *Ficus* sp. Climbers at the edge of the thickets were *Capparis erythrocarpa* Isert ; *Vernonia Tufnellae* S.

Moore ; *Senecio subscandens* Hochst. ; *Jasminum dichotomum* Vahl. ; *Lissochilus Oliverianus* Rchb. fil. and *Habenaria genuflexa* Rendle were seen locally in small clearings along the lake shore, and *Barleria ventricosa* Hochst. ex Nees, with beautiful pale blue flowers and an orange *Kalanchoë* (cf. *K. Petitiana* A. Rich. no. 3227) on rocky outcrops. Common in waste land and pasture were : *Crotalaria striata* DC ; *Pentas longiflora* Oliv. ; *Wedelia Menotriche* Oliv. et Hiern ; *Bidens pilosa* L. ; *Hyptis spicigera* Lam. ; *Pteris aquilina* L. The shrubs *Capparis roseiflora* Gilg. et Benedict, *Carissa edulis* Vahl, and *Erythrococca rigidifolia* Pax were scattered in savannah lands.

A flow of comparatively recent block-lava lies between Ngoma and Mont Ngoma, a grassy-sloped cinder cone with complex craters on the shore of Lake Kivu ; this is clothed with impenetrable thicket of which the chief constituents are *Rhus natalensis*, the dominant shrub ; *Olea chrysophylla*, a tree 20 ft. high ; *Carissa edulis* ; *Clerodendron myricoides* ; *Jasminum dichotomum* ; *Rumex maderensis* and *Senecio multicorymbosa*, which is common near the lake. The ferns *Nephrolepis cordifolia* and *Polypodium phymatodes* are frequent where the lava is more exposed. The chief plants in the craters of Mont Ngoma, which are breached on the side facing Lake Kivu, are : *Justicia flava*, which, with the less-common *J. Betonica*, forms a coarse herbaceous carpet on the floor of the eastern crater ; *Phytolacca dodecandra* L'Herit forming tangled thickets on the lower slopes ; and on the upper grassy slopes *Dodonaea viscosa* Jacq., *Rhus natalensis* Bernh. ; *Carissa edulis* Vahl ; and the herbs *Pseudarthria Hookeri* Wight et Arn. ; *Asclepias pubiseta* N. E. Br. ; *Geniosporum paludosum* Benth. ; *Micromeria biflora* Benth. *Sesbania aegyptiaca* Ait. and *Pluchea Dioscoridis* DC. grow locally on the marshy floor of the middle crater whose walls are covered with impenetrable thorn thicket of *Gymnosporia* sp., *Carissa edulis* and *Toddalia asiatica*, supporting little undergrowth except *Sanseviera* and the crimson *Haemanthus Mildbraedii* Perkins which is very abundant in all thickets along the lake shore.

The many small cinder cones and explosion craters that lie along the north shore of Lake Kivu between Kisenji and Sake are clothed with similar vegetation to that on Mont Ngoma, but shrubs of *Entada abyssinica* Steud. and *Acacia verugera* Schweinf. are common on the cones half way along the coast. Between Mont Ngoma and Kesheru the plains are chiefly composed of block-lava clothed with dense thicket, but near Kesheru lava of the smooth type occurs and is clothed with pasture and island thickets, in which large trees of *Cussonia Holstii*, *Erythrina tomentosa* and *Albizzia gummifera* were seen ; large areas are covered with thicket of woody herbs among which *Crotalaria axillaris* Dryand with large yellow flowers, *Lantana salviifolia* Jacq., *Hoslundia opposita* Vahl and *Pseudarthria Hookeri* Wight et Arn. are the most important. The lake shore itself is fringed with shrubs of *Sesbania aegyptiaca*, while *Potamogeton pectinatum* L. grows in profusion in water 1½–2 ft. deep.

Near Kesheru there are frequent cracks in the lava which emit copious quantities of slightly warm carbonic acid gas, which flows down furrows in the grassy pasture to the lake. The herbage, in which *Cyperaceae* are frequent, is stunted and slightly yellowish-brown where inundated by CO_2. A dead crow, a cuckoo and a number of small yellow butterflies were seen in one furrow where they had had the misfortune to shelter.

KWERUNGA.

From Kesheru we travelled for about five miles by canoe, owing to the impenetrable thicket which clothes the country around; we landed at Katerusi (Kwerunga), the scene of the violent eruption of 1912–1913. For half a mile we passed through rich banana plantations, native gardens, pasture and thickets of *Acanthus arboreus*. Common trees were *Erythrina tomentosa*, *Cussonia Holstii* and *Entada abyssinica*. The herbs *Crotalaria Claessensii* De Wild. and *Oldenlandia abyssinica* Hiern were noted in pasture grazed by the long-horned Ankole cattle. After another mile and a half of thicket the path emerges into the country which was devastated by the flow of lava from Kwerunga crater, and which extends along a wide front to Lake Kivu and the Sake gulf. The lava blocks are clothed with a lichen (*Stereocaulon denudatum* Flk.) which gives them a sinister, grey appearance, broken only by the scattered, pioneer plants of *Senecio Hochstetteri* Sch. Bip. Crossing the lava field we came to a small island of country at the foot of the cone which had not been touched by the lava flow; here was a flourishing thicket of *Rhus glaucescens* A. Rich. and *Ficus ingens* Miq. which had evidently regenerated from the old rootstocks buried deeply in volcanic debris and cinders.

The tumult of hills, 200–300 ft. high, which surround the cone of Kwerunga are composed of volcanic blocks, fine black cinders and beds of red ash highly impregnated with salt (sodium chloride) which is industriously mined by the natives. The hills cover an area of about five square miles and are surrounded by impenetrable thicket on all sides, except for the devastated region facing Lake Kivu. *Senecio Hochstetteri*, *Pteris vittata*, forming tufts with fronds 1–2 ft. high, and *Rumex maderensis* are scattered generally over the lower hills, while in more sheltered places grow *Oldenlandia corymbosa* L., *Mariscus Sieberianus* var. *evolutior* C. B. Cl. and the grass *Rhynchelytrum roseum* Stapf et C. E. Hubbard. The cone of Kwerunga supports little vegetation and in places it is so hot that rocks in fissures near the summit boil water with explosive violence. In spite of this several shrubs of *Ficus ingens* 3–5 ft. high were found growing within 30 ft. of the hot fissures, having germinated from seeds dropped in the dung of monkeys which frequently visit the crater. *Helichrysum leptothamnus* Moeser grew nearby, and colonies of the ferns *Nephrolepis cordifolia*, *Polypodium phymatodes* and *Pteris vittata* were seen within the explosion crater quite near hot fissures from which carbonic acid gas escaped. No other species of plants were seen on the Kwerunga hills, which thus present an ideal area for the study of colonisation and plant succession.

SUMMARY.

1. A collection of 453 numbers of plants was made from the eight volcanic peaks of Virunga, and the lowland country around them. A further 39 numbers were collected on the way to Virunga.

2. The alpine flora of the eight peaks is of one type, dominated by *Senecio Erici-Rosenii*, with a relatively poor number of other alpine plants.

3. The alpine flora is subject to much cloud, giving great humidity and excluding bright sunlight throughout the year—with resulting low day temperature and the prevention of frequent ground-frosts that are a feature at similar elevations on Kilimanjaro.

4. The sub-alpine and sub-tropical evergreen forests greatly resemble in composition the forests seen on East African mountains, and many species occur in both regions.

Conclusion.—I wish to thank the Director of the Royal Botanic Gardens, Kew, for obtaining the necessary permission from the Belgian Government for me to form a collection of plants in the Parc National Albert, as well as for providing funds covering my travelling expenses from Tanganyika Territory to the Kivu country and back. I would also thank the Herbarium staff at Kew for their interest in supplying the names of the plants collected in Virunga, which has greatly facilitated the compilation of this paper.

XVIII—NEW OR LITTLE-KNOWN PLANTS FROM SOUTH INDIA: III.*

Sonerila tinnevelliensis *C. E. C. Fischer*, sp. nov. [Melastomaceae]; *S. Brunonis* W. et A. affinis, sed minor, ramulis teretibus, foliis lanceolatis basim inaequalibus nervis basalis unijugis, calyce glanduloso-piloso, capsulis minoribus, seminis ellipsoideis differt.

An erect *undershrub* 12–30 cm. high; roots spreading, fibrous, hairy; stem woody below, more or less branched, nodes slightly swollen; twigs terete, glabrous, the youngest red. *Leaves* thinly membranous, lanceolate, usually narrowly so, acuminate, base cuneate, very unequal sided, one side always acute, the other acute or rounded and descending 2–7 mm. below the other, blade 4–11 cm. long, 1·2–2·7 cm. wide, with a few scattered smaller pairs intermixed, midrib slightly elevated below, lowest pair of nerves arising from above the shorter side, arching and running for $\frac{1}{3}$–$\frac{1}{2}$ the length of the blade, the next pair above running to about $\frac{1}{2}$ from the apex, followed by 4–5 slender short pairs, 1 or 2 nerves arising from the longer side below the insertion of the shorter side, ultimate reticulations small and fine, glabrous or with a few crisped hairs on the nerves, margins distantly serrate, serratures pointing forward, usually tipped

*Continued from *K.B.* 1933, 357.

with a short bristle ; petioles slender, 1·5–4 cm. long, glabrous, red. *Racemes* axillary and terminal, secund, few- to 30-flowered : rhachis red, 8–15 mm. long in flower, hardened and lengthened in fruit up to 4·2 cm. long, leaving small tubercles after the fall of the fruit, erect and straight or slightly curved throughout ; pedicels 4–5 mm. long, red when young, articulated on small tubercles, indurating and falling with the fruit, glabrous or with a few gland-tipped hairs, especially near the apex ; bracteoles on the tubercles minute,

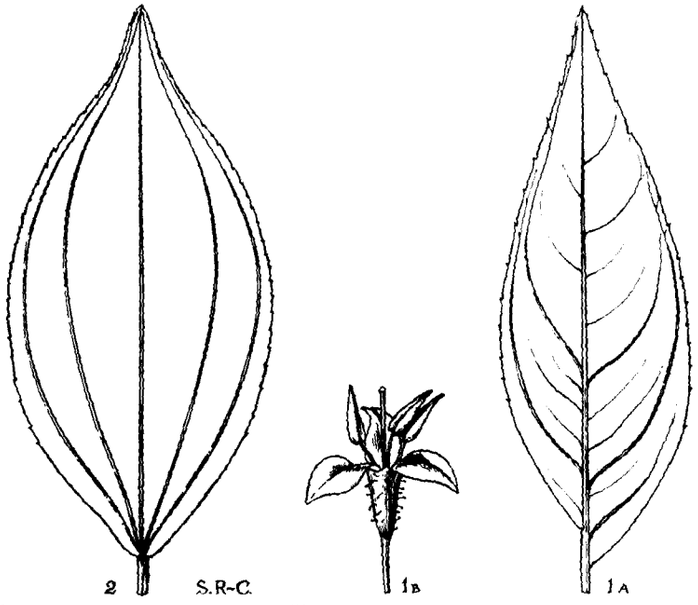


Fig. 1A, B. *Sonerila tinnevelliensis* C. E. C. Fischer. 1A, leaf nat. size. 1B, flower × 2.

Fig. 2. Leaf of *Sonerila Brunonis* W. et A., nat. size.

bearing a few gland-tipped hairs. *Calyx* narrowly funnel-shaped, 4–6 mm. long, shallowly 6-ribbed, bearing scattered, crisped, gland-tipped hairs, teeth, short, broadly triangular, acute. *Petals* 3, ovate-lanceolate, acute, 5–6 mm. long, pinkish-mauve (when dry), veined, glabrous on the upper surface, with a row of gland-tipped hairs on the mid nerve below. *Stamens* 3, glabrous ; *filaments* slender, erect, 2·8–4 mm. long ; *anthers* linear-lanceolate, bluntly acuminate, base narrowly cordate, 4·3–5 mm. long, golden-yellow. *Style* linear, slender, 8–9·5 mm. long, glabrous ; *stigma* small, capitate, minutely papillose. *Capsule* funnel-shaped, thinly corky, 5·5–6 mm. long, bluntly 6-ribbed, the ribs carried down the persistent petiole, apex very shortly 3- or 6-toothed, pale-brown, shining. *Seeds* escaping before the fall of the capsule, ellipsoid, 0·6–0·8 mm. long, muricate, at least near the apex, usually with a short apical bladder-like appendage.

Travancore : *Beddome*, without precise locality or number. Tinnevelly District : Kanikatti, frt. June, *C. A. Barber* 385 ; Agastiarmalai, frt. May, *C. A. Barber* 2900 ; River Payar, frt. May, *C. A. Barber* 2971 ; Kalivayalpil to Kanikatti, fls. and frt. June, *C. A. Barber* 3103 ; near Knapp's Hut, 2000–4000 ft. fls. and frt. Jan., *E. Barnes* S4a (type) ; (all above in Kew Herb.) ; Papanasam Hills, near Wood's Hut, fls. and frt. Jan., *E. Barnes* without number.

This species has been confused with *S. Brunonis* W. et A., Barber's 4 specimens being identified as that species. Beddome's specimen, which is fragmentary, is inscribed " Probably new, but too imperfect." The leaves and glandular-hairy calyx separate the two readily. It was not till the receipt of Prof. Barnes' specimens (collected in January 1933) that attention was directed to these older ones.

Arisaema convolutum *C. E. C. Fischer*, sp. nov. [Araceae-Aroideae] ; *A. Leschenaultii* Bl. affine, foliis majoribus, cauda spathae multo longiore, appendicibus spadicis cephaloto-convolutis differt.

A dioecious glabrous succulent *herb*. *Tuber* subdiscoid, 6 cm. wide, 2·5 cm. deep, light-green, much puckered on the surface, bearing several small pear-shaped bulbils, rootlets from the upper-most part of the new tubers numerous, succulent, pinkish, sometimes stoloniferous. *Cataphylls* 2–3, up to 20 cm. long, thin, obtuse. *Leaf* solitary ; *petiole* terete, sheathing the peduncle for 2–3 cm., up to 63 cm. long and 2·5 cm. diam. at the base, light-green with numerous fine longitudinal purple striations ; *segments* radiate, sessile, 7–15 (commonly 11–12 in the ♀ plants and 9–11 in the ♂), narrowly oblanceolate, finely caudately acuminate, in the larger leaflets the tail is filamentous and up to 5 cm. long, base tapered and decurrent, 12–38 cm. long (excluding the filamentous tail), 2·2–8·8 cm. wide, midrib stout, very prominent below, primary nerves subparallel, up to 20 or so in large leaflets, arising from the midrib 0·6–2 cm. apart at an angle of 30°, slightly raised below, uniting in a looped intramarginal vein 1–5 mm. from the erose, purple margin, secondary nerves fine, usually 3 between each pair of primaries, anastomosing, dark-green and somewhat glossy above, light-green and very glossy below, clammy to the touch. *Peduncle* terete, like the petiole but more slender, up to 40 cm. long. *Tube of spathe* narrowly funnel-shaped, 4–6 cm. long, 1·7–2 cm. wide at the mouth, split to the base, its edges overlapping to right or left, mouth sometimes slightly revolute, white with a yellowish-green tint near the margins, limb expanded, overarching, ovate, acuminate, margins involute towards the apex, 3·5–10 cm. long, 3–6 cm. wide, terminated by a pendant, ultimately filiform appendage 4–17 cm. long, purple, often very dark, within with 5–7 white bands tapering to a point towards the apex, paler without, veins corresponding with the white bands raised to form ridges on the outside. *Spadix* straight, sessile, a little longer than the tube of the spathe ; of ♂ 4·8–6·2 cm. long,



Fig. 3. *Arisaema convolutum* C. E. C. Fischer. A, plant; B, ♂ spadix; C, ♀ spadix. All × ⅔.

floriferous portion 1·6–2·4 cm. long, cylindric or narrowly conical; stamens scattered, mauve; *filaments* rather stout, 0·5 mm. long; *anthers* subglobose, opening by a pore; *neuters* 0; *appendix* cream-coloured, cylindric, sometimes slightly widened shortly above the flowers and then subclavate, terminated by a sublogose or clavate convoluted knob 0·8–1·3 cm. long. ♀ *spadix* 7 cm. long; floriferous portion 2–2·5 cm. long; ovaries crowded (up to 185 in number), subglobose, 2·5 mm. diam., bright-green with a crystalline appearance; *style* very short, stout, dark-purple; *stigma* muricate, mauve; *ovules* 4, *seeds* (in semi-ripe fruit) usually 2, sometimes 1, 3 or 4; *neuters* 0 or 3–5 among and above the uppermost flowers, subulate, green, up to 1 cm. long; *appendix* similar to that of the ♂ but more swollen in the middle and the convolute apex usually a little larger.

Nilgiri Hills: Pennant Shola, Parson's Valley, 7000–7500 ft., fls. May-June, *E. Barnes* AR7, "Found plentifully in several *sholas* on the S. side of Parson's Valley: rare in Governor's Shola. Where it was abundant appeared to be very wet by exposure to the S.W. monsoon. Grows on horizontal branches, in forks and on the roots of trees; also in the ground in leaf-mould."

Professor Barnes supplies the following observations: "The inflorescence has a strong putrid smell . . . definitely stronger on the tail of the spathe than in the tube or on the spadix. The inflorescence matures before the leaf opens, and in . . . male plants is often over and decomposing by the time the leaf has fully expanded. The ♂ plants are about ⅔ the dimensions of the ♀. . . . Underground runners are also apparently formed as a corm was found from which there emerged a brown stem that thickened into a smaller corm 2 in. away. There is no doubt that ♂ plants are more numerous than ♀."

Carex rara *Boot* subs. **capillacea** *Boot* [Cyperaceae].

The typical species is recorded from Ceylon as well as from the Eastern Himalayas and the Malay Archipelago; the subspecies (treated in the Flora of Brit. Ind. as a separate species), however, has not been found hitherto in the Indian region south of Sikkim and Bhutan and it was not, therefore, included in Part 9 of the Fl. of the Pres. of Madras (1931). Recently Prof. Barnes sent specimens to Kew, so that this sub species must be added.

Nilgiri Hills at Ootacamund, c. 7000 ft., *E. Barnes* without number.

Coelachne Meeboldii *C. E. C. Fischer*, sp. nov. [Graminae-Poaceae]; a *C. pulchella* R. Br. spiculis paucioribus et majoribus, rhachidibus pedicellis rhachillisque planis recedit.

Annual *herb* with short, very slender, fibrous roots. *Stems* very slender, glabrous, flaccid, trailing and rooting at the nodes, up to 45 cm. long, emitting a few suberect, sometimes branched, flowering culms up to 10 cm. long. *Leaves* distant on the trailing stems, approximate and at first overlapping on the flowering culms; *sheaths* loose, slightly widened upwards, shallowly ribbed and very

minutely scaberulous without, 1–1·8 cm. long, mouth truncate or with very short, rounded auricles on either side ; *ligule* a fringe of short hairs ; *blade* narrowly ensiform, subacute, 5–10 mm. long, flat or more usually involute, about 10-nerved, very minutely scaberulous. *Raceme* solitary, terminal, 2–3 cm. long, embraced at first by the uppermost sheath, later emerging : rhachis flat, channelled, 1–1·2 mm. wide, glabrous, joints usually 3, 3–5·6 mm. long, the uppermost shortest, more or less curved to accommodate the spikelets. *Spikelets* usually 3 pairs, 1 sessile and 1 pedicelled at the lower internodes, the apical pair sessile at the base and apex respectively of the uppermost joint ; *pedicels* flat, channelled, 2·8–3·4 mm. long, 0·5–0·6 mm. wide, glabrous. *Glumes* membranous, subequilong, 2·7–3·5 mm. long, glabrous, the lower flat or slightly concave, ensiform, subacute or obtuse, 3-nerved, the upper broader, oblong or elliptic-oblong, obtuse, concave, 5-nerved. *Florets* dissimilar, the lower the larger, its lemma membranous narrowly oblong, rounded at the apex, concave, 4–4·3 mm. long, margins narrowly inflexed, 7–9-nerved, glabrous ; its palea slightly shorter, elliptic-oblong, subacute, with widely inflexed margins nearly meeting, glabrous, nerveless. *Lodicules* minute. *Stamens* 3 ; anthers linear, 2·7 mm. long. *Rhachilla* between the lemmas 0·7–1 mm. long, flat, widening upwards with a transverse ledge above the middle, glabrous. *Upper lemma* coriaceous, broadly oblong, hemispheric in cross section, 2–2·3 mm. long, margins narrowly inflexed, back minutely punctate, sparsely hairy, the sides all round shaggily hairy ; palea slightly shorter, coriaceous, elliptic-oblong, subacute, margins inflexed, back flat, minutely punctate, hairy, enclosing a ♀ floret. *Lodicules* 2, short, oblong-quadrate or ligulate, truncate, glabrous. *Ovary* linear-ellipsoid, glabrous. *Grain* oblong, obtuse, plano-convex, 1·5–1·6 mm. long, fuscus, with a median longitudinal reddish-brown (red at first) line on the plane face.

Cochin State at Chalakudi, Nov., *A. Meebold* 12520 (type in Kew Herb., cotype in Breslau Herb.), " In tanks."

The plants appear to grow interlaced in dense mats.

Tripogon pungens *C. E. C. Fischer*, sp. nov. [Gramineae-Poaceae] ; ab omnibus congeneribus caule crasso ramoso vaginis vestito, foliis equitantibus rigidis pungentibus differt.

A densely tufted perennial *herb*. *Stems* branching, up to 20 cm. high, thickened with the imbricating old leaf-sheaths, slender, wiry and usually long-exserted above ; nodes concealed by the sheaths. *Leaves* mostly near the base, equitant, coriaceous ; sheaths 5–10 mm. long, imbricate, striate ; ligule represented by a minutely-hairy ridge ; blades convolute or involute, rigid, pungent, often curved, 1–5 cm. long, glabrous below, 6–8-ribbed and minutely hispidulous above. *Spikes* numerous, terminal, solitary, 4–6 cm. long ; rhachis narrow. *Spikelets* 7–9-flowered, narrowly ellipsoid, 4–6 mm. long. *Glumes* membranous ; the lower 2–2·5 mm. long, with a large lobe on one side, each lobe with a single nerve, obtuse (sometimes the glume

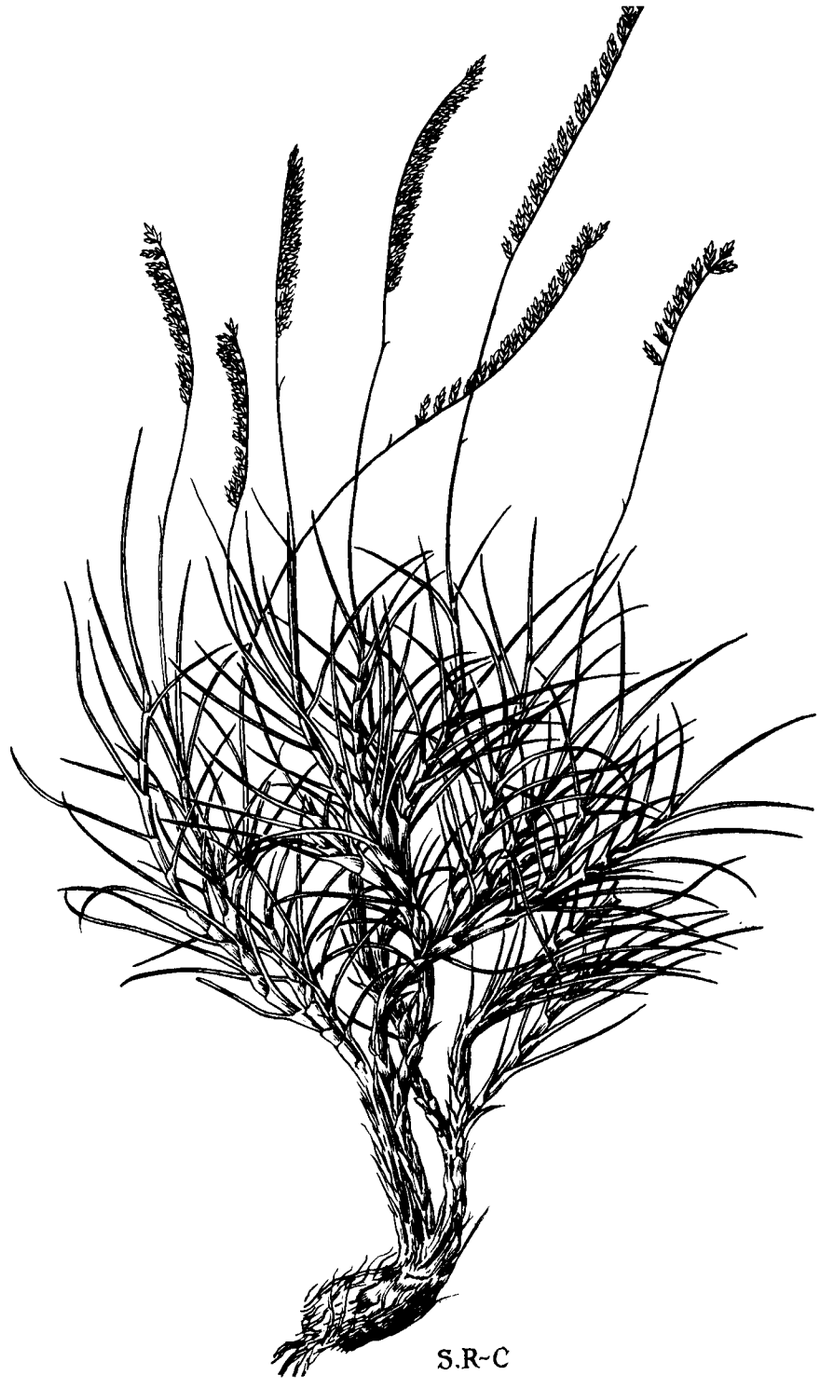


Fig. 4. *Tripogon pungens* C. E. C. Fischer, nat. size.

completely divided into 2 subequal parts) ; upper 3–4 mm. long, oblong, acute, strongly 1-ribbed, back rounded or more or less keeled. *Rhachilla* disarticulating at the base of each floret ; joints 0·6–1 mm. long, terete, more or less hairy. *Lemmas* with a short callus bearded with white hairs ¼–½ as long as the lemma, chartaceous, broadly ovate, obtuse, apex shortly 2-lobed, the lobes obtuse, bearing an arista from the sinus, 3-nerved, the lowest 2·5 mm. long with an arista 0·8–1 mm. long, the upper gradually smaller ; paleas oblanceolate, obtuse, complicate, 2–2·2 mm. long, 2-keeled, keels ciliolate, containing a bisexual floret. *Lodicules* 2, minute, narrowly obcuneate, truncate. *Stamens* 3 ; anthers oblong, 1 mm. long. *Ovary* minute, subglobose ; styles 2, distant at the base. *Grain* not seen.

S. Coimbatore District at Punachi in the Anaimalais Hills, about 3500 ft., Oct., *C. A. Barber* 3717 (type in Kew Herb., cotype in Madras Herb.). Several plants 4–6 cm. high, devoid of inflorescence, collected by *Sir A. G. and Lady Bourne* (no. 3011) at Neutral Saddle in the Palni Hills in June, is also this plant beyond doubt.

From its habit one would suppose that the plant grew among rocks with the lower part of the stem in crevices.

XIX—MISCELLANEOUS NOTES.

Robert Chodat.—We record with deep regret the death of Professor Robert Chodat, Professor of Botany in the University of Geneva, on April 28th, 1934. Professor Chodat was a botanist of remarkable versatility and enriched many diverse branches of botanical science by his researches. In his earlier years he worked on the *Polygalaceae* but his main botanical activities lay in the direction of morphology, physiology and biology. The *Algae* of the fresh-water lakes were subjects of his special study and his " Monographes d'Algues en culture pure " is among the best-known of his many publications.

Professor Chodat will always be remembered by his establishment of the Alpine Laboratory, " La Linnea," at Bourg St. Pierre, where every summer he conducted classes, and a band of students and research workers gathered around him to study the many problems presented by the alpine vegetation in its natural surroundings.

Professor Chodat was awarded the Linnean Medal in 1933, and was an Hon. Sc.D. of Cambridge, Liverpool and Manchester. He spoke English perfectly and he was a most charming and interesting companion, since his knowledge, both scientific and literary, was encylopaedic. It may safely be said that there was no branch of botany with which he was not fully conversant and to which, at some time, he had not made important contributions.

Brooklands, New Plymouth.—The Dominion of New Zealand is fortunate alike in the unique character of its native vegetation and in the generosity of its citizens. A few years ago we noted in the " Kew Bulletin " (1929, 63) the opening of the Otari Open Air Museum

at Wellington. Now we have to record with much interest the presentation of the Brooklands estate to the Borough of New Plymouth as a public reserve by the Trustees of the late Mr. Newton King. The official opening of the property as a public reserve by His Excellency the Governor General, Lord Bledisloe, took place on March 10th, 1934.

Brooklands adjoins Pukekara Park, a very beautiful public park belonging to New Plymouth, and forms a natural extension of it ; together they cover an area of over one hundred acres. In addition to the actual domain of Brooklands, the Trustees have presented five acres of native bush adjoining and, in order to give proper access to it and to make the whole one large reserve, Mr. T. C. List and Mr. C. A. Wilkinson have given an area of seven and a half acres.

Mr. Truby King, representing the members of the family of the late Mr. Newton King, formally handed over the property to the Borough Council on behalf of the Trustees of the estate and the members of the family. The estate forms part of the grant of land made to Captain King—who was unconnected with the family—in 1841 ; on his death in 1888 a portion was purchased by Mr. Newton King and comprises the estate now handed over to New Plymouth.

His Excellency the Governor General, after referring to the many public services performed by the late Sir Truby King, Mr. Newton King and other members of the family and to their great munificence in making this presentation, drew attention to the outstanding natural advantages which New Zealand possesses. " In two respects," Lord Bledisloe pointed out, " New Zealand is absolutely unique in the world. One is the number, variety and grandeur of its beauty spots within a relatively small area and other is its native bush which has no rival in the world. And there is economic value as well as aesthetic delight inherent in Nature's generous equipment.

" I make bold to utter a prophecy to the truth of which only your grandchildren can confidently testify," said His Excellency. " It is that New Zealand's main source of wealth will not be found in sheep-breeding, goldmining, petroleum wells or even dairy farming, but in its tourist traffic ; for hundreds of thousands will flock here from all over the world to see that sun-kissed land in the Pacific which Nature has most abundantly endowed with her aesthetic jewels. For every £50 that may accrue from the short-sighted felling in face of temporary economic stringency of some forest giant such as the great Kauris of the Waipoua forest, at least a million pounds is lost to posterity in the permanent commercial value of the natural beautification of the Dominion, quite apart from the spiritual inspiration which its contemplation evokes in every normal civilized being. And why should not New Plymouth be the centre of enlightenment for this purpose to the whole Dominion, radiating sanity and foresight as well as a love of the beautiful, bringing to men's hearts and minds the pure happiness

and mental peace which flow from contact with unspoilt nature and an intimate knowledge of her incomparable treasures? New Plymouth is well fitted for this much-needed pioneer task. Her children are trained in the schools to know and to love native plants and to cultivate thereby that capacity for observation which is a priceless equipment for every vocation in life. She has a sufficient rainfall, which while promoting growth is also some safeguard against destruction by fire, an equable climate, a rich, deep porous soil and a volcanic subsoil. In the matter of variety of types of indigenous timber trees and plants she is ideally situated in a geographical sense. Here North meets South and sub-tropical and temperate plants alike flourish in profusion—plants characteristic of the flora of both islands. It is significant that here in this generously equipped reserve is to be found, close to the extreme southern limit of its natural habitat, the largest and symmetrically the most perfect Puriri [*Vitex littoralis*] in the Dominion, and what tree can claim in its durable and fine-grained timber, its foliage, its flowers and its fruit, greater all-round beauty or utility? You have, too, tree ferns and Todeas of a size and quality which even Westland would find it difficult to emulate.

" I see around me," said Lord Bledisloe, " not merely native bush and well-trimmed English lawns, but also fine specimens of exotic trees imported from Great Britain and elsewhere 90 years ago, the most striking being the great Spanish chestnut with a lateral spread of 90 feet—a truly wonderful tree, and I can say so with confidence, because I have on my family estate the oldest and finest grove of Spanish chestnuts in England, containing one tree of 24 feet girth at breast height, but none with such far-spreading lateral branches as yours. In this connexion I may venture to utter a word of warning, although conscious that it is unnecessary to utter a word of warning, although conscious that it is unnecessary to do it, so far as your present enlightened borough authorities are concerned. It is this. Do not on any account, and however great the temptation may be, mix up your native and your exotic trees, even if a love of the Old Land, or a pride in the ' Devon, glorious Devon ' of your ancestors should stir up sentiment in favour of incursions of the latter into the sacred precincts of the former. If you or your children effect this promiscuous intercourse, this magnificent environment of pure native bush will be for ever ruined in the eyes not only of expert botanists but of those who love symmetry and arboreal compatability and who deem Nature's primeval plan to be better even than that of the most experienced landscape gardener."

Landscape Gardening.*—This book, which deals with all phases of garden construction and layout, should prove invaluable for anyone planning a garden, whether large or small. The subject is dealt with in such simple language that beginners should have no difficulty in following the various operations described, and, at the same time, there is much that the professional can study with profit. There are many excellent illustrations showing various types of gardens with details regarding their layout.

In addition to chapters dealing with constructional details for the ordinary garden, there are others on Town and Roof Gardening, Factory and Hotel Gardens, Airport Development, and Landscape Architecture in Relation to Estate Development. There are eight chapters dealing with gardens of other nations, each one contributed by a native of the country in question. These are valuable as a contrast to the opening chapter which deals with the history of the English garden. Not the least useful feature is the very complete list of plants suitable for all classes of garden soil and situations.

J. COUTTS.

* By Richard Sudell, F.I.L.A., A.R.H.S. Messrs. Ward Locke & Co., Ltd., London & Melbourne. Price 21s.

Peonies.*—As the use of the American spelling of the title indicates, this book is written primarily for the American amateur and based on American climatic conditions. For the most part, however, the information given in this book applies equally to both sides of the Atlantic, especially the chapters dealing with vegetative propagation, hybridizing, and seed sowing

Much sound advice is given on soil, drainage, planting and manuring, on the control of insect and fungus pests, and on the selection of stock. There are extensive lists of varieties, grouping them by colour, height and fragrance, and also giving a selection of the 50 best varieties, adopting the valuation, or rating as it is termed, of the American Peony Society. These lists are, however, of very little value to British gardeners, as few of the varieties are in cultivation here. It is interesting to note that a British variety, Kelway's Glorious, is placed second on the list with a rating of 9·8, and the old favourite, festiva maxima, at 9·3, whilst the newer Lady Alexander Duff stands at 9·1.

In a book of 70 pages the author devotes rather more than one page to " Some Interesting Species and Varieties," mentioning only 6 of the 30 or so known species, and omitting some of the most beautiful, or earliest flowering kinds, such as *P. cretica* and *P. anomala*, whilst throughout the book the lovely single varieties are not given the credit they deserve.

One of the principal objections to the freer use of peonies in border work is the large blanks left in the colour scheme from the end of July onwards and not everyone will agree with the author's statement that " the general effect of a Peony when it is not in bloom is that of a low-growing dense and beautifully foliaged shrub."

In his Classification of Flower Forms he adopts five types—single, Japanese, Anemone, semi-double and double—and these are

*By F. F. Rockwell. With an introduction by C. C. Sherlock. Drawings by George Holbrock and the author. New York. The Macmillan Company. 1933. Price 4s. 6d.

well illustrated. He is to be congratulated on scrapping the ambiguous, and to us unfamiliar, type names such as bomb, semi-rose and crown.

The book is well arranged and printed and should prove useful to those interested in the genus both as garden plants and as subjects for commercial growing. G. W. ROBINSON.

The Toxicology of Plants in South Africa.*—The publication of this work marks the second important contribution to the study of South African poisonous plants that has appeared during the last few years (K.B. 1933, 463). In the present volume the whole subject of plant poisoning of domesticated animals in South Africa, and, to a less extent of human beings, is considered, fundamental as well as specific aspects of plant poisoning being critically dealt with.

The earlier pages of the volume are devoted to a general discussion of plant poisoning and include interesting chapters on the factors determining toxicity in plants and on the action of plant poisons. Information that should appeal especially to stock-owners is that relating to diagnosis, treatment and prevention of poisoning, eradication of harmful plants, and legal aspects of plant-poisoning. Special sections are devoted to "poisonous foodstuffs," "photosensitization," and "fungi in relation to health of man and animal."

The latter and greater part of the volume consists of a systematic account of the known species of poisonous plants occurring in South Africa. Under each species notes are given regarding distribution, toxicity, active principles, post-mortem appearances, etc. The book is freely illustrated with photographs which are taken in some instances from the growing plant and in others from herbarium specimens. A useful bibliography and index are included.

F. N. HOWES.

Erratum.—In K.B. 1934, 97, line 7, "Engler's Jahrb. **66**" should read "Engler's Jahrb. **65**."

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BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1934

ROYAL BOTANIC GARDENS, KEW

XX—A KEY TO THE SPECIES OF DEUTZIA SECT. MESODEUTZIA.

H. K. Airy-Shaw.

While investigating *Deutzia rubens* Rehd. and its allies for an article in the current number of the "Botanical Magazine" (tab. 9362), the writer found that one or two species were undescribed, whilst certain readjustments in the conception of others seemed necessary. An exhaustive revision of this group scarcely seems called for so soon after the treatments of Rehder (in Sargent, Pl. Wils. **1**, 14: 1911) and Engler (Natürl. Pflanzenfam. ed. 2, **18a**, 199: 1930), but it was thought that publication of the results arrived at in the form of a key might be useful. Brief diagnoses, synonymy and citation of specimens of the new species are appended.

The arrangement attempts to indicate, as far as possible, a progression from the relatively simple to the more advanced. Thus the species with simple, subulate stamens precede those in which the filaments are predominantly or invariably winged and toothed. *Deutzia mollis* Craib probably represents the most primitive type, the leaves being in general the largest in the section, whilst the hairs of the dense pubescence are not reduced to a stellate base as in the majority of species. *D. rubens* Rehd. shows the most advanced staminal structure, for the two lateral teeth of the shorter filaments (*i.e.*, the inner whorl) are confluent behind the anther and produced a long way beyond it, so that the anther appears to be borne half-way up the ventral face of the filament. A tendency towards this can also be seen in *D. Hookeriana* (Schneid.) Airy-Shaw. The remaining species are more or less intermediate between these two extremes.

Key to Species.

Filaments all simple, subulate:

Leaves softly and densely tomentose-pubescent below, rather large; midrib below with long spreading simple hairs; inflorescence pubescent (Hupeh).....1. *D. mollis* Craib

Leaves stellate-lepidote below, not pubescent, smaller on the average:

Calyx and inflorescence stellate-lepidote; stellate hairs of lower surface of leaves with 5–8 rays, those of upper surface with 4–5, rarely 6, rays:

Stellate hairs of leaves (and often of inflorescence) with elongate erect central ray (Shensi, ? Shansi, ? Kansu)....
2. *D. micrantha* Engl.

Stellate hairs adpressed, without long erect central ray (Manchuria, Korea)...6. *D. amurensis* (Regel) Airy-Shaw

Calyx and inflorescence quite glabrous ; stellate hairs of lower surface entirely absent, those of upper surface 3–5-rayed (Manchuria, Korea, ? Chihli, Shantung).....
3. *D. glabrata* Kom.

Filaments variable in the same inflorescence or even flower, either simply subulate or more often shouldered or with a blunt or acute tooth on either side towards apex (unknown in no. 4) :

Midrib below with long, simple, laterally spreading hairs at least towards base ; stellate hairs of upper surface mostly 5–6-rayed ; short, scattered, spreading, simple hairs on branches of inflorescence :

Stellate hairs with elongate erect central ray (cf. also *D. micrantha*), mostly 5-rayed (Korea)...4. *D. kongoa* Airy-Shaw

Stellate hairs without such central ray, mostly 6-rayed (Chihli, ? Mongolia, ? Kansu, ? Honan).....5. *D. parviflora* Bunge

Midrib devoid of such hairs below ; stellate hairs of upper surface mostly 4–5-rayed ; inflorescence without simple spreading hairs :

Leaves mostly ovate, about twice as long as broad, very pale below ; stellate hairs on lower surface uniform, scattered ; inflorescences comparatively lax (Manchuria, Korea).....
6. *D. amurensis* (Regel) Airy-Shaw

Leaves mostly lanceolate, at least three times as long as broad, more or less concolorous ; stellate hairs on lower surface exceedingly dense, of two kinds, the smaller very minute and numerous, contiguous, the others considerably larger and fewer ; those on the upper surface often with an elongate erect central ray ; inflorescences dense and compact (only known in cultivation ; ? N. China).....
7. *D. compacta* Craib

Filaments all 3-dentate at apex (lateral teeth sometimes confluent) :

Lateral teeth of filaments not or scarcely exceeding the anther, often truncate or obtuse, never confluent ; central antheriferous tooth of longer filaments (outer whorl) often elongate, up to 2 mm. long :

Stellate hairs below 6–12-rayed (W. Himalaya).....
8. *D. corymbosa* R. Br.

Stellate hairs below 3–5-, mostly 4-rayed (W. Himalaya).....
9. *D. staurothrix* Airy-Shaw

Lateral teeth of filaments generally much exceeding the anther, those of the shorter filaments (inner whorl) generally confluent so that the anther appears to be borne ventrally half-way up the filament, which is then very shortly bifid or subentire at the (apparent) apex ; stellate hairs of upper leaf-surface 3–5-rayed :

Stellate hairs of lower surface very dense, small, 5–9-rayed ; inflorescence often scabrid owing to the stellate hairs being

stipitate on conical papilliform projections ; lateral teeth of shorter filaments only partially confluent (Yunnan, E. Himalaya).....10. *D. Hookeriana* (Schneid.) Airy-Shaw

Stellate hairs of lower surface very sparse to moderately dense, larger, 3–5-, more rarely 6-rayed ; inflorescences not scabrid ; lateral teeth of shorter filaments almost completely confluent (Shensi, Hupeh, Szechuan).....
11. *D. rubens* Rehd.

DIAGNOSES OF NEW SPECIES.

4. **Deutzia kongoa** *Airy-Shaw*, sp. nov. ; a *D. parviflora* Bunge pilis stellatis radio centrali erecto elongato plerumque praeditis, paginae superioris saepius 5-radiatis quam (ut plerumque in *D. parviflora*) 6-radiatis distincta.

KOREA : Prov. Kogen. Kongo-san, thickets, 1333 m., 5 July 1918, *Wilson* (Arn. Arb.) 10,431 : " Bush 2–4 ft., common." Ibid., cliffs and thickets, 666 m., 5 July 1918, *Wilson* (Arn. Arb.) 10,434 (type, Herb. Kew.) : " Bush 3–5 ft., common."

Both these specimens are unfortunately in fruit only. The species agrees with *D. parviflora* in the possession of long, spreading, apparently simple hairs at the side of the midrib on the lower leaf-surface : these often extend to the lateral nerves and sometimes even to the intervening tissue. Traces of minute stellate rays are generally discernible at their base. Neither *D. parviflora* nor *D. amurensis* ever seem to develop an erect central ray on the hairs of the upper surface.

6. **Deutzia amurensis** (*Regel*) *Airy-Shaw*, sp. nov. ; *D. parviflorae* Bunge proxima, sed differt foliis subtus magis discoloribus et saepe sublucidis et imprimis costa basin versus pilis simplicibus patentibus omnino carente, filamentis saepius edentatis.

D. parviflora var. *amurensis* Regel, Op. Fl. Usur. Stran. 66, t. v, fig. 7–13 (1862) (Mém. Acad. Sci. St. Pétersb. sér. 7, **4**), et in Vyestn. Ross. Obschtsch. Sadov. [3], 340, t. 96 (1862), et in Gartenfl. **11**, 278, t. 370, fig. 4–12 (1862).

D. parviflora Maxim. Prim. Fl. Amur. 110 (1859) (Mém. Acad. Imp. Sci. St. Pétersb. sér. 6, **9**), et Rev. Hydrang. 33 (1867) (Mém. Acad. Imp. Sci. St. Pétersb. sér. 7, **10**), *p.p.* ; Korshinsky in Acta Horti Petrop. **12**, 338 (1892) ; Komarov, Fl. Manch., in Acta Horti Petrop. **22**, 431 (1903) ; Nakai in Journ. Coll. Sci. Tok. **26**, 222 (1909) et **31**, 486 (1911) ; Yabe, Enum. Pl. South Manch. 61 (1912) ; Nakai in Bot. Mag. Tok. **35**, 96 (1921) ; Mori, Enum. Pl. Cor. 182 (1922) ; Chung, Cat. Trees & Shrubs China, 66 (1924), *p.p.* ; Nakai, Fl. Sylv. Kor. **15**, 65, t. xx (1926).

? *D. parviflora* var. *Bungei* Franch. in Morot, Journ. de Bot. **10**, 283 (1896).

MANCHURIA. Amur, *Maximowicz* (type) ; ad fl. Amur, inter Ust-Strelotschnaja et ostia fl. Dseja, 1857, *Radde* ; Pei-ling, Mukden to Yaloo River, ? 1885, *Rev. J. Webster* 127 ; between

Mukden and Tung-che-hsien, May-Aug. 1886, *James*; Chang-pei-shan, 300–2250 m., May-Aug. 1886, *James*; in cedretis jugis merid. vallis fl. Chingan, 19 June 1895, *Komarov* 836; districtus Ninguta, fl. Sui-fun, vallis Van-lu-gau, 19 June 1896, *Komarov* 836; fl. Jalu-dsian super., vallis Tadin-don, 22 June 1897, *Komarov* 838.

KOREA: Prov. Hei-an North. French Mine, Taiyudo, 160–1000 m., 15 June 1917, *Wilson* (Arn. Arb.) 8605: "Bush 3–6 ft., flower white; abundant everywhere." Cliffs, Pakadong, Unsan district, 1 Sept. 1918, *Wilson* (Arn. Arb.) 10,687: "Bush 2–4 ft., common."

Of the type specimens of Regel's var. *amurensis*, which were collected by Maximowicz and Maack at the mouth of the Sungari and Ussuri rivers, in the Amur region, I have seen only a fruiting example collected by Maximowicz. True *Deutzia parviflora*, however, is apparently confined to Chihli* and adjacent Mongolia, and therefore does not occur in the area occupied by *D. amurensis*. The presence or absence of simple, spreading hairs on either side of the midrib, at least towards the base, on the lower leaf-surface is a constant character for distinguishing these two species in all the specimens examined.

Regel states that Maack sent home seeds, but that none had so far germinated. Cultivated specimens received from T. Smith, Daisy Hill Nursery, Newry, and from W. E. Gumbleton, Queenstown, Ireland, in April 1896, are preserved in the Kew Herbarium. The source of these is unknown. A plant grown in the Arnold Arboretum, specimens of which were distributed under the name *Deutzia Lemoinei compacta*, is also referable to *D. amurensis*.

8. **Deutzia Hookeriana** (*C. K. Schneider*) *Airy-Shaw*, sp. nov.; a *D. rubente* Rehd. et *D. corymbosa* R. Br. (cui proxima) foliis subtus dense (nec sparsius quam supra) stellato-lepidotis distinctissima.

Deutzia corymbosa C. B. Clarke in Hook. fil. Fl. Brit. Ind. **2**, 406 (1878), *pro parte*.

D. parviflora var. *purpurascens* Franch. in Morot, Journ. de Bot. **10**, 283 (1896) (nec *D. purpurascens* Rehd., quae *D. discolor* var. *purpurascens* Franch.).

D. corymbosa var. *Hookeriana* C. K. Schneider in Mitt. Deutsch. Dendrol. Gesellsch. **13**, 184 (1904).

D. corymbosa var. *purpurascens* C. K. Schneider, *l.c.* 185 (1904).

D. corymbosa var. *yunnanensis* "Franch." ex Rehd. in Sarg. Pl. Wils. **1**, 23 (1911); "Franch." ex Chung, Cat. Trees & Shrubs of China, 65 (1924): sphalm. pro var. *purpurascens* Franch.

D. hypoglauca Rehd. in Journ. Arn. Arb. **5**, 158 (1924), quoad *Delavay* 986, non Rehd. in Sarg. Pl. Wils. **1**, 24 (1911).

NEPAL. Tambur river, 2100–3000 m., 22 Nov. 18—, *J. D. Hooker*.

*I have not been able to examine the specimens from Honan referred to *D. parviflora* by Rehder in Journ. Arn. Arb. **5**, 157 (1924).

SIKKIM. Choongtam, 2100–3000 m., 23 May 1849, *J. D. Hooker*: "Arbusc. 20 ped., fl. white." Lachen, 2100 m., 26 May 1849, *J. D. Hooker* (type, Herb. Kew.): "Frutex laxe ramosus 10 ped." Ibid., 6 July 1849, 2700–3000 m., *J. D. Hooker*: "Frutex 8–12 ped." Ibid., 3300–3600 m., 12 July 1849, *J. D. Hooker*.

BHUTAN. Towards Chuk, in woods, 1950 m., *Griffith* 2045 (Kew distrib. no. 2450).

TIBET. Chumbi, 29 June 1878, *Dungboo*: "Shrub 5 ft., flower white." Yatung, 27°51′ N., 88°35′ E., 1897, *Hobson*. Chumbi Valley below Rinchhengong and about Assam, July 1904, *Walsh* 162. Rongshar Valley, side of rocky gorge, 2850 m., 24 June 1924, *Hingston* 177: "Flower white." Ibid., amongst boulders in bed of gorge, 3300 m., 23 June 1924, *Hingston* 278: "Flower white." Ibid., bed of rocky gorge, 3300 m., 21 June 1924, *Hingston* 312: "Flower white." Nyima La, in forest, or in thickets lower down the valley, 3000–3300 m., 1 July 1924, *F. K. Ward* 5886: "Shrub of 6 ft.; flowers pale pink."

UPPER BURMA. Without exact locality, Oct. 1925, *Forrest* 27,530.

YUNNAN. Ad basin montis Tsang-chan supra Tali, 3000 m., 1883–1885, *Delavay* 986. In shady forests on the Mekong-Salwin divide, 27°54′ N., 98°50′ E., 2400 m., July 1921, *Forrest* 19,646: "Shrub of 1–2½ ft. Flowers white, flushed purplish exterior."

The segregation of this species from *D. corymbosa* affords yet another example of the distinctness of the east and west Himalayan floras. The occurrence of pairs of allied vicarious species in these two regions is probably more frequent than that of one species common to both.

10. **Deutzia staurothrix** *Airy-Shaw*, sp. nov.; a *D. corymbosa* R. Br. foliorum pilis stellatis utriusque paginae cruciformibus 4-radiatis, rarius 3- vel 5-radiatis, statim dignoscenda.

N. W. HIMALAYA. Without exact locality, temperate region, 2100–3000 m., *Thomson* (type, Herb. Kew.). Upper Chenab Valley, Rowli, 2550 m., 29 Aug. 1879, *R. Ellis* 429. Chamba, 1880, *R. Ellis* 429. Chenab Valley, Phindru, 2250 m., 15 June 1881, *R. Ellis* "1220–1221" (sic !). Kulu-Lahaul, Pulga, 7 June 1888, *Drummond* 22,828. Chamba, Alwar, 2400 m., 25 June 1917, *Stewart* 2436.

Vernacular name: *Bhatti* (R. Ellis).

Although in general facies this plant is indistinguishable from *D. corymbosa*, a glance at the indumentum of the leaves through a low-powered lens is sufficient to identify it, for the rather large, almost uniformly cruciform stellate hairs are quite unlike the smaller many-rayed structures found in that species. No additional character for separating them, however, has yet been detected. *D. staurothrix* may therefore be regarded with some probability as a "young," incipient species which has arisen, possibly by mutation, directly from *D. corymbosa*.

XXI—NEW TREES AND SHRUBS FROM TROPICAL AFRICA: III.* A. C. HOYLE & H. DUNKLEY.

Homalium rhodesicum *Dunkley*, sp. nov. [Samydaceae]; affinis *H. Wildemanniano* Gilg, sed foliis fere latis quam longis, nervis lateralibus paucioribus differt.

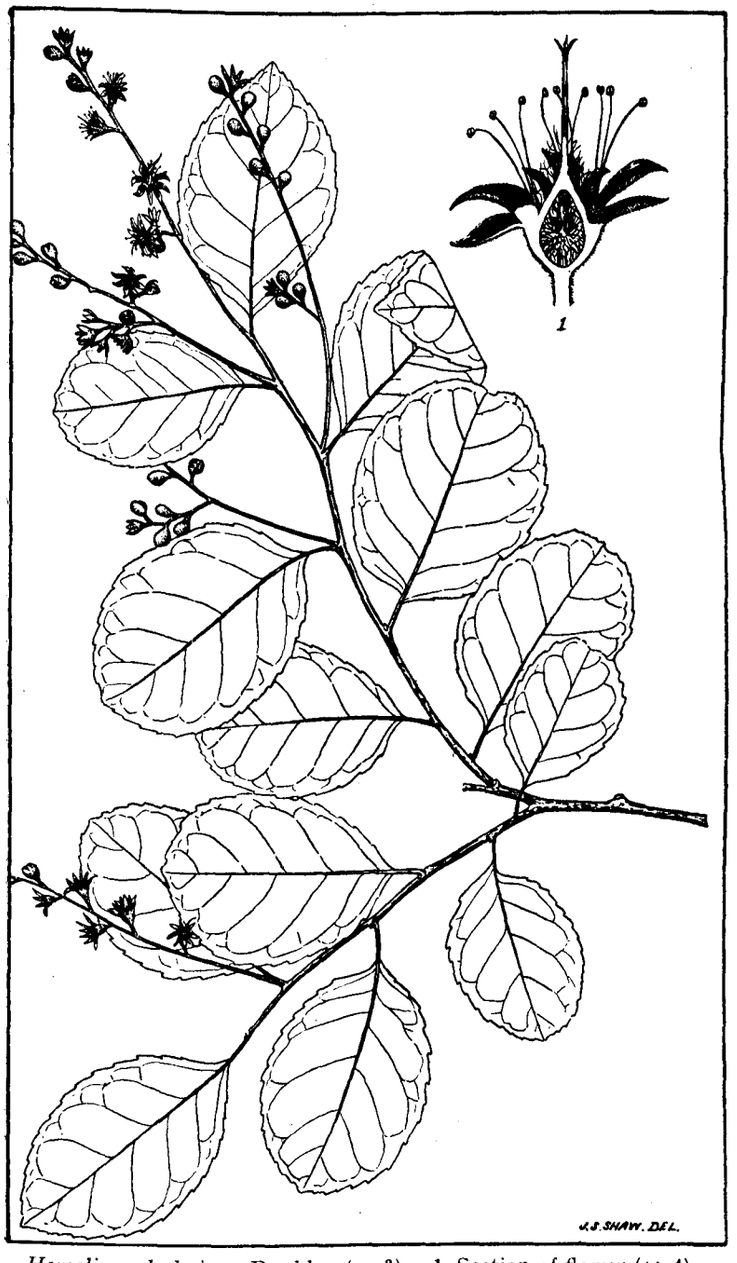
Arbor mediocris vel alta, ramulis novellis teretibus striatis subglabris lenticellosis pallide incano-griseis. *Folia* coriacea, in sicco purpurea, tenuiter reticulata, 4–7 cm. longa, 3–5 cm. lata, latissime elliptica vel ovato-oblonga, rare subrotundata, apice breviter acuminata vel rotundata, basi late et obtuse cuneata vel truncata, supra glabra nitida, infra opaca brunneo-rubra, in costa et axillis nervorum pubescentia; nervi laterales utrinque 6, costa nervisque elevatis, margine crasse et irregulariter crenato-serrato, dentibus apice glandulosis. *Paniculae* circiter 8 cm. longae, leviter ramosae, pauciflorae, ramulis puberulis; flores subsessiles. *Sepala* 7, ovata, acuta, 4 mm. longa, puberula, valvata, ciliata. *Petala* sepalis similia. *Glandulae* disci 6, magnae, tomentosae, sepalis oppositae. *Stamina* ternaria, petalis opposita; antherae versatiles; filamenta filiformia, basin versus applanata. *Staminodia* 6, minuta. *Ovarium* uniloculare, intus pilis crispatis implicatis repletum, extra longe pilosum, in tubo semi-submersum, placentis 3 ab apice suspensis, *ovulis* pendulis circiter 6; stylus trifidus. *Fructus* non visus.

SOUTH TROPICAL AFRICA. Northern Rhodesia: Kafue, *J. D. Martin* 66, type in Kew Herb. and Imperial Forestry Institute Herb., Oxford; " Medium-sized tree, river bank," Nov. 1931; vernacular name " Mulunga." Kafue Gorge, *D. Stevenson* 211, " Big tree, vernacular name ' Mwendamalonga ' (I. Tok.)," July, 1931. Kafue Gorge, *Burtt Davy* 20808, " Tree, bark smooth, grey," August, 1929.

Dombeya praetermissa *Dunkley*, sp. nov. [Sterculiaceae]; inter species *D. Kirkii* K. Schum. et *D. Mupangae* K. Schum. in sectione *Xeropetali*, foliis parvis, ambitu rotundatis vel late obovatis, basi leviter inaequaliter cordatis, floribus multo minoribus valde distincta.

Arbor circiter 6 m. alta, ramulis petiolis et ramis florentibus subfloccoso-tomentosis, *foliis* orbicularibus vel subovatis ad 8 cm. longis 7 cm. latis apice obtusis rotundatis vel obscure 3-lobatis, basi leviter inaequaliter cordatis quinquenervis crenulatis supra sparse stellato-tomentellis sicco brunneo-rubris subtus densius stellato-ferrugineo-tomentosis, petiolo tereti 1·5–2·5 cm. longo. *Flores* albi, odorati, in cymas terminales dispositi, ramulis et pedicellis longe pilosis. *Sepala* 5, ovato-acuminata, extra longe strigosa, intus glabra, 6 mm. longa. *Petala* 5, obliqua, inaequaliter bilobata, 8 mm. longa, 5 mm. lata, venulis prominentibus, minute ciliata. *Stamina* 15, filamentis basin versus applanatis. *Staminodia* 5,

*Continued from K.B. 1933, 174.



Homalium rhodesicum Dunkley (× ⅔). 1, Section of flower (× 4).

stamina superantes, apicem versus dilatata, 6 mm. longa. *Styli* 3, supra medium connati, reflexi, sparse pilosi. *Ovarium* globosum, 3-loculare, dense strigosum ; ovula in loculis 2. *Fructus* non visus.

EAST TROPICAL AFRICA. Kenya Colony : Kilifi Coast, *R. M. Graham* 350 type in Kew Herb. & Imp. Forestry Institute Herb. Oxford, " Small tree 20 ft., flowers white and scented, bark with a fairly strong fibre, common at Kwale." Vernacular name " Mbwale " (Swa.). *Wakefield* Nyika, between Lamu & Witu. *Whyte* s.n. *Gardner* 1452, " Savannah country on coast, south of Mombassa, small tree with white flowers, Mbwale (Swa.). Napier 1012, Voi, alt. 2100 ft. Vernacular name " Mukeu " (Kidabida). Tanganyika : Usambara, *Holst* 3180, June 1893.

Berlinia confusa *Hoyle*, sp. nov. [Caesalpiniaceae] ; affinis *B. auriculatae* Benth., a qua calycis tubo lobisque extus pubescentibus, ovario dense tomentoso, pedicellis longioribus, bracteolis longioribus et latioribus recedit.

Arbor, ramulis novellis striatis ferrugineo-puberulis. *Folia* paripinnata ; petiolus 1·5–2·5 cm., rhachis 3·5–5 cm. longus, ferrugineo-puberulus ; foliola 3-jugata, opposita vel subopposita, 4–9 cm. longa, 3–4·5 cm. lata, inferiora ovato-rotundata, reliqua elliptica vel obovata, apice vix acuminata, obtusa et emarginata, basi rotundata vel brevissime cuneata, supra nitidula, reticulata, glabra, minutissime punctulata, infra opaca, sparse puberula ; nervi laterales utrinque 5–7 ; petioluli 5–7 mm. longi, rugosi, puberuli. *Paniculae* terminales et axillares, circiter 15 cm. longae et latae, basi laxe et longe ramosae, ramis paucifloris racemosis usque ad 13 cm. longis, ferrugineo-tomentellae, sulcatae ; bracteae rotundatae, tomentosae, caducissimae ; pedicelli ad 4 cm. longi, sulcati, fulvo-tomentosi ; bracteolae 30–35 mm. longae, 9–15 mm. latae, extus fulvo-tomentosae, intus densissime pubescentes. *Calycis* tubus 10 mm. longus, pubescens, lobis 12–14 mm., longis 2·5–3·5 mm. latis extus medio pubescentibus sparse ciliatis intus glabris. *Petalum* posterius 4·5–5 cm. longum, 4 cm. latum, ungue 2–2·5 cm. longo extra cum limbo orbiculato emarginato dense pubescente. *Stamina* petalo aequilonga, basin versus pubescentia. *Ovarium* stipitatum, 6–8 mm. longum, ferrugineo-tomentosum, stylo filiforme glabro 4·5–5 cm. longo. *Fructus* non visus.

WEST TROPICAL AFRICA. Nigeria : Calabar, " In high forest," *J. Smith* 54, type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford, with flowers March, 1931. Cameroons : Bipinde, *Zenker* 2332.

Vernacular name (Benin) : " Ekpagoi."

Millettia Kennedyi *Hoyle*, sp. nov. [Papilionaceae] ; affinis *M. coruscanti* Dunn, a qua inflorescentia tenuiore ramosiore, floribus minoribus, foliolis haud acute acuminatis recedit.

Arbor (?) riparia, ramulis teretibus brunneis minute sericeis mox dense lenticellatis. *Folia* 15–20 cm. longa, 5–7-foliolata,

exstipellata ; petioli 2–4 cm., rhachides 4–5 cm. longi, fulvo sericei ; petioluli 2·5–3·5 mm. longi, rugulosi, sericei ; foliola 4–10 cm. (plerumque 6–8 cm.) longa, elliptica vel oblongo-elliptica vel oblanceolata vel obovata, apice obtusa vel breviter acuminata, acumine obtuso vel retuso, mucronata, basi rotundata vel breviter cuneata, supra glabra, nitidula, in sicco rubescentia, costa cum venis impressis, infra aureo-fulvo-sericea (effulgentia), laxe reticulata, costa nervisque prominentibus ; nervi laterales utrinque 8–10, arcuati et crebre conjuncti, nervis lateralibus secundi ordinis intercalariis conspicuis. *Paniculae* terminales, amplae, ferrugineo-sericeae, 25–30 cm. longae, in parte inferiore ramis longis (ad 20 cm.) breviter ramulosis, in parte superiore axi breviter ramuloso (ramulis plerumque 2–2·5 cm. longis) ; pedicelli 1·5–2 mm. longi, ferrugineo-sericei ; bracteolae minutae, ovatae, acutae, carinatae. *Calyx* 7–8 mm. longus, ferrugineo-sericeus ; tubus 3–4 mm. longus, lobis lanceolatis acutis aequilongus ; lobi superiores usque ad medium connati. *Vexillum* 11 mm. diametro, orbiculare, breviter emarginatum, subauriculatum, extra glabrum, intus super basin transverse callosum et pubescens, ungue 2 mm. longo ; carina 12–13 mm. longa, alis leviter superans, glabra. *Ovarium* 5–6 mm. longum, fulvo-tomentosum, circiter 5-ovulatum ; stylus circiter 11 mm. longus, pubescens. *Fructus* non visus.

WEST TROPICAL AFRICA. S. Nigeria : Sapoba (Jameson River), *J. D. Kennedy* 1841, type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford ; Eket, *P. A. Talbot* 3343.

Hippocratea hirtiuscula *Dunkley*, sp. nov. [Hippocrateaceae] ; affinis *H. indicae* Willd., a qua foliis minoribus lanceolato-ellipticis puberulis, ramulis novellis petiolis et inflorescentia pubescentibus recedit.

Frutex scandens, pubescens, ramulis 4-angulatis. *Stipulae* geminatae, sub-persistentes, filiformes. *Folia* anguste obovato vel oblongo-elliptica, minute papilloso-puberula, 2–4·5 cm. longa, 0·5–2 cm. lata, costa nervisque pubescentibus utrinque elevatis, nervis lateralibus utrinsecus 5–8, margine reflexo serrulato ciliato, petiolo crasso tomentoso 5–7·5 mm. longo. *Cymae* axillares terminalesque, multiflorae, foliis superantes, axi, pedunculis et pedicellis dense et breviter pubescentibus, bracteis deltoideis 0·5 mm. longis, bracteolis minutis puberulis. *Flores* minuti, 1 mm. longi, pedicello aequantes. *Sepala* 5, imbricata, tomentella, 0·5 mm. longa. *Petala* 5, imbricata, oblonga, glabra, 1·5 mm. longa. *Discus* tenuis, inconspicuus. *Stamina* 3, filamentis brevibus latis compressis, antheris uniloculari-bus dorsifixis. *Ovarium* glabrum, 3-lobatum, 3-loculare, stylo brevissimo, stigmate integro. *Ovula* in loculis 2. *Fructus* compressus, coriaceus, oblongus usque obovato-oblongus, apice obtusus, circa 2·5 cm. longus, 1·3 cm. latus. *Semina* in loculo duo, alata ; ala 2 cm. longa, 6 mm. lata.

SOUTH TROPICAL AFRICA. Northern Rhodesia : Bombwe Forest *J. D. Martin* 354, type, in Kew Herb. & Imp. For. Inst. Herb. Oxford.

Vernacular name " Naminda " (Tok. Sik.) flowering November.

The fruits are described from *Martin* 251, said to be collected from the type in June.

Salacia owabiensis *Hoyle*, sp. nov. [Hippocrateaceae] ; affinis *S. euryoidi* Hutch. et M. B. Moss, a qua floribus minoribus brevioribus, sepalis haud fimbriatis, foliis integerrimis recedit.

Frutex scandens, glaber, ramulis teretibus nigrescentibus tenuiusculis. *Folia* opposita vel subopposita, utrinque tenuiter reticulata, 8–12 cm. longa, 5–7 cm. lata, late elliptica vel oblongo-elliptica, abrupte breviterque acuminata, basi late cuneata, supra viridia leviter nitidula, infra pallidiora ; nervi laterales utrinque 5–6, tenuissimi, valde arcuati, infimi sub-basales, margine nervato ; petiolus 7–9 mm. longus, tenuiusculus, canaliculatus. *Fasciculi* multiflori, axillares, brevissime pedunculati vel subsessiles (pedunculi ad 4 mm. longi, crassi) ; bracteae minutae, ovatae, acumine fimbriato ; pedicelli 1·2–1·5 cm. longi, tenuissimi. *Sepala* 4, valde inaequalia, tandem reflexa, majora latissime ovata, usque ad 3 mm. longa et 4 mm. lata, minora 1 mm. longa, 1·5 mm. lata. *Stamina* 3 ; filamenta 3 3·5 mm. longa, subulata, compressa. *Ovarium* depresso-ovoideum ; stylus 4 mm. longus, subulatus stigmate parvo.

West Tropical Africa. Gold Coast : Owabi, *F. J. Lyon* 2641 type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford with flowers December, 1932. Climber in deciduous forest.

Fagara trijuga *Dunkley*, sp. nov. [Rutaceae] ; affinis *F. melanacanthae* Engl., sed foliolis paucioribus 3-jugatis subsessilibus apice breviter acuminatis haud caudatis, paniculis multo minoribus facile distinguitur.

Arbor parva, ramulis glabris sparse armatis ; spinae rectae, usque ad 1 cm. longae. *Folia* imparipinnata, 15–25 cm. longa, rhachide breviter armato cum petiolulis sparse ferrugineo-tomentosis ; petioli circiter 6 cm., rhachides 15–20 cm. longi ; petiolulus foliolo terminalis 0·5–1·5 cm. longus ; foliola 3-juga, subsessilia, chartacea, opposita vel fere opposita, 6–9 cm. longa, 3–5 cm. lata, ovata vel ovato-oblonga, apice acuta vel breviter acuminata, basi inaequaliter rotundata, inferiora nonnunquam minora, supra viridia, glabra ; costa breviter armata, nervis utrinque subprominentibus, subtus pallida, sparse pubescentia, dense glanduloso-punctulata, margine crenulato ; nervi laterales utrinque 10–12. *Paniculae* usque ad 18 cm. longae, ramis patentibus, rhachide et ramis ferrugineo-tomentellis, floribus in cymulas paucifloras dispositis unisexualibus ; pedicellis 1 mm. longis ; bracteae et bracteolae minutae, ovatae, ciliatae. *Sepala* 4, ovato-rotundata, glabra, fructu persistentia 1 mm. longa. *Petala* 4, oblonga, obtusa, glabra, glandulosa, 3·5 mm. longa. *Stamina* 4, filamentis 4 mm. longis complanatis, antheris versatilibus. *Discus* pulviniformis, glaber. *Ovarium abortivum* obscure 4-lobatum. *Fructus* 5 mm. longus, glaber, subglobosus, pericarpio rugoso dense

glanduloso-punctato. *Semina* reniformia solitaria, versus apicem loculi suspensa.

South Tropical Africa. Northern Rhodesia : Bombwe, *J. D. Martin* 137, 480 (fls.), 493 (fruit), all from type, in Kew Herb. and Imp. For. Inst. Herb. Oxford ; " Shrub to small tree 10′ × 5″, spiny, common in *Baikiaea* forests in the dense ' Mutemwa ' undergrowth " ; flowers collected in Nov., fruits on Feb. 27th, 1933. Vernacular name " Chongwemaura " (Tok.).

East Tropical Africa. Tanganyika : Kazikazi, Mayoni Dist. at 4200 ft., *B. D. Burtt* 3552 " straggling loose coppice shrub to 10 ft., spines straight, unlike any other local *Fagara*."

Pachylobus paniculatus *Hoyle*, sp. nov. [Burseraceae] ; affinis *P. Barteri* Engl., a qua panicularum ramis racemiformibus nec ramulosis, floribus paucioribus plerumque singulatim dispositis, pedicellis crassioribus, petalis longioribus subacutis squamis magnis argenteis munitis, recedit.

Arbor 16 m. alta, ramulis novellis striatis ferrugineo-stellato-lepidotis. *Folia* imparipinnata, 2–3-jugata, foliolis oppositis vel novellis irregularibus ; petioli 2–6 cm. longi, sparse lepidoti, striati ; rhachides 2–6·5 cm. longi ; petioluli plerumque 1–2 cm. longi (petiolulus folioli terminalis usque ad 3 cm. longus), tenuiusculi ; foliola 6–16 cm. longa, 3–6·5 cm. lata, elliptica vel lanceolato-elliptica, lateralia plus minusve falcata, apice obtuse acuminata, basin breviter cuneata vel rarissime rotundata, utrinque reticulata, supra glabra, nitidula, infra venulosa, sparsissime et minute stellato-lepidota, costa conspicue et alte striata ; nervi laterales 7–12, valde arcuati. *Paniculae* ad 30 cm. longae, 20 cm. latae, terminales (et axillares ?), ramis longissimis tenuiusculis 20–28 cm. longis dense stellato-lepidoto-pubescentibus ; bracteae et bracteolae caducissimae ; pedicelli 2–3 mm. longi, 1 mm. lati, valde costati, dense stellato-lepidoti. *Sepala* coriacea, 1·5 mm. longa, ovata, obtusa, extus ferrugineo-lepidota, intus fere glabra. *Petala* 4–4·5 mm. longa, ovata, subacuta, extra dense argenteo-lepidota, intus minutissime glanduloso-papillosa. *Stamina* 6, sub margine disci disposita ; filamenta subulato-lanceolata, 1·5 mm. longa, furfuracea ; antherae oblongo-ovoideae, minutissime glanduloso-papillosae, 1 mm. longae. *Discus* magnus, carnosulus, albidus. *Ovarium* depresso-ovoideum, 1·5 mm. diametro, stellato-pubescens ; stigma magnum, plus minusve 2–3-lobatum, albidum, obscure lepidotum. *Fructus* non visus.

West Tropical Africa. Gold Coast : Kintampo, *Vigne* 2535, type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford ; " Tree in fringing forest, 50 ft. high and 5 ft. girth ; altitude 1100 ft." ; with flowers, Oct. 1932.

Canthium Martinii *Dunkley* sp. nov. [Rubiaceae] ; affinis *C. malacocarpo* (K. Schum. et K. Krause) Bullock, sed foliis herbaceis basi breviter cuneatis haud rotundatis, fasciculis multifloris ex

axillis foliorum delapsorum orientibus, cortice ramulorum papyraceo et pallide cinereo differt.

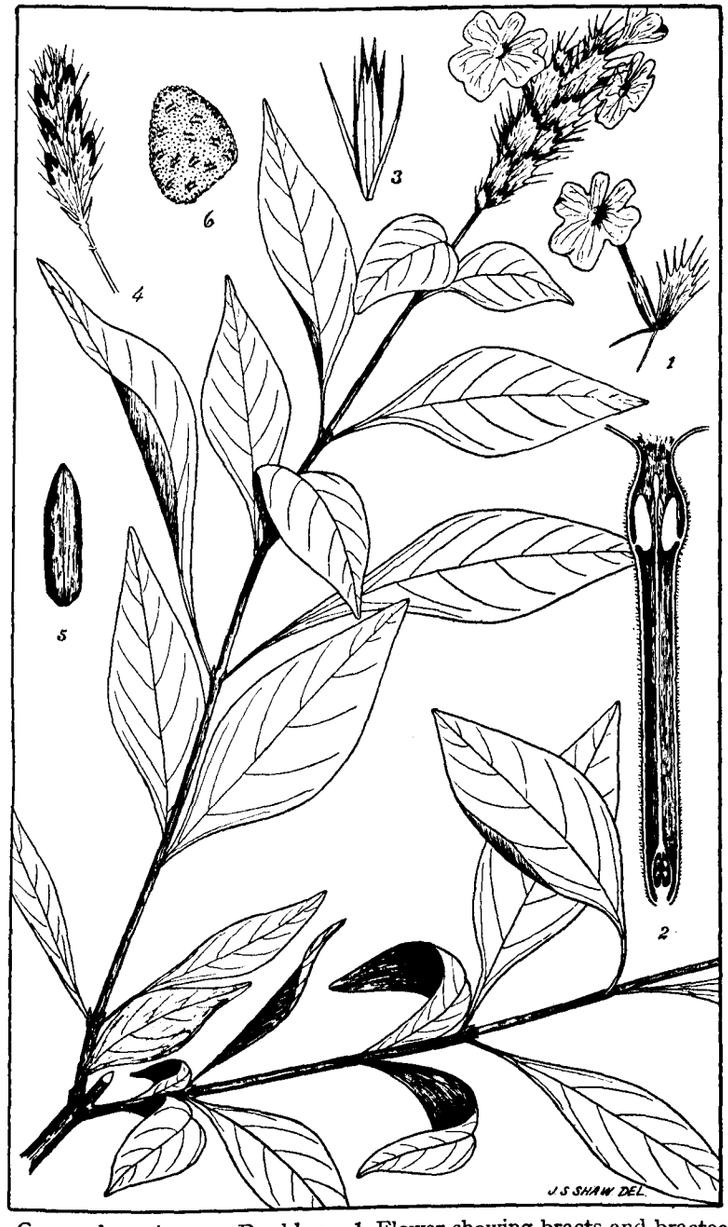
Frutex scandens, glaber, ramis teretibus angulo recto patentibus ramulis lateralibus brevibus 2-foliatis, cortice cinereo usque cinereo-brunneo. *Folia* elliptica vel ovato-elliptica, apice obtuse vel late et brevissime acuminata, basi subrotundata vel breviter cuneata, 5–7 cm. longa, 2–4 cm. lata, glabra, nervis lateralibus utrinsecus circiter 4 subtus subprominentibus ; petioli circiter 7 mm. longi. *Stipulae* caducissimae, basim versus ciliatae, triangulari-subulatae, 2 mm. longae. *Fasciculi* multiflori (30–50), pedicellis 7·5 mm. longis parce puberulis, bracteis minutis puberulis. *Calyx* parvus, denticulatus vel truncatus. *Corolla* 5 mm. longa, 4-loba, tubo 3 mm. longo, lobis reflexis 2 mm. longis. *Stamina* 4, filamentis brevibus, antheris oblongo-ellipticis 1·5 mm. longis. Ovarium 2-loculare ; ovula in loculis 1, pendula ; stylus glaber, filiformis, stigmate oblongo alte sulcato, longe exsertus. *Fructus* non visus.

South Tropical Africa. Northern Rhodesia : Bombwe, *J. D. Martin* 135/31 ; November, 1931 ; "A typical many stemmed Teak Forest woody climber." Type in Kew Herb., and Imperial Forestry Inst. Herb., Oxford.

Vernacular name " Sikanganteme " (Tok.).

Bonamia Vignei *Hoyle*, sp. nov. [Convolvulaceae] ; affinis *B. cymosae* Hallier f., a qua sepalis obtusis nec acute acuminatis, fructu multo majore, foliis longioribus haud sericeo-tomentellis nervis lateralibus paucioribus, pilis medifixis majoribus, recedit.

Frutex scandens, tenuis, novellis pilis longis fulvis plerumque medifixis crispatis munitis ; ramuli tenues, teretes, virides, pubescentes, novellis tomentosis. *Folia* subcoriacea, 5–12 cm. longa, 2–5 cm. lata, oblongo- vel lanceolato-elliptica vel plerumque obovata, apice late et obtuse vel acute acuminata, mucronata, basi subcordata vel rotundata, utrinque primum sparse pilosa margine ciliato, supra tandem glabra, costa cum nervis impressis, infra laxe reticulata, furfuracea, costa tomentosa nervis pubescentibus ; nervi laterales tenues 5–7 vel rarissime 9 ; petioli crassi, 3–6 mm. longi, tomentosi. *Paniculae* cymosae, terminales, densae, subcorymbosae, subsessiles, circiter 5 cm. diametro, et cymae axillares, pauciflorae, subsolitariae, 2–3 cm. latae, omnino dense fulvo-tomentosae ; bracteae 2 mm. longae, subulatae, tomentosae, deciduae ; bracteolae ellipticae ; pedicelli 4–6 mm. longi, tomentosi. *Sepala* 4–7 mm. longa, 3–5 mm. lata, subaequalia, elliptica vel latissime elliptica, extra tomentosa, intus glabra, fructu accrescentia, suborbicularia, 7 mm. diametro, glabrescentia. *Corollae tubus* 5–7 mm. longus, 2–3 mm. latus, anguste campanulatus, intus in fauce villosus ; lobi tubo aequilongi forma variabiles, elliptici vel lanceolati vel lineari-lanceolati, apiculati, extra adpresso-tomentosi, intus glabri, margine ciliati. *Stamina* in ore tubi disposita, exserta ; filamenta praeter basim glabra, corollae lobis fere aequilonga ;



Crossandra spinescens Dunkley. 1, Flower showing bracts and bracteoles (× ⅔) ; 2, longitudinal section of flower (× 3) ; 3, Calyx and bracteoles (× 2) ; 4, fruiting head (× ⅔) ; 5, Capsule (× 2) ; 6, seed (× 5).

antherae ovoideae, 2 mm. longae. *Ovarium* glabrum, ovoideum, 1 mm. diametro ; styli 2, liberi, 13 mm. longi, filiformes ; stigmata reniformia, 1 mm. diametro. *Fructus* capsularis, coriaceus, brunneus, oblique ovoideus, apiculatus, 8–10 mm. diametro, in calyce accrescenti pateriformi dispositus, valvis 4 dehiscens, extra rugulosus, nitidulus. *Semina* 2, vel rarius 1, oblique ovoidea, crassa, 6–8 mm. diametro, sanguinea, glanduloso-papillosa ; hilum curvatum, tenue, subbasale ; cadentia semina placentam biconcavam nigram persistentem relinquentia.

WEST TROPICAL AFRICA. Gold Coast : Tiasi, *Vigne* 1387, type, in Kew Herb., and Imperial Forestry Institute Herb., Oxford, with flowers, October, 1928 ; Owabi, *F. J. Lyon* 2631, with flowers and fruits, December, 1932 ; "A thin liane in closed forest, flowers white ; altitude 650 ft." ; " Climber in deciduous forest."

Crossandra spinescens *Dunkley*, sp. nov. [Acanthaceae] ; affinis *C. Greenstockii* S. Moore, a qua bracteis glabrescentibus longispinosis, calycis segmentis longioribus, foliis minoribus lanceolato-ellipticis recedit.

Frutex, ramis et ramulis breviter et dense pubescentibus, alabastris subulatis albo-sericeo-tomentosis. *Folia* utrinque sparse puberula, chartacea, lanceolato-elliptica, 6–10 cm. longa, 2–4 cm. lata, apice acuta, basi angustata petiolo decurrentia, supra viridia, nervis obscuris, infra pallidiora, costa nervisque subprominentibus ; nervi laterales utrinque 8–9, tenues, arcuati. *Spicae* terminales, densae, breviter pedunculatae, usque ad 8 cm. longae, bracteis obovatis dense breviterque pubescentibus apicem versus dentatis, dentibus circiter 10 spinoso-subulatis, 5–7 mm. longis, nervis 5–7 prominentibus, margine ciliatis, bracteolis subulato-linearibus calycem aequantibus. *Calycis segmenta* 5, scariosa, postico apice dentibus 2 innocuis puberulis munito 1·2 cm. longo. *Corolla* aurantiaca, tubo extra puberulo intus glabro 1·5–2 cm. longo, lobis 5, 2 posticis minoribus, antico breviter 2-fido 1 cm. longo. *Stamina* 4, in fauce tubi affixa, filamentis brevibus, antheris unilocularibus. *Ovarium* 2-loculare ; ovula in loculis 2 ; stylus glaber, stigmate tumido. *Capsula* oblongo-linearis, loculicide dehiscens, 1·5 × 0·5 cm. *Semina* 4, plano-compressa, sub-orbiculata, tuberculis et squamis adpressis laciniatis munita.

SOUTH TROPICAL AFRICA. Northern Rhodesia : Bombwe, *J. D. Martin* 219, type in Kew Herb. and Imp. For. Inst. Herb., Oxford ; "A small ant-heap shrub." Vernacular name " Kanyangomaluba " (Tok.)

Southern Rhodesia : Zambesi valley, Darwin District, *Swynnerton* 4004, " sub-shrub, growing in masses."

XXII—BOTRYOSTEGE: A NEW GENUS OF ERICACEAE.

The late O. STAPF.

This rather striking plant was discovered by Maximowicz in the year 1861 and described by him as *Tripetaleia bracteata* in 1867. It was collected by him and others in several localities on the volcanoes in the neighbourhood of Hakodate in the island of Yezo at altitudes above 2000 ft. In 1862 Maximowicz's native collector Tschonoski also found it in the northern part of Hondo, whilst still later records proved the extension of its area in that island as far south as 36° N. Lat. It frequently associates with the commoner *Tripetaleia paniculata*, whose range extends over the whole of both islands and also includes Kiusiu. Although described so long ago, it was not introduced into cultivation until 1915, after Wilson had collected it in Hondo the previous year.

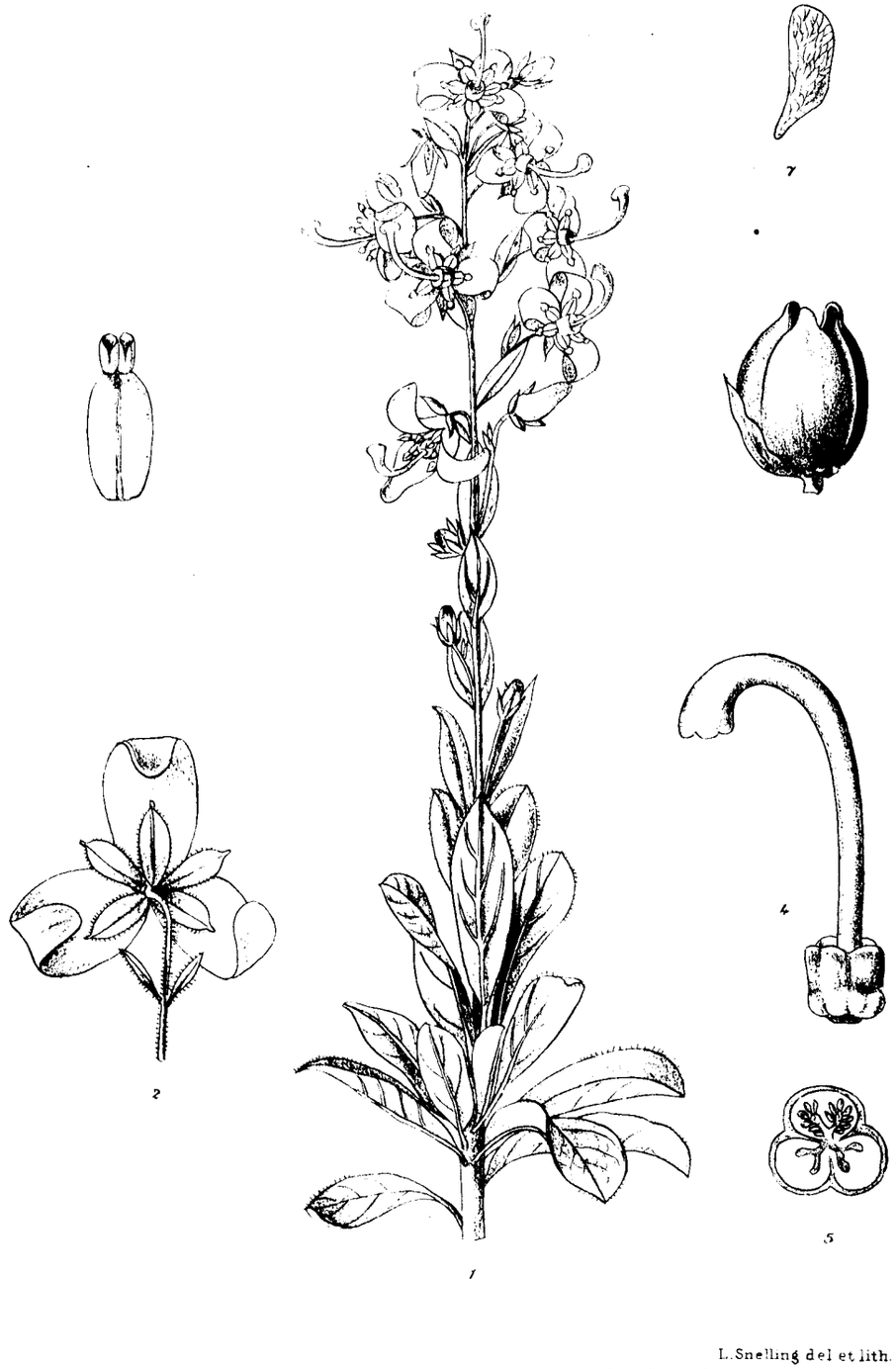
The taxonomic position of *Tripetaleia* has long been uncertain. When Siebold and Zuccarini established it, they suggested, though with considerable hesitation, that it might belong to *Olacaceae*, a family very imperfectly known at the time. Subsequent authors as Lindley, Endlicher, Römer and Miquel accepted this suggestion with more or less reserve, but when Bentham and Hooker were dealing with the *Olacaceae* in their Genera Plantarum (**1, 345 : 1862**) they excluded *Tripetaleia* from this family and proposed to place it in *Ericaceae*, without, however, entering further into the question. Then in 1871 Maximowicz, in an Addendum to his " Rhododendreae Asiae orientalis," pointed out the similarity which existed between *Tripetaleia* and the rare North American genus *Elliottia* (Bot. Mag. t. 8413), which had variously been placed by successive authors near *Clethra* (Bot. Mag. t. 1057, 3743, 8970) or near *Cyrilla* (Bot. Mag. t. 2456) and *Cliftonia* (Bot. Mag. t. 1625 as *Mylocaryum*), the last two genera belonging to *Cyrillaceae*, itself a family of very dubious position. Of these Maximowicz thought *Clethra* too different to be taken into consideration as a close ally of *Tripetaleia* and *Elliottia*. He rather looked upon the latter two as a connecting link between *Rhododendreae* and *Cyrillaceae*. Very shortly afterwards (1873) Hooker, in the second volume of the Genera Plantarum, reduced *Tripetaleia* to *Elliottia* which he placed in the tribe *Rhodoreae* of *Ericaceae*, associating it with the other dialypetalous members of the family, except *Clethra*, which was treated as a *genus anomalum*. As to the *Cyrillaceae*, these were at the same time assigned a place near the *Aquifoliaceae* (*Ilicineae*) and did not any longer come into consideration as related to *Elliottia*. More recently (1889) Drude in the " Natürlichen Pflanzenfamilien " restored *Tripetaleia* as distinct from *Elliottia*, but he otherwise accepted its association with the other dialypetalous *Ericaceae*, which he grouped in an emended tribe *Ledeae* ; *Clethra* becoming the type of a distinct family *Clethraceae* (see Bot. Mag. t. 8970). This arrangement left five genera in *Ledeae*, three with summer-green leaves and a very similar facies, namely *Elliottia* (1 spec.), *Tripetaleia* (2 spec.) and *Cladothamnus*

(1 spec.) and two with evergreen leaves and a very distinct appearance, *Bejaria* (16 spec.) and *Ledum* (3 spec.). It seems quite natural so far as the wider affinities come into consideration, but it breaks down with respect to the plant figured here and its relations to the original *Tripetaleia* and to *Elliottia*. The nature of these relations will become apparent from an examination of the three sections (each containing one species), which Hooker recognised when he enlarged the concept of *Elliottia*, the italicised portions at the commencement of each section being a translation of Hooker's Latin diagnoses in the Genera Plantarum **2**, 598.

Section 1 (*E. racemosa*, the species on which the genus was based) *with a short cupular* 4–5*-dentate calyx*, 4–5 *petals*, 5–10 *stamens*, *a sessile ovary and "ebracteate" pedicels*. As to this I would remark that I have found the flowers to be tetramerous in all their parts, or occasionally pentamerous in the calyx, and the ovary to be borne on a short gynophore as long as the ovary proper and as stout or even stouter, its surface apparently acting as a disc. Whether it elongates after flowering we do not know. With regard to the absence of bracts, I find that bracts as well as bracteoles occur occasionally, but they are small and generally early deciduous. The bracteoles, however small, often carry rudimentary flower-buds in their axils, suggesting a tendency towards reversion to an original more paniculate inflorescence, the normal inflorescences being typical racemes with a few occasional ramifications of a second order. As to the number of ovules, there is a considerable discrepancy in the statements of authors. Baillon (1860) speaks of *E. racemosa* as having "a great number" of ovules covering the outside of a fleshy "double" placenta. Hooker (1873) credits *Elliottia* (sensu lato) with few or many ovules*; Drude (1889) attributed to *E. racemosa* a 4-celled 4-ovuled ovary, whilst Sargent (1902) and Britton (1908) say "ovules numerous in each cavity." My own dissections of the ovaries of field- and cultivated specimens and microtome-sections, kindly prepared for me by Dr. C. R. Metcalfe, would seem to establish the presence of about 10 shield-like ovules tightly appressed to the placenta in each cell. I am not sure, however, that they are normal, very few of them showing an embryo-sac and an indication of a micropyle. If they should be normal as to number, shape and position relative to the placenta, the question of the generic identity of *Elliottia racemosa* and *Tripetaleia paniculata* will have to be reconsidered.

Section 2 (*E. paniculata*, that is the *Tripetaleia paniculata* of Siebold and Zuccarini) *with a short cupular* 5*-lobed calyx*, 3–5 *petals*, 3–6 *stamens*, *a stipitate ovary and linear bracts*. The calyx is practically as in section 1, but with the teeth often very

*When figuring *E. racemosa* in the Botanical Magazine (t. 8413) Hooker omitted to state the number of ovules, but a section of the ovary (fig. 3) suggests a limited number, whilst a drawing, by the same author, on a sheet in the Kew Herbarium, is accompanied by the note "3–4 amphitropous ovules in each cell."



L. Snelling del et lith.

Botryostege bracteata (Maxim.) Stapf. 1, a flowering branch, nat. size; 2, a flower in back view, ×3; 3, a stamen, ×5; 4, the gynoecium, ×5; 5, transverse section of the ovary, the ovules being omitted in two of the carpels, ×6; 6, a fruit, ×5; 7, a seed, ×24.

[*To face page* 192.

minute or quite obsolete, so that the calyx might be described as "cupular, truncate." The number of calyx teeth, if any, is generally 5, but there may be fewer owing to suppression. I can find no confirmation of Hooker's statement "petala 3–5, stamina 3–6"; their numbers seem to be constantly 3 and 6 respectively. The description of the ovary as stipitate is due to the presence of a gynophore as in section 1, but owing to its diameter being less than that of the ovary even in the flower—the body composed of gynophore (stipe) and ovary is of the shape of a short stout club—it is more conspicuous, and as it shrinks and elongates during maturation, the ripe capsule appears quite distinctly "stalked" or stipitate. The bracts and bracteoles are of the same nature as in section 1, but generally more developed and only rarely quite suppressed; both are finally deciduous.

Section 3 (*E. bracteata*, that is *Tripetaleia bracteata*) *with* 5 *linear-oblong sepals exceeding the capsule*, 3–5 *petals and* 3–5 *stamens, a sessile ovary and ample bracts.* This diagnosis is correct except in so far as I have always found the flowers trimerous from the petals onwards and as the gynophore is very short and, in the flower, as stout as the ovary, it is easily overlooked in this stage. In the mature fruit it may have become more obvious.

To resume briefly; sections 1 and 2 are, except for the numbers of parts of the flower, so much alike that they might be said to be congeneric, but the ovules, which are still very imperfectly known, seem to be peculiar, and until their exact nature is worked out, it will be better to treat the union of the two sections under *Elliottia* as provisional. Section 3, however, differs from both very markedly in the calyx, which consists of 5 perfectly distinct subfoliaceous sepals, in the comparatively large bracts which very much resemble the foliage-leaves except for their size and in the purely racemose inflorescences. It approaches more closely to *Cladothamnus* than to *Elliottia* (Sections 1 and 2). *Cladothamnus* (Bot. Mag. t. 8353) differing mainly in its strictly pentamerous flowers, which stand singly or raceme-fashion in groups of 2 or 3 at the ends of branchlets with more or less reduced foliage-leaves to support them. In the circumstances it seems to me most expedient to reduce *Tripetaleia paniculata* to *Elliottia* for the present and to treat *T. bracteata* as the type of a distinct genus most nearly allied to *Cladothamnus* and for this I propose the name *Botryostege*. The geographical distribution of these three deciduous-leaved genera of *Ledeae* is interesting: *Elliottia* in two widely distant areas, one covering practically all Japan (*E. paniculata*), the other reduced to a very few stations in Eastern Georgia and adjacent South Carolina, *Botryostege* in Yezo and the northern half of Hondo, and *Cladothamnus* in the Pacific coast ranges from Alaska to Oregon. This distribution is in accord with the numerous instances which testify to the ancient relationship of the floras of Eastern Asia and North America and it is significant that the species most isolated from the common circumpacific area

of the group, *E. racemosa*, is a typical relict species, and evidently doomed to early extinction. Nor can the remainder of the group, all sharply defined and very homogeneous species, be looked upon as being in the ascendancy. They are rather vestiges of an old aberrant type of *Ericaceae* still enjoying some vigour in Japan, which has preserved so much of its tertiary flora. There is no space left to speak here of the other two genera of *Ledeae*. They are, as already stated, not very intimately connected with the group under discussion, but they too fit into our picture of the tertiary floral connections between Eastern Asia and America, one, *Ledum*, a little diversified circum-polar group with southward radiations, the other, *Bejaria*, an essentially Andine type which has lost its linkage in the north and blossomed out into a fair number of partly dominant species.

The following is a description of the plant, together with a list of synonyms :—

Botryostege Stapf (gen. nov.) ; a *Tripetaleia* Siebold et Zucc., et etiam ab *Elliottia* Muhl., cui sub titulo sectionis subiunctum erat, calyce 5-sepalo, sepalis et bracteis subfoliaceis distinctum, potius *Cladothamno* Bong., affine, sed floribus calyce excepto 3-meris racemosis distans.

Calyx 5-sepalus, sepalis lineari-oblongis subfoliaceis maiusculis. *Petala* 3, leviter imbricata, lineari-oblonga, revoluta. *Stamina* 6, filamentis late complanatis ; antherae dorso basi affixae, loculis poro apicali in rimam decurrente dehiscentibus. *Discus hypogynus* crassus, gynophorum cingens. *Ovarium* gynophoro brevissimo insidens, 3-loculare, apice intruso ; stylus elongatus, sursum curvatus, et sub apice clavatus ; stigma basi annulatum, lobulatum. *Ovula* numerosissima. *Capsula* brevissime vel vix stipitata, globosa, 3-loba, poro apicali dehiscens, deinde tarde septicide et saepe horizontaliter disrupta, valvis tenaciter crustaceis ab axi placentifero solutis. *Semina* numerosissima, oblique oblonga, basi acuta ; testa laxe cellulosa apice in alam brevem obtusam producta ; albumen carnosum. *Embryo* minutus, cylindricus, apice 2-lobus.—*Fruticulus* subglaber, ramosissimus, gemmis perulatis. *Folia* alterna, petiolata, petiolo brevissimo, obovata, integra, hydathoda terminata. *Flores* in racemos terminales pauci- vel pluriflores dispositi ; bracteae subfoliaceae, diu persistentes ; pedicelli graciles, demum elongati, 2-bracteolati. *Capsulae* erectae.

Botryostege bracteata *Stapf* (comb. nov. e *Tripetaleia bracteata* Maxim.). Species unica.

Syn. : *Tripetaleia bracteata* Maximowicz in Bull. Acad. Pétersb. **11**, 433 vel Mél. Biol. **6**, 206 (1867) **16**, 407 vel Mél. Biol. **8**, 622 (1871) ; Franch. & Sav. Enum. Pl. Jap. **1**, 294 (1875) ; de Boissieu in Bull. Herb. Boiss. **5**, 915 (1897) ; Ono in Bot. Mag. Tokyo, **11**, 67 (1897) ; Inui, Hattori & Kuseno in Bot. Mag. Tokyo, **12**, 24 (1898) ; Schneider, Ill. Handb. Laubholzk. **2**, 467, fig. 311, g-i (1909) ; Matsumura, Index Pl. Jap. **2**, pt. 2, 466 (1912) ; Komatsu in Matsumura, Ic. Pl. Koisikav. **1**, 141, t. 71 (1913) ; Bailey, Stand. Cycl. Hort. **6**, 3383 (1917) ; Nakai, Trees & Shrubs Japan, **1**, 15 (1927) ; Rehder, Man. Cult. Trees & Shrubs, 677 (1927).

Elliottia bracteata Hook. f. in Benth. & Hook. f., Gen. Plant. **2**, 598 (1876).

XXIII—NOTES ON AFRICAN GRASSES : XVI.*

A. P. Goossens.

Brachiaria stolonifera *Goossens*, sp. nov. ; affinis *B. Marlothii* Stent, sed spiculis majoribus elliptico-lanceolatis acutis differt.

Gramen perenne, caespitosum, stoloniferum. *Culmi* usque ad 19 cm. alti, geniculati, graciles, striati, sparse pilosi, 1–2-nodes. *Foliorum vaginae* striatae, carinatae, basi dense villosae, apicem versus sparse villosae ; *ligulae* ciliatae ; *laminae* lineari-lanceolatae, acuminatae, apice acutae, usque ad 7 cm. longae, usque ad 5 mm. latae, planae, supra pubescentes, subtus pilosae (pilis basi bulbosis), marginibus scabridis et sparse ciliatis. *Inflorescentia* usque ad 7·15 cm. longa, paniculata, exserta, erecta ; axis gracilis, triqueter, inferne laevis, superne secus angulos scaber ; rami 5, solitarii, distantes, 2·5–3 cm. longi, suberecti ; rhachis 2·5–3 cm. longa, gracilis, triquetra, basi dense pubescens, angulis scabridis ; pedicelli brevissimi, scaberuli, apice subdiscoidei. *Spiculae* 2-florae, 3 mm. longae, densae, elliptico-lanceolatae, acutae, sericeo-pubescentes. *Glumae* membranaceae, inaequales ; inferior 2·25 mm. longa, ovata, obtusa vel subacuta, 3-nervis ; superior spiculam aequans, concava, 5-nervis. *Lemmata* 2, dissimillima ; lemma inferius membranaceum, ♂, 3 mm. longum, *glumae superiori* simillimum sed dorso depressum ; palea lemmati similis sed subhyalina et glabra ; lemma superius subcoriaceum, ♀, 2·25 mm. longum, abrupte mucronatum ; palea lemmati similis sed emucronata. *Antherae* 1·5 mm. longae, lineares.

Cape Province : Gordonia District ; along the Molopo River, *Pole Evans and Pentz in Nat. Herb. Pretoria*, 8327 (type) ; *Goossens* 608.

Themeda triandra *Forssk.* var. **trachyspathea** *Goossens*, var. nov. ; affinis var. *punctatae* Stapf, sed vaginis foliorum scabridis et apicem versus pilis e tuberculis ortis dense hirsutis differt.

Swaziland : Hlumi, on mountain slope under trees, *van Vuren in Nat. Herb. Pretoria* 10082.

Panicum coloratum *L.* var. **makarikariensis** *Goossens*, var. nov. *Gramen* glaucissimum ; culmi validi, usque ad 2·25 m. alti ; foliorum vaginae inferiores basi dense sericeo-pilosae.

Bechuanaland : Makarikari pan, on the Nati River, *Pentz in Nat. Herb. Pretoria* 8416 ; *Phillips and Goossens in Nat. Herb. Pretoria* 8787.

*Continued from K.B. 1934, 119.

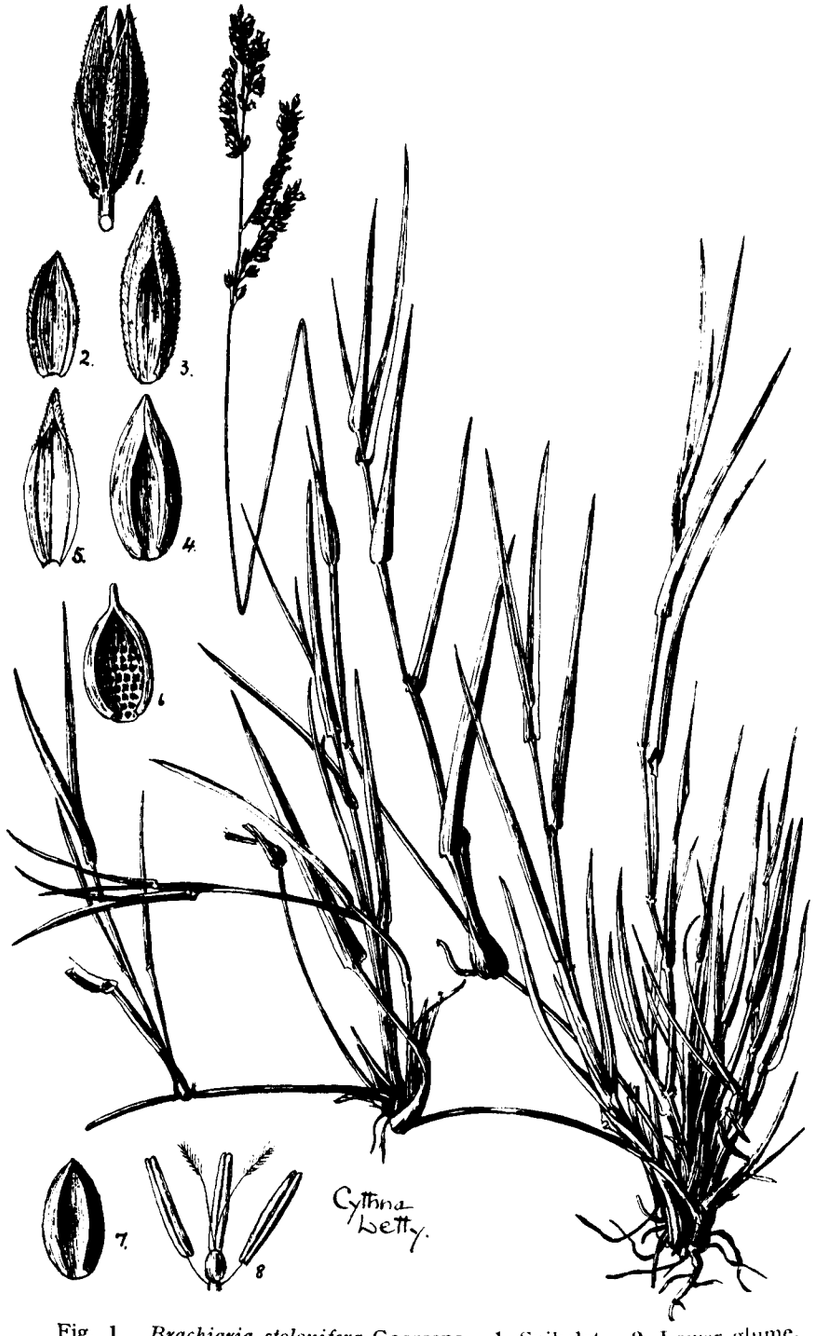


Fig. 1. *Brachiaria stolonifera* Goossens. 1, Spikelet. 2, Lower glume. 3, Lower lemma. 4, Pale of lower lemma. 5, Upper glume. 6, Upper lemma. 7, Pale. 8, Flower.

This grass is now cultivated at the Prinshof Experimental Station, and promises to become very valuable as a pasture grass. At the Makarikari pan this grass is especially sought by " Wilde Beeste."

Sporobolus Smutsii *Stent* var. **longifolius** *Goossens*, var. nov.; a typo differt culmis majoribus, foliorum laminis plus 8 cm. longis, stolonibus validis internodiis multo longioribus 7·5–10 cm. longis.

TRANSVAAL: Zoutpansberg District; Messina, *Pole Evans* 2629.

ZULULAND: Magut, *Goossens* 609.

Sporobolus bechuanicus *Goossens*, sp. nov.; affinis *S. indico* R. Br., sed spiculis majoribus pallidis, glumis valde inaequalibus, foliorum laminis supra scabridis differt.

Gramen perenne, caespitosum. *Culmi* usque ad 1·1 m. longi, teretes, glabri, laeves, 3–5-nodes. *Folia* plerumque basalia; vaginae striatae, glabrae, laeves; ligulae ciliatae; laminae lineares, acuminatae, usque ad 20 cm. longae, 3·5 mm. latae, planae vel convolutae, graciles, striatae, glabrae, subtus laeves, supra scabridae, marginibus breviter et rigide ciliatis. *Inflorescentia* spicata, usque ad 23·3 cm. longa, 5–7 mm. lata; rami verticillati, appressi, graciles, glabri, laeves; ramuli solitarii, graciles, glabri, laeves. *Spiculae* uniflorae, 2·5–2·75 mm. longae, pallidae. *Glumae* valde inaequales, submembranaceae, glabrae, laeves; inferior 1 mm. longa, ovata, apice subobtusa, enervis; superior 2·5 mm. longa, ovata, subacuminata, apice acuta, uninervis. *Lemma* ovatum, subacutum, 2·5–2·75 mm. longum, submembranaceum, uninerve. *Palea* lemmati textura et forma similis, truncata. *Antherae* 1·25 mm. longae, lineares.

BECHUANALAND PROTECTORATE: Bushman mine, *Pentz in Nat. Herb. Pretoria* 8417 (type); Makarikari Lake, *Pole Evans* 3277, 3279.

Allied to *S. indicus* R. Br., from which it differs in the large pallid spikelets, the very unequal glumes and the leaves which are scabrid on the upper surface.

Monelytrum annuum *Goossens*, sp. nov.; affinis *M. Luderitziano* Hack., sed foliorum laminis longioribus, spiculis minoribus differt.

Gramen annuum, caespitosum. *Culmi* erecti, usque ad 33 cm. longi, ramosi, 2–3-nodes, teretes, canaliculati, glabri, laeves. *Foliorum vaginae* striatae, carinatae, glabrae, laeves; ligulae leviter membranaceae, ciliolatae; laminae lineares, basi contractae, acuminatae, acutae, usque ad 16 cm. longae, 3–4 mm. latae, planae, laeves, glabrae, marginibus rigide ciliatis. *Panicula* angusta, cylindrica, spicata, usque ad 12·5 cm. longa. *Fasciculi* basi villosi, decidui, 4-spiculati; spiculae 3 inferiores fertiles; spicula summa sterilis, bracteiformis. *Spiculae* fertiles 1-florae. *Gluma* solitaria, herbacea, usque ad 5·25 mm. longa, lanceolata, basi villosa, prominenter 5-nervis (sed in spicula summa 3-nervis), acuminata, aristata, nervis et marginibus scabridis; arista usque ad 4·25 mm. longa, scabrida. *Lemma* lanceolatum, acuminatum, usque ad 5 mm.



Fig. 2. *Sporobolus bechuanicus* Goossens. 1, Spikelet. 2, Lower glume. 3, Upper glume. 4, Lemma. 5, Pale. 6, Flower.

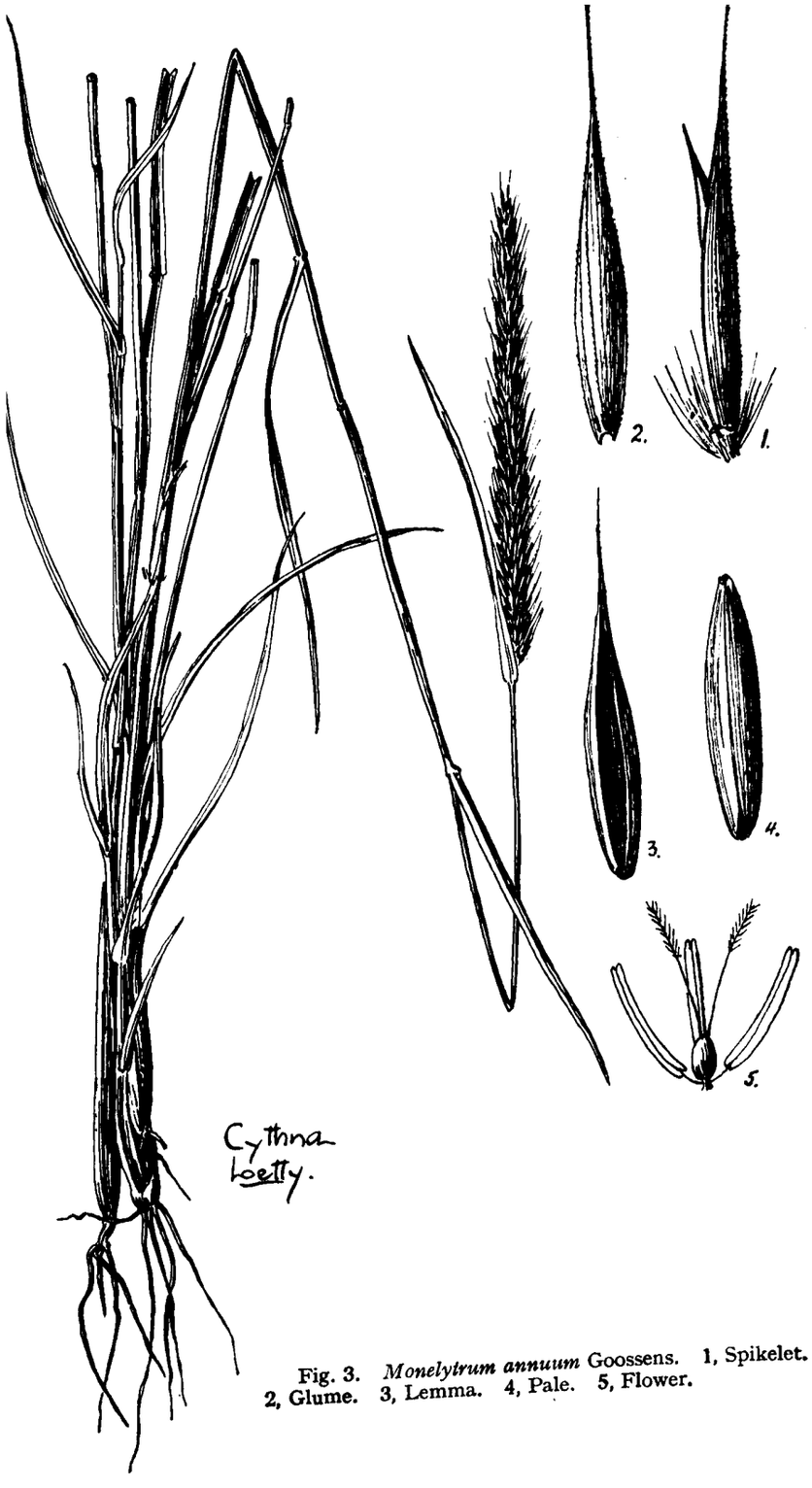


Fig. 3. *Monelytrum annuum* Goossens. 1, Spikelet. 2, Glume. 3, Lemma. 4, Pale. 5, Flower.

longum, membranaceum, sparse pilosum, 3-nerve, breviter aristatum; arista scaberula. *Paleae* submembranaceae, usque ad 3·25 mm. longae, emarginatae vel bifidae, binerves. *Lodiculae* 0. *Antherae* 1·75 mm. longae, lineares.

SOUTH WEST AFRICA: Without precise locality, *Drinkuth* 11.

The leaves are longer, and the spikelets smaller, than in *M. Luderitzianum* Hack. The plant is also an annual.

Crinipes gynoglossa *Goossens*, sp. nov.; affinis *C. abyssinicae* Hochst., sed culmis gracillimis, foliorum laminis angustissime linearibus, panicula multo minore differt.

Gramen perenne, dense caespitosum. *Culmi* usque ad 49 cm. alti, erecti, adscendentes, simplices, teretes, gracillimi, glabri, laeves, 1–2-nodes; internodium summum longe exsertum. *Foliorum laminae* usque ad 23 cm. longae, anguste lineares, basi convolutae, apice pungentes, infernes laeves, superne prominenter striatae, glabrae; ligulae ciliatae; vaginae persistentes, pubescentes, ore longe barbatae. *Panicula* usque ad 5·5 cm. longa, erecta, laxa, angusta; rhachis sinuata, glabra, subtriquetra; rami erecti, usque ad 1·25 cm. longi, singuli vel bini, 1–4-spiculati. *Spiculae* 3–4-florae, usque ad 7 mm. longae, lateraliter compressae, pedicellatae; rhachilla supra glumas et inter lemmata articulata, supra florem summum producta. *Glumae* inaequales, membranaceae; inferior brevior, oblonga, integra vel 2-lobata, 2·25 mm. longa; superior oblongo-lanceolata, 3-lobata, 3·25 mm. longa, carinata, 1-nervis, mucronata vel breviter aristulata. *Flores* hermaphroditi. *Lemmata* 3–4, e glumis exserta, oblonga, 3-lobata, 5 mm. longa, basi pilosa, 3-nervia, nervis excurrentibus, mucronata vel breviter aristulata; callus crassus, pilis longis obtectus. *Paleae* 3·5 mm. longae, anguste lineares, basi subbarbatae, apicem versus scabridae, 2-lobatae. *Stamina* 3; antherae lineares. *Ovarium* glabrum, anguste oblongum, inter stylos appendice deltoidea instructum. *Caryopsis* linearioblonga; embryo brevis; hilum basale, punctiforme.

TRANSVAAL: Barberton District; Kaapsche Hoop, *Pole Evans* 1022.

Enneapogon spathaceus *Goossens* sp. nov.; affinis *E. molli* Lehm., sed culmis validioribus altioribus, vaginis internodiis longioribus, panicula laxiore, glumis 7-nervibus differt.

Gramen perenne. *Culmi* erecti vel geniculati vel decumbentes, usque ad 90 cm. alti, simplices vel ramosi, glabri vel nodis hirsutis. *Foliorum vaginae* internodiis longiores, molliter glanduloso-pubescentes vel tandem subglabrae; laminae lineares, usque ad 20 cm. longae, usque ad 3·5 mm. latae, plerumque convolutae, molliter glanduloso-pubescentes. *Paniculae* angustae, lineares vel lanceolatae, usque ad 14 cm. longae; rami solitarii, usque ad 2·5 cm. longi. *Spiculae* usque ad 6 mm. longae. *Glumae* subaequales, breviter glanduloso-pilosae, apice lobatae, breviter mucronatae. *Lemmata*



Fig. 4. *Crinipes gynoglossa* Goossens. 1, Spikelet. 2, Lower glume. 3, Upper glume. 4-5, Lemma. 6, Pale. 7, Lodicule. 8, Flower.

inferiora extra villosa, intus glabra ; aristae plumosae, 4–5·5 mm longae. *Paleae* 3·5 mm. longae, secus carinas glanduloso-hirsutae.

TRANSVAAL : Zoutpansberg District ; Messina, in Botanical Reserve, *Pole Evans in Nat. Herb. Pretoria* 110083, 110084.

It comes near to *E. mollis* Lehm., but the culms are stouter, taller and sheathed all along ; the panicle is laxer ; and the glumes are 7-nerved.

XXIV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XX.* T. PETCH.

ENTOMOGENOUS FUNGI FROM BRITISH GUIANA.

The following entomogenous fungi were collected by Mr. Paul Richards during the Oxford University Expedition to British Guiana. All the specimens were collected in one locality, Moraballi Creek, and, except where otherwise stated, in the undergrowth layers of the forest, within two or three metres from the ground.

The collection is of value in affording additional material of several of Möller's Brazilian species, and the conidial stages of several well-known *Cordyceps*. It is remarkable in containing numerous gatherings of *Ophiocordyceps unilateralis* (Tul.) Petch., a species which apparently evaded Möller and has been considered rare.

I am indebted to Sir Guy A. K. Marshall, and to Messrs. H. St. J. Donisthorpe, F. W. Edwards, O. W. Richards, and W. Tams for the determination of the insects.

Hypocrella phyllogena (*Mont.*) *Speg.*, Fung. Argent. Pug. **4**, (1881), emend Petch in Ann. Roy. Bot. Gard. Perad. **7**, 228 (1921).

On leaves of *Ochnocarpus* sp., " pale orange," August 21, 1929, *Richards* 135 ; on under side of leaves of *Aspidosperma excelsum* Benth., 90 feet from ground, September 27, 1929, *Richards* 493 ; on leaves of *Hernandia guianensis*, Arawan River, North Western District, May 1929, *Martyn* 46.

One stroma in No. 493 is the form from which von Höhnel named *Hypocrella coronata*.

H. libera *Syd.* in Ann. Myc. **14**, 85 (1916).

On leaves of small tree in undergrowth of moist Mora forest, August 21, 1929, *Richards* 155 ; on leaves of seedling *Cassia pteridophylla* in Wallaba forest, November 2, 1929, *Richards* 747.

Aschersonia Goldiana *Sacc. et Ellis* in Sacc. Syll. Fung. **14**, 990 (1890).

On dead leaf on floor of moist forest, August 21, 1929, *Richards* 142 ; on leaves of Morabukea tree, 130 feet up, October 24, 1929, *Richards* 669.

*Continued from K.B. 1934, 126.

A. turbinata Berk. in Ann. Mag. Nat. Hist. ser 2, **9**, 199 (1852).

On peduncles of *Psychotria* sp. in undergrowth, " yellow, orange inside," September 6, 1929, *Richards* 338.

Cordyceps tuberculata (*Lebert*) *Maire* in Bull. Soc. d'Hist. Nat. de l'Afrique du Nord, **8**, 165 (1917).

On moth (Noctuid) on leaf of palm in Wallaba forest, September 20, 1929, *Richards* 405 ; on moth (*Cocytius duponchel* Poey) on bark ; at base of tree, " primrose yellow," August 26, 1929, *Richards* 236 ; on moth (Noctuid) attached to palm leaf in mixed forest, October 10, 1929, *Richards* 571.

No. 405 is perithecial ; part-spores 4–8μ long.

C. polyarthra *Möller* in Schimper, Bot. Mitteil. aus den Tropen, **9**, 213 (1901).

On a lepidopterous pupa on floor of mixed forest, " pale yellowish, smooth," September 26, 1929, *Richards* 461.

The specimen agrees with Möller's description and figures. It bears conidial and perithecial clavae, both long and filiform, the perithecial clavae so thin that they are not at first recognised as such. Möller described the colour as honey yellow (Sacc. 30, melleus). In the dried specimen the clavae are dark red-brown and horny, subtranslucent. I have another specimen from British Guiana collected by Mr. A. W. Bartlett.

Möller stated that the conidial clava divided above into a brush of separate branches, but he was unable to determine the mode of attachment of the conidia. In this specimen, the conidial clavae divide at the apex into spreading branches which ultimately separate into individual hyphae bearing clusters of phialides at the tips. The tip of the hypha is about 3μ diameter, and bears a cluster of phialides, forming a small head. The phialides are about 4 high, 2·5μ diameter, globose with conical neck, or conoid, 4×2μ. The conidia are narrow-oval, subcymbiform or curved, or cylindric, ends obtuse, 3–4×1·25–1·5μ.

From von Höhnel's description, this Isaria appears to be his *Gibellula eximia* from Brazil. It is not, however, a *Gibellula*, and it is quite different from the specimens from Java which von Höhnel distributed as *Gibellula eximia*.

C. dipterigena *B. et Br.* in Journ. Linn. Soc. **14**, 111 (1873).

On a fly (Muscidae, Calyptratae) on a fallen leaf, " fructifications buff-white," October 23, 1929, *Richards* 664 ; on a fly (Asilidae, Asilinae) attached to the leaf-stalk of a shrub in undergrowth of mixed forest, October 15, 1929, *Richards* 572.

No. 664 bears six perithecial clavae from the thorax, as figured by Möller for his *C. muscicola*. No. 572 bears two immature clavae from the thorax and a conidial clava from the tip of the abdomen, as in Ceylon specimens of *C. dipterigena*. The conidial stage is a *Hymenostilbe*, which has been described as *H. dipterigena* Petch.

C. Lloydii *Fawcett* in Ann. Mag. Nat. Hist. ser. 5, **18,** 316 (1886).

On ants (*Camponotus* sp.) on leaves of various plants in undergrowth, August 26, 1929, *Richards* 238 (in part) ; on an ant (*Camponotus* sp.) on leaf of sapling tree in undergrowth of Wallaba forest, November 7, 1929, *Richards* 774 ; on *Camponotus* sp., without number ; without data, A. W. Bartlett. These specimens are in part conidial and are those cited in the description of *Hymenostilbe Formicarum* Petch in Trans. Brit. Myc. Soc. **16,** 218 (1932).

C. bicephala *Berk.* in Hook. Journ. Bot. **8,** 278 (1856).

C. australis Speg., Fung. Argent. Pug. **4,** 80 (1881).

On an ant (*Megaponera foetens* F.) on small tree in undergrowth of rain forest, August 21, 1929, *Richards* 149 (in part) ; on an ant (*Polyrachis* sp.) on leaf in undergrowth, " red, stipe black," August 27, 1929, *Richards* 246 ; on an ant (*Megaponera foetens* F.) buried in moss on a tree trunk, near ground, in well-lit Morabukea forest, September 24, 1929, *Richards* 450 ; on ants (*Megaponera foetens* F.) among moss on rotten log in dark forest, " cap and upper part of stipe scarlet, lower part of stipe black," September 25, 1929, *Richards* 451 ; on an ant (*Megaponera foetens* F.) among moss on trunk of tree, about 4 feet from ground in mixed forest, " head scarlet, stalk dull black, except at top, which is scarlet," October 29, 1929, *Richards* 708 ; inside rotten log, Supenaam Forest Reserve, Bartica, August 1930, *Martyn* 210.

The perithecial clava is apparently readily identified when fresh by its red head and red apex of the stalk. In specimens preserved in formalin the apex of the stalk is white, and the head white or pale ochraceous. Mr. Richards states that these red-tipped forms are always found among moss on tree-trunks, the insect often being quite hidden by the moss and generally rather badly decayed.

C. bicephala is quite distinct from *C. myrmecophila* Ces. The majority of the specimens in this collection are perithecial, with straight or flexuose, simple, rhizomorphic stalks up to 8 cm. long. One clava has a short barren branch, at about one-third of its height from the head. No. 149 contains three conidial specimens, (*a*) with a short conidial clava arising from an antenna ; (*b*) an immature black clava from the thorax, and a short conidial clava from an antenna ; (*c*) a conidial clava from an antenna, another from the thorax, and a curved perithecial clava from the abdomen, which bears a conidial branch just below the head. The conidial stage was named *Isaria melanopus* by Spegazzini, and now stands as *Hymenostilbe melanopoda* (Speg.) Petch (Trans. Brit. Myc. Soc. **16,** 209 : 1932).

C. sphecocephala (*Kl.*) *Berk. et Curt.* in Journ. Linn. Soc. **10,** 376 (1869).

On a wasp (*Gymnopolybia* sp.) on leaf of Morabukea, 70 feet from ground, September 27, 1929, *Richards* 381.

Ophiocordyceps unilateralis (*Tul.*) *Petch* in Trans. Brit. Myc. Soc. **16,** 74 (1931).

Cordyceps unilateralis (Tul.) Sacc. in Michelia **1,** 320 (1878). On an ant (*Camponotus* sp.) on leaf of monocotyledon in the herbaceous layer of tropical rain-forest, August 14, 1929, *Richards* 17 ; on ants (*Meganoponera foetens* F. and *Camponotus* sp.) on leaf in dark rain forest, August 16, 1929, *Richards* 39 and 40 ; on an ant (*Camponotus* sp.) on leaf in undergrowth, August 17, 1929, *Richards* 67 ; on an ant on leaf of *Miconia* sp. August 17, 1929, *Richards* 95 ; on an ant (*Camponotus* sp.) on a small tree in undergrowth of rain forest, August 21, 1929, *Richards* 149 (in part) ; on ants (*Camponotus* sp.) on leaves of various plants in undergrowth, August 26, 1929, *Richards* 238 (in part) ; on an ant (*Camponotus* sp.) on upper surface of leaf of small shrub in swamp forest, August 27, 1929, *Richards* 247 ; on an ant (*Camponotus* sp.) on leaf in undergrowth, August 30, 1929, *Richards* 280 ; on ants (*Camponotus* sp.) on leaves of tree at 3 feet and 30 feet, September 26, 1929, *Richards* 489 ; on an ant (*Camponotus* sp.) on leaf in forest undergrowth, September 26, 1929, *Richards* 490.

Mr. Richards states that *O. unilateralis* is usually found on the under side of the leaves of shrubs and young trees. In these specimens, the number of perithecial plates on a clava varies from one to four. If the tip of a clava has been broken off, a plate may grow over the broken end and simulate a terminal hemispherical head ; or two plates may occur on opposite sides of the clava, with a similar appearance. The perithecial clavae usually arise from the head of the insect and bear conidiophores towards the apex, but independent conidial clavae may arise anywhere. As previously recorded, the conidial stage is a *Hirsutella.*

Stilbum Buquetii *Mont. et Robin* in Ch. Robin, Hist. Veg. Parasit. 640 (1853).

On a weevil (*Anchonus* sp.) on stem of climber in well-lit sandy forest, August 23, 1929, *Richards* 197.

The specimen bears only one clava, from between the abdomen and the thorax, which is immature, but its villose stalk agrees with Robin's description.

XXV—AFRICAN ORCHIDS : VI.* V. S. Summerhayes.

Habenaria (§ Ceratopetala) tentaculigera *Rchb. f.* in Flora, 1867, 101. *H. ludens* Kraenzl. in Engl. Jahrb. **51,** 394 (1914) ; Schlechter, in Engl. Jahrb. **53,** 510 (1915).

An examination of the two type collections (*Welwitsch* 716 and *Kassner* 2132) and of other gatherings from Nyasaland and southern Tanganyika Territory has shown that they all represent the same species. The really remarkable column, in which the two parts of the very much elongated anther connective lie parallel to one another,

*Continued from K.B. 1933, 254.

each bearing a loculus at the anterior end and together almost completely surrounding the orifice of the spur, is the most characteristic feature of the species. Slight variations in the spur and other parts of the perianth are such as might be expected in different individuals or populations.

Habenaria (§ Bilabrellae) ndiana *Rendle* in Journ. Linn. Soc. Lond. **30**, 393 (Feb. 1895). *H. ingrata* Rendle in Journ. Bot. 1895, 279 (Sept. 1895); Summerhayes in Kew Bull. 1933, 102.

On comparison of the type specimens of these two species at the British Museum it is clear that they are identical. The distinguishing features of the species are the short slender anther canals which curve upwards until they are almost parallel with the anther, and the short club-shaped stigmatic arms.

Centrostigma Schlechteri (*Kraenzl.*) *Schltr.* in Engl. Jahrb. **53**, 523 (1915). *C. nyassanum* Schltr. l.c.

An examination of all the material at Kew of the genus *Centrostigma* has convinced me that at present only two species can be recognised, perhaps only one! Material from the Livingstone Mountains, Southern Rhodesia and the Transvaal (including the Type collections of both species cited above) belongs without doubt to one species which must bear the earlier name *C. Schlechteri* (Kraenzl.) Schltr. *C. occultans* (Rchb. f.) Schltr., known so far only from Angola, may eventually prove to be the same.

In the present state of our knowledge *C. Schlechteri* may be distinguished from *C. occultans* by the presence of a small additional horn-like outgrowth on the outer side of each stigmatic branch. This outgrowth varies in length from 0·8–4·5 mm. and usually projects straight forward. When describing his new genus (*Centrostigma*) Schlechter, although pointing out the presence and importance of the large horn arising from the inner surface of the stigma, overlooked this small additional horn, which, however, is plainly shown in Kraenzlin's drawings of *Habenaria Schlechteri* in Xenia Orchidacea, **3**, t. 286, figs. 5–9.

I cannot find the outer horn in any specimens of *C. occultans* which I have seen. In view of the variations in size of the outgrowth in flowers of *C. Schlechteri* it seems possible, however, that the presence or absence is of no value for the delimitation of species. The other characters which have been suggested as of specific value, *e.g.*, the height of the anther, the amount of division of the side lobes of the lip and the size of the flowers, do not seem to be constant or correlated with one another and in my opinion are worthless. It seems advisable, however, to keep *C. occultans* distinct from *C. Schlechteri* until more material is available especially from the intervening regions.

Hetaeria occidentalis *Summerhayes* sp. nov.; affinis *H. Mannii* Benth., a qua sepala lateralia pro rata angustiora, petala linearia

apice non spathulata, labelli lobis lateralibus late flabellatis ex ungue angulo recto divergentibus, labello basi distincte bisaccato, rostelli lobis longioribus differt.

Herba terrestris; caulis pauciramosus, inferne procumbens e nodis radicans, superne erectus 5–7-foliatus, internodiis usque ad 6·5 cm. longis. *Folia* basi breviter vaginantia, petiolata; lamina oblique lanceolata vel ovato-lanceolata, apice acuminata, basi cuneata vel subrotundata, 6–16 cm. longa, 2–5·5 cm. lata, chartacea, forsan variegata; petiolus 0·7–2 cm. longus. *Inflorescentia* terminalis, spicata, erecta, subdense multiflora, pedunculo 6–11 cm. longo bracteis 2–3 lanceolatis acuminatis instructo, spica 6–13 cm. longa circiter 1·5 cm. diametro. *Flores* suberecti, rosei et flavi; bracteae lanceolatae, acuminatae, ovarium aequantes vel superantes. *Sepalum* intermedium lanceolatum, subacutum, 4–5 mm. longum, 1·5 mm. latum; sepala lateralia oblique oblongo-lanceolata, acuta, 5–6·5 mm. longa, 2–2·7 mm. lata; omnia sepala extra sparse glanduloso-pilosa. *Petala* linearia, obtusa, 4–5 mm. longa, 0·5 mm. lata. *Labellum* inferne saccatum, basi sacco breviter bilobo, supra saccum valde angustatum, apice divergente bilobum, lobis late flabellatis marginibus leviter undulatis, totum labellum 5–5·5 mm. longum, lobis 3–3·75 mm. longis 2–3·2 mm. latis, sacculis 1–2 mm. longis. *Columna* crassa, apice dilatata, 1·5 mm. longa, facie appendicibus duabus triangularibus apice incurvatis instructa; anthera columnae dorso affixa, acuta, columnam superans, 2 mm. longa; stigmata lateralia, subhemisphaerica, rostello bilobo, lobis erectis spathulatis obtusis 1·2 mm. longis. *Ovarium* 6–11 mm. longum, subdense glanduloso-pilosum.

Gold Coast. Kibbi to Akim, Dec. 1899, *Johnson* 592. French Guinea. Faranna, Mangata, Jan. 1909, *Chevalier* 20424. Nigeria. Northern provinces: Kontagora, in a damp ravine, Jan. 1906, *Dalziel* 231. Southern provinces: Iloro, Sept. 1920, *Punch* (type); Oban District, 1911–2, *Talbot*.

A close relative of *H. Mannii* Benth., from which it differs by the characters given above. The very broad diverging lobes of the lip form a striking feature.

Hetaeria heterosepala *Summerhayes*, comb. nov. *Cheirostylis heterosepala* Rchb. f. Otia Bot. Hamburg. **1**, 110 (1881); Rolfe in Dyer, Fl. Trop. Afr. **7**, 183 (1897).

Rolfe notes that this species differs from other species of *Cheirostylis* in having the lateral sepals free. The structure of the column, however, seems quite different from that in *C. lepida* Rolfe and other species, but resembles that in the genus *Hetaeria*. In particular there are two quite well-developed longitudinal keels on the front of the column. *H. heterosepala*, however, has the flowers resupinate, a feature I have not seen in any other true *Hetaeria*.

Hetaeria tetraptera *Summerhayes*, comb. nov. *Monochilus tetrapterus* Rchb. f. Otia Bot. Hamburg. **1**, 110 (1881). *Zeuxine tetraptera*

Durand et Schinz, Consp. Fl. Afr. **5**, 57 (1892). *Z. Batesii* Rolfe in Dyer, Fl. Trop. Afr. **7**, 182 (1897).

On dissection of the type specimens I can see no significant differences between these two species. The supposed " trifid " lip of *Z. tetraptera* given in Rolfe's key is taken from Reichenbach's description in which, however, the middle lobe is said to be a minute apiculus. There is a slight protuberance corresponding to this in the lip of *Z. Batesii*. *Hetaeria tetraptera* is quite a characteristic member of the genus having a superior lip and distinct outgrowths on the front of the column.

Hetaeria Stammleri *Summerhayes*, comb. nov. *Zeuxine Stammleri* Schltr. in Engl. Jahrb. **38**, 151 (1906).

This species also seems best placed in *Hetaeria*, but here the outgrowths on the front of the column are united by their front margins to form a sort of small pouch just below the rostellum. In other features the species resembles the other African species of the genus.

The study of these species of *Zeuxine* and *Hetaeria* and also of drawings, etc., of many Asiatic species has made me feel doubtful if the two genera can be maintained separately. *Hetaeria* is generally distinguished from *Zeuxine* by the presence of outgrowths on the front of the column ; it also usually possesses non-resupinate flowers. Unfortunately there seem to be species which cannot be satisfactorily placed using the above characters. A complete revision of all the species will have to be carried out before this question can be definitely settled.

Malaxis Weberbaueriana *Summerhayes*, comb. nov. *Liparis Weberbaueriana* Kraenzl. in Orchis, **2**, 128 (1908).

An examination of the type specimen of this species shows that it is correctly placed in *Malaxis*, with which genus it agrees in habit and floral structure. The flowers are, however, resupinate, a character not frequently found in *Malaxis*.

Malaxis prorepens *Summerhayes*, comb. nov. *Microstylis prorepens* Kraenzl. in Engl. Jahrb. **17**, 48 (1893).

Malaxis Maclaudii *Summerhayes*, comb. nov. *Microstylis Maclaudii* Finet in Bull. Soc. Bot. Fr. **54**, 533, t. 11, figs. 19–28 (1907).

There is a specimen of this species at Kew collected in the southern Sudan (Lado, Yei River) by *F. Sillitoe*, No. 145.

Malaxis Chevalieri *Summerhayes*, sp. nov. *Liparis Sassandrae* A. Chev. Bot. Afr. Occ. Franç. 613 (1920), nomen. ; affinis *M. Maclaudii* (Finet) Summerhayes, a qua floribus minoribus, petalis eciliatis, labello angustiore callo singulo juxta columnam instructo facile distinguenda.

Herba terrestris ; caulis primarius repens ; caules secondarii erecti, graciles, 2·5–6 cm. alti, inferne cataphyllis vaginantibus acutis

imbricatis vestiti, prope apicem triphylli. *Folia* basi vaginantia, 7–17 mm. longe petiolata ; lamina ovata vel lanceolata, acuta, 2·5–6·5 cm. longa, 1·5–3·2 cm. lata. *Inflorescentiae* 6–10 cm. longae, pedunculo gracili vaginulis paucis lineari-lanceolatis acuminatis instructo. *Flores* in racemo brevi multifloro subcorymbose dispositi, non resupinati : bracteae lanceolatae, setaceo-acuminatae. *Sepala* oblongo-lanceolata, subacuta, 3 mm. longa, 1·3–1·4 mm. lata. *Petala* rhomboideo-lanceolata, subacuta, 2·8 mm. longa, 1 mm. lata, marginibus integris. *Labellum* quadrato-cuneatum, basi rotundatum marginibus incrassatis, apice rotundatum retuso-incisum marginibus erosis, 3 mm. longum, antice 2·8 mm. latum, basi juxta columnam callo singulo oblongo integro instructum. *Columna* 1 mm. longa ; anthera obtusa, 0·3 mm. longa ; rostellum apice truncatum leviter 3-dentatum.

Ivory Coast. Sassandra River, near Touna, under trees by river, May 1909, *Chevalier* 21786.

An inconspicuous little plant chiefly interesting for the umbellate inflorescence which, among African members of the genus, is found only in *M. Maclaudii* (Finet) Summerhayes. Whereas in Finet's species the lip bears two parallel calli at the base with in front of them a subulate projecting central tooth, in *M. Chevalieri* there is merely an entire cushion-like callus in the centre at the very base. The petals also have entire margins whereas in *M. Maclaudii* they are shortly ciliate.

Malaxis melanotoessa *Summerhayes* sp. nov. ; affinis *M. Weberbauerianae* (Kraenzl.) Summerh., a qua planta minora, labello longiore quam lato, columna dimidio breviore differt.

Herba terrestris, caule primario repente. *Caules* secondarii erecti, graciles, 3–8 cm. alti, inferne cataphyllis vaginantibus obtecti, apice 4–5-foliati. *Folia* basi vaginantia, petiolo 4–12 mm. longo ; lamina lanceolata, elliptico-lanceolata vel ovato-lanceolata, acuta, basi obliqua, uno latere rotundata, usque ad 5 cm. longa et 2·2 cm. lata, crenulata. *Inflorescentia* terminalis, erecta, gracilis, 3–6 cm. longa, laxiuscule 6–12-flora ; bracteae basi late ovatae, cordatae, apice fere setaceo-acuminatae, usque ad 4 mm. longae. *Flores* patentes, ovario pedicellato bracteam superante. *Sepala* ovato-lanceolata, subacuta, lateralia obliqua, 3 mm. longa, 1·6 mm. lata. *Petala* lanceolato-ligulata, obtusa, 2·8–3 mm. longa, 0·8 mm. lata. *Labellum* sessile, fere oblongum, basi auriculis rotundatis, apice rotundatum leviter emarginatum, in toto 3·5 mm. longum, 2·5 mm. latum, dimidio inferiore lineis duabus lateralibus latis papillato-puberulis instructum, ecallosum. *Columna* brevis, 0·8 mm. longa.

Liberia : Gola Forest, about 17 miles south of Ba, on humus of damp rocks, May 1910, *Bunting* (type in Herb. Brit. Mus.).

" Flowers pale greenish yellow. Lip dark purple at insertion and becoming creamish at length."

This rather small and not very striking species is allied to *M. Weberbaueriana* (Kraenzl.) Summerh., from which it differs in the

characters given in the diagnosis. Both species possess two broad lines of short hairs, one on each side of the median vein, in the lower part of the lip. The name is given in allusion to the dark coloured auricles (ears) at the base of the tip.

Liparis suborbicularis *Summerhayes* sp. nov. ; affinis *L. Deistelii* Schltr., a qua labello suborbiculari, callis longioribus, petalis pro rata latioribus differt.

Herba epiphytica ; pseudobulbi approximati, parvi, 1–2 cm. longi, vaginis membranaceis obtecti, radicibus flexuosis glabris instructi, superne 3–5-foliati. *Folia* elliptico-lanceolata, acuta, leviter curvata, basi vaginantia, petiolo indistincto minus 1 cm. longo ; lamina 2–11 cm. longa, 5–18 mm. lata, subchartacea, folia inferiora valde minora. *Inflorescentia* erecta, gracilis, 12–14 cm. longa, pedunculo 6–7·5 cm. longo, racemo laxe circiter 15-floro ; bracteae lanceolatae, acuminatae, 3–6 mm. longae, ovario pedicellato breviores. *Flores* patentes. *Sepalum* intermedium linearioblongum, obtusum, 7 mm. longum, 1·25 mm. latum ; sepala lateralia semiorbicularia, apice acuta, basi angustata, 4·5 mm. longa, 2·5 mm. lata. *Petala* linearia, obtusa, 7 mm. longa, 0·8 mm. lata. *Labellum* suborbiculare, apice trilobum, lobis lateralibus majoribus rotundatis, intermedio ad apiculo redacto, basi in auriculas parvas quadratas decurrens, totum labellum 4·5 mm. longum, 4 mm. latum, ante columnam callis duobus longe dentiformibus acutis instructum. *Columna* incurvata, medio utrinque ala late deltoidea instructa, 5 mm. longa.

S. NIGERIA. Oban District, 1911, *Talbot* 871 (Type in Herb. Mus. Brit.).

Polystachya reflexa *Lindl.* in Bot. Reg. **27,** Misc. 18 (1841). *P. liberica* Rolfe in Kew Bull. 1908, 72. *P. Smytheana* Rolfe l.c. 71. *P. elastica* A. Chev. Expl. Bot. Afr. Occ. Franç. 616 (1920), pro parte, non Lindl.

This species was described by Lindley in 1841 from a cultivated plant from Sierra Leone and the original specimen is represented by 3 drawings (all of the flower) in Lindley's herbarium. On the same sheet is a specimen consisting of a stem bearing a leaf and flower and labelled " D[uke] of Devonshire, Oct. 1843 " ; obviously a subsequent addition. By combining the drawings and specimen as the same species Rolfe was able to draw up the description in the Flora of Tropical Africa (**7,** 127) and this was accepted by Kraenzlin in his monograph, at any rate as regards leaves and floral dimensions.

It is, however, obvious that the specimen on Lindley's sheet does not agree with the drawings and actually is *P. galeata* (Sw.) Rchb. f. On the other hand an examination of Lindley's drawings shows clearly that *P. reflexa* is the same species as was subsequently described by Rolfe as *P. liberica* and *P. Smytheana*. It therefore belongs to the section *Elasticae* and has nothing whatever to do with *P. galeata*. The lip completely reflexed in the centre with its

cushion of hairs is very characteristic of sect. *Elasticae*, as also the lack of leaves, which are absent in the other specimens of *P. reflexa*, and in the section generally are small and not developed much at the time of flowering.

Polystachya longiscapa *Summerhayes* sp. nov. ; affinis *P. flexuosae* (Rolfe) Schltr., a qua planta valde robusta altiore, foliis majoribus, inflorescentia saepe ramosa, floribus multo majoribus pallide roseis facile distinguenda.

Herba perennis saxicola ; caules caespitosi, pseudobulbosi, cylindrici, sursum attenuati, 10–12 cm. alti, 1–2 cm. diametro, circiter 10-foliati. *Folia* imbricata, basi vaginantia, articulata, ligulato-lanceolata, apice breviter acute bilobulata, 20–35 cm. longa, 1·5–2 cm. lata. *Scapus* erectus, 50–90 cm. altus, teres, vaginis arcte imbricatis 7–12 cm. longis apice leviter carinatis acutis vestitus, apice breviter ramosus vel simplex ; racemi terminales vel ex axillis vaginarum superiorum orientes, e basi sursum floriferi, 3–9 cm. longi, dense multiflori ; rhachis robusta, pubescens ; bracteae patentes, acuminato-setaceae, subrigidae, usque ad 9 mm. longae, basi persistentes. *Flores* non resupinati, pallide rosei vel coeruleo-rosei. *Sepala* oblongo-ligulata, apice subacuta vel obtusa, 18–21 mm. longa, intermedio 5 mm. lato, lateralibus cum pede gynostegii mentum obtusum 5·5–6·5 mm. longum formantibus. *Petala* ligulato-oblanceolata, apice obtusa vel apiculata, circiter 19 mm. longa, supra medium 4–4·5 mm. lata. *Labellum* ex ungue brevi ovato-oblongum, basi rotundatum, apice leviter retusum, 17–18 mm. longum, prope basin 9–10 mm. latum, ecallosum. *Gynostegium* leviter curvatum, superne dilatatum, 5–6 mm. longum.

TANGANYIKA TERRITORY. Morogoro District : Lupanga Peak, Uluguru Mts., along rock course of waterfall in open, below the forest, 1500 m., May 1933, *Burtt* 3496 (type) ; in open in rocky areas, and among rocks in forest, 1200 m., Sept. 1932, *Wallace* 178.

This plant is clearly allied to *P. flexuosa* Schltr., which is a native of Kilimanjaro, and almost a small edition of the present species. However, apart from size the two species differ in flower-colour ; also in *P. flexuosa* the lip is softly hairy on the disc whereas in *P. longiscapa* it is quite glabrous.

The interesting feature in both is the relatively long scape and terminal short and dense inflorescence which in *P. longiscapa* is branched. *P. flexuosa* is placed by Kraenzlin in the section *Dendrobianthe* but this is clearly not its correct position. In the inflorescence both species, and particularly *P. longiscapa*, approach the remarkable monotypic genus *Neobenthamia*, which, after being originally sent home by Kirk so long ago as 1884, was collected by Mr. G. B. Wallace in the same district as our new species.

Diaphananthe Burttii *Summerhayes* sp. nov. ; affinis *D. Mildbraedii* Schltr., sed foliis multo majoribus, petalis et labello latioribus, labello ecristato, rostello latiore tridentato differt.

Herba epiphytica ; caulis brevis, usque ad 5 cm. longus, 3–4-foliatus, vaginis foliorum omnino obtectus. *Folia* e basi vaginantia articulata, lineari-oblanceolata, apice valde inaequaliter breviter acute vel subacute bilobulata, lobulo breviore subnullo, 10–16 cm. longa, supra medium 1·5–2 cm. lata, coriacea, vaginis striatis. *Racemi* dependentes, graciles, sublaxe 6–10-flori, 6–9 cm. longi ; bracteae amplexicaules, oblique cupulares, obtusae, 1–3 mm. longae. *Flores* albi, erecti, ovario pedicellato 7–11 mm. longo. *Sepala* elliptico-oblonga, obtusa ; intermedium 4·5 mm. longum, 1·8–2·8 mm. latum ; lateralia 5 mm. longa, 1·5 mm. lata. *Petala* elliptico-orbicularia, apice obtusa vel rotundata, 5–5·5 mm. longa, 4–5 mm. lata. *Labellum* ex ungue brevissimo ambitu transverse ellipticum, obscure quadrilobum, lobulis lateralibus quam intermediis majoribus omnibus rotundatis marginibus irregulariter crenatis undulatis, totum labellum 5–5·5 mm. longum, 7·5–9 mm. latum ; calcar leviter incurvatum vel rectum, dimidio apicale modice inflatum, 1 cm. longum. *Columna* 2·5 mm. alta, dorso convexa, facie concava, pede brevissimo vel nullo ; clinandrium fere orbiculare, leviter excavatum ; anthera leviter cucullata, antice leviter retusa ; pollinia subglobosa, stipitibus 2 distinctis gracilibus viscidiis 2 liberis semiellipticis vel fere lunatis ; rostellum latum apice tridentatum ; stigma basi valde excavatum et quasi saccatum, sacci marginibus inferioribus prominentibus callum obtuse tridentatum formantibus.

BELGIAN CONGO. Virunga Mts., Namlagira Volcano, east slope, in moist forest 15 ft. from ground, not common, 6500 ft., Jan. 1931, *Burtt* 3138 (type).

I find it extremely difficult to place this puzzling plant satisfactorily. It is similar to *Diaphananthe Mildbraedii* Schltr. in general features and possesses the short stem characteristic of this group of *Diaphananthe* as well as the separate viscidia found in *D. Mildbraedii* and *D. kamerunensis* Schltr. On the other hand it lacks any tooth or outgrowth on the lip, the rostellum is shortly three-lobed and the lip broader than long, all characters of *Rhipidoglossum*. The column also seems to possess a very short foot, another character of the last-named genus. The most remarkable feature, however, is the sac-like depression in the column at the base of the stigma. The lower edges or wall of this depression are elevated above the outside portion of the column to form a sort of circular callus with 3 obtuse points projecting beyond the rest and jutting out slightly over the mouth of the lip-spur which is just below. This feature is developed to a much less extent in *D. Mildbraedii*.

I include this plant for the time in the genus *Diaphananthe* on account of the general vegetative characters, but it is possible that it is better placed in *Rhipidoglossum*. Much further work is required on the Angraecoid orchids before a really final classification can be reached and certainly the relationship of these two genera to one another requires careful examination. It is possible that *D. Burttii* will have to be made the type of a new genus when more data are available.

Aerangis (§ Rangaeris) brachyceras *Summerhayes*, sp. nov. ; inter species generis caule elongato usque 20 cm. longo, foliis linearioblongis suberectis, inflorescentiis suberectis subdense multifloris, floribus parvis suaveolentibus, calcari leviter incurvato 5–6 mm. longo, viscidiis duobus distinctibus cohaerentibus facile distinguenda.

Herba epiphytica vel saxicola. *Caulis* erectus, usque ad 20 cm. altus, inferne radicibus numerosis flexuosis breviter denseque pilosis instructus, superne foliorum vaginis imbricatis striatis omnino obtectus. *Folia* suberecta vel erecto-patentia, stricta vel rarius leviter curvata, basi articulata vaginantia, lineari-oblonga, apice inaequaliter obtuse biloba, 8–13 cm. longa, 7–13 mm. lata. *Racemi* multi ex axillis foliorum inferiorum orti, suberecti, 4–13 cm. longi, basi cataphyllis 2–3 vaginantibus instructi, subdense 7–15-flori ; bracteae patulae, late lanceolatae, acutae vel acuminatae, 2·5–5 mm. longae. *Flores* pro genere parvi, pallide flavi, adscendentes. *Sepalum* intermedium oblongo-lanceolatum, acutum, 5·5–7 mm. longum, 1·5–2 mm. latum ; sepala lateralia lineari-oblonga vel lineari-oblanceolata, acuta, 6–7·5 mm. longa, 1·2–1·5 mm. lata. *Petala* oblonga vel elliptico-oblonga, obtusa vel rotundata, 5–5·5 mm. longa, 1·4–2 mm. lata, sepalis breviora. *Labellum* late lanceolatum vel oblongo-lanceolatum, acutum vel breviter acuminatum, 5·5 mm. longum, medio circiter 3 mm. latum ; calcar cylindricum, dimidio apicali leviter inflatum, leviter incurvatum, 5–6 mm. longum. *Columna* leviter incurvata, 2 mm. longa ; anthera fere hemisphaerica, antice truncata ; pollinia 2 subglobosa, stipitibus 2 distinctis linearibus 0·75 mm. longis, viscidiis 2 subquadratis connatis ; rostellum breviter productum, obtusum, utrinque lobulo parvo instructum ; stigma excavatum, labio inferiore prominente.

BELGIAN CONGO. Virunga Mts., E. of Mt. Namlagira, on 1905 Kanamaharargi Lavas, on lichen and moss covered lava boulders, very common, sweet scented, Jan. 1931, *Burtt* 3123 (type). UGANDA. Mt. Elgon, Bankoko and Bulago, on trees and rocks in forest, 6–7000 ft., June 1924, *Snowden* 900. Butandiga, on rocky knoll 7000 ft., Jan. 1918, *Dummer* 3686 (fruiting specimen).

Aerangis brachyceras is outstanding in the genus on account of the elongated stem which may sometimes reach a total length of over 20 cm. although many plants have relatively short ones. The species falls into sect. *Rangaeris* characterised by the presence of two separate stipes to the pollinia. In most species of the section there is a common gland to both stipes but in *A. filipes* Schltr. two glands are present. *A. brachyceras* seems to be intermediate in that the two glands, although distinctly visible, are adherent along their adjacent edges. The almost upright inflorescences with their rather closely placed small flowers is also a striking feature of the species in a genus where pendulous or at least widely spreading inflorescences are usual.

In view of the known distribution it is probable that the species will be found on other East African mountains, such, for instance, as Ruwenzori and Kenya.

Aerangis (§ Euaerangis) calodictyon *Summerhayes*, sp. nov. ; affinis *A. rhodostictae* Schltr., a qua foliis brevioribus latioribusque, floribus albis, labello apice rotundato facile distinguenda.

Herba epiphytica, radicibus numerosis flexuosis glabris, caule brevissimo 2–4-foliato. *Folio* elliptico-oblanceolata vel lineari-oblanceolata, apice inaequaliter acute bilobata, sinu acuto, 5–8 cm. longa, 1·5–2·5 cm. lata, pulchre retinervia, tenuiter coriacea, subtranslucentia. *Inflorescentiae* subpatentes, 9–13 cm. longae, dimidio superiore 5–7-florae ; bracteae lanceolato-triangulares, acutae, 3–5 mm. longae. *Flores* albi, 3–4 cm. diametro, ovario pedicellato circiter 1·5 cm. longo. *Sepalum* intermedium oblongo-ellipticum, apiculatum, 1·6–1·8 cm. longum, 6–7 mm. latum ; sepala lateralia similia, aequilonga, 5–6 mm. lata. *Petala* elliptica, basi angustata, apice acutata, apiculata, 1·6 cm. longa, 7–8 mm. lata. *Labellum* e basi cuneata suborbiculari-flabellata, rotundata, margine ± crispata, 1·8–2 cm. longa, 1·5 cm. lata ; calcar filiforme, 7 mm. supra basin valde incurvatum, prope apicem leviter inflatum, 3–4 cm. longum. *Columna* 4 mm. alta, infra antheram valde dilatata ; androclinium rotundatum, dorso leviter retusum ; anthera semiglobosa ; pollinia ellipsoidea, pallide flava, stipite singulo, superne dilatato inferne filiformi, viscidio elliptico ; rostellum elongatum, obtusum.

Tanganyika Territory. 60 miles inland from Dar es Salaam, epiphytic on liane, communicated by Mr. R. H. Pullen-Burry, flowered in Royal Botanic Gardens, Kew.

A handsome member of the genus allied to *A. rhodosticta* Schltr. and characterised by the broadly cuneate rounded not acute lip. The flowers are quite white except the spur which is faintly reddish on the distal part. The rather thin somewhat translucent leaves are green with a network of darker veins, giving a pleasing effect.

XXVI—FIRMIANA AND ERYTHROPSIS. H. N. Ridley.

The two genera of *Sterculiaceae*, *Firmiana* Mars. and *Erythropsis* Lindl., together with *Scaphium*, *Pterygota*, *Pterocymbium*, etc., though separated by R. Brown from *Sterculia* (Bennett, Pl. Jav. Rar. 235), were reunited with it by Bentham and Hooker in the Genera Plantarum, and by Masters in Fl. Brit. Ind. Most of the above genera have been separated by later botanists, but *Firmiana* and *Erythropsis*, though very distinct, are still constantly confused.

The genus **Firmiana** was proposed by Marsigli (Saggi Padov. **1**, 106 : 1786) for *Sterculia platanifolia* Linn. fil. (Suppl. 423), a native of China and Japan. To the same genus belong **F. maior** *Hand.-Mazz.* (Anz. Akad. Wiss. Wien 1923, **60**, 96 : 1924), of Yunnan, **F. diversifolia** *A. Gray* (U.S. Explor. Exped. Bot. **1**, 185, t. 13 : 1854), of Fiji, and **F. papuana** *Mildbraed* (in Engl. Jahrb. **62**, 365 : 1929), of Papua.

F. platanifolia (*Linn. f.*) *Mars.* has been renamed *F. simplex* by W. F. Wight, who has identified it, as did De Candolle (Prodr. **1**, 483) with *Hibiscus simplex* Linn. (Sp. Pl. ed. 2, 977). Linné's description is as follows: "Planta *mihi triennis*, Caule *indiviso, recto, crassiusculo*. Folia *integerrima, cordata, triloba, obtusiuscula, glabra, margine inaequali, nervis subtus poro mellifero*. Flores *non vidi*. *Habitat in* Asia." He compares it with a figure in Sloane's "History of Jamaica" which clearly represents *Hibiscus elatus*. Linné saw no flowers of his plant and no type exists. His description, as far as it goes, is quite unsuited to the *Firmiana*, a big, branched tree with leaves usually not cordate, pubescent beneath, with acute points to the lobes, and no honey gland on the nerve bases. Whatever the plant was, it could not be *Firmiana*.

Firmiana Merrittii *Merrill* in Phil. Journ. Sci. Bot. **9**, 314 (1914) from Mindoro (*Merritt* 8555) is probably a true *Firmiana*. Only fallen leaves and fruits are known. The leaves somewhat resemble those of *F. diversifolia*, but, unlike any other species in the genus, are rounded and entire. The fruit resembles that of the above-mentioned species.

Firmiana borneensis Merrill (in Univ. Calif. Publ. Bot. **15**, 192 : 1929) is **Scaphium affine** (*Masters*) *Pierre*, Fl. For. Cochinch., fasc. 13, sub. t. 193–95 (1889).

All the remaining species commonly referred to this genus by authors belong to the genus **Erythropsis** *Lindl.*, which is distinguished by the long cylindric or funnel-shaped sepaline tube with very short teeth, the ovary tapering gradually to the 5 recurved stigmas, and the one-seeded carpels. In **Firmiana** *Mars.* the flowers are very small with a short campanulate tube and longer narrow reflexed sepaline lobes, the style is distinct from the ovary, the stigmas capitate, and the carpels often two-seeded.

The following species belong to the genus **Erythropsis** *Lindl.* :

E. colorata (*Roxb.*) *Burkill* in Gard. Bull. Straits Settlements, **5**, 231 (1931). *E. Roxburghiana* Schott. *Sterculia colorata* Roxb. Cor. Pl. **1**, 26, t. 25 (1795).

India, Burma, Andamans, Ceylon, Siam, Cambodia.

var. **bracteata** (*Aug. DC.*) *Ridley*, comb. nov. *Firmiana bracteata* Aug. DC. in Bull. Herb. Boiss. sér. 2, **3**, 369 (1903).

Cambodia. This appears to be merely an abnormal form with long bracts.

E. fulgens (*Mast.*) *Ridley*, Fl. Mal. Penins. **1**, 277 (1922). *Sterculia fulgens* Wall. Cat. 1135, nomen ; Mast. in Hook. fil. Fl. Brit. Ind. **1**, 360 (1874).

Burma, Siam, Penang, Perak, Sumatra.

E. pallens *Ridley*, sp. nov. *Sterculia pallens* Wall. ex Voigt, Hort. Suburb. Calc. 105 (1845), nomen ; Hochreutiner in Bull.

Inst. Buitenzorg, **19,** 22, (1904), nomen ; King in Journ. As. Soc. Beng. **62,** 73 (1891). Species ab *E. fulgente* (Mast.) Ridley, cui affinis, foliis subtus dense velutinis, lobis acutis, panicula dense velutina, calyce campanulato multo breviore dense velutino flavo, lobis longioribus latioribus distincta.

Arbor. Folia ambitu ovata vel rotundata, late triloba vel sub-5-loba, lobis subacutis, basi cordata, 13–27 cm. longa, 15–32 cm. lata, coriacea, supra parce pilosa, subtus pilis stellatis dense pallide velutina ; costa et nervi primarii crassi, subtus elevati, reticulationibus latis ; petioli validi, dense pilosi, 11–22 cm. longi. *Paniculae* complures, axillares, dense velutinae, 9–20 cm. longae, ramis 1–3 cm. longis, pedicellis 3–5 mm. longis. *Calyx* campanulatus, velutinus, flavus, 1·5–2 cm. longus, lobis 5 triangulari-lanceolatis acutis 4 mm. longis 2 mm. latis extra velutinis intus glabris. *Flores masculi* : androecium stipite gracili glabro praeditum, antheris **15** in capitulo globoso 2 mm. lato. *Flores feminei* masculis saepe commixti : gynophorum crassum, 1·5 cm. longum ; carpella **5,** conica, stigmatibus brevibus recurvis ; antherae abortivae in serie unica basali dispositae. *Folliculae* papyraceae, glabrae, oblongo-lanceolatae, obtusae, reticulato-nervosae, 6 cm. longae, 2·5 cm. latae, stipitibus circiter **5** mm. longis, gynophoro lignoso 1·5 cm. longo. *Semen* singulum, ellipsoideum, 1 cm. longum, siccitate brunneum, rugosum.

N. W. India. Without locality, *Royle*. Garhwal, *Falconer* 289 (type). Kumaon, *Thomson* ; above Kota, 2500 feet, *Strachey & Winterbottom* 2. Dehra Dun, below Mussoorie, 3000 ft., *P. W. Mackinnon*. United Provinces : Rajpur-Soheria Forests, Champaran, *Haines* 1967, 1968 ; above Rajpur, dry aspects, *Haines* 2162 ; Mohand, Siwaliks, *Haines* 2531.

Bengal. Udali, Chenga Hill, Darjeeling, *Gamble* 1623A.

Madras. Gadikota, *Gamble* 10,833 ; Horsleykonda, *Gamble* 15,134.

Wallich's *Sterculia pallens* was based on a plant supposed to come from Nepal, cultivated in the Botanic Gardens, Calcutta, of which he never saw the flowers. It was confused by Masters and other botanists with *S. fulgens* Wall. (*Erythropsis fulgens* Ridley), a native of Penang. In this as in *E. colorata* (Roxb.) Lindl. the stellate hairs on flowers and leaves are extremely short, giving a scurfy appearance. In *E. pallens* Ridley they are long and form a whitish velvety covering to the flowers, shoots and underside of the leaves. No one seems to have recorded the colour of the flowers but they appear to be bright yellow.

E. Barteri (*Mast.*) *Ridley*, comb. nov. *Sterculia Barteri* Mast. in Oliv. Fl. Trop. Afr. **1,** 218 (1868) ; et in Hook. Ic. Pl. t. 2277 (1894).

Tropical Africa.

E. Migeodii (*Exell*) *Ridley*, comb. nov. *Firmiana Migeodii* Exell in Journ. Bot. **68,** 83 (1930).

East Africa.

E. erythrosiphon (*Baill.*) *Ridley*, comb. nov. *Sterculia erythrosiphon* Baill. in Bull. Soc. Linn. Par. **1,** 486 (1885).

Madagascar.

The African species have the long sepaline tube with short teeth of *Erythropsis*, and like the other species are leafless when in flower, but the flowers are much smaller and more slender and usually in lax panicles. They might form a section of the genus.

XXVII—GENERIC NAMES PUBLISHED IN ZINN'S CATALOGUS.

T. A. Sprague.

The starting-point for the recognized nomenclature of Phanerogams, fixed by the second International Botanical Congress held at Vienna in 1905, is the publication of Linnaeus, Species Plantarum ed. 1 (1753). The binary system of nomenclature for species inaugurated by Linnaeus in that work was not immediately accepted by certain of his contemporaries, who continued using " phrase-names " for species. Among these authors were Philip Miller (Gard. Dict. Abridg. 1754 ; Gard. Dict. ed. 7, 1759), John Hill (Brit. Herbal, 1756 ; Fl. Brit. 1760), Patrick Browne (Hist. Jam. 1756), Zinn (Catal. Pl. Gotting. 1757), Fabricius (Enum. Pl. Hort. Helmst. 1759, 1763), Boehmer (Ludwig. Def. Gen. Pl. ed. 3, 1760), Scopoli (Fl. Carniol. 1760), Adanson (Fam. Pl. 1763), and Haller (Hist. Stirp. Helv. 1768). The generic names published by these authors were rejected by C. E. Moss (Cambridge British Flora, **2,** p. xii : 1914), and A. J. Wilmott (Babington, Man. Brit. Bot. ed. 10, p. ix : 1922), on the ground that international botanical nomenclature was a development of the binary nomenclatural system instituted by Linnaeus, and that generic names published by authors who did not adopt that system should consequently be ignored. The contrary view was taken by most botanists, including Briquet, Schinz, Harms and Fernald. At the fifth International Botanical Congress, held at Cambridge in 1930, a new article was proposed dealing with this question : " Art. 19 bis . . . Names are legitimate only when they are a development of the system of nomenclature introduced by Linneaus in 1753 (Species Plantarum), which established consistent binary nomenclature for species " (International Botanical Congress, Cambridge, 1930. Nomenclature. Proposals by British Botanists, 201 : 1929 ; Briquet, Rec. Syn. Doc. Vme Congr. Internat. Bot. Cambridge 1930, 12 ; Briquet, Avis Préal. 8 : 1930). On a ballot being taken, it was rejected by 239 votes to 158, the decision of the Vienna Congress* being thereby confirmed (Rep. Bot. Congr. Cambridge, 1930, 567–570 : 1931). The question may accordingly be regarded as closed.

*Art. B 17 ter, J 17 ter and others (Texte Syn. Doc. Congr. Vienne, 1905, 33, 35) were rejected in favour of Art I 17 ter (Internat. Rules, ed. 2, Art. 20), which was adopted by 133 votes to 36 (Act. Congr. Bot. Vienne, 1905, 98–102).

The recent acquisition by the Kew Library of a copy of Zinn's Catalogus afforded an opportunity for listing the new generic names published in it. There are 24 of these, all but four, however, being taxonomic or nomenclatural synonyms, later homonyms, or nomina rejicienda. The generic names **Faba** (*Leguminosae*), **Odontites** (*Scrophulariaceae*), and **Rhagadiolus** (*Compositae*) must now be attributed to Zinn (1757) instead of to later authors. This will cause no practical inconvenience. The only nomenclatural change necessitated is the replacement of *Helminthia* Juss. (1789) by **Helminthotheca** *Zinn.* (1757). As the genus is a small one frequently included in *Picris* L. (1753), and the two names *Helminthia* and *Helminthotheca* are very similar, it seems hardly worth while conserving the former.

The generic name *Mariscus* Zinn. (1757) has been taken up by Fernald and other botanists in place of *Cladium* P. Br. (1756) on the ground that the latter name was published without a generic description. In the writer's opinion Patrick Browne supplied a generic as well as a specific description of his *Cladium culmo nodoso, floribus quasi umbellatus, umbellis gradatim assurgentibus.* But even if the description given by Patrick Browne is regarded as a combined generic and specific one, *Cladium* P. Br. (1756) was still validly published, since it was the name of a *monotypic new genus based on a new species* (Briquet, Rec. Syn. 44, Art. 38 ter ; Briquet, Avis Préal. 13, Art. 38 ter ; Rep. Internat. Bot. Congr. Cambridge, 1930, 595). Hence **Cladium** *P. Br.* must be maintained under International Rules.

List of the New Generic Names.

Alectorophus Zinn, 288 (*Rhinanthus Crista-galli*) : **Rhinanthus** *L.* (1753).

Asterocephalus Zinn, 381 (*Scabiosa columbaria*) : **Scabiosa** *L.* (1753), partim.

*Coronopus** Zinn, 325 (*Cochlearia Coronopus*) ; Boehm. in Ludw. Def. Gen. Pl. ed. 3, 226 (1760) ; Gaertn. Fruct. **2,** 293 (1791) ; nomen illegitimum (non Mill. 1754) : *Carara* Medik. (1792) : *Senebiera* DC. (1799).

Dictamnus Zinn, 316 (*Origanum Dictamnus*), nomen illegitimum (non L. 1753) : **Amaracus** *Gled.* (1764).

Epipactis Zinn, 85 (*Serapias Helleborine, Ophrys ovata, O. Nidus-avis*), nomen illegitimum : **Serapias** *L.* + **Ophrys** *L.*

Faba *Zinn,* 357 (*Vicia Faba*) ; Boehm. in Ludw. Def. Gen. Pl. ed. 3, 257 (1760) ; Adans. Fam. Pl. **2,** 331 (1763).—Validated by reference to Tourn. Inst. **1,** 391, t. 212 (1719).

Helenia Zinn, 417 (*Helenium autumnale*) : **Helenium** *L.* (1753).

Helminthotheca *Zinn,* 430 (*Picris Echioides*) : *Helminthia* Juss. (1789).—The name *Helminthotheca* Zinn was validated by reference to the generic description previously given in Haller, Enum. Pl. Gotting. 413 (1753).

Intybus Zinn, 429 (*Hieracium sabaudum, H. umbellatum*) : **Hieracium** *L.* (1753), partim.

Lappa Zinn, 386 (*Arctium Lappa*) : **Arctium** *L.* (1753).

Lerchia Zinn, 30 (*Chenopodium fruticosum, Ch. altissimum*) : **Suaeda** *Forsk.* (1775), nomen conservandum.

Libanotis Zinn, 226 (*Athamanta Libanotis*) : **Seseli** *L.* (1753).

Limnopeuce Zinn, 55 (*Hippuris vulgaris*) : **Hippuris** *L.* (1753).

Mariscus Zinn, 79 (*Schoenus Mariscus*) : **Cladium** *P. Br.* (1756).

Nasturtium Zinn, 326 (*Thlaspi arvense, Th. saxatile, Th. perfoliatum, Th. hirtum, Th. campestre, Th. montanum, Th. Bursa-pastoris, Lepidium sativum, L. ruderale, L. virginicum*), nomen illegitimum (non Mill. 1754) : **Thlaspi** *L.* (1753).

Odontites *Zinn,* 289 (*Euphrasia Odontites*) ; Boehm. in Ludw. Def. Gen. Pl. ed. 3, 126 (1760) ; Haller, Hist. Stirp. Helv. **1,** 134 (1768) ; Moench, Meth. 439 (1794).—Validated by reference to the generic description previously given in Haller, Enum. Stirp. Helv. 627 (1742).

Pyrethrum Zinn, 414 (*Chrysanthemum frutescens, Ch. corymbosum*) : **Chrysanthemum** *L.* (1753), partim.

Rhagadiolus *Zinn,* 436 (*Hyoseris Rhagadioloides, H. Hedypnois ? Lapsana Zacintha*) ; Scop. Introd. 122 (1777).—Validated by a description.

Squamaria Zinn, 277 (*Lathraea Squamaria*) : **Lathraea** *L.* (1753).

Stellaria Zinn, 55 (*Callitriche palustris*) : **Callitriche** *L.* (1753).

Taraxacum Zinn, 425 (*Leontodon Taraxacum, L. hispidus, Crepis rubra, C. alpina*) : *Leontodon L.* (1753).

Tetralix Zinn, 202 (*Erica herbacea*) : **Erica** *L.* (1753), pro parte maxima.

Unifolium Zinn, 104 (*Convallaria bifolia*) : **Maianthemum** *Web.* (1780), nomen conservandum.

Viscago Zinn, 188 (*Cucubalus baccifer, C. Behen, C. tataricus, C. Otites, C. reflexus, Silene lusitanica, S. quinquevulnera, S. nocturna, S. nutans, S. amoena, S. fruticosa, S. gigantea, S. conoidea, S. conica, S. Behen, S. pendula, S. rubella, S. cretica, S. Armeria*), nomen illegitimum : **Cucubalus** *L.* (1753) + **Silene** *L.* (1753).

*The question whether *Coronopus* Zinn should be conserved is at present *sub judice.*

XXVIII—MISCELLANEOUS NOTES.

Poorman or Kawau Orange of New Zealand.—A note on this interesting Citrus fruit has recently been received from Mr. N. R. W. Thomas, Chairman of the Auckland Citrus Committee of the New Zealand Institute of Horticulture. The New Zealand summer does not appear to be hot enough to bring the ordinary grape fruit of commerce (*Citrus Paradisi* Dacf. forma ; *C. decumana* Murr. var. " grape-fruit ") to perfection, and the orange under consideration—

classed as a "pomelo" or "grape-fruit"—would seem to be regarded as a satisfactory substitute and better adapted to the climate. Mr. Thomas states that "the New Zealand Poorman may be described as a flattened fruit up to 4 inches in diameter, with a distinct odour, orange-coloured flesh, plenty of juice with just the necessary tang of bitterness to give it a flavour of its own, generally few seeds, thin rind, and curing well. The result to date is that your Committee is unanimous in recommending that only what it calls the Morrison's Seedless Strain of Poorman should be grown. For this fruit the name 'Kawau Orange' has been appropriated. This seedless strain gives large fruit with all the best qualities of the Poorman for juice content, flavour, odour and curing. It is generally, if not entirely, free from seeds and, in short, makes an excellent fruit for breakfast, dessert or preserving. . . ."

The history of the introduction of this fruit to New Zealand begins at the time when Sir George Grey was Governor. About 1855 he was living in Kawau Island where, in his garden, he established plants—including this Citrus—from all parts of the world. Prior to this period, nothing definite seems to be known of its history.

"From Kawau the first budwood for propagation of the Poorman's Orange, as it was described by Sir George Grey on account of its heavy bearing qualities, was given to Mr. Edward Morrison, N.D.H. (N.Z.) who was present and remembers the visit quite well. Some of the progeny of these buds are still in possession of the family, but subsequently other buds were given to the late Mr. David Hay, who shared them with Mr. C. T. Wren. As a result of the propagation in their three nurseries, Poorman oranges were extensively planted round Auckland and in many places further north."

"Various strains having from none to many seeds" appear to have been developed and an "investigation by Mr. Green has involved the sampling of many plantings including some of those in New South Wales where it would seem that the earlier and poorer strains of the N.Z. Poorman arrived." It is sometimes referred to as a "bitter orange."

At the present time, in reference to plantings, Mr. Thomas states that "The survey has shown that there are considerable groves, up to 400 trees, of the Kawau Orange, or Morrison's Seedless strain, planted in various localities, though unfortunately the other strains would seem to predominate. It is estimated that there are at least 8000 bearing trees of the New Zealand Poorman planted in New Zealand, to say nothing of the large plantings made in the last few years that will soon be coming into production."

It is recommended that with proper marketing arrangements, New Zealand should be able to supply all the breakfast and marmalade oranges she can absorb, and that the Kawau orange should not be used in its immature state "as it seems to be quite clear that the longer the fruit can be allowed to hang on the tree the greater and better is its juice content."

It may be of interest to mention that in a note on "The Early History of Citrus Importations," in the New Zealand Journal of Agriculture, 1929, p. 21, the author, Mr. G. A. Green, N.D.H., refers to the difficulty in 1881 of selling the poorman orange—grown by Mr. H. Dobbie with other Citrus fruits in a grove at Whangarei—owing to overseas competition. In the same article Mr. Green states "The Poorman Industry has also established itself and the fruit is now recognised as of outstanding value for marmalade and a most useful breakfast fruit. It promises to be an industry of great economic value."

J. H. HOLLAND.

Wild Flower Schedules.—The Wild Plant Conservation Board has recently issued a number of schedules of wild flowers which require particular protection in different counties. Nearly thirty lists have been drawn up and are intended for the guidance of the local authorities concerned with the administration of the bye-law forbidding the uprooting of wild plants. With the object of avoiding lists of unwieldly length, some rare species (most of which are inconspicuous and therefore chiefly of botanical interest only) have been omitted. The English and Latin names of each species are given, and the lists should prove of great value, not only in dealing justly with offenders when caught, but also in drawing the attention of local authorities to the need for protecting plants which, though comparatively common in their own neighbourhood, may be rare in Britain as a whole (e.g., fritillaries, grape-hyacinths, etc.).

The Koenig Collection in the Lund Herbarium.—Inadvertently two of the sheets borrowed from the Lund Herbarium were omitted from the Catalogue published in K.B. 1932, 49–76. Indeed, one of them appeared in the list (No. 20) of "species mentioned in Retz. Obs. but not found in the Collection" (p. 76). These two sheets are :—

RUTACEAE.

Glycosmis mauritiana (Lam.) Tanaka, det. T. Tanaka.

The sheet is stamped with the Museum Acharianum stamp and is inscribed on the front in ink "Coromandelia" under the specimen and in the right hand bottom corner, "L. pentaphylla." Presumably this is the specimen referred to under *Limonia pentaphylla* Retz. Obs. 5, 24.

CYPERACEAE.

Cyperus Luzulae Retz.

Inscribed in ink at the foot on the back :—

"Cyperus Luzulae Rottb. ic. Hellw."

This must be the specimen of which Retzius wrote in Retz. Obs. 4, 11 "Cyperus enim Rottböllii, quem benevolentia Cl. König possideo." It would seem, therefore, that it was presented by Rottboell to König and given by the latter to Retzius. It is an American and not an Indian species.

I take this opportunity to correct two errors in the paper quoted above :—

No. 276, page 71, should read *Saccolepis*.

No. 289, page 72, *Dimeria avenacea* is a new combination for *D. pusilla* Thw. and not for var. *pallida* Thw. of the latter.

C. E. C. FISCHER.

Pseudogeneric names.—Names resembling generic names have been given by certain authors to particular *species*. Thus *Phaeocephalum* Ehrh. was a unitary specific name given by Ehrhart (Beitr. 146) to *Schoenus fuscus* L., and *Leucocoma* Ehrh. is a name for *Eriophorum alpinum* L. Another class of unitary specific name is exemplified by the Abyssinian plant-names published by Bruce (Travels, **5**, 1–80 : 1790), e.g. "Sassa" (l.c. 31) and "Gaguedi" (l.c. 52). *Sassa*, as a generic name, dates from Gmelin, Syst. **2**, 1038 (1791), and must be attributed to Gmelin. *Gaguedi* Bruce is mentioned in the list of Nomina generica conservanda as a synonym of *Protea* R.Br. (1810), but has no claim to recognition under the International Rules.

Seventy-eight Indian species were described under their Sanskrit names by Sir William Jones (Asiatick Researches **4**, 240–312 : 1795). Some of these Sanskrit names of species were apparently taken, by various authors, for scientific names of genera, and were included as such in the Index Kewensis. Thus *Syama* Jones is cited in the Index as a synonym of *Pupalia* Juss., and *Cuveraca* Jones as a synonym of *Cedrela* P. Br.

Some of these *unitary specific names* proposed by Jones were adopted as *generic names* by later authors. Thus the name *Vanda*, given by Jones to a *species* doubtfully identified by him with *Epidendrum retusum* L. (now *Rhynchostylis retusa* Bl.), was adopted as the name of a *different genus* by Robert Brown in Bot. Reg. **6**, t. 506 (1820). The name *Madhuca*, given by Jones (l.c. 285) to a species identified by him with *Bassia longifolia* L., was adopted as a generic name by Gmelin, Syst. **2**, 799 (1791). T. A. SPRAGUE.

Ceratophytum tetragonolobum.—The practice once widely prevalent of basing new species on imperfect material is a hindrance to the progress of systematic botany. This is well illustrated by the case of *Bignonia tetragonoloba* Jacq. Fragm. 36, t. 40 (1800–1809), which was based on a single fruit received by Jacquin from Caracas, Venezuela, with the description "*Bignonia nova, quae frutex scandens, semper florens, flore albo odorato, foliis ternatis.*" Jacquin's description of the fruit and seed was as follows :—

"Siliqua a decem ad duodecim uncias longa, obtuse tetragona cum angulis rotundatis, crassissima, sublignea, bivalvis cum dissepimento medio parallelo, valvulis ultra unciam latis, utrinque simul ad suturas tres quartas unciae partes aequantibus, ad tactum ob tubercula minima scabriuscula, ad lentem praeterea punctis sive

omis nigris adspersa, caeterum fusca. Semina numerosa, plana, sca, utrinque excurrentia in alam oblongam hyalinam obtusamque. epraesentatur siliqua integra ; tum etiam valvulae pars summa terna, semen, et aucta portio superficiei siliquae."

This description was naturally insufficient to determine even the nus of *Bignoniaceae* to which the plant belonged, and *B. tetra-noloba* has accordingly remained up to the present among the species dubiae." The figure of the fruit, however, was recently cognized by one of us at sight as representing a species of *Cera-phytum*, a genus established by Pittier in 1928, and revised by us Kew Bull. 1933, 321–323. The species must, therefore, be known future as **Ceratophytum tetragonolobum** (*Jacq.*) *Sprague et andwith*, comb. nov.

Two species of *Ceratophytum* were previously known, namely *capricorne* Pittier and *C. tobagense* (Urb.) Sprague et Sandwith *brachycarpum* Pittier). These are closely related, but have been istinguished hitherto by the shape of the leaflets, the length of the nther thecae, and by certain characters of the capsule and seed. omparison of *C. tetragonolobum* with *C. capricorne* and *C. tobagense* necessarily confined to the latter characters and yields the llowing result.

tetragonolobum: Capsule 25–30 cm. long (27·5 cm. in the figure), epidote-punctate. Seeds 5·5 cm. broad.

capricorne: Capsule about 40 cm. long, non-punctate. Seeds ·5–5 cm. broad.

tobagense: Capsule 16–27 cm. long, lepidote-punctate. Seeds ·3–4 cm. broad.

This result is inconclusive owing to the very incomplete data vailable for *C. tetragonolobum*. It strengthens a suspicion, however, vhich we had previously entertained, that when further material omes to hand, it may be necessary to unite the two species distinguished by Pittier, since *C. tetragonolobum* resembles one of them in he fruit characters, and the other in the dimensions of the seed. So long as Pittier's two species are upheld, they will continue to bear he names *C. capricorne* and *C. tobagense* respectively, since neither an be definitely identified with *C. tetragonolobum*. If and when hey are united, however, the combined species will be known as *C. etragonolobum*. T. A. SPRAGUE and N. Y. SANDWITH.

Paintings of Riviera and Alpine plants.—A series of 658 water-colour illustrations of wild flowers from the Riviera and various parts of the Alps, executed by the late Miss Sidney E Forster, has been presented by her niece, Miss Alice E. Pepys. The figures, which are natural size and on separate cards, measuring 6¼ by 4¼ in., appear to be very faithful to nature, and botanical details are carefully shown as far as they are visible without magnification. Many of the figures are charming studies.

The cards are arranged in six leather-covered boxes, four containing 445 paintings of Riviera plants, and the remaining two including 213 paintings of plants from Switzerland, Savoy, Bavaria and the Black Forest. The cards are arranged in systematic order starting with *Ranunculaceae*, and there is a list of the contents in each box. The series of paintings of Riviera flowers will be extremely useful to botanists intending to visit that region for the first time, as most of the characteristic plants and a fair proportion of the rarer species are included.

New combinations from the Hand-List of Trees and Shrubs.—The following new combinations are published here prior to their appearance in the forthcoming new edition of the "Hand-List of Trees and Shrubs":—

Cytisus Reverchonii (*Degen et Hervier*) *Bean*, comb. nov.
Sarothamnus Reverchonii Degen et Hervier in Magyar Bot. Lap. **5**, 6 (1906).

Neillia glabrata (*Rydberg*) *Bean*, comb. nov.
Opulaster glabratus Rydberg in Bull. Torr. Bot. Club, **31**, 558 (1904).
Physocarpus glabratus (Rydberg) Rehder in Mitteil. Deutsch. Dendrol. Ges. 1915, 221.

Neillia intermedia (*Rydberg*) *Bean*, comb. nov.
Opulaster intermedius Rydberg in Britton, Man. Fl. N.U.S. 492 (1901).
Physocarpus intermedius (Rydberg) Daniels in Univ. Missouri Studies, Sc. ser. 1, no. 1, 149 (1907).
Physocarpus Ramaleyi A. Nelson, New Man. Bot. Centr. Rocky Mts. 248 (1909)—partim.

Neillia stellata (*Rydberg*) *Bean*, comb. nov.
Opulaster stellatus Rydberg in Small, Fl. Southeast States, 513 (1903).
Physocarpus stellatus (Rydberg) Redher in Journ. Arnold Arb. **1**, 256 (1920).

Veronica brachysiphon (*Summerhayes*) *Bean*, comb. nov.
Hebe brachysiphon Summerhayes in Kew Bull. 1927, 397.

The Genus Diaporthe.*—The number of species included in the genus *Diaporthe* since its definition by Nitschke in 1870 is over 650. Many of these differ in nothing but host plant, while, on the other hand, several species with little to distinguish them have sometimes been described on the same host. Until recent years knowledge of conidial connections was purely observational, and little was known of life-histories. Following on a series of papers on the group in which studies based on careful cultural work are described, Dr. Wehmeyer has now produced a general account of the genus.

*By L. E. Wehmeyer. The genus Diaporthe and its Segregates. University of Michigan Press, pp. xii+349, 18 plates. 1933. $3.50.

As far as possible he has examined authentic material of the species mentioned. The amount of work involved is enormous. The author is to be congratulated on the courage which led him to undertake it and on the very satisfactory presentation of the results of his studies.

After an introduction giving an account of morphology and development in the genus *Diaporthe*, and such facts as are known of its geographical distribution, the main body of the work is occupied by full descriptions of all the species recognised by the author, with synonymy, host relations, and mention of conidial connections. 107 species (of which 7 are new to science) are thus described, distributed in five genera, namely *Diaporthe*, *Cryptodiaporthe*, *Diaporthella*, *Apioporthe* and *Diaporthopsis*. The old divisions of *Diaporthe* into *Chorostate*, *Euporthe* and *Tetrastaga* are not maintained. 88 species are excluded from the genus, 18 are listed as doubtful, and 151 were not seen by the author. The remainder are reduced to synonymy. The species maintained are separated on morphological grounds, hence many names which are regarded by the author as merely host forms occur as synonyms. Under *Diaporthe eres* Nits. for instance, about 128 described species, on 68 different host-plants, are included. At the same time the synonymy is given under each host, so that should later experimental work prove the validity of any of such forms as species or varieties it would be easy to segregate them. In such cases of wholesale reduction the author has perhaps wisely decided to retain for the species the name which is most commonly used. To attempt to find the earliest valid epithet would be at present an almost impossible task apart from the fact that opinions may differ as to the suggested synonymy.

The author is not always accurate in the matter of citation. Throughout the work the date of Nitschke's "Pyrenomycetes Germanici" is given as 1867, whereas *Diaporthe* occurs in the "Zweite Lieferung" of the work, which was not published until 1870. Probably the mistake is due to the use of a volume from which the second title-page had been removed before binding. Similarly in the case of Fries' "Summ. Veg. Scand." the date is given as 1846, whereas the references are to the "Pars posterior," published in 1849.

One point of nomenclature requires comment, since various writers have followed the same procedure, and it is liable to cause much confusion. The author has made the combination *Cryptodiaporthe salicella* (Fr.) for a second time, on the ground that when Petrak made the combination he was dealing with *C. salicina* (Curr.) and not with the true *Sphaeria salicella* of Fries. This procedure is contrary to the International Rules as they now stand. It is unfortunate that the full text of the Rules as revised at Cambridge has not yet been published, but it is possible to gather from the report of the discussions that there is a clause inserted in the rule regarding transference of a species from one genus to another to the effect that when the author of a new combination applies it

erroneously in its new position to a different species, the combination must be retained for the type to which the specific epithet was originally given. Thus the name *Cryptodiaporthe salicella* (Fr.) Petrak must apply to Fries' species. If Dr. Wehmeyer is right, Petrak's description (but not his name) is referable to *C. salicina* (Curr.), but this has no influence on the validity of the new combination *Cryptodiaporthe salicella* (Fr.) Petrak.

The format of the book is good. The type is clear and there appear to be no typographical errors. The descriptions are accompanied by numerous figures showing habit and details of spores. The volume is heavier to handle than it need have been owing to the unnecessarily wide margins and the similarly unnecessary use of surfaced paper for the plates. The work is one which should be in every mycological library. It will be of the greatest value to both pure mycologists and plant pathologists, and it is to be hoped that in time other genera of the *Pyrenomycetes* will be dealt with in a similar thorough manner.

E. M. WAKEFIELD.

The Flora of Iceland and the Faeroes.* The publication of a handbook of the flora of Iceland and the Faeroes will be welcomed not only by those who seek information about the plants of these islands, but by students of the Arctic flora in general. More especially is this handbook of value since it is based on the very extensive knowledge of Arctic plants possessed by the late Professor C. H. Ostenfeld, whose untimely death in 1931 prevented him from finishing the book. However, in the able hands of Mr. J. Gröntved this Flora has now been completed.

The book is a handy size for use in the field. It contains an analytical dichotomous key to the families based on somewhat unorthodox, but eminently practical lines. Under each family are keys to the genera and in some cases to the introduced species. Descriptive keys to the native species, the remaining introduced species and to the hybrids are given in the text, the more important taxonomic characters being supplied as well as notes on habitat, frequency and distribution. The usefulness of some of the longer keys might have been increased had references been given to the page where the contrasting paragraph occurs. Popular names in use both in Iceland and in the Faeroes are quoted, and are indexed separately, as are the generic names. At the end there is a glossary of common botanical terms. For those ill-acquainted with the geography of these islands, sketch maps are provided showing the more important localities.

The arrangement of families follows in general Engler's system, but there are certain modifications. *Narthecium* and *Tofieldia* are placed in the *Colchicaceae* and *Paris* in the *Convallariaceae*. In the *Orchidaceae* the genus *Habenaria* is retained for species now usually

*By C. H. Ostenfeld and Johs. Gröntved. Levin & Munksgaard, Copenhagen, 1934. Pp. 195, 2 maps, Dan. Cr. 6.50.

recognized as belonging to other genera, viz. *Platanthera*, *Coeloglossum* and *Leucorchis*.

The printing and finish of the book are good and typographic errors are few. The text is in English. Certain of the recommendations regarding spelling contained in the International Rules have not been observed by the authors. For example *Borraginaceae*, *Bartschia* and *Coralliorrhiza* are given in place of *Boraginaceae*, *Bartsia* and *Corallorrhiza*; *Geranium silvaticum* is used instead of *Geranium sylvaticum*, which was the original spelling deliberately adopted by Linnaeus; capital letters are not used for old generic names employed as specific epithets; the gender of *Orchis* is wrongly given as masculine, and *Oenotheraceae* is used for *Onagraceae*, the latter being the correct name for the family under the Rules. These, however, are but minor blemishes not detracting seriously from the value of the work.

E. MILNE-REDHEAD.

The Care and Repair of Ornamental Trees.* —The author of this book very rightly directs attention to the ill-health and premature decay of many trees through inattention to necessary pruning and repair work after injury by storms, and to the necessity for bracing together heavy limbs to enable them to withstand gusty winds. In many directions it is possible to find apparently healthy trees with decayed cavities in trunks and branches, and it is upon such trees that the author advocates repair work, not upon trees that are in an advanced state of decay, for no matter how much attention they may get they can never be improved to any appreciable extent. Such trees should be removed and replaced by young ones.

The book opens with a chapter dealing with physiological questions concerning trees and is followed by a chapter on pruning. The second chapter is chiefly devoted to old trees and the work is clearly described, special emphasis being laid upon the necessity for reducing the weight of very heavy branches. Why the author is so careful to recommend tools of foreign manufacture is a mystery, for first-rate tools suitable for the purpose are made in this country and have been in use at Kew for more than forty years.

He then discusses dressings for wounds, various kinds of material for filling cavities, the treatment of backward trees, fungus diseases and insect pests, transplanting large trees, the bolting and bracing of heavy branches, trees and the law, planting and care of street trees, road planting and other subjects.

In confining himself very largely to the treatment of old ornamental trees, the author has neglected a vital question, namely the production of good ornamental trees by proper and regular pruning in early years. It is only by such attention that many trees growing in open positions can be induced to form a good

*By A. D. C. Le Sueur, B.Sc., F.S.I., Dip. For. Published by Country Life Ltd., 20, Tavistock Street, London, W.C.2. 1934. Pp. xiv+257, 42 illustrations. Price 10*s.* 6*d.* net.

central trunk and a uniform head of branches. Improperly developed trees are more liable to storm injury than those of uniform development. It would, indeed, have been more useful had he given particulars regarding the pruning of growing trees rather than a somewhat inadequate description of the transplanting of large trees, for the latter is highly skilled and expensive work that cannot be properly dealt with in a few pages. Apart from this the book gives a very accurate description of work connected with old ornamental trees, and it can be recommended to all who are interested in the subject. The book is well printed on good paper and is illustrated by numerous photographs. W. DALLIMORE.

World Sugar Production and Consumption.* The experience of the author when Lecturer on the sugar trade at the City of London College emphasised the need of a book of convenient size giving a comprehensive survey of the world's production of sugar from cane and beet, with special reference to the economic-geographical aspects. The present volume fills this need with conspicuous success. Commencing with a chapter discussing in a general way the world trade in sugar, the author then gives details regarding the cultivation of the sugar cane and preparation from it of cane sugar. General conditions controlling cane sugar production are then dealt with, including such problems as sets, soil, climatic factors, labour, work in the factory, etc. Chapter three concerns the general conditions attending beet sugar production, including climate, soil, labour and other questions. The various countries most interested in cane sugar are then passed in review and problems incidental to each one are discussed. Some further particulars are then given on beet sugar, the refining industry, the competent factors of consumption, and the future prospects of consumption and production. Although a small book, it is full of useful information and will be found to be of value alike to growers, manufacturers, importers and users of sugar. W. DALLIMORE.

Descriptive Dictionary of Phanerogamic Genera.—Systematic botanists who are not fortunate in living within reach of a great Herbarium and Library are faced with many difficulties in determining even the genera of the plants with which they have to deal. So many new genera are being described and others restored to generic rank, that a large array of taxonomic works has hitherto been needed for the purpose. So far as genera are concerned, the problem has been largely solved by the publication of M. Albert Lemée's great dictionary, of which the fifth volume (Pal-Sci) has just appeared.* This work contains descriptions in French of all recognized genera of Phanerogams with references to their places of publication and revision. All synonyms are also assigned to their appropriate genera in accordance with the results of the latest research. The fifth volume contains an appendix (A–R) containing names published too late for inclusion in the general alphabetical sequence. The occurrence in the Supplement of numerous genera published in 1933 is an indication of the up-to-date character of the work.

The Culture and Marketing of Tea.†—In his preface, the author states that this book does not pretend to be an exhaustive treatise on tea; nevertheless, after fourteen years' experience in north-east India, he has produced a comprehensive volume which will be of interest and service to all connected with the industry.

The whole subject is treated in four parts, the first of which gives a general account of the tea plant and includes chapters on suitable climates and soils. It may be mentioned that the citation of the botanical name of the plant is not correct: it should be *Thea sinensis* L. not *Thea sinensis* (L.) Sims.‡

The second part deals with the chemistry and pharmacology of tea and the changes taking place in the various processes of manufacture. Part three, which takes up about half the book, deals with the tea countries of the world. The first chapter, on tea in China, tells us that the first authentic account of tea was written by Lo-Yu, who lived about A.D. 780. China gave both the word "tea" and the beverage to the world, and "the words *te*, *Chia* and *Cha* denote tea in various Chinese dialects and in one or other of these forms has passed into most other languages." Four chapters in this part deal with tea in north-east India, and it is on this region that the author speaks with real authority and gives a clear account of the area itself, the development of the industry, the actual culture of the plant and the manufacture of tea.

There is also a chapter on terms used in describing teas, and others on tea in Japan and Formosa, north and south India, Ceylon and Java.

Part four is entitled "The British Tea Trade" and deals with the marketing, production and consumption of tea. London is

*World Sugar Production and Consumption, by C. J. Robertson, B.Sc., M.A., Ph.D. John Bale, Sons & Danielsson, Ltd., Oxford House, 83–91, Great Titchfield Street, London, W.1, 1934, pp. vi+142, price 5*s.* net.

*Dictionnaire descriptif et synonymique des genres de plantes phanérogames, par Albert Lemée. Tome v: Pal-Sci. London, Dulau & Co., 32, Old Bond Street, 1934, pp. iii+1152. Price Fr. 250.

†By Dr. C. R. Harler. Humphrey Milford, Oxford University Press, London, 1933. Pp. xi+389, 8 plates and 2 maps. Price 12*s.* 6*d.*

‡International Rules of Botanical Nomenclature, Ed. 2, Art. 41. "An alteration of the diagnostic characters or of the circumscription of a group does not warrant the citation of an author other than the one who first published its name."

the most important market for tea and it is practically the centre of the trade for all countries. The market is concentrated in Mincing Lane and its immediate neighbourhood, where the stocks at any one time may lie between 100 and 200 million pounds and upwards.

Now, out of a world's production of about 900 million pounds, the United Kingdom takes approximately half, and Dr. Harler states that at the present time the annual tea consumption per head in Great Britain is about 9 lbs. In Russia, in normal times, it is about 3·7 lbs. in the towns, and 0·37 lbs. in the villages; in Siberia 1·8 lbs., and in Russian Central Asia and Turkestan 2·7 lbs.

A correspondent in the "Tea and Coffee Trade Journal," Jan. 1934, p. 66 gives the United Kingdom as the largest consumer in Europe 9·87 lbs. per person per annum at the same time quoting figures for Germany of 0·20, Italy 0·009, France 0·09 and Holland 3·17 lbs. per head respectively.

An outstanding feature of the work under review indicates that the production is largely from Empire sources: India (in 1931) 807,000 acres producing 394 million pounds; Ceylon (1929) 470,000 acres producing 251 million pounds; Africa (1928) 8900 acres producing 1,745,000 pounds in Nyasaland; 5,600 acres producing 150,000 pounds in Kenya and 2000 acres producing 800,000 pounds in Natal all showing great possibilities of expansion.

J. H. HOLLAND.

Nature Teaching.*—The sixth edition of this useful little book differs little from the fifth, which was reviewed in the "Kew Bulletin" for 1925. The opportunity has been taken to bring the information in the chapters on insects and fungi into line with recent research and the section on plant habitats has been revised. The lists of plants in the appendices have also been brought up to date. Teachers of nature-study for whom it is primarily intended—and senior students in the tropics will continue to find this book both helpful and interesting.

Florae Siamensis Enumeratio.†—The lamented death of Prof. W. G. Craib, the author of the previous parts of this publication, occurred when part 2 of vol. 2, now issued, was in the press. This latest part completes the *Rubiaceae* and includes also the families *Valerianaceae* and *Dipsacaceae*, the two latter represented each by a single species. It comprises 216 species and 27 varieties of which

*By Sir Francis Watts. The West India Committee, 14 Trinity Square, London, E.C.3. 6th Ed. 1934, pp. vii + 216, text figs. 22. Price 3*s.* 6*d.*

†A list of the plants known from Siam with records of their occurrence, by W. G. Craib. Vol. 2, part 2. Published under the auspices of the Siam Society by the Bangkok Times Press Ltd., 1934, pages 147–234 + vi. Price 12*s.* 10*d.* or 7 *Tes.*

78 species and 17 varieties by Prof. Craib and 8 species by Miss Geddes were first described for this work in the "Kew Bulletin."

Together with this part a 6-paged leaflet of errata to vol. 1 is issued.

A prefatory note gives the welcome information that the enumeration is to be continued under the editorship of Dr. A. F. G. Kerr, on whose collections and notes so much of the past work has been founded.

C. E. C. FISCHER.

Further note on the genus Kraussia.—In K.B. 1931, 254–7, the writer published a short account of the genus *Kraussia* Harv., in which three species were enumerated. Since then attention has been increasingly focussed on the artificiality of the primary division of the *Rubiaceae* by means of the septation and number of ovules per loculus of the ovary. Examination of the genus *Rhabdostigma* Hook. f. with this idea in mind, reveals the fact that there is really no essential difference between the two genera *Kraussia* and *Rhabdostigma* and the latter thus falls into synonymy, the species being redistributed as shown below. The specimens cited are deposited in the Kew Herbarium.

Kraussia *Harv.*—Bullock in Kew Bull. 1931, 255.

Rhabdostigma Hook. f. in Benth. et Hook. f. Gen. Pl. **2,** 109 (1873); Hiern in Oliv. Fl. Trop. Afr. **3,** 130 (1877); K. Schum. in Engl. Pflanzenw. Ost-Afr. **C.** 383 (1895); et in Engl. et Prantl, Naturl. Pflanzenfam. **4,** 4, 87 (1897).

Galiniera Baill. Hist. Pl. **7,** 431 (1880), quoad syn., non Del.

Kraussia Kirkii (*Hook. f.*) *Bullock*, comb. nov.

Rhabdostigma Kirkii Hook. f. in Benth. et Hook. f., Gen. Pl. **2,** 109 (1873); Hiern. in Oliv. Fl. Trop. Afr. **3,** 131 (1877); Oliv. in Hook. Ic. Pl. t. 2275 (1893); K. Schum. in Engl. Pflanzenw. Ost-Afr. **C.** 383 (1895) et in Engl. et Prantl, Naturl. Pflanzenfam. **4,** 4, 87 (1897).

TANGANYIKA TERRITORY:—*Kirk* 105! *Holst* 2982! *Goetze* 108! *Musk* 73! A fruiting specimen from Mafia Island, *Wallace* 817, may belong here.

Kraussia Schlechteri (*K. Schum.*) *Bullock*, comb. nov.

Rhabdostigma Schlechteri K. Schum. in Engl. Bot. Jahrb. **28,** 68 (1899).

Kraussia incerta Bullock in Kew Bull. 1931, 256.

Add to *exsiccata* in K.B. 1931, 256, under *Kraussia incerta*:—TRANSVAAL: *Schlechter* 11605 (type number in Herb. Kew.)! *Pole-Evans* 3416 (25)!

A. A. BULLOCK.

SIR LIONEL PHILLIPS.—We much regret that, owing to erroneous information received at Kew, the announcement of Sir Lionel Phillips' death appeared on p. 138 of K.B. 1934. We are happy to learn that Sir Lionel is alive and well.

Birthday Honours. We note with pleasure that Mr. A. D. Cotton, F.L.S., has been made an Officer, and Messrs. W. E. Broadway and F. G. Harcourt, Members of the Most Excellent Order of the British Empire.

The Toxicology of Plants in South Africa. In the review of this work which appeared in the last number of the "Kew Bulletin" we omitted to state that copies can be obtained from Messrs. Gordon and Gotch, Ltd., Gordon House, 75 79, Farringdon Street, E.C.4.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 6 1934

ROYAL BOTANIC GARDENS, KEW

XXIX—NEW MATERIAL OF MONOTES KERSTINGII FROM THE GOLD COAST.

HELEN BANCROFT (Imperial Forestry Institute, Oxford.)

Very complete and representative material of *Monotes Kerstingii* Gilg* has recently been sent to the Imperial Forestry Institute by Mr. C. Vigne, Assistant Conservator of Forests in the Gold Coast Colony.

Gilg's original description of this species (2, pp. 288–290) has been extended by Hutchinson and Dalziel (3, p. 197; fig. 87), so that the essential diagnostic features are already sufficiently well known. It seems, however, desirable to give a brief account of the ecology of *M. Kerstingii* in the new habitat recorded by Mr. Vigne, together with a description of the wood anatomy of the species.

The Gold Coast material comprises herbarium specimens of flowering branches and wood blocks from the same tree: one from the centre of the original trunk, showing a heart-wood of irregular contour, very distinct from the sap-wood, and a second from the periphery of the trunk, with the bark attached. The bark shows a close, layered structure, is reddish-brown in colour and is finely and irregularly fissured externally; it varies in thickness from 5 to 9 mm. Mature fruits from another tree were subsequently sent by Mr. Vigne, who informs the writer that he obtained the material from the Bosomoa Forest Reserve, at a point 12 miles south of Kintampo (8° 2′ N. by 1° 52′ W.), the only place in the Gold Coast Colony, so far as he is aware, from which *Monotes Kerstingii* has, as yet, been recorded, although he believes it to occur elsewhere. The tree is not common, however, and Mr. Vigne has not been able to discover any vernacular name applied to it.†

ECOLOGY

In the Bosomoa Reserve, *Monotes Kerstingii* attains a height of 40 feet and a girth of 4 feet, growing in comparatively wet savanna woodland, near the edge of the closed forest, at an altitude of approximately 1000 feet‡; the soil it inhabits is sandy, with outcrops

* *Vigne* 3000.

† No vernacular name was recorded by Gilg in his original account of the species (2, pp. 288-290); or by Hutchinson & Dalziel in their description of *M. Kerstingii* as occurring in the French Sudan, French Guinea, Togoland and Northern Nigeria (3, p. 197).

‡ *Cf.* the conditions under which the species was originally discovered by Kersting in Upper Guinea, namely in open savanna, at an altitude of 400 metres (2, p. 290).

of sandstone ; and the rainfall of the area is about 60 inches, with a pronounced dry season in December, January and February. Flowering takes place in June, the month of heaviest rainfall, and fruiting in November and December.*

The area from which *Monotes Kerstingii* is recorded is interesting as being the only station where Mr. Vigne has found *Faurea speciosa* Welw. and *Protea Elliotii* C. H. Wright ; other associates are common savanna trees, such as *Uapaca togoensis* Pax, *Lophira alata* Banks, *Terminalia sokodensis* Engl., *Syzygium guineense* DC., *Crossopteryx febrifuga* Benth., *Hymenocardia acida* Tul., *Cussonia longissima* Hutch. et J. M. Dalz., *Detarium senegalense* Gmelin, *Vitex Cienkowskii* Kotschy, *Bridelia ferruginea* Benth., *Burkea africana* Hook. f., *Daniellia Oliveri* Hutch. et J. M. Dalz., *Lannea acida* A. Rich., *Entada abyssinica* Steud., *Parinari curatellaefolia* Planch.,† and *P. polyandra* Benth.; also certain shrubs, such as *Grewia mollis* Juss. and *Pavetta crassipes* K. Sch.

The Characters of the Wood

General Properties

Very hard and very heavy.

Weight of air-dry wood :—about 66 lbs. per cubic foot.

Specific Gravity of air-dry wood :—1·057.

Texture :—fine and close.

Grain.—Fairly straight ; occasional irregularities occur in the longitudinal direction of the elements.

Colour.—Sap-wood reddish-brown with occasional dark lines running longitudinally through the wood ; these appear as short, radially-extended flecks on the transverse surface of the wood. Heart-wood distinctly darker than sap-wood, with a blackish tinge.

Lustre.—Slight.

Macroscopic Features

Growth Rings.—Visible on transverse surface, and occasionally on radial surface. Marked by darker colour and denser appearance of ground-mass of wood, with somewhat fewer vessels ; occasionally rings more distinctly marked by complete absence of vessels.

Vessels.—Visible only with lens on transverse surface ; typically solitary, numerous, evenly distributed (except for point noted above), with occasional tendency to alignment in short oblique series. Vessel-lines visible to eye on longitudinal surfaces ; individual elements visible with lens.

Ground-Mass of Wood.—Dense, individual elements not distinct, even with lens ; soft tissue not visible.

Rays.—Extremely fine, very numerous and closely-set. Visible only with lens on transverse surface ; hardly visible with lens on

* Kersting found the species flowering in May, and fruiting in October, in Upper Guinea.

† *Monotes Kerstingii* is sometimes mistaken for this species.

Plate VIII



Fig. 3. Radial section.

Fig. 2. *Monotes Kerstingii* Gilg. Tangential section.

Fig. 1. Tranverse section.

tangential surface; visible to eye on radial surface as fine horizontal streaks of same colour as ground-mass in heart-wood, but of somewhat darker colour in sap-wood. With lens, rays seen to be very faintly marked with fine glistening horizontal lines, indicating horizontal walls of ray-cells.

RIPPLE-MARKS.—Absent.

SECRETORY CANALS.—Absent; occasional dark lines, however, appear to indicate the presence of resin in the tissues.

MICROSCOPIC FEATURES

(Plate VIII, Figs. 1, 2 & 3)

GROWTH-RINGS.—Irregular in contour; marked by decrease in size and number of vessels (in some cases by their complete absence), also by absence of diffuse parenchyma cells, and in some cases by radial compression of from 1 to 3 or 4 rows of fibres, which are, at these points, more definitely radially arranged than elsewhere: this feature, however, is very irregular.

VESSELS.—*Arrangement:* scattered and fairly evenly distributed, except at boundaries of growth rings; bounded on one or both sides by rays; generally solitary, with tendency to arrangement in short oblique series; pairs very infrequent; groups of more than 2 vessels extremely rare.

Numerical distribution: moderately numerous to numerous; 21 ± 3 solitary vessels per sq. mm., with approximately 0·95% of pairs.

Size: very small to (generally) small; tangential diameter of solitary vessels in transverse section, $61 \pm 15\mu$; radial diameter, $98 \pm 20\mu$; vessel-elements generally short; length, $436 \pm 90\mu$.*

Form of vessel-elements: elongated and straight-sided, elliptical in transverse section; with and without " tails " at one or both ends; tails variable in length and breadth.

Perforations: simple; horizontal or oblique, the longer elements having the more oblique perforations.

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* The classes here used for numerical distribution and size of elements and rays are those proposed by Chattaway (1). The figures represent the mean and standard deviation of 100 counts or measurements, except in the case of vessel-element length. In this instance, measurements were taken only from macerated material, because of the difficulty of determining the *complete* length of each element from sections. Although a large amount of macerated material was examined, only 29 whole and perfect elements were discovered, and only these were ultimately considered. The mean length and standard deviation given above were obtained by measuring the *total* length of each element, including the " tails " where these were present; this was the case in 14 out of the 29. Neglecting the tails, as suggested by Chattaway (1, p. 24), the mean length and standard deviation were $394 \pm 94\mu$.

It may be noted that the longer vessel-elements were not necessarily those with tail-like extensions; out of the 29 elements, 7 were 500μ, and above, in length: 2 of these were without tails.

(N.B. The method of expressing counts and measurements in terms of means and standard deviations, rather than as maxima or ranges, according to general practice, is due to a suggestion made by Mr. S. H. Clarke, of the Forest Products Research Laboratory, in an as yet unpublished paper. The writer is greatly indebted to Mr. Clarke for the opportunity to see his work.)

Walls : comparatively thin.
Pits : mainly small, a little variable in size ; numerous, but non-contiguous ; somewhat unevenly distributed ; apertures somewhat rounded, or (generally) elliptical or slit-like, at varying inclinations or horizontal. Vessel-fibre pits distinguishable as being in regular lines, with an almost vertical to somewhat spiral direction. All pits bordered, with whatever elements they communicate, except those communicating with marginal cells of rays (and sometimes, in the case of higher rays, with certain central body cells also) ; these are simple, larger than all others, elliptical to irregular in shape ; in some cases the apertures appear to have somewhat thickened rims, and suggest actual perforations rather than pits.*
Tyloses : present.
Vessel-contents : occasionally resinous, in connection with the tyloses.

TRACHEIDS.—None observed.

FIBRE-TRACHEIDS.—Typical examples somewhat wider and thinner-walled than true libriform fibres ; elongated, similar in length to the fibres, tapering and pointed at ends ; generally pitted throughout length ; pits bordered, with narrow oblique apertures. Transitions to true fibres occur.

FIBRES.—*Arrangement :* forming main ground-mass of wood ; irregular in arrangement generally, but occasionally forming subradial to radial rows at limits of growth-rings, where individual fibres tend to be radially compressed. Course vertical to somewhat oblique and irregular ; occasionally ends of fibres turn at right angles and follow horizontal course of rays.
Shape : variable in transverse section, depending on arrangement ; elongated, tapering gradually, generally sharply pointed.
Length : short ; 1·275±0·24 mm.
Walls : thick to very thick, not varying appreciably in thickness in early and late wood.
Lumina : very small in comparison with thickness of walls ; rounded, elliptical or slit-like in transverse section, according to outline of fibre-elements.
Pits : on all walls, and throughout length, except in the case of elements with very slender-pointed ends ; bordered, with oblique to nearly vertical slit-like apertures.
Septation : absent.
Contents : none.

PARENCHYMA.—*Amount :* fairly abundant.
Arrangement : metatracheal—diffuse, with very occasional tendency to form uniseriate tangential lines of 3 or 4 cells, or small groups ; *paratracheal*—fairly conspicuous, never forming complete sheaths round vessels, but often forming small " caps " to larger vessels.
Appearance of cells : in transverse section—somewhat variable n size, often rather large, rounded to irregular in shape ; *in longitudinal section*—not very conspicuous, typically in short single vertical series, in which cambiform rows are not obvious ; cells elongated vertically, though variably so ; end walls mainly horizontal.

Pits : small, simple ; not numerous, but occasionally very distinct on vertical walls, rounded to elliptical in shape ; interparenchyma pits (on end walls) not grouped.
Crystal-bearing cells : absent.
Cell-contents : variably resinous.

RAYS.—*Arrangement :* closely-set and very numerous, 16±2 per mm.; deflected by, and contiguous to, vessels, or separated from them by 1 or 2 series of ground-tissue elements ; non-storeyed.
Shape and size : narrowly spindle-shaped in tangential section of wood ; extremely fine ; uniseriate, very rarely locally biseriate, 12±3·4μ in width ; extremely low, from 2–29, frequently from 3–11, and most frequently 9, cells, and 174±105μ in height.
Ray-type and shape of ray-cells : slightly heterogeneous ; *in transverse section*—cells generally radially elongated, though variably so, often compressed by contour of vessels ; *in tangential section*—marginal cells oval, body cells rounded or squarish to (generally) elliptical ; *in radial section*—cells generally horizontally elongated, though sometimes almost square ; upper and lower marginal cells more variable than others. End walls of cells upright to inclined, sometimes curved.

Walls : comparatively thick.
Pits : simple, on all walls of cells ; numerous on end walls ; generally small and rounded or elliptical, but large and elliptical to somewhat irregular in shape on walls of 1 or 2 series at upper and lower margins, and also on walls of certain central body cells of higher rays, where these are in contact with vessels. (In some cases, these large " pits " have the appearance of actual perforations ; *cf.* description of vessel-pits).
Contents : resinous.

The writer wishes to express her grateful thanks to Mr. C. Vigne for the material of *Monotes Kerstingii* Gilg here described, and for information regarding the habitat of the species ; to Mr. A. L. Clinkard for the photographs forming Plate I ; and also to the Christopher Welch Trustees for a grant enabling this research to be carried out.

REFERENCES.

1. CHATTAWAY, M. M. " Proposed Standards for Numerical Values used in describing Woods." *Tropical Woods*, **29**, 20 (1932).
2. GILG, E. " Weitere Beiträge zur Kenntnis der Afrikanischen Dipterocarpaceen-Gattung *Monotes*." *Engl. Bot. Jahrb.* **41**, 287 (1908).
3. HUTCHINSON, J., and DALZIEL, J. M. *Flora of West Tropical Africa*, **1** (1927).

* Owing to the small size and delicate nature of the structures, it has not yet been possible to obtain conclusive evidence on this point.

XXX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXI.*

Fungi collected in British Guiana, chiefly by the Oxford University Expedition, 1929.

E. M. WAKEFIELD.

The fungi enumerated in the following list were for the most part collected between the middle of August and the end of November 1929, during the visit of the Oxford University Expedition to the Colony. Mr. Paul W. Richards was responsible for the collection of fungi, and he was assisted for about a fortnight in October by Mr. E. B. Martyn, mycologist to the Department of Agriculture for British Guiana. Other members of the Expedition contributed occasional specimens, but all these are cited under the numbers given by Richards. Earlier records of the same species have been added, as giving some indication of relative frequency. Further some additional records made by Martyn have been included, since these were obtained from similar forest areas, and provide valuable supplementary information as to the types of fungi found in these regions.

The fungi collected by the Oxford University Expedition were all obtained from the rain-forest area, characterised by high and even temperature and constantly high humidity. Most of the specimens came from a relatively restricted area near the camp at Moraballi Creek, near Bartica, on the river Essequibo, but a few were collected at the first Falls of the Essequibo, lower down the river. The phanerogamic vegetation of the Moraballi Creek region has been described in detail by T. A. W. Davis and P. W. Richards in the Journal of Ecology (**21**, 350: 1933, and **22**, 106: 1934). For explanations of the five types of forest associations (Mora, Morabukea, Greenheart, Mixed and Wallaba) mentioned in recording habitats the reader is referred to these papers.

Mr. Martyn's additional records were made chiefly just north of the Tinamu Fall, near the junction of the Cuyuni River with the Essequibo, and at Mabaruma in the North-Western District.

Of particular interest are the many species of stipitate Polyporaceae, such as the genus *Amauroderma*, which are contained in these relatively small collections. Tropical South America appears to be rich in these forms, which are found amongst dead leaves in the shade of the forests, and probably grow from buried roots. Unfortunately these fungi usually occur as solitary specimens, and many of the species recorded hitherto are known only from the type gatherings, which in some cases are very scanty. The material now available has furnished data for more adequate descriptions of several forms, notably *Amauroderma renatum*, which has been regarded as a very doubtful species and was referred by Bresadola to *A. exile*. It is very close to *A. exile* in structure, but is distinguished by the larger pores and by its spores.

*Continued from K.B. 1934, 205.

The Oxford University Expedition collection was comparatively rich in entomogenous fungi. These have been worked out by Mr. T. Petch and are the subject of a separate paper.*

In the compilation of the following list material preserved at Kew and in the herbarium of the Department of Agriculture, British Guiana, has been examined, and as far as possible the older records cited have been checked. Synonymy is given only in so far as it refers to British Guiana records. Certain unlocalised records which are cited are to be found in Richard Schomburgk's "Reisen in Britisch Guiana, 1840-44" (which includes the earlier records of G. F. W. Meyer), in Berkeley's Decades, and in a list by M. C. Cooke in Grevillea, **13**, 32 (1884).

For the determination of the species of *Hypoxylon* and *Nummularia* I am indebted to Professor J. H. Miller, who examined the specimens during his visit to Kew in 1930.

HYMENOMYCETES.

Lentinus crinitus (*Linn.*) *Fr.* Syst. Orb. Veg. **1**, 77 (1825). *L. nigripes* Fr. ex Kl. in Linnaea **8**, 479 (1833); *L. fumigatus* Lév. in Ann. sci. nat. sér. 3, **5**, 117 (1846); *L. Schomburgkii* Berk. in Trans. Linn. Soc. **20**, 111, (1846).

On dead log, Moraballi Creek, October 16th, 1929, *Richards* 590; without locality, *Schomburgk* (Brit. Guiana, **3**, 868).

The collector's note with No. 590 states that both pileus and gills are at first white, becoming brownish later.

Schizophyllum radiatum (*Sw.*) *Fr.* Nov. Symb. in Nova Acta Sci. ser. 3, **1**, 41 (1851).

On dead trunk of *Protium* sp., Moraballi Creek, September 19, 1929, *Richards* 402; on lime, Essequibo River, October 1923, *Altson* 44.

The determination of this species is in accordance with the recent paper by Linder (Amer. Journ. Bot. **20**, 557: 1933), who maintains that it is distinct from *S. commune* Fr. Probably older records from British Guiana under the name *S. commune* refer also to *S. radiatum*. These are:—Near Bartica Grove, November 1886, *Jenman* 2344 (as *S. commune* var. *flabellare*); Mazaruni, July 1904, *Bartlett* 7930.

Polyporus camerarius *Berk.* in Hook. Journ. Bot. **8**, 143 (1856).

On ground in swamp, north of Tinamu Fall, Cuyuni River, Essequibo, March 7th, 1931, *Martyn* 295; among dead leaves on floor of Greenheart bush, north of Tinamu Fall, March 10th, 1931, *Martyn* 323; without locality, det. M. C. Cooke in Herb. Kew.

Both the recent specimens were solitary. Although resembling a species of *Amauroderma* in habit, this species differs from the

*See K.B. 1934, 202.

accepted definition of that genus in its white flesh and almost hyaline hyphae. Spores not found, but probably hyaline.

P. Rhizomorpha *Mont.* in Ann. sci. nat. sér. 2, **13,** 202 (1840).

On dead twig in undergrowth, Moraballi Creek, October 29, 1929, *Richards* 716; on bark of living tree, Conawarook River, September 1905, *Bartlett* 8612; on log, Weri-Werai-kam Creek, Essequibo, August 1930, *Martyn* 199.

Bartlett 8612 includes one sporophore, but the other specimens consist of rhizomorphs only.

P. Leprieurii *Mont.* in Ann. sci. nat. sér. 2, 13, 203 (1840).
subelegans Murr. in N. Amer. Flor. 9, 62 (1907).

On log, Supenaam Forest Reserve, Bartica, August 15, 1930, *Martyn* 209; on tree-trunk, Mabaruma, North Western District, November 1928, *Martyn* 2; on dead branch, north of Tinamu Fall, Cuyuni River, March 10, 1931, *Martyn* 326; without locality, Herb. W. J. Hooker (Kew); without localities, Herb. Dept. Agric. Brit. Guiana, *Bartlett* 8045; without locality, Schomburgk (Brit. Guiana 3, 869).

Herbarium specimens of this species become uniformly deep alutaceous or even chestnut-brown in colour on the upper surface. According to the collector's notes with Nos. 2 and 209, however, the pileus when fresh is cream to light brown, and the pore-surface dark brown in colour. No. 326 is a very small form, very shortly stipitate, and with a regular somewhat spathulate pileus. At first sight it appears very different from the large, lobate fungus which is the usual form found. In microscopic structure, however, it is identical, and may be only an early stage.

P. guianensis *Mont.* in Ann. sci. nat sér. 2, **13,** 201 (1840).
On dead log, Moraballi Creek, October 25, 1929, *Richards* 683.

P. sulphureus (*Bull.*) *Fr.* Syst. Myc. **1,** 357 (1821).
On dead log, Moraballi Creek, October 16, 1929, *Richards* 620.

This fungus agrees with the European form in microscopic structure and in the presence of conidia. It is, however, thinner than the usual temperate form, and flabellate, with a short stalk. The collector's note states that it was white when fresh, tough and fleshy.

P. albo-gilvus *Berk.* et *Curt.* in Journ. Linn. Soc. **10,** 308 (1869).
On dead log, Moraballi Creek, October 21, 1929, *Richards* 656.

The tissue is very brittle when dry, on account of the abundant crystals contained in it. Lloyd has stated that this species is the same as *P. flavescens* Mont., but according to a note by Bresadola in the Kew Herbarium this is not the case.

P. gilvus (*Schw.*) *Fr.* Elench. **1,** 104 (1828).

On rotten bark in light, well-drained part of forest, Moraballi Creek, August 22, 1929, *Richards* 175; on dead log, Moraballi Creek, October 24, 1929, *Richards* 671.

The specimens are of a thin form, approaching *Polystictus licnoides* (Mont.) Fr.

P. nivosus *Berk.* in Hook. Journ. Bot **8,** 196 (1856).

On branch of felled tree in Wallaba forest, Moraballi Creek, October 19, 1929, *Richards* 621.

According to the collector's note the pore-surface in this specimen was greyish to brown when fresh, and the dried specimen does not give the impression of having been pure white. The spores are cylindrical, 8–9 × 2·5–3μ. In this character and in the paler flesh the species differs from *P. neofulvus* Lloyd.

P. valenzuelianus *Mont.* in Ramon de la Sagra, Hist. Cuba (Pl. Cell.), 398 (1845).

On dead log in Wallaba Forest, Moraballi Creek, October 19, 1929, *Richards* 622.

P. micromegas *Mont.* in Ramon de la Sagra, Hist. Cuba (Pl. Cell.), 423 (1845).

Common on all dead wood. In Wallaba forest, Moraballi Creek, October 11, 1929, *Richards* 547; Moraballi Creek, October 16, 1929, *Richards* 582; October 25, 1929, *Richards* 681; without precise locality, September 1904, *Bartlett* 8416; Cuyuni River, October 1904, *Bartlett* 8340, 8368.

When fresh *P. micromegas* has usually a salmon-pinkish (coral) tinge on both surfaces, but the colour is variable. No. 547 is noted as being "dull orange-yellow." *Bartlett* 8368 is subresupinate.

The species was referred to *P. zonalis* Berk. in Saccardo's Sylloge, but, as Bresadola has pointed out, it is distinct from that species.

Amauroderma renatum (*Berk.*) *Murr.* in North Amer. Flora **9,** 117 (1908).

On humus on floor of Morabukea forest, Moraballi Creek, August 24, 1929, *Richards* 214; among dead leaves in deep shade, Morabukea forest, Moraballi Creek, September 5, 1929, *Richards* 329 p.p.; on floor of forest, Moraballi Creek, October 24, 1929, *Richards* 673; among dead leaves on floor of Greenheart bush, north of Tinamu Fall, Cuyuni River, March 10, 1931, *Martyn* 324, 325; in open high mixed bush and Greenheart, north of Tinamu Fall, March 10, 1931 *Martyn* 334; on rather swampy ground, among leaves, north of Tinamu Fall, March 7, 1931, *Martyn* 297A; Conawarook River, September 1905, *Bartlett* 8615.

Most of the specimens here enumerated are more fully developed than the type specimens from Brazil, and were only placed in this

species after careful comparison of the microscopic characters. The type material of *Polyporus renatus* Berk. consists of three specimens. One of these is a tall form with a slender, regular stem and very minute greyish pores. This may well be the same as *P. exilis* and may have influenced Bresadola in referring this species to *P. exilis*. The other two specimens, on the other hand, are different in habit, having a lobed, rather irregular pileus, and a somewhat stouter and more irregular (twisted or nodulose) stem. The pores in these two specimens are for the most part not properly developed, but in one of them there are two patches of fresh pores overgrowing the older layer, and these are obviously considerably larger than those of *P. exilis*, though not as large as those of the present specimens. The colour of the flesh is cinnamon.

In most of the specimens under consideration the pores are large, up to ·5 mm. in width and even 1 mm. in the longer diameter. They are thin-walled, polygonal, and radially elongated, but rather shallow. The general colour of the pore-surface is brown, approximately " Saccardo's umber " of Ridgway. The hyphal structure is similar to that of *A. exile*, but the spores, which are present in *Martyn* 325, are different, being elliptical, very pale fuscous (almost hyaline), and 12–13×9μ. The flesh of the pileus is very thin and " Sayal Brown " in colour.

No. 329 was mixed with *A. exile*, and but for the difference in spores it might be supposed that these two species were forms of one. On the whole, however, *A. renatum* is larger than *A. exile*, and the pileus is more infundibuliform and frequently laterally cut.

Amauroderma exile (*Berk.*) *Lloyd*, Syn. Stip. Polyp. 120 (1912), sub icone. *Ganoderma* (*Amauroderma*) *exile* (Berk.) Pat. in Bull. Soc. Myc. Fr. 5, 77 (1889).

Among dead leaves in deep shade, Morabukea forest, Moraballi Creek, September 5, 1929, *Richards* 329 p.p.; arising from dead leaves on the ground and from dead stems in mixed forest, Mabaruma, North-Western District, November 1928, *Martyn* 8 p.p.

Apparently common in such situations. A small, slender species. Spores are present in No. 8 and are almost hyaline, thin-walled, subglobose, 8μ diameter or 8×7μ.

A. partitum (*Berk.*) *Wakef.* comb. nov. *Polyporus partitus* Berk. in Hook. Journ. Bot. 8, 170 (1856).

On swampy ground among leaves, north of Tinamu Fall, Cuyuni River, March 7, 1931, *Martyn* 297.

The pores in this species are large, like those of *A. renatum*, but it differs in that both flesh and pore-surface are whitish. Spores not seen in this specimen, but in the type (Spruce 20), they are yellowish, smooth, 11–13×8–9μ. On account of the white flesh Patouillard did not include this species in his account of the genus *Ganoderma*, and has placed it in the section *Leucoporus*. In general habit and in the large yellowish spores it is, however, too closely

allied to such forms as *A. exile* and *A. renatum* to be placed in another genus. Bresadola (Ann. Myc. **14**, 238 : 1916) first noted that it is an *Amauroderma*, but did not actually make the combination.

A. macrum (*Berk.*) *Wakef.* comb. nov.

Ganoderma (*Amauroderma*) *macer* (Berk.) Pat. in Bull. Soc. Myc. Fr. **5**, 79 (1889).

On the ground at foot of stump, Moraballi Creek, October 24, 1929, *Richards* 672.

If correctly referred this is a younger specimen than the single fruit-body which constitutes the type, and the description requires some amplification. The upper surface of the pileus is covered at first with a deep-brown matt to velvety coating, showing bare blackish concentric zones. In the dried specimen the pileus has a pale margin, and the pore-surface is pale brown, of the same colour as the flesh. The collector's notes from the fresh specimen are " Hymenial surface white, upper surface chocolate-brown, narrow white margin."

The pores are thick-walled, but not as " ocellate " as in the type specimen. Spores subglobose, smooth, pale fuliginous, 10–11μ in diameter.

A. Schomburgkii (*Mont. et Berk.*) *Lloyd*, Syn. Stip. Polyp. 118 (1912) sub icone. *Ganoderma* (*Amauroderma*) *Schomburgkii* (Mont. et Berk.) Pat. in Bull. Soc. Myc. Fr. **5**, 77, (1889).

On floor of forest, in shade, Moraballi Creek, October 25. 1929, *Richards* 678 ; without precise locality, *Schomburgk* (type).

This specimen has a second pileus growing above the old one, on a single stem 8 to 10 inches high.

A. variabile (*Berk.*) *Lloyd*, Syn. Stip. Polyp. 112 (1912), sub icone, *Ganoderma* (*Amauroderma*) *variabile* (Berk.) Pat. in Bull. Soc. Myc. Fr. **5**, 76 (1889).

Among dead leaves on floor of mixed forest, Moraballi Creek, August 22, 1929, *Richards* 167.

A single specimen. Spores not found.

A. longipes (*Lév.*) *Lloyd*, Syn. Stip. Polyp. 116 (1912) sub icone. *Ganoderma* (*Amauroderma*) *longipes* (Lév.) Pat. in Bull. Soc. Myc. Fr. **5**, 75 (1889).

Solitary, on floor of mixed bush (crabwood and Mora) on dry, sandy soil, near Tinamu Fall, Cuyuni River, Mar. 3, 1931, *Martyn* 271 ; without precise locality, *Schomburgk* (Brit. Guiana 3, 869).

A. ocellatum (*Berk.*) *Lloyd*, Syn. Stip. Polyp. 118 (1912) sub icone. *Polyporus ocellatus* Berk. in Hook. Journ. Bot. 8, 172 (1856).

On rotting tree-stump in dry, well-lit Wallaba forest, Moraballi Creek, September 26, 1929, *Richards* 485 ; in forests of Ohio Creek,

West Kaluni River, Mazaruni River, May 5, 1929, *A. Wade* ; without precise locality, 1884 (as *Fomes pansus*, det. M. C. Cooke) in Herb. Kew.

The types of *Polyporus ocellatus* from Brazil were thin, polystictoid forms, with smooth, zoned pileus. These Guiana specimens are much larger, the pileus is thicker and tends to become radially rugulose. The pores are always thick-walled and more or less glaucous, but the " ocellate " condition is probably a question of age. The species is marked by its very hard, rigid texture, due to the presence in the pore-walls of thick-walled, brown, skeletal hyphae, the projecting ends of which may be forked. The flesh of the pileus is thin and red-brown.

Ganoderma opacum (*Berk. et Mont.*) *Pat.* in Bull. Soc. Myc. Fr. **5,** 67 (1889).

At base of a large tree in Greenheart bush, north of Tinamu Fall, Cuyuni River, March 10, 1931, *Martyn* 328.

In its central stem and dull, zoned crust this species suggests *Amauroderma,* but the spores are typically those of *Ganoderma.*

G. nitidum *Murr.* in North Amer. Flora **9,** 123 (1908).

On rotting stump in dry, well-lit Wallaba forest, Moraballi Creek, September 26, 1929, *Richards* 486.

These are small specimens, somewhat ungulate in shape, and with thicker flesh than the type. They agree with Murrill's species in the very resinous crust of the pileus and in the small (9–10 × 8μ), only slightly pitted spores. The pore surface of the dried specimens is yellow, but the collector's note states that it was pure white when fresh.

G. tuberculosum *Murr.* in North Amer. Flora **9,** 12 (1908).

On decayed tree-stump, Lamaha Dam, Botanic Gardens, Georgetown, November 1929, *Martyn* 167.

The collector's note states that the hymenium was cream-colour when fresh, the upper surface of the pileus red-brown, shining, with a yellow (mustard-colour) margin. The species is near to sessile forms of *G. lucidum,* but is easily distinguished by the smaller and more globose spores.

G. fornicatum (*Fr.*) *Pat.* in Bull. Soc. Myc. Fr. **5,** 71 (1889). *G. subfornicatum* Murr. in N. Amer. Flor. **9,** 121 (1908).

On dead trees in well-lit forest, Moraballi Creek, September 23, 1929, *Richards* 487 ; near Ananda-basu, right bank of Maicwac River, April 1926, *Altson* 554 ; Conawarook River, September 1905, *Bartlett* 8698.

In No. 487 the specimens vary from stipitate to almost sessile.

G. applanatum (*Pers.*) *Pat.* var. **tornatum** (*Pers.*) *Humphr.* in Philipp. Journ. Sci. **45,** 543 (1931).

On fallen tree-trunk in mixed rain-forest, Moraballi Creek, August 21, 1929, *Richards* 136 ; on trunk of dead *Licania buxifolia* Sandw. in dark Wallaba forest, Moraballi Creek, October 7, 1929, *Richards* 529 ; on fallen log, mixed forest, Moraballi Creek, October 17, 1929, *Richards* 604 ; on dead log, Moraballi Creek, October 21, 1929, *Richards* 659 p.p.; on dead log, Upper Arawan River, Aruka Road, North-Western District, May 1929, *Martyn* 60 (stipitate form).

No. 60 is of the form which has passed as *Ganoderma gibbosum* (Bl. et Nees). The small spores are those of var. *tornatum* Pers. as understood by Humphrey.

Fomes hornodermus (*Mont.*) *Cooke* in Grevillea **13,** 119 (1885). *F. sulcatus* Cooke in Grevillea **13,** 32 (1884).

On very old rotting stump of Greenheart (*Ocotea Rodiei*) in mixed forest, Moraballi Creek, September 25, 1929, *Richards* 460 ; on under side of large dead branch in undergrowth of swampy " Low Bush," Moraballi Creek, November 13, 1929, *Richards* 798 ; without precise locality, in Herb. Kew (type of *F. sulcatus*).

No. 460 consists of small neat specimens, like the material on which *F. sulcatus* was founded. No. 798 is a semi-resupinate specimen, extending for some distance along a branch, with only a narrow reflexed margin.

F. microporus (*Sw.*) *Cooke* in Grevillea **14,** 20 (1885). *F. Auberianus* (Mont.) Murr. in Bull. Torr. Bot. Club **32,** 491 (1905).

On dead log, Moraballi Creek, October 17, 1929, *Richards* 616 ; on dead log, north of Tinamu Fall, Cuyuni River, March 10, 1933, *Martyn* 333.

The collector's note with No. 616 states that the hymenial surface was pinkish when fresh. In No. 333 it is said to be orange, and the upper surface of the pileus white, tinged orange.

This species is common in the West Indies and South America and has often been referred to *Fomes lignosus* (Kl.). There is, however, some doubt as to the correctness of this identification with the Eastern species. There is no doubt as to the agreement of these specimens with the type of *F. microporus,* and this name antedates Montagne's *Polyporus Auberianus.*

F. marmoratus (*B. et C.*) *Cooke* in Grevillea **14,** 18 (1885).

On trunk of dead *Licania buxifolia* in dark Wallaba forest, Moraballi Creek, October 7, 1929, *Richards* 530 ; on dead stump of tree in second-growth forest, island in Essequibo River, October 14, 1929, *Richards* 562 ; on dead log, Moraballi Creek, October 21, 1929, *Richards* 659 p.p. (mixed with *Ganoderma applanatum* var. *tornatum*).

F. pseudosenex (*Murr*). *Sacc. et Trott.* Syll. Fung. **21,** 292 (1912).

On dead trunk, 20 feet above ground, in mixed forest, Moraballi Creek, October 17, 1929, *Richards* 605 ; on branch of small tree,

Moraballi Creek, November 1929, *Richards* 856 ; at base of Mora, Moraballi Creek, October 1929, *Richards* 613 ; on dead log in Wallaba forest, Moraballi Creek, October 19, 1929, *Richards* 618.

No. 605 is a very large specimen. No. 618 is small and evidently young, but still shows four layers of pores.

F. roseo-cinereus (*Murr.*) *Sacc. et Trott.* Syll. Fung. **21,** 291 (1912).

On dead Mora trunk, 8 feet above the ground, Moraballi Creek, October 16, 1929, *Richards* 574 ; inside rotted base of fallen tree, Moraballi Creek, October 16, 1929, *Richards* 593 ; on fallen trunk, Moraballi Creek, October 1929, *Richards* 611.

No. 593 includes both ungulate and resupinate forms, while No. 574 is applanate. No. 611 is in part resupinate and is darker in colour than usual. No. 593 has occasional setae (rare) and No. 574 none. The species was described as having no setae, and a specimen from Costa Rica, determined by Murrill, at New York, has none, but in the type gathering abundant setae are present. Flat specimens suggest *F. linteus*, but differ in the larger, usually greyish pores, and in the larger spores, which vary from hyaline to brown.

The fungus appears to cause a brown rot of the wood of the host.

F. tropicalis *Cooke* in Grevillea **15,** 22 (1886).

On the buttresses of a tree, Supenaam Creek, March 1931, *Martyn* 358.

Polystictus luteo-nitidus (*Berk.*) *Cooke* in Grevillea **14,** 77 (1886).

Among dead leaves on the ground, north of Tinamu Fall, Cuyuni River, March 10, 1931, *Martyn* 322.

P. gallinaceus (*Berk. et Cooke*) *Cooke* in Grevillea **14,** 78 (1886).

On fallen log in mixed forest, Moraballi Creek, September 25, 1929, *Richards* 458 ; on dead wood, Moraballi Creek, October 25, 1929, *Richards* 682 ; on log, Moraballi Creek, October 26, 1929, *Richards* 696 ; Pomeroon River, September 1904, *Bartlett* 8081 ; without precise localities, September-October 1904, *Bartlett* 8420, 8421, 8422, 8424 ; Tinamu Fall, Cuyuni River, October 1904, *Bartlett* 8433 ; among dead leaves on sandy soil, in mixed forest, north of Tinamu Fall, March 8, 1931, *Martyn* 307 ; on dead log, north of Tinamu Fall, March 10, 1931, *Martyn* 321 (?).

This species, which is evidently common in British Guiana, occurs also in Brazil, and has usually been referred to *P. mutabilis* B. et C. The original gatherings of *P. mutabilis* were from North Carolina, and examination of these has shown that this South American form is not the same. The confusion appears to have originated with Berkeley himself, who referred a specimen from Rio Negro (*Spruce* 176) to his *P. mutabilis*. Lloyd has continued the confusion, the figure he gives in his " Stipitate Polyporoids " for *P. mutabilis* being in reality a photograph of one of the original

gatherings of *P. gallinaceus*. *P. gallinaceus* differs from *P. mutabilis* in its very regular, spathulate shape, thinner substance, and darker, grey-zoned pileus. The fine striation on the pileus gives it a slightly silky appearance. The stem and base of the pileus is at first distinctly velvety, and the pores are very minute, smaller and shallower than those of *P. mutabilis*. The spores are hyaline, globose or subglobose, 3·5–4μ in diameter, whereas those of P. *mutabilis* are elliptical and about 5×3μ.

No. 321, if rightly referred here, is a very dark form, more irregular in shape than usual. The collector's note states that in these specimens the upper surface of the pileus was blackish when fresh, but the hymenium white.

P. polygrammus (*Berk. et Curt.*) *Cooke* in Grevillea **14,** 78 (1886).

On dead log, Moraballi Creek, October 21, 1929, *Richards* 655.

The type is represented by one specimen only, and differs in some respects. These specimens grew in groups of two or three pilei, having the short stems united towards the base. According to the collector's notes the colour when fresh is white ; the dried specimens are yellowish. The stem and basal part of the pileus is distinctly hairy when seen under a lens, as in some species of *Favolus*; in fact, but for the minute pores the species suggests *Favolus*. The spores are hyaline, 4×2–2·5μ.

Polystictus substereinus (*Murr.*) *Wakef.* comb. nov. *Polyporus subterraneus* (Murr.) Sacc. et Trott. (sic !) in Sacc. Syll. Fung. **21,** 276 (1912).

On dead log, Moraballi Creek, October 16, 1929, *Richards* 586.

It is possible that this is synonymous with *P. caryophyllaceus* B. et C. ex Cooke, but the type of that species is so inadequate that it is impossible to be certain of its identity. The resemblance to a *Stereum* is very striking. The species is close to *P. stereinus* B. et C., but thinner and lighter in colour, and with more distinct zones on the pileus.

P. modestus (*Kunze*) *Fr.* Nov. Symb. in Nova Acta Sci., ser. 3, **1,** 74 (1851). *P. albo-cervinus* Berk. in Hook. Journ. Bot. **8,** 234 (1856).

On rotten wood in dark rain-forest, Moraballi Creek, August 16, 1929, *Richards* 43 ; on fallen tree in Morabukea forest, Moraballi Creek, September 6, 1929, *Richards* 337 ; Moraballi Creek, October 20, 1929, *Richards* 636 ; on small Mora trunk, Supenaam Forest Reserve, Bartica, August 13, 1930, *Martyn* 203 ; Pomeroon River, September 1904, *Bartlett* 7950 ; without precise localities, *Bartlett* 7928, and in Herb. Kew.

P. sanguineus (*Linn.*) *Fr.* Nov. Symb. in Nova Acta Sci., ser. 3, **1,** 75 (1851).

Common on dead wood. Moraballi Creek, October 4, 1929, *Richards* 517 ; October 19, 1929, *Richards* 631 ; Lama, April 1887,

Jenman 3794 ; without precise localities, *Jenman* 7032, *Bartlett* 7929, 7978, *Meyer* (Esseq. 304 : 1818), *Schomburgk* (Brit. Guiana 3, 869) ; Mazaruni River, October 1923, *Altson* 43 ; Weri-Werai-Kam Creek, Essequibo, August 1930, *Martyn* 198.

P. trichomallus (*Berk. et Mont.*) *Fr.* Nov. Symb. in Nova Acta Sci. ser. 3, **1**, 78 (1851).

On dead log in Wallaba forest, Moraballi Creek, October 19, 1929, *Richards* 619 ; Upper Demerara River, September 1887, *Jenman* 4097 ; Pomeroon River, *Bartlett* 8684 ; without precise locality, in Herb. Kew (see Cooke in Grevillea **13**, 33,: 1884).

P. versatilis (*Berk.*) *Fr.* Nov. Symb. in Nova Acta Sci. ser **3**, **1** 92 (1851).

On rotting wood of a fence post, Botanic Gardens, Georgetown, July 1929, *Martyn* 74.

When fresh this fungus was dark purple throughout. The dried specimens are brownish, and somewhat darker in colour than the majority of specimens from the East, where the species is more common.

P. pinsitus *Fr.* Nov. Symb. in Nova Acta Sci. ser **3**, **1**, 86 (1851) ; Epicr. 479 (1836-38).

On dead log, Moraballi Creek, October 16, 1929, *Richards* 579 ; on dead twig, Mabaruma, North Western District, November 1928, *Martyn* 5.

These specimens have smaller pores than usual. I have collected a similar form in the West Indies.

P. vinosus (*Berk.*) *Cooke* in Grevillea **15**, 51 (1886).

On small dead tree in Mora forest, Moraballi Creek, September 12, 1929, *Richards* 372 ; Pomeroon River, September 1904, *Bartlett* 8434, 8435 ; Cuyuni River, October 1904, *Bartlett* 8269, 8305 ; Tinamu Fall, Cuyuni River, October 1904, *Bartlett* 8432 ; Aruka River, October 1905, *Bartlett* 8610.

P. licnoides (*Mont.*) *Fr.* Nov. Symb. in Nova Acta Sci. ser. 3, **1**, 92 (1851).

On bark of dead Morabukea (*Mora Gonggrijpii*) in virgin forest, Moraballi Creek, August 13, 1929, *Richards* 2 ; on dead logs, October 17, 1929, *Richards* 615 ; October 25, 1929, *Richards* 684, 686 ; on dead wood in second-growth forest, First Falls of Essequibo River, October 14, 1929, *Richards* 565 ; on dead stump in mixed forest, Mabaruma, North-Western District, April 1929, *Martyn* 29.

P. aculeans (*Berk.*) *Cooke* in Grevillea **14**, 86 (1886).

On rotting trunk of *Licania* sp., Moraballi Creek, September 25, 1929, *Richards* 456.

The species is allied to *P. caperatus*, of which it may be a form. It differs in the less pubescent, radiately ridged and aculeate surface, and the usually whitish hymenium.

P. caperatus (*Berk.*) *Fr.* Nov. Symb. in Nova Acta Sci. ser. 3, **1**, 92 (1851).

On fallen trunk, Moraballi Creek, August 21, 1929, *Richards* 138 ; on small dead tree in undergrowth of Greenheart forest, Moraballi Creek, October 11, 1929, *Richards* 546 (resupinate form) ; on log, Moraballi Creek, October 16, 1929, *Richards* 581 ; on log in Wallaba forest, October 19, 1929, *Richards* 629 ; on dead standing trunk, Moraballi Creek, October 25, 1929, *Richards* 679 ; Cuyuni River, October 1904, *Bartlett* 8085 ; north of Tinamu Fall, Cuyuni River, March 10, 1931, *Martyn* 320 ; without precise locality (resupinate form) in Herb. Berk.

P. Sector (*Ehrenb.*) *Cooke* in Grevillea **14**, 86 (1886).

Common. On old logs, Morabukea forest, Moraballi Creek, August 31, 1929, *Richards* 289 ; on rotting trunk of *Licania* sp., Moraballi Creek, September 25, 1929, *Richards* 455 ; on bark of tree, in Wallaba forest, Moraballi Creek, October 11, 1929, *Richards* 545 ; on dead log, Moraballi Creek, October 1929, *Richards* 609.

P. membranaceus (*Sw.*) *Fr.* Nov. Symb. in Nova Acta Sci. ser. 3, **1**, 93 (1851). *Polyporus Flabellum* Mont. in Ramon de la Sagra, Hist. Cuba (Pl. Cell.), 388 (1845).

On dead log in Wallaba forest, Moraballi Creek, October 19, 1929, *Richards* 637 ; October 23, 1929, *Richards* 662.

Poria carneopallens (*Berk.*) *Cooke* in Grevillea **14**, 110 (1886).

On damp, rotting log near Tinamu Fall, Cuyuni River, March 5, 1931, *Martyn* 287.

Distinguished by its colour (pale orange when fresh), reflexed margin, and horny consistency when dry. Encrusted cystidia and clusters of crystals are present in the tissue.

P. cruentata (*Mont.*) *Cooke* in Grevillea **14**, 110 (1886).

On trunk of small dead tree in undergrowth of Morabukea forest, Moraballi Creek, November 1, 1929, *Richards* 723.

The colour when fresh is described as " flame-colour with orange border." When dry the species bears a close resemblance to *Poria taxicola*. The material has been compared with the type at Paris, and it is now clear that the species is a good one and not a resupinate form of *Polyporus dichrous* Fr., as has been suggested.

P. epimiltina (*Berk.*) *Lloyd*, Myc. Notes **6**, 63, 969 (1920).

On dead stump, Moraballi Creek, October 16, 1929, *Richards* 592.

Trametes corrugata (*Pers.*) *Bres.* in Hedwigia **51**, 316 (1912). *Polystictus Persoonii* Fr. ex Cooke in Grevillea 14, 85 (1886).

Very common on dead logs. Moraballi Creek, October 16, 1929, *Richards* 573; in Wallaba forest, October 19, 1929, *Richards* 617; First Falls of Essequibo River, October 14, 1929, *Richards* 614; Lookout, Essequibo River, July 1923, *Altson* 139; without precise locality, *Bartlett* 8305.

T. hydnoides (*Sw.*) *Fr.* Epicr. 490 (1836-38).

General in forests. On fallen branches of *Pithecolobium Saman*, Botanic Gardens, Georgetown, November 1929, *Martyn* 166; Botanic Gardens, Georgetown, May 1924, *Altson* 141; Lama, April 1887, *Jenman* 3793; without precise localities, June 1893, *Jenman* 6507, in Herb. Dept. Agric. Brit. Guiana, and *Schomburgk* (Brit. Guiana 3, 870).

Hexagonia Bartlettii *Mass.* in Kew Bull. 1908, 216.

On small branch at top of Morabukea tree (*Mora Gonggrijpii*) (140 ft.), Moraballi Creek, October 17, 1929, *Richards* 639; on dead branch, probably from felled tree, Moraballi Creek, October 21, 1929, *Richards* 657; Botanic Gardens, Georgetown, *Bartlett* 8701 (type).

Daedalea Sprucei *Berk.* in Hook. Journ. Bot. **8**, 236 (1856).

On dead bark of living *Cassia pteridifolia* Sandw. in dry, well-lit forest, Moraballi Creek, September 23, 1929, *Richards* 426; Rockstone, June 1904, *Bartlett* 7919; Cuyuni River, October 1904, *Bartlett* 8431; without precise locality, in Herb. Kew (Cooke in Grevillea 13, 33: 1884).

Favolus melanopus *Mont.* in Ann. sci. nat. sér. 4, **1**, 136 (1854).

On dead log in Morabukea forest, Moraballi Creek, October 20th, 1929, *Richards* 624.

The species resembles closely *Polyporus guianensis* Mont., but differs in the smooth, non-striate pileus and darker and more rigid pore-walls.

Gloeoporus conchoides *Mont.* in Ramon de La Sagra, Hist. Cuba (Pl. Cell.), 385 (1845).

140 ft. above ground on branch of *Mora Gonggrijpii*, October 20, 1929, *Richards* 652; without precise locality, in Herb. W. J. Hooker, Kew.

Irpex griseo-fuscus *Mont.* in Ann. sci. nat. sér. 4, **1**, 137 (1854).

On bark of dead *Mora* sp., Moraballi Creek, August 13, 1929, *Richards* 1; on stump in swampy *Mora* Forest, August 22, 1929, *Richards* 179; on dead log in dry, well-lit forest, Moraballi Creek, September 16, 1929, *Richards* 383; on dead log, Moraballi Creek, October 16, 1929, *Richards* 578; on log in Wallaba Forest, October 19, 1929, *Richards* 625.

Forming large colonies on fallen trees, apparently common.

Lenzites Palisoti *Fr.* Epicr. 404 (1836-38). *L. repanda* (Pers.) Fr. Epicr. 404 (1836-38).

Common on dead logs, Moraballi Creek, October 16, 1929, *Richards* 584, 585; Bartica, April 1887, *Jenman* 3890; August 1893, *Jenman* 6828.

The species varies as to hymenial form, No. 585 being poroid. *Jenman* 6828 (in the herbarium of the British Guiana Department of Agriculture) consists of brownish specimens, probably discoloured by poison.

L. striata (*Sw.*) *Fr.* Epicr. 404 (1836-38).

On dead log, Mabaruma, North-Western District, November 1928, *Martyn* 13; Suddie, July 1905, *Bartlett* 7942; on posts, coast region, April 1892, *Jenman* 6423.

Cladoderris dendritica *Pers.* ex Fr. Fung. Nat. in K. Vet. Ak. Handl. Stockholm, 142 (1848).

On dead log, Moraballi Creek, October 16, 1929, *Richards* 580; Botanic Gardens, Georgetown, November 1907, *Bartlett* 8714; without precise locality, October 1894, *Jenman* 6830.

Hypolyssus Montagnei *Berk.* in Hook. Lond. Journ. Bot. **1**, 139 (1842).

Common on dead sticks, especially in well-lit forest, Moraballi Creek, October 12, 1929, *Richards* 550; November 1, 1929, *Richards* 730; Pomeroon River, September 1904, *Bartlett* 8019.

Stereum hydrophorum *Berk.* in Ann. & Mag. Nat. Hist. **14**, 327 (1844).

On rotten log in low, sandy forest, Moraballi Creek, September 17, 1929, *Richards* 387; on dead logs, Moraballi Creek, October 1929, *Richards* 606, 607 (very young specimens).

A note accompanying the specimens states that when found the cups were filled with water containing mosquito larvæ and water-beetles, and that in such cases the fibrils grew out from the pileus into the water.

S. australe *Lloyd*, Mycological Writings, Letter No. 48, 10 (1913).

On dead log in Wallaba forest, Moraballi Creek, October 19, 1929, *Richards* 630; on log in mixed forest, Mabaruma, North-Western District, November 1928, *Martyn* 11.

Hymenochaete damaecornis (*Link*) *Lév.* in Ann. sci. nat. sér. **3, 5**, 151 (1846).

Among dead leaves in mixed forest, Moraballi Creek, October 23, 1929, *Richards* 663 (young specimen); Mabaruma, North-Western District, November 1928, *Martyn* 8, p.p.; on decayed wood, Thururu Tributary, Upper Pomeroon River, July 1906, *Bartlett* 8627; Cuyuni River, October 1904, *Bartlett* 8270.

H. luteobadia (*Fr.*) *Wakef.* in Kew Bull. 1917, 13. *H. laeta* Berk. ex Cooke in Grevillea **8**, 146 (1880).

On fallen branch, Moraballi Creek, September 5, 1929, *Richards* **331** ; October 1929, *Richards* 610 ; Supenaam Forest Survey Camp 3, Bartica, August 17, 1930, *Martyn* 216 ; North of Tinamu Fall, Cuyuni River, March 10, 1931, *Martyn* 327 ; without precise locality, *Schomburgk*.

Auricularia mesenterica (*Dicks.*) *Fr.* Epicr. 535 (1836-38).

On dead wood in second-growth forest, First Falls of Essequibo, October 14, 1929, *Richards* 563.

A. polytricha (*Mont.*) Sacc. Misc. Myc. 1 in Atti d. R. Istit. Veneto di sci., ser. 6, **2**, (1884).

Supenaam Forest Survey, Bartica, August 1930, *Martyn* 205 ; without precise locality, *Schomburgk* in Herb. W. J. Hooker (Kew.)

A. delicata (*Fr.*) *Lloyd*, Mycological Writings, Letter 66, 9 (1917). *A. tremellosa* (Fr.) Petch in Ann. Roy. Bot. Gard. Peradeniya, **5**, 414 (1910).

On fallen log, Moraballi Creek, November 13, 1929, *Richards* 833.

Iola Hookerianum *Moell.* in Schimper, Bot. Mitt. aus den Tropen, **8**, 24 and 163 (1895).

On calyptras of a moss, on log in moist, fairly well-lit forest, Moraballi Creek, September 26, 1929, *Richards* 226.

Neotyphula *Wakef.* gen. nov.

Sporophora tenella, stipitata, haud gelatinosa, stipite filiformi atro, a clavula distincto, clavula cylindrica vel inaequilaterali, simplici vel rarius bifurcata. Hymenium laeve, pulverulentum. Basidia transverse septata, sterigmatibus lateralibus 3–4. Sporae hyalinae.

N. guianensis *Wakef.* sp. nov.

Sporophora gregaria, stipitata, anguste typhuloidea, 1–1·2 cm. alta. Stipes ater, glaber, compresso-filiformis, 4–7 mm. circiter longus, in clavulam ut columella productus. Clavula cylindrica vel saepe unilateralis, 0·5-0·75 cm. circiter longa, ad 1 mm. crassa, viva grisea, siccitate plus minus avellanea, spongiosa, pulverulenta. Hyphae stipitis rectae, subrigidae fuscidulae, 2·5–3μ ; hyphae subhymeniales pallidae, flexuosae, 2μ diametro. Basidia curvata, 3·4-septata, hyalina, 35–50$\times$7–8μ ; sterigmata 5–8 (–10)$\times$2μ. Sporae (si genuinae) hyalinae, oblongae, uno latere depressae, 8–10 (–12)$\times$ 4–5μ.

Hab. Ad truncos emortuos, Moraballi Creek, Guiana Anglica, August 21, 1929, *Richards* 139.

This very distinctive fungus was found at the end of the rainy season in the drier Wallaba forest, forming an extensive colony on a fallen rotting tree-trunk. The genus differs from *Eocronartium* Atk.

in the distinct black stem, which is continued to the top of the club as a columella, in the spongy (not gelatinous) texture of the club, and in not being parasitic on mosses. In *N. guianensis* the club is frequently developed on one side of the stem only, with the result that the plants on drying tend to curl spirally inwards as the hymenium contracts. (See fig. 1, A). Unfortunately the spores had been shed and only a very few detached spores were seen. These however are undoubtedly Basidiomycetous, as seen from the figure, and they probably belong to this fungus.

Tremella fuciformis *Berk.* in Hook. Journ. Bot. **8**, 277 (1856).

On dead log, Moraballi Creek, October 16, 1929, *Richards* 588.

Guepinia spathularia (*Schw.*) *Fr.* Elench. **2**, 32 (1828).

On charred dead branch, Mabaruma, North-Western District, November 1928, *Martyn* 6.

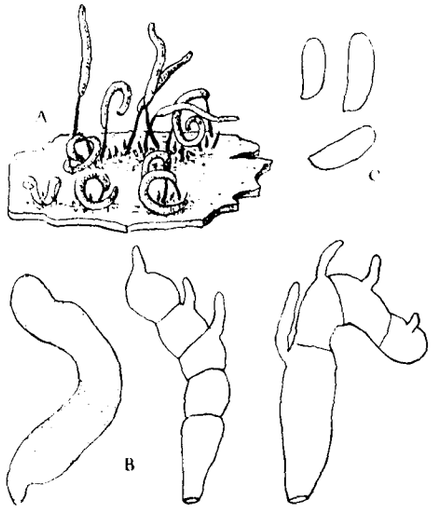


Fig. 1. *Neotyphula guianensis* Wakef. A. Habit (x2); B. One young and two mature basidia (x1100); C. Spores (x1100).

GASTEROMYCETES.

Dictyophora indusiata (*Vent.*) *Fischer* in Sarasin et Roux, Nova Caledonia **1**, part 1, 3 (1914).

On a bush-rope coiling round a tree, about 10 feet from ground, Moraballi Creek, October 26, 1929, *Sandwith* (noted only) ; without precise locality,—June 1897, *Jenman* 7263 ; September 1904, *Bartlett* 7878.

Cyathus limbatus *Tul.* in Ann. sci. nat. sér. 3, **1**, 78 (1844).

On soil of disused seed-box, Botanic Gardens, Georgetown, August 1933, *Martyn* 404 ; without precise locality, in Herb. Hooker, Kew.

Geaster mirabilis *Mont.* in Ann. sci. nat. sér. 4, **3,** 139 (1855).
On rotting twigs on floor of shady forest, Moraballi Creek, September 6, 1929, *Richards* 336.

USTILAGINEAE.

Spacelotheca cordobensis (*Speg.*) *Jackson* in Journ. Dept. Agr. Porto Rico **14,** 298 (1930). *S. Panici-leucophaei* (Bref.) Clinton in North Amer. Flora **7,** 28 (1906.)
On *Panicum geminatum* Forsk., Botanic Gardens, Georgetown, December 1929, *Martyn* 190.

PYRENOMYCETES.

Xylaria obovata *Berk.* in Journ. Linn. Soc. **10,** 380 (1860).
On dead twig in mixed forest, Upper Arawan River, Aruka River, North Western District, May 1929, *Martyn* 50.

X. anisopleura *Mont.* in Ann. sci. nat. sér. 2, 13, 348 (1840).
On dead branches on the ground, Moraballi Creek, October 16, 1929, *Richards* 575.
The specimens have not yet formed ascospores, but there is little doubt that they belong to this species.

X. dealbata *Berk. et Curt.* in Journ. Acad. Nat. Sci. Philadelphia, New Ser., **2,** 284 (1853).
On dead rotting log in mixed forest, Upper Arawan River, North-Western District, May 1929, *Martyn* 45.

X. Telfairii (*Berk.*) *Sacc.* Syll. Fung. **1,** 320 (1882). *X. involuta* (Kl.) Cooke in Grevillea **11,** 82 (1883).
X. tabacina (Kickx) Berk. in Hook. Journ Bot. **6,** 225 (1854).
On dead log, Moraballi Creek, October 19, 1929, *Richards* 634, 635.

X. biceps *Speg.* var. **microsperma** *Speg.*, Fung. Guar., Pug. 1, 86 (1883).
On dead log, Moraballi Creek, October 23, 1929, *Richards* 660.
Spores $8 \times 3{\cdot}5\mu$.

Camillea Leprieurii *Mont.* in Ann. sci. nat. sér. 4, **3,** 112 (1855).
On branch of fallen tree in clearing, Moraballi Creek, September 4, 1929, *Richards* 324 ; on branch of small dead tree in dry, well-lit Wallaba forest, Moraballi Creek, September 28, 1929, *Richards* 488.
The collector's note with No. 488 states that it had a peculiar smell when fresh.

C. mucronata *Mont.* in Ann. sci. nat. sér. 4, **3,** 112 (1855).

A large colony, covering whole log, in Greenheart bush, left bank of Cuyuni River, Stop-off Fall, March 1, 1931, *Martyn* 255.

C. Cyclops *Mont.* in Ann. sci. nat. sér. 4, **3,** 113 (1855).
On bark, Ananda-basu Creek, 1929, *Altson* 461.

C. poculiformis (*Kunze*) *Lloyd*, Syn. Large Pyrenomycetes, 9 (1917).
On dead logs and on standing dead tree-trunk in mixed forest, October 25, 1929, *Richards* 676, 677 ; November 6, 1929, *Richards* 759 ; Pomeroon River, September 1904, *Bartlett* 8696 (determined wrongly as " *Hypoxylon turbinatum* ").
In No. 677 the stromata are almost sessile, as in *C. globosa*, whereas in No. 676 the stalks are comparatively long.

Hypoxylon areolatum *B. et C.* in Journ. Linn. Soc. **10,** 384 (1869). *Penzigia macrospora* Penz. et Sacc. in Malpighia 11, 494 (1897).
On dead log in Wallaba forest, Moraballi Creek, October 23, 1929, *Richards* 661.

H. lucidulum *Mont.* in Ann. sci. nat. sér. 2, **13,** 354 (1840).
At base of dead, standing trunk, Moraballi Creek, October 25, 1929, *Richards* 685.

H. pavimentosum *Ces.* Mycet. it. Born. 18 (1879).
On dead log, Moraballi Creek, October 1929, *Richards* 649.
Varying from small rounded stromata which suggest *Kretzschmaria* to more effused crusts due to coalescence. The abrupt, vertically cut margin of the stroma is characteristic.

H. stygium (*Lév.*) *Sacc.* Syll. Fung. **1,** 379 (1882).
On rotten stick on floor of Wallaba forest, Moraballi Creek, October 11, 1929, *Richards* 543.
Probably this species, but the specimen is without spores.

H. annulatum (*Schw.*) *Mont.* in Gay, Fl. Chil. **7,** 445 (1850).
On bark of felled tree in clearing, Moraballi Creek, October 30, 1929, *Richards* 707.

H. rubigineo-areolatum *Rehm.* var. **Bakeri** (*Earle*) *Miller* in Journ. Dept. Agric. Porto Rico **14,** 273 (1930).
On dead tree in second-growth forest, First Falls of Essequibo, October 14, 1929, *Richards* 564.

Kretzschmaria Clavus *Fr.* Summ. Veg. Scand. 409 (1846).
On standing mossy trunk, Moraballi Creek, October 1929, *Richards* 608 ; on bark at foot of *Mora Gonggrijpii*, Moraballi Creek, October 1929, *Richards* 642.

Nummularia Baileyi (*B. et Br.*) *Cooke* in Grevillea **12,** 6 (1883).
On under side of dead branch, Moraballi Creek, October 16, 1929, *Richards* 577.

Seynesia erumpens (*B. et C.*) *Petrak* in Ann. Myc. **25**, 339 (1927).

On dead palm rachis in swamp, north of Tinamu Fall, Cuyuni River, March 7, 1931, *Martyn* 296.

The mucilaginous appendages of the spores described by Sydow (as *Steganopycnis oncospermatis*) and Petrak are well shown in these specimens.

Micropeltella constricta *Stev. et Manter* in Bot. Gaz. **79**, 281 (1925).

Associated with *Dictyothyriella guianensis* on leaves of seedling *Licania buxifolia* Sandw. in undergrowth of Wallaba forest, Moraballi Creek, October 11, 1929, *Richards* 549 p.p.; on leaves of *Duguetia neglecta* Sandw., Moraballi Creek, October 1929, *Richards* 555 p.p.; on unknown *Anonaceae*, Kartabo, July 22, 1922, *Stevens* 568 (type).

Dictyothyriella guianensis *Stev. et Manter* in Bot. Gaz. **79**, 274 (1925).

On leaves of various trees and shrubs in rain forest, Moraballi Creek, September 3, 1929, *Richards* 295; on leaves of seedling *Licania buxifolia* Sandw., in undergrowth of Wallaba forest, Moraballi Creek, October 11, 1929, *Richards* 549 p.p.; on *Costus* sp., Rockstone, July 16, 1922, *Stevens* 1005; on *Pesequeria latifolia*, Kartabo, July 22, 1922, *Stevens* 534; on *Philodendron* sp., Kartabo, July 23, 1922, *Stevens* 1006; on *Licania*, *Tabernaemontana* and *Bauhinia* sp., Rockstone, July 17, 1922, *Stevens* 479, 473, 469; on unknown *Marantaceae*, July 21, 1922, *Stevens* 505; on unknown *Apocynaceae*, Tumatumari, July 11, 1922, *Stevens* 163; on unknown hosts, Kartabo, July 17-23, 1922, *Stevens* 530, 606, 608; Tumatumari, July 8-11, 1922, *Stevens* 993, 155; Wismar, July 14, 1922, *Stevens* 275.

DISCOMYCETES.

Cookeina Tricholoma (*Mont.*) *Kuntze*, Rev. Gen. Pl. **2**, 849 (1891).

On twig on floor of mixed rain-forest, Moraballi Creek, August 22, 1929, *Richards* 173; October 20, 1929, *Richards* 651; Supenaam Forest Reserve, near Bartica, August 13, 1930, *Martyn* 208.

Polydiscidium *Wakef.* gen. nov.

Ascomata gelatinosa, caespitosa, erecta, ramosa. Apothecia in ramulis terminalia, parva, planiuscula. Asci cylindraceo-clavati, paraphysati, paraphysibus mucoso-cohaerentibus. Sporae octonae, monostichae, ellipticae, fuscidae, uniseptatae.

P. Martynii *Wakef.* sp. nov.

Ascomata gelatinosa, caespitosa, 8 mm. circiter alta, atro-purpurea, siccitate fusca, rugosa, ramosa, ramulis ultimis brevissimis, teretiusculis. Hyphae contextus pallidae, 2-3μ diametro, hinc inde prope septa ad 10μ inflatae, laxe intertextae, mucoso obvolutae, marginem versus in cellulas brunneas, plus minus

elongato-subquadratas transformatae. Apothecia atro-pupurea, terminalia, minuta, vix 1 mm. diametro, planiuscula, interdum compressione undulata. Asci cylindracei, 40–45×4·5–5μ, octospori. Paraphyses numerosae, hyalinae, filiformes, sursum paullulum incrassatae, mucoso-cohaerentes, ascos aequantes. Sporae monostichae, ellipticae, fuscidulae, 7–8×3–4μ, uniseptatae, ad septa non constrictae.

Hab. in ligno putrido, Upper Arawan River, Guiana Anglica, *Martyn* 43, May 1929.

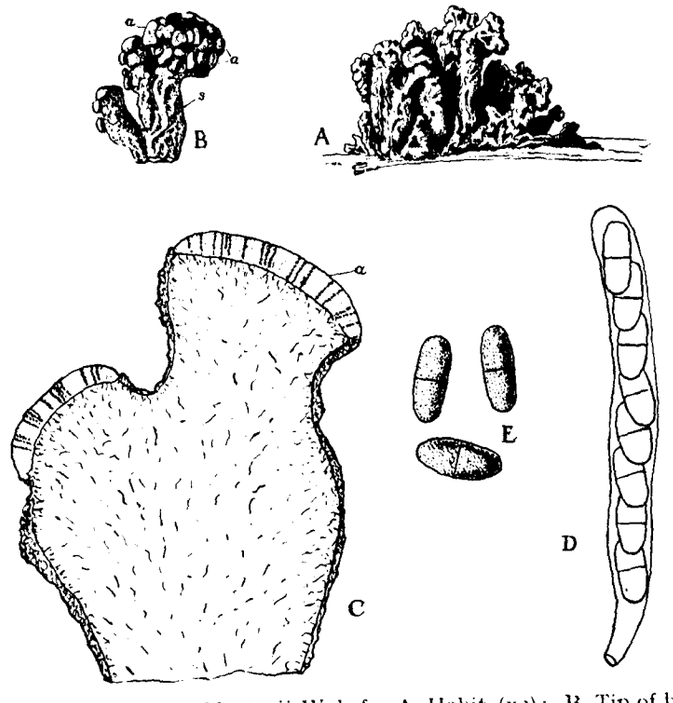


Fig. 2. *Polydiscidium Martynii* Wakef. A. Habit (x2); B. Tip of branch of ascoma enlarged; *a*, apothecia, *s*, stalk; C. Vertical section showing two apothecia (much magnified); D. Ascus (x1500); E. Spores (x1800).

This fungus is remarkable in habit, consisting of a branched gelatinous body somewhat resembling the conidial stage of *Coryne sarcoides*, but bearing numerous disks. In the above technical description the whole structure has been designated the ascoma, and each separate disk as an apothecium. The material is unfortunately very scanty, but there is no doubt that this habit is one quite different from that of most of the cup-fungi: it is suggestive rather of a fruticose lichen, but no trace of lichen-gonidia has been

found. The two celled brown spores are also unusual in the group. *Sorokina* Sacc. has similar spores, but differs in the simple, sessile ascophore.

FUNGI IMPERFECTI.

Phyllosticta Turconii *Trinch.* in Sacc. Syll. Fung. **22**, 863 (1913).

On leaves of *Philodendron Demerarae* Gleason, First Falls of Essequibo River, October 14, 1929, *Richards* 567.

Rhizomorpha corynephora *Kunze* in Weig. Exs.; Berk. in Hook. Journ. **8**, 277 (1856).

On twigs in undergrowth of Greenheart forest, Moraballi Creek, September 14, 1929, *Richards* 379; on living twig of Anonaceous tree, Moraballi Creek, September 15, 1929, *Richards* 380; on skeleton leaf hanging from twig of small Anonaceous tree in forest undergrowth, Moraballi Creek, October 1929, *Richards* 531; Upper Arawan River, May 1929, *Martyn* 44; Kykoverall, Essequibo River, October 1904, *Bartlett* 8297; Cuyuni River, October 1904, *Bartlett* 8093; North Western District, November 1915, in Herb. Dept. Agr. Brit. Guiana.

This curious growth is apparently common in the forest undergrowth, but no fruit has so far been found.

XXXI—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXXI.

1301. **Pelargonium (Hoarea) Fergusoniae** *L. Bolus* [Geraniaceae]; *P. attenuato* Harv. affine, ut videtur, sed indumento setoso, haud strigoso, petiolis subflexuosis, in plantis feris 3–5·5 cm. longis, foliorum lobis ultimis vix longis angustisque.

Folia 1–2, hysterantha, orbicularia, setosa, demum fere glabra, ad 6 cm. diametro, palmate 3-partita, partibus irregulariter 1–3-pinnatipartitis, segmentis ultimis linearibus vel oblongis vel oblongo-ovatis acutis 1–7 mm. longis 1–2 mm. latis. *Pedunculus* subflexuosus, saepius 5–10 cm. longus. *Inflorescentia* ramosa, ramis ad 8-fl., floribus 6–8 eodem tempore expansis. *Bracteae* lanceolatae, acuminatae, 2·5 mm. longae. *Pedicelli* cum calcare aequilongo ad 3 cm. longi. *Sepala* e parum infra medium recurvata, posteriore semper erecto, linearia, acuminata, 0·8–1 cm. longa, basi 1–1·5 mm. lata, cum pedicello parce pubescentia, pilis adpressis, pilis glanduliferis patentibus inconspicuis interjectis. *Petala* 5, straminea, obtusa vel subacuta, marginibus undulatis, anteriora 3 e basi vel parum supra laxe patentia, inferne inconspicue lineata, ad 2·6 cm. longa, 1·5–2 mm. lata, posteriora dimidio inferiore erecta et contigua ibique stamina subvaginantia, dimidio superiore demum recurvata et divergentia, lamina latere altero (exteriore) leviter ampliata, inferne lineis prope medium nota, rubicunde ornata, ad 3 cm. longa, ad 3 mm. lata, ungue 4 mm. longo. *Stamina* 5 antherifera, filamentis 2–5 mm., staminodiis ad 3 mm. longis, antheris purpureis, polline aurantiaco.

Ovarium sericeum, 2 mm. longum, stylo 3 mm., stigmatibus 2 mm. longis.

SOUTH AFRICA. Cape Province: near Riversdale, May 1932, *L. Bolus & E. Ferguson* (Bolus Herbarium, no. 20512). Flowered in cultivation Nov.–Dec.

1302. **Centella lanata** *R. H. Compton* [Umbelliferae]; affinis *C. erianthae* Drude, sed habitu robustiore, caulibus et foliorum paginis copiose albo-lanatis marginibus crebrius serratis differt.

Suffrutex vagans, intricatus, internodiis elongatis, nodis non radicans, caulibus et petiolis et laminis utrimque dense albo-lanatis demum glabrescentibus. *Caules* graciles, teretes, striati, parum rigidi, internodiis 2·5-7·5 cm. longis, foliis pedunculisque fasciculatis. *Petiolus* gracilis, ad 5 cm. longus, basi scarioso-amplexicaulis; lamina firma, herbacea, orbiculato-cordata vel reniformis, 1·6–2·4 cm. longa, 2–3·2 cm. lata, venis palmatis, margine regulariter dentato, dentibus late triangulari-acutis 1 mm. longis 1·5–2 mm. latis. *Inflorescentiae* aliquae pedunculo maturo 1·6 mm. longo, bracteis involucralibus 2 late deltoideo-orbicularibus acuminatis 4 mm. longis 4 mm. latis, flore uno subsessili bisexuali, sepalis obsoletis, petalis subviridibus ovatis obtusis, fructu 2 mm. longo 1 mm. lato venis reticulatis; aliquae pedunculo breviore, bracteis involucralibus 4 ovatis acuminatis, floribus 5 masculis subsessilibus, stigmatibus rudimentariis.

SOUTH AFRICA. Cape Province: Knysna Division; Formosa Peak, south slope, 1400 m., 4 May 1933, *Compton* 4235.

Centella lanata is allied to *C. eriantha* Drude in general form, but is well distinguished by the copious white woolly clothing of stems and both leaf-surfaces, more robust growth, and finer serration of the leaf-margins. It agrees with *C. eriantha* in its polygamous inflorescences. (N.B. Sonder in Fl. Cap. **2**. 528 is in error in his statements on this subject.)

1303. **Stoebe Ensori** *R. H. Compton* [Compositae]; ab *S. capitata* Berg. bracteis exterioribus involucri pilosis, et ab *S. incana* Thunb. et *S. spirali* Less. bracteis floribus brevioribus bene distinguitur.

Suffrutex humilis, ramosus, expansus vel suberectus. *Caules* teretes, lanati, glabrescentes. *Folia* numerosa, sparsa, imbricata, torta, erecta vel subpatentia, sessilia, oblongo-lanceolata, acuta, mucronata, 2–6 mm. longa, 1–2 mm. lata, supra dense albo-lanata, infra laxe lanata. *Inflorescentia* globosa vel cylindrica, 2·5 cm. longa, 8–12 mm. diametro. *Bracteae involucrales* 2–3 mm. longae, linearilanceolatae, brunneo-scariosae, acuminatae, exteriores pilosae, interiores glabrae. *Corolla* 3 mm. longa, segmentis triangulatis acutis patentibus roseis. *Achaenia* minute puberula, annulo distincto. *Pappi setae* circiter 12, connatae, plumosae.

SOUTH AFRICA. Cape Province: Uniondale Division; Lauterwater (Long Kloof), dry hills, 750 m. 3 May 1933, *Compton* 4195.

Well distinguished from *S. capitata* Berg. by its pilose outer involucral scales, and from *S. incana* Thunb. and *S. spiralis* Less. by their length which is less than that of the flower. The foliage is also distinctive.

Named in compliment to Mr. R. W. Ensor of Appledale, Lauterwater, who pointed out the plant to me on his farm.

1304. **Lobelia valida** *L. Bolus* [Lobeliaceae] ; *L. triquetrae* affinis, sed foliis dissimilibus, floribus in racemis permultis majoribusque praecipue differt.

Planta erecta glabra vel partibus herbaceis rarius irregulariter parceque hispidis, e basi ramosa, 15–45 cm. alta. *Caulis* basi 5–8 mm. diametro, cum ramis foliosis 4-angulatus vel 4-altus ob bases decurrentes foliorum. *Folia* adscendentia vel fere erecta, oblongo-obovata, 4–10 cm. longa, 0·4–1·8 cm. lata., sessilia, apice rotundata vel subtruncata, irregulariter dentata vel rarius lobulata, sat crassa, saepissime levia politaque. *Pedunculus* 2–5 cm. longus. *Racemus* gradatim elongatus, 6–9 cm. longus vel ultra, floribus superioribus corymbose dispositis, eodem tempore 7–8 expansis. *Pedicelli* fere erecti, 0·5–1·5 cm. longi. *Bracteae* inferiores oblongae, utrinque 1–2 denticulatae, 7–8 mm. longae, superiores lineares, acutae, subintegrae. *Calycis tubus* obconicus, 10-costatus, 3 mm. longus, apice 3 mm. diam. *Sepala* lineari-lanceolata, acuminata, saepius 5–5·5 mm. longa. *Corolla* saturate caerulea, 1·7 cm. longa, tubo intus papillato apice callis 2 luteis ornato 9 mm. longo posteriore per 2 mm. coalito, labio anteriore ad 1·4 cm. lato dimidio inferiore nota alba late ornato fere ad dimidium vel parum ultra diviso, segmentis suborbicularibus minute apiculatis posterioribus subobovatis vel spathulato obovatis. *Antherae* 2 anteriores barbatae, 3 posteriores apicem versus externe hirsutae.

SOUTH AFRICA. Cape Province : Riversdale Division ; Still Bay, April 1909, *J. Muir*, 193 (National Herbarium no. 5106) ; Nov. 1929, *E. Ferguson* (National Botanic Gardens no. 391/32) ; Jan. 1931, *L. Bolus* (Bolus Herb. no. 19464, type).

1305. **Mandragora Shebbearei** *C. E. C. Fischer* [Solanaceae] ; a *M. caulescente* C. B. Clarke foliis anguste oblanceolatis, calyce tubuloso pilis glanduloso-capitatis parce instructo, corolla anguste infundibulari recedit.

Herba perennis ; caulis crassus, circiter 5 cm. longus, apice brevissime ramosus. *Folia* rosulata, subcoriacea, anguste oblanceolata, obtusa, decurrentia, 4–11 cm. longa, 1·5–3 cm. lata, nervis lateralibus utrinque 8–16 a costa crassa angulo lato ortis, marginibus undulatis ; petioli crassi, plani, usque 7 cm. longi. *Flores* numerosi, solitarii, axillares ; pedicelli graciles, 6–7 mm. longi, statu fructifero usque 2 cm. longi, pilis sparsis brevibus glanduloso-capitatis vestiti. *Calyx* subcarnosus, tubulosus, 8–9·5 mm longus, reticulato-venosus, extra pilis brevibus glanduloso-capitatis instructus ; lobi 5, lingulati,

obtusi, uno 2·7 mm. longo, reliquis 1·7 mm. longis. *Corolla* anguste infundibularis, 1·8 cm. longa ; lobi rotundato-oblongi, obtusi, marginibus undulatis. *Stamina* 5, supra medium tubum inserta ; filamenta gracilia, 3·5 mm. longa ; antherae in fauce tubi, oblongae, 2 mm. longae. *Ovarium* globosum, 2·5 mm. diametro ; stylus gracilis, circiter 4 mm. exsertus ; stigma magnum, peltatum. *Capsula* glabra, circiter 1 cm. diametro, in calyce persistente inflato rigide cartilagineo valde reticulato-venoso 4 cm. longo fere 2 cm. diametro inclusa. *Semina* numerosa, subreniformia, compressa, 3·5 mm. longa, granulata.

TIBET. Tinkye-la, on the pass, 4800 m., July 1933, *E.O. Shebbeare* (Mount Everest Expedition) 102.

Only 1 or 2 flowers were present among many bladder-like fruiting calyces. The specimen was mouldy, so that it was difficult to separate the flowers from the surrounding foliage.

1306. **Struthiola Fourcadei** *R. H. Compton* [Thymelaeaceae] ; tubi perianthii longitudine, foliis junioribus albo-sericeis, squamis 12 pilis longioribus obtectis conspicue distincta.

Frutex erectus, virgatus, ad 1 m. altus, parce ramosus. *Caules* teretes sericeo-villosi, demum glabrescentes, rigidi, foliorum cicatricibus prominentibus. *Folia* sparsa, imbricata, erecto-patentia, anguste lanceolata, 1–1·4 cm. longa, 2·5–3·5 mm. lata, acuta, marginibus leviter incurvatis, facie superiore laeve glabra, facie inferiore striata villis sericeis albis basi bulbosis, demum deciduis, ita superficie subpapillosa superante. *Flores* axillares, solitarii, numerosi. *Bractiolae* 4 mm. longae, lineari-lanceolatae, longitudinaliter plicatae, sericeo-villosae. *Perianthii tubus* 2·2–2·6 cm. longus, gracilis, supra parum dilatatus, albus, sericeo-villosus ; lobi ovati, acuti, 4 mm. longi, 1·5 mm. lati, infra sericeo-villosi, supra glabri. *Squamae* 12, subulatae, erectae, flavae, 1·25 mm. longae, villis amplectentibus 2 mm. longis. *Antherae* inclusae, sessiles, lanceolatae, acutae. *Ovarium* glabrum, stylo filiformi 1·4–1·6 cm. longo, stigmate minute capitellato.

SOUTH AFRICA. Cape Province : Humansdorp Division ; Witte Els Bosch, mountain slopes, 450 m., August 1920, *Fourcade* 810 (type). Knysna Division ; Formosa Peak, 1350 m., 4 May 1933, *Compton* 4260.

A well-marked species, conspicuous on account of the length of its perianth tube, the silky white appearance of its young leaves, and the twelve squamae enveloped in hairs which exceed them in length.

1307. **Carex montis-Everestii** *Kükenthal* [Cyperaceae] ; e sectione *Frigidarum* subsect. *Fuliginosarum*. Inter *C. nivalem* Boott et *C. macrogynam* Turcz. intermedia : a *C. nivali* differt s tatura humillima, foliis angustis, spiculis minoribus, terminali mascula, utriculis multo brevioribus ; a *C. macrogyna* differt vaginis

basilaribus purpurascentibus integris (nec brunneis reticulatim fissis), squamis atro-fuscis nitidis glabris marginibus haud hyalinis, utriculis marginibus laevibus.

Rhizoma dense caespitosum et stoloniferum. *Culmus* 1·5–2 cm. altus, gracilis, impresso-trigonus, laevis, inferne foliatus. *Folia* culmo breviora, canaliculato-plana, carinata, vix 1 mm. lata, apice circinata ; vaginae basilares brunneo-purpureae, integrae. *Spiculae* 2, pedunculatae, subfastigiatae, subobovato-oblongae ; superior mascula, basi interdum floribus 1–2 femineis instructa, 5–6 mm. longa ; inferior longius pedunculata, feminea, 7–10 mm. longa, densiflora, subcernua ; pedunculi setacei, sublaeves. *Bracteae* squamiformes, basi vaginante rhachin amplectentes. *Squamae* ovato-lanceolatae, acutae, atro-fuscae, nitidae, e carina viridi breviter mucronatae, glabrae. *Utriculi* squamas subaequantes, papyracei, ovati vel elliptici, valde compressi, 2 mm. longi, subenerves, inferne pallide virentes, apice atro-sanguinei, glabri, marginibus laeves, in rostrum breve ore oblique sectum sensim abeuntes, basi breviter stipitati. *Nux* perlaxe inclusa, parvula, stipitata. *Stylus* fere inclusus. *Stigmata* 3, longa.

TIBET. Mt. Everest, Camp I, in moraine, 5460 m., 2 July 1933, *R. L. Wager*.

1308. **Paspalidium platyrrhachis** *C. E. Hubbard* [Gramineae-Paniceae] ; a *P. geminato* (Forssk.) Stapf axi primario lato dorso complanato, spiculis multo majoribus distinguitur.

Gramen aquaticum. *Culmi* longi, fluitantes, validiusculi, ramosi, glabri laevesque. *Folia* glabra, laevia ; vaginae latae, compressae, carinatae, tenuiter striatae ; ligulae brevissimae, truncatae, dense ciliolatae ; laminae lineares, basi abrupte contractae, in apicem subobtusum longe attenuatae, usque ad 18 cm. (vel ultra) longae et 6 mm. latae, planae. *Inflorescentia* subspiciformis, 22–28 cm. longa, erecta ; axis primarius laevis, glaber, usque ad 3 mm. latus, dorso complanatus, costa media flexuosa, internodiis alternatim lateraliter herbaceo-marginatis et alatis. *Racemi* circiter 10, 1–2·5 cm. longi, sessiles, erecti, solitarii vel nonnunquam bini, inferiores usque ad 4·5 cm. distantes ; rhachis dorso complanata, 1–2 mm. lata, in acumine subulato terminata. *Spiculae* subsessiles, biseriatae, contiguae, anguste ovatae, acutae, 3·3–4 mm. longae, pallidae, glabrae, laeves. *Gluma* inferior lata, apice rotundata, usque ad 1 mm. longa, hyalina, enervis ; gluma superior ovata, apice rotundata, 2 mm. longa, tenuiter membranacea, 2–5 nervis. *Anthoecium inferum* ♂ : lemma spiculam aequans, dorso planum, explanatum late elliptico-ovatum, firme membranaceum, 5–7-nerve ; palea ovato-elliptica vel elliptica, obtusa, lemmati subaequilonga, carinis angustissime alatis ; antherae 1·6 mm. longae. *Anthoecium superum* ♀ anguste ovato-ellipticum vel ellipticum, acutum, infero paullo brevius : lemma et palea coriacea, tenuiter transverse rugosa.

NORTHERN RHODESIA. Kafue Flats, near Mazabuka, in very deep water in flood channels, 990 m., April 1932, *Trapnell* 1086.

1309. **Leersia oncothrix** *C. E. Hubbard* [Gramineae-Oryzeae] ; a *L. drepanotrichi* Stapf spiculis oblongis vel elliptico-oblongis multo majoribus differt.

Gramen perenne. *Culmi* e rhizomate brevi nudo erecti, 1·2 m. alti, graciles, subteretes, basi ramosi, superne simplices, 4-nodes, nodis minute pubescentibus, ceterum glabri laevesque. *Foliorum vaginae* glabrae, laeves, ore auriculatae, auriculis erectis angustis usque ad 4 mm. longis, inferiores internodiis longiores, compressae, papyraceae, superiores internodiis breviores, striatae ; ligulae membranaceae, auriculis adnatae ; laminae anguste lineares, acutissimae, usque ad 26 cm. longae, complicatae, marginibus convolutis, explanatae usque ad 3 mm. latae, glabrae, scaberulae. *Panicula* angusta, laxiuscula, 15 cm. longa, siccitate pallide brunnea ; axis primarius filiformis, minute scaberulus ; rami tenuiter filiformes, erecti, solitarii vel bini, asperuli, apicem versus 1–3 racemos gerentes, inferiores usque ad 8 cm. longi ; racemi 0·6–1·9 cm. longi, 3–7-spiculati ; pedicelli brevissimi. *Spiculae* oblongae vel elliptico-oblongae, 3·3–3·5 mm. longae, 1·5–1·7 mm. latae. *Glumae* minutissimae. *Lemma* semi-elliptico-oblongum, oblique acutum, tenuiter coriaceum, 5-nerve, pilis minutis rigidis semicirculariter curvatis laxe obsitum, carinis pilis similibus paullo longioribus ciliatum. *Palea* lemmati aequilonga et subsimilis, 3-nervis. *Antherae* 6, lineares, 2·5 mm. longae.

NORTHERN RHODESIA. Kalomo, in wet vlei on rather sour soil, 1200 m., March 1932, *Trapnell* 993.

1310. **Tristachya longispiculata** *C. E. Hubbard* [Gramineae-Arundinelleae]; affinis T. *Rehmannii* Hack., sed paniculus et spiculis longioribus, foliorum laminis longioribus et latioribus differt.

Gramen perenne caespitosum, e rhizomate valido ortum. *Culmi* erecti, usque ad 1·2 m. alti, validiusculi, teretes, simplices, uninodes, glabri, paniculam versus scabridi, ceterum laeves ; internodia exserta, summum (pedunculus) usque ad 38 cm. longum. *Foliorum vaginae* rigidae, inferiores persistentes, basi sericeo-villosae, ceterae glabrae, superne asperulae ; ligulae ad seriem ciliorum redactae ; laminae lineares, in acumen tenue attenuatae, usque ad 45 cm. longae, 5–6 mm. latae, planae, firmae, glabrae, scaberulae. *Panicula* 22–25 cm. longa, contracta, nutans, 6–15 triades spicularum gerens ; rhachis gracilis, scaberula, glabra ; rami filiformes, scabridi, usque ad 8 cm. longi, inferiores 2–4-nati ; pedicelli 0. *Spiculae* anguste anceolatae, acuminatae, 3–3·6 cm. longae. *Gluma inferior* anguste anceolata, acuta vel subobtusa, 17–20 mm. longa, apice fragili excepto coriacea, 3-nervis, glabra ; gluma superior anguste lanceolata, longe subulato-acuminata, spiculae aequilonga, chartacea, 3-nervis, minutissime pubescens. *Anthoecium inferum* ♂ : lemma anguste anceolatum, acute acuminatum, 25–27 mm. longum, tenuiter characeum, glabrum, asperulum, superne 5-nerve ; palea linear-

lanceolata, 18 mm. longa. *Anthoecium superum* ♀, lineare : callus gracilis, pungens, 2·5–3 mm. longus, barbatus ; lemma 7·5–9 mm. longum, bilobum, lobis in aristas capillares 16–20 mm. longas attenuatis, coriaceum, 7-nerve, minute pubescens ; arista 6·2–8 cm. longa, columna pallida scaberula 26–30 mm. longa ; palea linearis, 7 mm. longa. *Antherae* 3, 5–6 mm. longae. *Ovarium* apice pilosum.

ANGOLA. Benguella ; country of the Ganguellas and Ambuellas, *Gossweiler* 2772.

XXXII—NOTES ON THE FLORA OF SOUTHERN AFRICA: V.*

THE GENUS RUELLIA IN THUNBERG'S HERBARIUM.

R. A. DYER and E. MILNE-REDHEAD.

The authors are much indebted to the Director of the Botanical Institution, Uppsala, who kindly sent on loan to Kew the material of *Ruellia* in Thunberg's herbarium on which the following notes are based. All the specimens are types, two having been described by Linn.f. and four by Thunberg. Examination of these has made necessary a number of changes both taxonomic and nomenclatural. Two species (*R. depressa* and *R. spinescens*) had been transferred previously to their correct position in *Scrophulariaceae* under *Aptosimum* Burch.; now, however, a third, *R. ovata* Thunb., has to be referred to the same family under *Peliostomum* E. Mey. ex Benth. where it becomes synonymous with *P. virgatum* E. Mey. ex Benth. Of the remaining three species, two are retained in *Ruellia* and the third is placed in *Chaetacanthus* Nees. None of the specimens cited under *R. ovata* by Clarke (Thiselton-Dyer, Fl. Cap. **5**, pt. 1, 14) belongs to that species ; most of them are *R. cordata* Thunb., erroneously placed in the synonymy of *R. ovata* by Clarke, who had not the opportunity of examining Thunberg's types. Further, *R. pilosa* Linn.f., placed doubtfully under *R. ovata* by Clarke, is apparently identical with *R. Zeyheri* (Sond.) T. Anders. and the epithet "*pilosa*" takes priority.

ACANTHACEAE.

Chaetacanthus setiger (*Pers.*) *Lindl.* Nat. Syst. Bot. ed. 2, 444 (1836) ; Lindau in Engl. Jahrb. **18**, 38 (1893). *Ruellia aristata* Thunb. Prod. 104 (1800), non Vahl (1791). *R. setigera* Pers. Syn. **2**, 176 (1807). *Chaetacanthus Persoonii* C. B. Cl. in Thiselton-Dyer, Fl. Cap. **5**, pt. 1, 18 (1901), non Nees. *C. glandulosus* Nees in DC. Prod. **11**, 462 (1847) ; C.B. Cl. l.c. 19.

The pubescence and relative lengths of the calyx teeth and corolla-tube, used by Clarke to distinguish *C. Persoonii* and *C. glandulosus*, are variable characters and it seems impracticable to retain more than one species. Although placed in the genus *Ruellia* by both Thunberg and Persoon an examination of the flowers of the type specimen of *R. aristata* Thunb. (*Ruellia setigera* Pers.) shows it to have only 2 stamens and not 4 as was assumed by Clarke (l.c. 19), who in consequence excluded it from the genus *Chaetacanthus*.

* Continued from K.B. 1933, 462.

There are two β specimens named *R. aristata* in Thunberg's herbarium, one of which agrees with the type ; the other is *Barleria irritans* Nees.

Ruellia cordata *Thunb.* Prod. 104 (1800). *R. ovata* C.B. Cl. l.c. 14, pro parte, non Thunb. *Fabrina rigida* E. Mey. in Drege, Zwei Pflanzengeogr. Documente, 134, 185 (1843), nomen.

Ruellia pilosa *Linn.f.* Suppl. 290 (1781) ; Thunb. Prod. 104 (1800). *Dipteracanthus Zeyheri* Sond. in Linnaea, **23**, 90 (1850). *Ruellia Zeyheri* (Sond.) T. Anders. in Journ. Linn. Soc. **7**, 25 (1863), C.B. Cl. l.c. 13. *R. ovata* C.B. Cl. l.c. 14, pro parte, non Thunb.

SCROPHULARIACEAE.

Aptosimum depressum (*Linn.f.*) *Burch.* Trav. S. Afr. **1**, 260 (1822), nomen, ex Benth. in Bot. Reg. t. 1882 (1836) ; Hiern. in Thiselton-Dyer, Fl. Cap. **4**, pt. 2, 131 (1904). *Ruellia depressa* Linn.f. Suppl. 290 (1781) ; Thunb. Prod. 104 (1800).

Aptosimum spinescens (*Thunb.*) *E. Weber* in Beih. Bot. Centralbl. **21**, 2, 18 (1907). *Ruellia spinescens* Thunb. Prod. 104 (1800). *Aptosimum abietinum* Burch. Trav. S. Afr. **1**, 308 (1822) ; Hiern l.c. 128.

Peliostomum virgatum *E.Mey. ex Benth.* in Bot. Reg. sub. t. 1882 (1836) ; Hiern, l.c. 133 (1904) ; E. Weber l.c. 91 (1907). *Ruellia ovata* Thunb. Prod. 104 (1800), non Cav. (1794) et non C.B. Cl. l.c. 14.

MISCELLANEOUS NEW SPECIES.

R. A. DYER.

Wahlenbergia kowiensis *R. A. Dyer*, sp. nov. [Campanulaceae], affinis *W. macrae* Schltr. et v. Brehmer, habitu strictiore, foliis latioribus ascendentibus, floribus confertis cum fructibus majoribus distinguitur.

Herba annua, erecta, e basi parce ramosa, circiter 15 cm. alta ; rami dense foliati, inferne pilis albidis reflexis induti. *Folia* late linearia, acuta, usque ad 1·5 cm. longa, circiter 2 mm. lata, serrulata, glabra, demum submembranacea. *Inflorescentia* crebre cymosa, breviter pedunculata, pauciflora ; pedicelli laterales usque ad 1 cm. longi, glabri ; bracteolae anguste lanceolatae. *Receptaculum* campanulatum, costatum. *Calycis* segmenta linearia, acuta, 3–3·5 mm. longa. *Corollae* tubus 3 mm. longus ; lobi lanceolati, 3·5 mm. longi. *Stylus* pubescens, 2·5–3 mm. longus, stigmate trifido cylindrico crasso 2 mm. longo coronatus.

EASTERN CAPE PROVINCE. Bathurst Division : Kowie West ; in grass on sandy knolls behind coastal bush, occasional, flowers white, 27 Nov., 1921, *Miss L. Britten* 2844.

Cineraria Britteniae *Hutch.* et *R. A. Dyer*, sp. nov. [Compositae], affinis *C. deltoideae* Sond., sed foliorum auriculis majoribus, lamina reniformi-orbiculari (haud deltoidea), achaeniis vix alatis differt.

Herba; caulis leviter flexuosus, angularis, angulis purpureis, parce pubescens, demum glabrescens. *Folia* reniformi-orbicularia, basi late cordata, 3·5–4·5 cm. lata, digitate lobulata et nervosa, lobulis repando-dentatis vel crasse serratis, parce pubescentia vel glabra; petioli 2–4 cm. longi, basi auriculis plerumque magnis amplexicaulibus suborbicularibus repando-dentatis alati. *Inflorescentia* laxe corymbosa; pedunculi ultimi bracteis 3–5-linearibus vel subulato-lanceolatis instructi. *Involucrum* campanulatum, circiter 5 mm. diametro; bracteae circiter 12, *lineari-lanceolatae*, striatae, 4–5 mm. longae. *Flores* radii circiter 5, flavi. *Achaenia* lenticularia, obscure costata et minutissime papillosa, vix alata.

Eastern Cape Province. Albany Division: Signal Hill, near Grahamstown, edge of bush on southern slope, 25 Dec., 1926, *Miss L. Britten* 5550 (type); in shady woods near Grahamstown 2,000 ft., MacOwan 522 (partim). Stockenstrom Division: Katberg, 3,000–4,000 ft., Feb., *Baur* 1067.

Helichrysum vellereum *R. A. Dyer*, sp. nov. [Compositae]; affinis *H. crassifolio* Less. inflorescentiis minus ramosis, capitulis compactiore aggregatis foliis superioribus approximatis, bracteis interioribus minoribus apice rotundato margine plano haud rugoso acheniis glabris distinguitur.

Herba perennis robusta, inferne plerumque sublignosa, usque ad 40 cm. alta, basi ramosa. *Caules* subdecumbentes vel plus minusve erecti, albo-tomentosi, plus minusve ramosi, ramis brevibus alternis. *Folia* oblongo-vel spatulato-oblanceolata, inferne angustata, sessilia, obtusa, 2–5 cm. longa, 0·5–1 cm. lata, utrimque aequaliter albo-tomentosa. *Capitula* apice ramorum brevium glomerata vel arcte subcorymbosa, foliis superioribus approximata. *Involucrum* campanulato-cylindricum, circiter 4 mm. altum, 4 mm. latum floribus plus minusve aequalibus; bracteae arcte imbricatae, inferne tomentosae, superne planae, scariosae, albae, erectae vel leviter patentes, apice rotundatae. *Receptaculum* planum. *Pappi* setae superne attenuatae, subcapillares, barbellatae. *Achaenia* 1 mm. longa, glabra.

Eastern Cape Province. Bathurst Division: sand dunes near the mouth of the Great Fish River, Jan., Feb., *MacOwan* 1441 (type); sand hills on sea shore near Port Alfred, Dec., *Galpin* 2931; Port Alfred, Jan., *Salisbury*, without number; Humansdorp Division: common at Slang River on sand near beach; subdecumbent, heads white, Nov., *Phillips* 3378. A note in Kew Herbarium states that *Fourcade* 1821 is equal to *Phillips* 3378 and was collected at the same time and place.

Senecio mimetes *Hutch.* et *R. A. Dyer*, sp. nov. [Compositae], affinis *S. lanceo* Ait. sed virgata, ab initio glabra, foliis irregulariter

dentatis minus auriculatis, pedunculorum bracteis paucioribus et minus conspicuis differt.

Herba virgata circiter 1 m. alta; caulis foliatus, glaber, costatus. *Folia* oblongo-lanceolata ad anguste triangulari-lanceolata, basi amplexicaulia et breviter decurrentia, apice acuta, 4–6 cm. longa, 1–2 cm. lata, irregulariter dentata, ab initio glabra, coriacea, nitida, superiora sensim minora et laxiora. *Inflorescentia* laxe corymbosa, gracilis, ramis inferioribus elongatis; bracteae foliaceae, acute acuminatae; pedunculi ultimi bracteis paucis linearibus instructi. *Involucrum* late campanulatum, 7–8 mm. diametro; bracteae circiter 20, lineari-lanceolatae, acuminatae, carinatae, 4–5 mm. longae, glabrae. *Flores* radii pauci, flavi. *Achaenia* nigrescentia, sulcata, glabra. *Pappus* albus.

Eastern Cape Province. Uitenhage Division: Van Staadens Berg, foot of mountain, below 1,000 ft., Dec. *Drege* (type); without locality, *Zeyher* 701. Albany Division: amongst rocks at Howieson's Poort, Dec., *MacOwan* 696. Bathurst Division: between Kaffir Drift and Blaauwkrantz, Sept., *Burchell* 3878.

Scabiosa albanensis *R. A. Dyer*, sp. nov. [Dipsacaceae]; *S. anthemifoliae* E. et Z. affinis, caulibus elongatis foliatis breviore pubescentibus, foliis inferioribus bipinnati-partitis lobis linearibus glabris vel sparse hispidis, capitulis minoribus differt.

Caules erecti vel suberecti, basi lignosi; rami subrigidi vel graciles dense foliati, hispidi, pilis brevibus reflexis satis induti. *Folia* caulium basin versus demum decidua, superne numerosa; inferiora bipinnati-partita, 3–5 cm. longa, lobis linearibus; superiora pinnati- vel bipinnati-partita, glabra vel sparse hispida, margine revoluto. *Pedunculi* 12–20 mm. longi, graciles, pilis paucis sed infra capitulum densioribus hispidi. *Capitula* subglobosa; involucri bracteae lineares vel anguste lineari-lanceolatae. *Calycis* setae ante anthesin ultra alabastra capituli distincte exsertae; involucelli arcte costati. *Corolla* 4-fida, vix 1 cm. longa, extra dense pubescens. *S. columbaria* Linn. var. *dissecta* Sond. in Harv. et Sond. Fl. Cap. 3 : 43 pro parte; *S. pallida* var. E. Mey. *a*, in Drege Zwei Pfl. Docum. 218.

Eastern Cape Province. Albany Division: Beggars Bush near Grahamstown in grassveld on mountain slope, May, *Britten* 1965 (type); Assegai Bush, *Drege*; Featherstone Kloof, in grass, *MacOwan* 204.

Euphorbia Nesemannii *R. A. Dyer*, sp. nov. [Euphorbiaceae]; affinis *E. mammillari* Linn. radice tuberosa caudice brevissimo subterraneo continua, ramis apice caudicis emittentibus haud vel perraro ramosis haud tuberculatis distinguitur.

Planta succulenta, perennis, dioica, armata, radice tuberosa. *Tuber* caudice continuum, subcylindricum, basin versus angustatum vel ramosum, radicibus paucis tenuibus instructum; radices nonnunquam ramos aerios emittentes. *Caudex* brevissimus, apice ramis 5-pluribus instructus. *Rami* 6–14-angulati, 8–30 cm. longi,

rariter masculorum 40 cm. longi, 1–3 cm. crassi, basi angustati; anguli crebri, 2–3 mm. prominentes, pedunculis persistentibus armatis. *Folia* minutissima, mox decidua. *Cyathia* apice ramorum aggregata; mascula plura, pedunculata; pedunculi 0·5–1·5 cm. longi, bracteis circiter 5 superioribus plus minusve oblongis ciliatis obtusis mucronulatis instructi; involucrum campanulatum, glabrum; glandulae contiguae, transverse oblongo-ellipticae, 1 1·25 mm. latae; lobi interiores crasse fimbriati; feminea subsimilia sed breviori-pedunculata. *Ovarium* glabrum, sessile; styli circiter 1·5 mm. longi, basin versus connati, apice breviter bilobi. *Capsula* triloba, 4–5 mm. diametro, glabra.

CAPE PROVINCE: Robertson Division; in rich soil under large "Haakdoorn" on dry ridge about 1½ miles south of Robertson, rare, *Nesemann ex Dyer* 2437 ♀; dry ridge 1½ miles from Robertson under small bushes, *Nesemann ex Dyer* 2438 ♂; dry gravel kopje west of Robertson, *Nesemann ex Dyer* 2440 ♀ (type); amongst *Rhenoster* bushes in fairly rich soil, 3 miles north of Robertson, *Nesemann ex Dyer* 2441 ♂ (type).

I am greatly indebted to Mr. A Nesemann, who took great trouble in collecting a representative series of specimens from different habitats near Robertson and forwarded them to the Albany Museum, Grahamstown, in July 1930. Plants in rich soil and those deriving additional moisture from a watercourse spill-way were comparatively luxuriant, some branches attaining a height of 2 ft., whereas mature plants on dry stony ridges were occasionally only 6 in. high. During normal development the main root is tuberous and carrot-like, but in the event of the tuber decaying the branches are supported by the lateral fibrous root-system. From some of these fibrous roots near the surface, one or a series of aerial branches may be produced, more commonly so on plants in dry and stony areas. In addition to the effect of external factors the number of angles is apparently influenced both by the age of the branches and age of the plant: branches from old plants having more angles than branches of similar size from young plants. Variations in the inflorescence were also found: three sessile involucres occasionally terminated a peduncle, and some cyathia had 6 glands and 6 inner lobes.

The closest affinity of *E. Nesemannii* is with *E. mammillaris* Linn. and *E. fimbriata* Scop. It seems doubtful whether the latter two are distinct species, but owing to the absence of type specimens it must remain a matter of opinion.

Euphorbia tubiglans *Marl.* MS., sp. nov. [Euphorbiaceae]; affinis *E. Susannae* Marl. a qua tubero caudice continuo subterraneo napiformi vel fusiformi, ramis longioribus minus tuberculatis apice caudicis emittentibus, glandulis involucri marginibus lateralibus involutis pseudotubulosis differt.

Planta succulenta, humilis, perennis, dioica, anacantha, radice tuberosa. *Tuber* caudice brevissimo continuum napiforme vel fusiforme, 2–5 cm. crassum, junior tenerum, demum durum cortice

rimulato. *Rami* 2–5, succulenti, apice caudicis subterrannei emittentes, plerumque pentagoni rariter hexagoni, usque 12 cm. longi, 1·3–1·7 cm. crassi, basin versus subcylindrici, ad pedem angustati et stipiformes; anguli crebri, juniores 3–4 mm. prominentes virides, basibus foliorum leviter tuberculati. *Folia* triangulari-acuta, canaliculata, ciliata, mox decidua. *Cyathia* apice ramorum aggregata; mascula 3–6, pedunculata; pedunculi circiter 2·5 mm. longi, apicem versus bracteis oblongis obtusis instructi; involucrum campanulatum, glabrum; glandulae margine crasse denticulatae, marginibus lateralibus involutis, pseudotubulosae, rubrae; lobi interiores albo-fimbriati; feminea subsimilia sed breviori-pedunculata. *Ovarium* pilosulum; styli 3 mm. longi, 1 mm. connati. *Capsula* triloba, subglabra.

CAPE PROVINCE. Steytlerville Division: near Steytlerville, *Herre* 1596 (type); near Steytlerville in karroid veld, *Pringle*, without no. Ladismith Division: near Lemonshoek and Garcia Pass on small cone-shaped peak in the open and near rocks, *R. Primos in Herb. Marloth* 13724. Swellendam Division: Angora near Bonnievale in Breede River valley, *Smith in Herb. Marloth* without no.

The herbarium specimens and notes which form the basis of this description were forwarded by the widow of Dr. R. Marloth to Dr. I. B. Pole-Evans, Chief of the division of Plant Industry, South Africa. The type specimen flowered at Stellenbosch University, and others in Dr. Marloth's garden in Cape Town during Jan. 1931. Flowering material to complete the specimen collected by Dr. Pringle in 1933 was received independently at Kew from the Albany Museum, Grahamstown, by the same mail which contained Dr. Marloth's notes from Pretoria. The trivial name was suggested by the distinctive shape of the involucre-glands.

Agathosma bicornuta *R. A. Dyer*, sp. nov. [Rutaceae]; affinis *A. thymifoliae* Sond. a qua ramulis pubescentibus foliis minus orbicularibus vel ellipticis persistentioribus calycis segmentis oblongis brevioribus ovario 2-lobo valde distinguitur.

Fruticulus subrigidus, 30–60 cm. altus, dense ramosus; ramuli graciles, breviter pubescentes, imbricato-foliati. *Folia* perbreviter petiolata, ovalia vel elliptica, rariter orbicularia vel elliptico-ovata, suberecta, 3–4 mm. longa, 1·5–2 mm. lata, obtusa, superne leviter recurvata, glabra, infra glanduloso-punctata apicem versus glandulo maiore instructa, supra eglandulosa, subconcava. *Umbella* 12–15-flora; pedicelli graciles, 2·5–3·5 mm. longi, glabri, basi minutissime bracteolati. *Calyx* glaber, 5-partitus, segmenta oblonga, obtusa, 0·5 mm. longa, leviter incrassata. *Petala* oblanceolata vel lineari-oblanceolata, apice rotundata, 2·5–3 mm. longa, extra glabra intra pilis paucis induta. *Stamina* 5, circiter 5 mm. longa; staminodia filiformia, 2–3 mm. longa, medio pilis patulis induta, apice glandulo minuto instructa. *Discus* cupularis satis productus, margine leviter 5-crenato. *Ovarium* 2-loculare; cocci cornuti; cornu ovario

aequilongo. *Stylus* filiformis, usque 5mm. longus, glaber.—*A. thymifolia* Dummer in Fedde Rep. 11, 407 (1912) non Schlechtendal.

EASTERN CAPE PROVINCE. Albany Division: on the rocky slopes of Bothasberg, 2200 ft., July, Aug. and Sept., *MacOwan* 560 (type); "Hounslow" farm, on dry scrubby hills, 1600 ft., Sept., *Galpin* 75. Somerset East Division: Commadagga (near the border of Albany Division) on dry hillside, July, *Burchell* 3324.

MacOwan sent duplicate material of his no. 560 to Sonder who referred it to *A. thymifolia* Schechtendal. This species was otherwise known only from the sand hills near Saldanha Bay, but apart from the widely separated localities and different habitats, *A. bicornuta* is readily distinguished by the characters given above. Further, the capsules are 2-coccus and those of *A. thymifolia* 4-coccus, whereas *Agathosma* species are usually 3-coccus. Dummer l.c. gave no description and merely cited under *A. thymifolia*, the two specimens *Burchell* 3324 and *MacOwan* 560.

Agathosma clavisepala *R. A. Dyer*, sp. nov. [Rutaceae]; affinis *A. piliferae* Schlechtendal et *A. Nivenii* Sond. ab illa foliis oblongis obtusis haud ciliato-mucronatis ovario bicornuto, ab hac foliis leviter latioribus margine minus recurvato pedicellis longioribus pilosis ab ambabus calycis lobis angustioribus apice clavato differt.

Frutex satis vel intricato-ramosus, subrigidus, 0·5–1 m. altus; ramuli graciles, dense foliati, puberuli, pilis recurvis induti. *Folia* breviter petiolata, patula vel subreflexa, oblonga vel subovalia, obtusa vel rariter subacuta, basi rotundata, 3–5 mm. longa, 1·25–2 mm. lata, glabra, supra plana, infra subconcava, eglandulosa, leviter costata, margine leviter recurvato glandulo-crenato; petioli glabri, erecti, ramulis subadpressi, 0·5–1 mm. longi. *Umbella* plus minusve 12-flora; pedicelli graciles, pilosi, 3–5 mm. longi, basi minutissime bracteolati. *Calyx* persistens, 5-partitus; segmenta 1·5 mm. longa, inferne ovato-lanceolata, ciliata, apice crasso clavato glabro. *Petala* oblonga vel leviter ovato-oblonga, obtusa, 4 mm. longa, 1·5 mm. lata, alba, basi breviter unguiculata, intra basem versus pilis brevibus recurvis induta. *Stamina* 4–5 mm. longa; staminodia anguste elliptica, circiter 2 mm. longa, patente pilosa, glandula apiculo notata. *Discus* cupularis, margine 5-crenato. *Ovarium* 2-lobum, disco immersum. *Stylus* filiformis 4–5 mm. longus, glaber. *Fructus* 4–5 mm. longus, bicornutus, rugosus.

EASTERN CAPE PROVINCE. Albany Division: near Salem, June, *Wilmot in Nat. Herb. Pretoria* 15304 (type); "Rockcliffe" near Sidbury, Nov., *Daly* 822. Bathurst Division: Southwell, on banks of small stream, Nov., *Britten* 2244.

This species is readily distinguished from its near allies by the clavate calyx-segments. Mr. L. S. Wilmot states that butter is tainted when made from the milk of cows which have grazed it.

XXXIII—ADDITIONS TO THE FLORA OF CYPRUS.

A. K. JACKSON.

The Director has received through the Director of the Department of Agriculture, Cyprus, a second valuable collection of dried specimens made by Mr. A. Syngrassides in various parts of the island. The specimens have been identified and laid into the Herbarium. Several species new to the flora were noted in the course of determining the collection and these are given below. Three species found by Druce but not given by Holmboe from Cyprus are also included here as confirmation of Druce's records. Some numbers of Sintenis and Rigo represented at Kew but apparently not seen by Holmboe are also quoted.

It is probable that a considerable number of species which occur in the island have yet to be collected. Herbarium material and fruits and seeds for cultivation would be welcome.

Eruca sativa *Mill.* Gard. Dict. ed. 8, n. l. (1768). var. **eriocarpa** (*Boiss.*) *Post* Fl. Syria, 79 (1896).

Brassica Eruca L. var β S. et S. Fl. Graec. 43 t. 647 (1830).

Mia Milia-Mandres, 29.3.33, above sea level, growing on rocky grounds, *Syngrassides* 323.

Holmboe in his "Studies on the Vegetation of Cyprus" (1914) does not record this variety from Cyprus, although there is a figure of the plant under the name *Brassica Eruca* L. in Sibthorp and Smith Fl. Graec. 43. t. 647. (1830) with the locality given as "In insula Cypri campis depressis."

The variety *eriocarpa* has been found in Spain, Asia Minor, Syria, Palestine and North Africa.

Trigonella spinosa *L.* Sp. Pl. 777 (1753).

Nursery Garden, Kyrenia, 21.4.33, growing in a good loam among cultivated plants, *Syngrassides* 182.

This species was hitherto only known to occur in Syria, Palestine, Rhodes, and possibly Crete. Linnaeus gives the locality as Crete only, but as the plant has never since been found in the island, recent authors (Hal. Fl. Graec. 1,353: 1900; Hayek, Prod. Fl. Balc. 1,832: 1926) have doubted its occurrence there. Now that the species has been collected in Cyprus, it seems to be more probable that the plant was and possibly still is to be found in Crete, since the floras of the two islands are closely related in many ways.

Medicago scutellata *Mill.* Gard. Dict. ed. 8 n. 2 (1768).

Myrtou, 6.5.32, in barley-crops, *Syngrassides* 203.

There is a specimen of this species in Herb. Kew collected "in agris pr. Larnaka vacchia," 4.3.1880, *Sintenis et Rigo* 821, but Holmboe does not record the species in his "Studies on the Vegetation of Cyprus."

The species occurs in France, Portugal, Spain, Italy, Balkan Peninsula, Russia, Syria and Palestine.

Centaurium spicatum (*L.*) *Fritsch* in Mitteil Naturwiss. Ver. Wien, **97** (1907). *Erythraea spicata* (*L.*) *Pers.* Syn. **1**, 283 (1805). *Gentiana spicata* L. Sp. Pl. 230 (1753).

Kykko, near Nicosia, 20.6.32, growing on old walls of water tanks, *Syngrassides* 398.

Widely distributed throughout the Mediterranean region, Portugal, Iraq, Persia and Afghanistan.

Scrophularia peregrina *L.* Sp. Pl. 621 (1753)

Lefka, 4.4.32. In orange groves etc., *Syngrassides* 246.

Holmboe records only one species of *Scrophularia* for the island, *S. sphaerocarpa* Boiss. et Reut. There are, however, in Herb. Kew specimens of *S. peregrina* collected by Sintenis from two localities in Cyprus :—Carpass. in rupibus prope Kantara, 17.4.1880, *Sintenis et Rigo* 142; Prope Galata, 25.6.1880, *Sintenis et Rigo* 172.

Druce also records the species from Lapithos, Cyprus, in Rep. B. E. C. **9**, 469, 1930 (1931).

Occurs mainly in the Mediterranean region.

Micromeria Juliana (*L.*) *Benth.* Lab. 373 (1834).

Agios Epiktitos, 24.5.32, growing on roadsides, *Syngrassides* 280. In vineis prope Galata, 16.6.1880, *Sintenis et Rigo* 563.

Occurs in Portugal and most of the countries of the Mediterranean.

Lamium maculatum *L.* Sp. Pl. ed. 2, 809 (1763).

Pedoulas, 28.3.32, High. Alt., growing in hedges, stones, banks etc., *Syngrassides* 51.

Distributed throughout Europe from the British Isles and Scandinavia to Portugal and the Mediterranean region and eastwards to Persia.

Plantago Bellardii *All.* Fl. Pedem. **1**, 82, t. 85, f.3 (1785).

Before Athalassa, 8.4.33. Above sea level, on dry rocky fields, *Syngrassides* 13.

A species common in South Europe and the Orient.

Chenopodium murale *L.* Sp. Pl. 219 (1753).

Cuodhara beyond Kythraea, 8.4.32, growing as a garden weed, *Syngrassides* 375.

Also collected by Sintenis at Kythraea, May 1880, *Sintenis et Rigo* 587. Druce in his list of new records for Cyprus in the B.E.C. Report 1930 (1931) states that the plant is common at Limassol and that it is probably the *C. rubrum* of Holmboe. As *C. murale* is a common weed of cultivation in the Mediterranean area and as *C. rubrum L.* is not found in that region at all, it seems certain that the two species have been confused. Holmboe did not find the so-

called *C. rubrum* himself, his record is based on a plant collected by Samson without special locality and listed in Thompson's Flora of Cyprus, Journ. Bot. **44**, 337 (1906).

Kythraea, 13.5.32, by running waters on banks of streams *Syngrassides* 219. Kythraea, 13.5.32, by running waters, quite common, *Syngrassides* 291. Ad rivulos Kythraea, 7.6.1880, *Sintenis et Rigo* 677.

Common throughout Europe, Orient and N. Africa.

Euphorbia biglandulosa *Desf.* in Ann. Mus. Par. **12**, 114 (1808).

Saïtta, 9.3.32, growing on mountains, *Syngrassides* 348.

Occurs in Sicily, Greece, Asia Minor and Syria.

Urtica urens *L.* Sp. Pl. 984 (1753).

Cuodhara beyond Kythraea, 8.4.32, growing as a garden weed, *Syngrassides* 374.

This species is recorded by Druce in Rep. B.E.C. **9**, 469, 1930 (1931), from Tsuda, Limassol, Famagusta, Ay Napa, and Nicosia.

Very common throughout Europe, Eastern Asia and North Africa.

Brachiaria eruciformis (*S. et S.*) *Griseb.* in Ledeb. Fl. Ross. **4**, 469 (1853).

Panicum eruciforme S. et S. Fl. Graec. **1**, 44, t. 59 (1806).

Lapithos, Experimental Lime Plantation, 12.6.32, in cultivated fields, in wet places, *Syngrassides* 217.

Originally described from the island of Samos, since found in South Italy, Sicily, Macedonia, Asia Minor, Syria, Persia, Egypt and Abyssinia.

Setaria viridis *P. Beauv.* Agrost. 51 (1812).

Lapithos, Experimental Lime Plantation, 12.6.32, quite a common weed in gardens, *Syngrassides* 237.

Generally distributed throughout Europe, Caucasus, Asia Minor, Persia, Arabia, N. Africa, Afghanistan, Siberia, and Japan.

Cutandia memphitica (*Spr.*) *Richt.* Pl. Eur. 77 (1890).

Dactylis memphitica Spr. hort. Hal. add. **1**, 20 (1799).

Famagusta, in the Nursery Garden, 10.3.33, in sandy soil, *Syngrassides* 42.

Occurs in south-east Spain, Syria, Palestine, Arabia, Egypt Persia, and North Africa.

Serrafalcus arvensis (*L.*) *Parl.* Fl. It. **1**, 393 (1848).

Bromus arvensis L. Sp. Pl. 77. (1753).

Between Nisou and Stavrovouni, 12.4.33, in dry hills, on rocky ground, *Syngrassides* 18.

Common throughout Europe, Asia Minor, Iraq and Persia.

XXXIV—THE GIANT LOBELIAS OF EAST AFRICA.*

E. A. Bruce.

Addenda et Corrigenda

Arising out of correspondence with Professor L. Hauman and his paper on the same subject (Les Lobelia Géants des mont. du Congo Belge, Dec. 1933), the following additions and corrections should be made in the paper which was published in *Kew Bull.* 1934, p. 61 *et seq.*

p. 62, **L. lanuriensis** *De Wild.* was first described in 1920 (see below).

pp. 65, 70, 76, 77, for *L. karisimbensis* R. E. Fr. and Th. Fr. jr., read **L. lanuriensis** *De Wild.* and vice versa.

L. lanuriensis *De Wild.*, although not included in Fries' revision "Die Riesen-Lobelien Afrikas" (1922), was first published in 1920 (Rev. Zool. Afr. 8, Suppl. Bot. 29) and therefore has precedence over *L. karisimbensis*.

pp. 62, 65, 68, 76, the name *Lobelia Stuhlmannii* Schweinf. should be regarded as a *nomen confusum* and discarded (see Hauman l.c., pp. 13, 22, 24, 25 (1933).

Stuhlmann's no. 2406 becomes **L. lanuriensis** var. **Ericeti** *Hauman.*

p. 73, add as synonym under **L. Mildbraedii** *Engl. L. sauvibracteata* Hauman, and add to geography:—Belgian Congo: Kivu, Lake Kani, about 7300 ft., *Scaetta* 35M, 22M.

p. 68, to the Longisepala Series add **L. petiolata** *Hauman* (Hauman l.c. p. 36); this differs from *L. longisepala* in its narrower leathery leaves and shorter pedicels, and from *L. lukwangulensis* in its laxer inflorescence and larger flowers.

L. intermedia *Hauman* (l.c. p. 31). This may prove to be only a high altitude form of *L. giberroa* Hemsl., which has a wide range and is very variable. B. D. Burtt's specimen, no. 3140, from the same locality, is identical with the type of *L. intermedia*, the flowers of which are the same as those of *L. giberroa*, though the leaves are narrower.

XXXV—MISCELLANEOUS NOTES

Leonard Cockayne.—We have to announce, with deep regret, the death, early in July, of Dr. Leonard Cockayne, C.M.G., F.R.S., F.N.Z.Inst., Honorary Botanist to the New Zealand State Forest Service. An account of Dr. Cockayne's work will appear in a subsequent number of the Bulletin.

James Groves.—James Groves was born in London on January 19th, 1858, the youngest of a family of three who collaborated in a lifelong study of one of the most isolated and difficult groups of plants, the *Charophyta*. For a number of years before his death on March 20th, 1933, he was recognized throughout the world as the authority on these plants, and all the more critical material received at Kew was identified by him.

In 1880, with his elder brother Henry Groves, he published a "Review of the British Characeae" in the "Journal of Botany," and in 1920 and 1924 appeared the two volumes of his *magnum opus*, a monograph on "British Charophyta," published by the Royal Society. Three years ago Groves, in conjunction with the present writer, started a conspectus of the world's Charophyta. It is much to be regretted that his unique critical knowledge will not be available when completing this work.

British botanists will recall that it was Henry and James Groves who edited the ninth edition of Babington's "Manual of British Botany" in 1904.

Groves was also interested in botanical nomenclature, and took an active part in the discussions at the Imperial Botanical Conference in London in 1924. From time to time he contributed to the "Journal of Botany" notes dealing with various points in nomenclature.

C. V. B. MARQUAND.

Nathaniel Lord Britton.—Dr. N. L. Britton, who died on June 25 last in his seventy-sixth year, achieved distinction not only by his personal scientific research, but also as an organizer and administrator. His name will always be associated with the foundation and rise of the New York Botanical Garden, which had become one of the great botanical Institutions of the world by the time of his retirement in 1929. Born on January 15, 1859, Britton took the degree of E.M. at Columbia University in 1879, proceeding to Ph.D. two years later. From 1879 to 1887 he was Assistant in Geology at the University, and from 1880 to 1890 Botanist and Assistant Geologist in the New Jersey Geological Survey. Most of his early scientific papers, however, dealt with botanical subjects, and in 1887 he became Instructor in Botany at Columbia University, in 1890 Adjunct Professor, and in 1891 Professor of Botany, a position which he relinquished in 1896 after his appointment as first Director-in-Chief of the New York Botanical Garden.

The Act of Incorporation of the New York Botanical Garden, approved in 1891 and amended in 1894, provided that as soon as the Corporation had raised the sum of $250,000, a part of Bronx Park should be appropriated for the Garden, and the City of New York would erect a suitable fire-proof building for a botanical museum and herbarium, with lecture-rooms and laboratories. The required amount was raised by June, 1895, by means of subscriptions of $25,000 each from Columbia College, J. Pierpont Morgan, Andrew Carnegie, Cornelius Vanderbilt, John D. Rockefeller, D. O. Mills, and the Hon. Addison Brown, and smaller sums from other indi-

* Continued from K.B. 1934, 88.

viduals and firms. By an agreement dated January 8, 1896, Columbia University undertook to deposit its Herbarium and Botanical Library with the New York Botanical Garden, mutual facilities for study being arranged between the two Institutions.

As an original member and Secretary of the Corporation, one of the original board of Scientific Directors, and first Director-in-Chief (1896-1929), Britton took a predominant part in the development of the Garden. A portion of the northern part of Bronx Park of about two hundred acres was allotted for the Garden and accepted in August 1895, and a topographical survey of the tract, with a map on the scale of fifty feet to the inch with five foot contours, was completed by the end of the year. A commencement of the educational work of the Garden was made in 1895 by labelling 100 of the largest trees.

Plans for the development of the Garden and Museums were approved before the end of 1896, those for the Museums including sections devoted to Economic Plants, General Botany, Physiology, Palaeobotany, and the illustration of the flora within 100 miles radius of New York, by means of herbarium specimens mounted in swinging frames. Pending the construction of the buildings the accumulated museum and herbarium material had to be stored in six different places.

The scientific staff in 1898 included George V. Nash, General Assistant, Willard N. Clute, Curator, and W. R. Maxon, Assistant in herbarium and museum work, in addition to Drs. P. A. Rydberg, J. K. Small, Marshall A. Howe and others who were employed for short periods.

The year 1900 was memorable for the completion of the Museum building and of eight houses of the main Conservatories. In that year over 50,000 museum and herbarium specimens were added to the collections and about 112,000 specimens were mounted for the herbarium. The staff had meantime increased to ten members. The sole publication hitherto issued had been the " Bulletin of the New York Botanical Garden," of which the first part appeared in April, 1896. This was reinforced in 1900 by the " Journal " edited by Dr. D. T. MacDougal, who had been appointed Director of the Laboratories in 1899. The first volume contains accounts of the Museum Building, Library, Herbarium, Plantations, Laboratories and Horticultural Houses and a report on Britton's official visit to Europe in 1900 in connexion with the Paris Exposition and the International Botanical Congress held in conjunction with it.

Among his many activities was the promotion of botanical exploration, especially in America. As early as 1897, botanical collections were made in Montana by Rydberg and Bessey, with the aid of funds supplied by Mr. W. E. Dodge, the results appearing as a " Catalogue of the Flora of Montana and the Yellowstone Park," in the first volume of the " Memoirs of the New York Botanical Garden " (1900). In 1898 Mr. and Mrs. Heller were sent to Porto

Rico to collect economic and herbarium material, at the expense of Mr. Cornelius Vanderbilt. By the year 1905 the staff of the Garden had increased to sixteen, and the " Journal " of that year records the results of botanical explorations in the Bahamas by Nash and Britton, in Haiti by Nash, in Arizona, Mexico and California by MacDougal, in Panama by Cowell, and in Utah by Rydberg. The same volume contains a report by Britton on his trip to Europe during May-July 1905, for the purpose of visiting certain European botanical gardens and museums and of attending the International Botanical Congress held at Vienna, in which he took a prominent part. It is gratifying to note that he found the equipment and facilities provided for work at Kew " as complete and convenient as could be devised," and that he " thoroughly enjoyed consulting the herbarium and library " during his visit.

The nomenclatural decisions of the Vienna Congress, and especially the establishment of a list of conserved generic names, were unacceptable to Britton and to various other botanists in the United States, and they accordingly rejected the International Rules of Nomenclature and proposed a new set of rules entitled, " American Code of Botanical Nomenclature " (Bull. Torr. Bot. Club, **34**, 167-178 : 1907). For some time feeling ran high, the view being expressed, by supporters of the International Rules, that those who took part in an International Congress were morally bound to abide by its decisions. Britton, however, was of opinion that strict priority of publication should be observed, and that it was unjust to reject an earlier plant name in favour of a later one, even if the latter were much better known. Britton was sensitive, although he did not show it, and he may be honoured, even by those who regard his views as mistaken, for enduring what must have been a very unpleasant situation rather than be false to his convictions. The so-called " American Code "—the title was a source of offence to many American botanists—was, however, in certain respects in advance of the International Rules, notably in the explicit recognition that plant names should be applied according to a type-method, and a few of its best features were eventually accepted by the International Botanical Congress held at Cambridge in 1930.

Rigid adherence to priority, though causing great practical inconvenience by the extensive name changes entailed, nevertheless had its merits in calling attention to the need for bibliographical research. Many systematic botanists in the nineteenth century had omitted to pay adequate attention to the work of their predecessors. Britton developed this somewhat neglected side of botanical research, and eventually, in 1913, succeeded in establishing the new post of Bibliographer, filled by Dr. J. H. Barnhart, who had previously performed much of the work in his capacity of Librarian.

Britton's plans for the investigation and description of the North American flora were far-reaching. His first large work of this nature was the " Illustrated Flora of the Northern United

States and Canada " (1896-98 ; ed. 2, 1913). This was followed by his " Manual of the Flora of the Northern States and Canada " (1901 ; ed. 3, 1907), " North American Trees " (1908, assisted by J. A. Shafer), " Flora of Bermuda " (1918), " Flora of the American Virgin Islands " (1918), " Bahama Flora " (1920, with C. F. Millspaugh), and " Botany of Porto Rico and the Virgin Islands " (1923, with P. Wilson). Other areas were dealt with by his staff.

A great taxonomic enterprise initiated by Britton in 1905 was the " Flora of North America," to be completed in 34 volumes. This was " designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago and Curacao." Up to date, 73 parts belonging to 18 volumes have been issued, vol. 9 (Polyporaceae—Agaricaceae) being now complete. The account of the Mimosaceae and Caesalpiniaceae (1928-30) was the joint work of Britton and the late Dr. J. N. Rose. These authors also collaborated in what was Britton's most important piece of monographic work, namely " The Cactaceae," a magnificent quarto work in four volumes with many coloured and other illustrations, published by the Carnegie Institution of Washington (1919-23). This work illustrates a feature characteristic of Britton's taxonomic work, and shared by some of his staff, namely the treatment as " genera " of groups regarded by most other botanists as sections or subsections, or at most as subgenera. The recognition of such micro-genera is very inconvenient for all but experts, and it is hoped that the next monographer of Cactaceae may reduce their number considerably.

During Britton's tenure of office the number of publications issued by the New York Botanical Garden rose to seven. "Addisonia" started in 1916, is now in its eighteenth volume, and consists of coloured illustrations with popular descriptions of plants of the United States and its territorial possessions, and of other plants flowering in the New York Botanical Garden. " Mycologia," now the official organ of the Mycological Society of America, was started in 1909 and is now in its twenty-sixth volume. The new journal " Brittonia " was founded in Britton's honour in 1931.

The account given above embraces only a part of Britton's manifold activities. The development of the Garden and the acquisition of new plants for the living collections was the subject of his constant solicitude, and by the time of his retirement the area of the Garden had increased to 400 acres. The staff had increased to twenty-four, apart from Honorary Curators, and the Library contained over 35,000 books in addition to pamphlets. A series of popular lectures in connexion with the Garden was inaugurated in December 1895, by a lecture by Dr. (later Sir) Daniel Morris, then Assistant Director of the Royal Botanic Gardens, Kew, on the rise and progress of that Institution. This system of public lectures proved to be a very popular feature and was gradually

extended, forty-one being delivered in 1929, in addition to three winter lectures and demonstrations in the Greenhouses. A lecture in connection with this series was given by the present Director of Kew, when visiting the New York Botanical Garden after the Ithaca Conference in 1926 (*K.B.* 1927 App. 1., p. 2).

For the value of Britton's services in dealing with the intricate problems which arose, problems of a political, legal, administrative and financial nature, reference may be made to the tribute paid to him by the Scientific Directors on his retirement (Journ. N.Y. Bot. Gard, **31**, 2-4). When it is remembered that the Garden is dependent upon an annual appropriation by the City of New York, on private benefactions, and membership fees, the magnitude of Britton's achievement may be appreciated. The number of annual members, each paying $10, rose from 443 in 1896 to nearly 2,000 in 1929.

Reference should be made to "Science", vol. 80, No. 2066, of Aug. 3rd, 1934, for some interesting personal reminiscences of Dr. Britton written by his lifelong friend Dr. H. H. Rusby.

No account of Britton's career would be complete without a reference to his wife, Mrs. Elizabeth Gertrude Britton (née Knight), who predeceased him by only four months. Miss E. G. Knight was born at New York on January 9, 1858, and after graduation in 1875 at the Normal (now Hunter) College at the early age of seventeen, became critic teacher and, in 1883, Tutor in Natural Science at that Institution. She became a member of the Torrey Botanical Club in 1879, and wrote the first of a long series of papers on North American Mosses in 1883. The moss collections of the New York Botanical Garden were from the first under her charge, and she held the official post of Honorary Curator of Mosses from 1912 till her decease. In 1885 she married Dr. Britton, and three years later, after a joint visit to Kew, gave an account of the Royal Botanic Gardens at a meeting of the Torrey Botanical Club, and suggested the establishment of a similar Institution in New York (see *Kew Bulletin*, 1927, App. I, p. 3). A Committee was appointed, and its action resulted in the incorporation of the New York Botanical Garden in 1891. During the whole of her husband's directorship of the Garden, she acted as his constant helper, accompanying him on his expeditions to the West Indies and on his visits to Europe. In addition to other activities Mrs. Britton was one of the prime movers in organising the Wild Flower Preservation Society of America of which she acted as Secretary Treasurer.

The debt of the New York Botanical Garden to Dr. and Mrs. Britton may be fitly expressed by the well-known epitaph: *Si monumentum requiris circumspice.*

T. A. SPRAGUE.

Sixth International Botanical Congress, Amsterdam, 1935.—The following notice has been received from the Secretary for Nomenclature.

" Motions dealing with Nomenclature for consideration by the Congress should be sent, before January 1, 1935, to Dr. T. A. Sprague,

The Herbarium, Royal Botanic Gardens, Kew, Surrey, England, who has undertaken to collate and report on them at the request of the Executive Committee of the Congress, and the Executive Committee for Nomenclature, no Rapporteur général having been appointed at Cambridge.

" Motions must be presented in the form of additional articles (or amendments) to the International Rules, ed. 3, the English text* of which may be obtained from Messrs. Taylor and Francis, Red Lion Court, Fleet Street, London, E.C. 4, at the price of 2s. They must be drafted as briefly as possible in Latin, English, French, German, or Italian. At least 100 printed copies must be presented.

" Only motions relating to new points which were not settled at previous Congresses can be presented. Motions not complying with these conditions will not be discussed unless the Amsterdam Congress 1935 decides to take them into consideration.

" In accordance with the decision of the Cambridge Congress, the changes in the Rules made by that Congress will be considered at Amsterdam for confirmation, amendment, or rejection."

The Flora of Liverpool.†—Dr. Green is to be congratulated on the production of this revised edition of the well-known Liverpool Flora, which he edited over thirty years ago.

The chief innovation in the new edition is the series of eight short articles on areas of special botanical interest, well illustrated by vegetation photographs. Among the areas dealt with are the extensive sand dunes from Southport to Hoylake, which are among the finest in Britain, and the well-known peat " Mosses " which support a very characteristic acid-loving flora.

A popular area like the Liverpool district has, of course, been much built over during the last thirty years, and the consequent changes in the vegetation are reflected in the diminution or extinction of many of the species recorded in the earlier edition, and in the number of aliens that have been added to the list.

The black-and-white illustrations by Miss E. M. Wood, which were one of the most attractive features of the earlier edition, have happily been retained and greatly add to the value of the work.

All interested in this botanically rich area will welcome the appearance of an up-to-date edition of Dr. Green's Flora.

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*The edition in 3 languages (English, French, German) is in print and will shortly be published with examples and lists of names by GUSTAV FISCHER, Jena.

†The Flora of the Liverpool District. Edited by C. Theodore Green, M.R.C.S., L.R.C.P., D.P.H. T. Buncle & Co., Arbroath, 1933, pp. xi. + 163, 802 figures and several plates.

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ROYAL BOTANIC GARDENS, KEW

XXXVI—THE FLORA OF THE LIBYAN DESERT.

In the " Kew Bulletin," 1931, 161–166, a list of the species collected by Mr. W. B. K. Shaw on Major R. A. Bagnold's first expedition to the Libyan Desert was published, together with Mr. Shaw's botanical observations.

Mr. Shaw accompanied a second expedition in 1932, and again brought back a valuable botanical collection from this arid and little-known region. These have been determined by Mr. J. Hutchinson, and are recorded below. For convenience the names of the plants in the first list, which were not collected on the second journey, have been incorporated, in order to make the list of Libyan Desert plants as complete as possible. A reference to the first list is given in such cases.

BOTANICAL NOTES.

W. B. K. Shaw.

The specimens were collected during the expedition to the Libyan Desert in the autumn of 1932 under the leadership of Major R. A. Bagnold, Royal Corps of Signals.

The party of eight members in 4 light Ford cars left Cairo at the end of September and returned thither some two months later after having covered over 6000 miles of largely unexplored country. The route was roughly as follows :—Cairo—Kharga—J. 'Uweinat—Sarra Well—Tekro—J. 'Uweinat—along the eastern boundary of French Equatorial Africa—El Fasher—Meidob Hills—Bir Natrun—Merga—Lagia—Selima— Wadi Halfa—Dakhla—Baharia—Cairo.

The great distances traversed, limited means of transport and the demands of other work rather restricted the time available for the collection of botanical specimens. For this reason attention was concentrated on obtaining a selection of plants from the most remote areas visited, and those areas more easily accessible, such as the Egyptian oases and the sub-desert country of N. Darfur, were neglected.

Between the Nile and Kharga and on from Kharga to J. 'Uweinat there is very little vegetation. A few plants of *Capparis decidua* Pax (Arabic *Tundub*), *Fagonia Bruguieri* DC. and *Cornulaca monacantha* Del. were seen on the limestone north of Kharga but not much to the south.

The great mountain mass of J. 'Uweinat presented a very dried-up appearance, even more so than on the previous visit as the

last good rains seem to have been in 1927. The following additional species were collected: *Juncus maritimus* Lam., *Astragalus Vogelii* Bornm., *Lotononis platicarpos* B. D. Jacks., *Pulicaria undulata* DC., *Desmostachya bipinnata* Stapf, *Cassia obovata* Collad., *Tribulus mollis* Ehrenb. and *Lavandula coronopifolia* Poir. In Broun and Massey's "Flora of the Sudan" (p. 360) this *Lavandula* is reported from the Red Sea Hills, J. Meidob at 3500 ft. and J. Marra at 8200 ft.

There was much *Citrullus Colocynthis* Schrad. on the plain around the mountain and also *Aristida plumosa* L. The latter, with *A. ciliata* Desf. and *A. acutiflora* Trin. et Rupr., are the most common plants in the heart of the Libyan Desert—in the real "howling" desert—growing in small drainage lines or in pure sand. Shallow pans of dried mud on the plain west of J. 'Uweinat contained species of *Aristida*, *Maerua crassifolia* Forssk., *Crotalaria thebaica* DC., and *Acacia flava* Schweinf.

West of Sarra Well, towards the Tibesti mountains, which we did not approach closely, there was very little vegetation, only one grass (no. 20) being found.

At Tekro, a small oasis, *Tamarix* sp., *Acacia flava* Schweinf., much *Salvadora persica* L., *Desmostachya bipinnata* Stapf, and *Juncus maritimus* Lam. were collected.

Going north again from Tekro to J. 'Unweinat for the first 50 miles or so a number of scattered bushes of *Capparis decidua* Pax and one or two patches of *Acacia* were seen. At lat. 20°5′, long. 21°45′, there was an interesting shallow mud-pan about half a mile in diameter, watered, at the occasional rains, by a wadi issuing from a plateau to the west. Here many plants of *Acacia flava* Schweinf. and *Salsola foetida* Del. were found but apparently no other species.

In the Mourdi Valley in lat. 18° 25′ there were solitary plants of *Capparis decidua* Pax, *Acacia flava* Schweinf., *Aristida plumosa* L., *Fagonia Bruguieri* DC. and a *Tribulus*, probably *T. mollis* Ehrenb. (No. 30).

At lat. 17° 55′, long. 24° 55′, in barren featureless country of rolling sand "downs," we ran into a small "forest" of dead trees. These extended for some 5 miles along our route, at a density of 3–5 per acre. All the trees had fallen and the trunks, some 12–15″ in diameter, were cut off at ground level by the sand blast. The wood was blackened and hard, and looked like *Acacia*. The altitude here is about 2100 feet above sea-level, with no sign of depression but rather the reverse. Where, then, did the trees get their water?

In this area, roughly lat. 17° 30′, long. 24° 15′, we met with many patches of green "gizu." This type of vegetation plays so important a part in the annual grazing cycle of the nomad camel-owning tribes of N. Kordofan and Darfur that it is worthy of some description here. The name "Gizu" is derived from the Arabic which means "to content animals with green or fresh pasture," and this implies that they do not require watering. The nomads' year is divided approximately as follows: April to July, "summer

grazing" on trees and dried grasses with the herds watering at the permanent wells; July to September, "rains grazing" on the green vegetation which the rains have brought, in the region roughly between lats. 14° and 15°; and, if conditions have been favourable, October to March, "winter grazing." It is the last type, the "gizu," with which we are concerned here.

If the rainfall has been sufficient there springs up on the rolling sand country, which is typical of the southern edge of the desert in about lat. 16° to 17°, a sparse covering of low herbs and grasses in large but often strictly localized patches. When the "gizu" is plentiful the nomads move up north with their camels in early autumn and may remain there, living largely on camel's milk, until February or March. During this period the camels will have neither the need nor the opportunity to drink, the "gizu" grasses being succulent enough to take the place of water. The following species were collected from the "gizu" area: *Cyperus compressus* Linn., *Danthonia Forskalei* Trin., *Indigofera argentea* Burm. f., *Indigofera arenaria* A. Rich., *Cenchrus catharticus* Del., *Neurada procumbens* L., *Lithospermum callosum* Vahl., *Giseckia pharnaceoides* L., *Farsetia ramosissima* Hochst., *Morettia Philaeana* DC. Newbold (Sudan Notes & Records, 1924, 87) also reports *Blepharis edulis* Pers., and *Fagonia Bruguieri* DC.

As one approaches the foothills of the Ennedi range in the neighbourhood of Wadi Guroguro, the vegetation increases and the country changes from rolling sand to rocky ridges. Here were found *Acacia*, *Capparis decidua* Pax, *Boscia octandra* Hochst., *Maerua* sp., *Cornulaca monacantha* Del., *Forskohlea tenacissima* L., *Euphorbia granulata* Forssk., *Tribulus alatus* Del., *Rhynchosia Memnonia* DC., *Morettia Philaeana* DC., and *Monsonia nivea* Webb.

From the Wadi Guroguro to where we struck the Wadi Howa in long. 25°, we were again passing through rolling sand country, the surface either green with "gizu" vegetation from this year's rain, or bare except for the plant stubs of previous years. We dug down in the pure sand at one place and 15″ below the surface the sand was moist enough to ball in the hand for a moment. The ground level here is about 2200 ft. altitude, probably 300–400 ft. above the static water table. The loose, sandy surface must play an important part in preventing evaporation and so conserving the scant moisture from an occasional rainstorm from which the plants take their supply.

The Wadi Howa is a remarkable feature, here forming a shallow depression some 4 miles across with a wide belt of trees down the centre. It starts far away to the south-west in French Equatorial Africa, and after winding across the desert for more than 300 miles loses itself in the sands south of Bir Natrun. There is no evidence or tradition of water ever having flowed along it in modern times, though it was probably a river in the Miocene period. How does the vegetation obtain its water? At the place where we crossed it, trees of *Acacia spirocarpa* Hochst., *Maerua* sp., *Balanites aegyptiaca*

Del., *Boscia octandra* Hochst., and *Leptadenia Spartium* Wight were noticed.

From here southwards to El Fasher we were in the sub-desert country of N. Darfur. The plant types are already fairly well known, and there was no time to make a satisfactory collection in this area of denser vegetation.

Coming north on the return journey the true desert began at about lat. 16° 30′. A few patches of " gizu " were seen, but less than to the west, and occasional bushes of *Capparis decidua* Pax, *Maerua* sp., *Fagonia Bruguieri* DC. and *Cornulaca monacantha* Del. were seen. We re-crossed the Wadi Howa in long. 25° 45′; trees were more scattered here, though some were quite large, such as individual *Acacia spirocarpa* Hochst. I have previously crossed the Wadi still further to the east in long. 27° where the trees are fewer with *Salvadora persica* L. as the predominant species.

West and south-west of Bir Natrun, and between there and Merga, occasional plants of *Capparis decidua* Pax, *Acacia flava* Schweinf. and *Cornulaca monacantha* Del. were noticed, and the same sort of vegetation occurs between Merga and Lagia, though with fewer Acacias. The plants of Bir Natrun and Merga are referred to in Sudan Notes and Records 1924, 87 and 1928, 157.

At Lagia Arba'in half-a-dozen Date Palms, one Dom Palm, *Acacia flava* Schweinf. and *Sporobolus* sp. were growing.

Altogether these journeys have added one family and 11 species not included in the " Flora of the Sudan " by Broun and Massey (1929).

Complete list of plants collected by Mr. W. B. K. Shaw on two expeditions to the Libyan Desert (the first list appeared in the Kew Bulletin, 1931, 161-166).

GNETACEAE.

Ephedra alata var. **Decaisnei** *Stapf*—See *K.B.* 1931, 163.

CAPPARIDACEAE.

Cleome droserifolia *Del.*—See *K.B.* 1931, 163.

Uweinat : about 2050 ft., in sand among rocks of dry watercourse ; a stiff aromatic herb, No. 2.

C. arabica *Linn.*—See *K.B.* 1931, 163.

Maerua crassifolia *Forssk.* Fl. Aegypt.-Arab. p. cxiii (1775).

20 miles south-west of Uweinat, about 1750 ft., a solitary tree, 15 ft., in drainage line on stony plain, No. 16. Vernacular name : *Sareh.*

Distrib.—Mauritania to Arabia and Palestine, and in Somaliland.

CRUCIFERAE.

Farsetia ramosissima *Hochst.* in Flora, **24**, pt. 1, 42 (1841) ; Oliv. Fl. Trop. Afr. **1**, 63.

Approx. lat. 17°N., long. 24° 30′ E., about 2200 ft., in rolling sandy country, No. 46.

Distrib.—Eastern Sudan and Eritrea, with a variety in the Western Sudan ; also in Somaliland.

Morettia Philaeana *DC.*—See *K.B.* 1931, 163.

Wadi Guroguro, about 2300 ft., in sand under shady rocks, Nos. 40, 47.

MOLLUGINACEAE.

Giseckia pharnaceoides *Linn.* Mant. **2**, 562 (1771) ; Oliv. Fl. Trop. Afr. **2**, 593.

Approx. lat. 17° 00′ N., long. 24° 30′ E., about 2200 ft., in rolling sand country, No. 45.

A common tropical weed.

CHENOPODIACEAE.

Salsola foetida *Del.* Fl. Aegypt. Illustr. no. 310 (1812) ; Baker & Wright in Dyer, Fl. Trop. Afr. **6**, pt. 1, 87.

Lat. 20° 05′ N., long. 21° 45′ E., about 1800 ft., sandy plain and small mud pan at foot of plateau, stems woody, 1–2 ft. high, No. 24.

Distrib.—North Africa to India.

S. tetrandra *Forssk.*—See *K.B.* 1931, 163.

Cornulaca monacantha *Del.*—See *K.B.* 1931, 164.

Haloxylon Schweinfurthii *Aschers.*—See *K.B.* 1931, 164.

AMARANTACEAE.

Aerva tomentosa var. **Bovei** *C. B. Clarke*—See *K.B.* 1931, 164.

Uweinat : about 2000 ft., Wadi bed, in clumps 2–3 ft. in diam., 2 ft. high, No. 11.

ZYGOPHYLLACEAE.

Fagonia Bruguieri *DC.*—See *K.B.* 1931, 164.

Foot of Jebel Yorguehda, about 1800 ft., on drainage line at foot of hill, in clumps, prickly, 1–2 ft. high, No.26.

Tribulus alatus *Del.* Fl. Aegypt. Illustr. 62 (1812) ; Oliv. Fl. Trop. Afr. **1**, 284.

Wadi Guroguro, about 2300 ft., in sand under shady rocks, No. 37.

Distrib.—Across N. Africa to India.

Tribulus mollis *Ehrenb.* inSchwe inf. Beitr. Fl. Aethiop. **1**, 29 (1867).

Uweinat, about 2000 ft., in sandy bed of Wadi, prostrate over sand, No. 13.

Distrib.—Libyan Desert through Eastern Sudan to Somaliland.

GERANIACEAE.

Monsonia nivea *Webb.* Fragm. Fl. Aethiop. 59 (1854) ; Hutch. & Dalz. Fl. West Trop. Afr. **1**, 138.

Wadi Guroguro, about 2300 ft., sand under shady rocks, No. 41.

Distrib.—Mauritania to Egypt.

TAMARICACEAE.

Tamarix mannifera *Ehrenb. ex Bunge*—See *K.B.* 1931, 164.

EUPHORBIACEAE.

Euphorbia granulata *Forssk.* Fl. Aegypt.-Arab. p. cxii (1775) ; N.E. Br. in Dyer, Fl. Trop. Afr. **6**, pt. 1, 502.

Wadi Guroguro, about 2300 ft., prostrate in sand under shady rocks, No. 32.

Widely distributed in tropical Africa, Egypt and Arabia.

ROSACEAE.

Neurada procumbens *Linn.* Sp. Pl. 441 (1753) ; Oliv. Fl. Trop. Afr. **2**, 382 ; Hutch. & Dalz. Fl. West Trop. Afr. **1**, 314.

Approx. Lat. 17° 00′ N., Long. 24° 30′ E., about 2200 ft., in rolling sand country, No. 43.

Distrib.—N. African deserts generally eastward to India.

CAESALPINIACEAE.

Cassia obovata *Collad.* Hist. Cass. 92, t. 15A (1816) ; Oliv. Fl. Trop. Afr. **2**, 277 ; Hutch. & Dalz. Fl. West Trop. Afr. **1**, 335.

Uweinat, about 1000 ft., sandy bed of wadi, 12–18 ins. high, No. 12. Vernacular name : *Sanna.*

Distrib.— Tropical Africa generally, extending to S. Africa and India.

MIMOSACEAE.

Acacia flava *Schweinf.*—See *K.B.* 1931, 164.

Uweinat, above and below 2200 ft., dry watercourse, tree up to 12–15 ft., Nos. 3, 10.

A. tortilis *Hayne*—See *K.B.* 1931, 165.

PAPILIONACEAE.

Alhagi Maurorum *Medic.*—See *K.B.* 1931, 165.

Astragalus Vogelii (*Webb.*) *Bornm.* in Beih. Bot. Centrahl. **33**, 233 (1915) ; Hutch. & Dalz. Fl. West Trop. Afr. **1**, 387.

Uweinat, about 2200 ft., dry watercourse, semi-prostrate, 6–12 ins. No. 4.

Distrib.—Dry regions from the Cape Verde Islands to Arabia.

Crotalaria thebaica *DC.* Prodr. **2**, 128 ; Baker in Oliv. Fl. Trop. Afr. 2 : 11.

20 miles south of Uweinat, about 1750 ft., drainage line on stony plain, low herb 12 ins. Nos. 17 ; 36 (seedling).

Distrib.—Eastern Sudan and Nubia.

Indigofera argentea *Burm. f.* Fl. Ind. 171 (1768). *I. semitrijuga* Forssk.—Baker in Oliv. Fl. Trop. Afr. 2 : 93.

Approx. Lat. 17° 25′ N., Long. 24° 10′ E., about 2300 ft., in rolling sandy country, No. 35.

Distrib.—N.E. Trop. Africa, Socotra, and Egypt to India.

Lotononis platicarpos (" platycarpus ") *B. D. Jacks.* Ind. Kew. **2**, 118 (1895). *Lotus platicarpos* Viv. Pl. Aegypt. Dec. 14 (1830). *Lotononis Leobordea* Benth. (1843) ; Baker in Oliv. Fl. Trop. Afr. **2**, 5 ; Bak. f. Legum. Trop. Afr. 17.

Uweinat, about 2200 ft., in dry watercourse, creeping over sandy surface, No. 5.

Distrib.—Algeria to Persia and Arabia, and in the drier parts of Tropical Africa.

Rhynchosia Memnonia *DC.* Prodr. **2**, 386 ; Baker in Oliv. Fl. Trop. Afr. **2**, 220 ; Hutch. & Dalz. Fl. West Trop. Afr. **1**, 401.

Wadi Guroguro, about 2300 ft., in sand under shady rocks, No. 38.

Distrib.—Tropical Africa generally.

SALICACEAE.

Salix safsaf *Forssk.**—See *K.B.* 1931 : 165.

URTICACEAE.

Forskohlea tenacissima *Linn.* Mant. 72 (1767)

Wadi Guroguro, about 2300 ft., in sand under shady rocks, No. 31.

Distrib.—Northern Africa to Arabia and N.W. India.

SALVADORACEAE.

Salvadora persica *Linn.* Sp. Pl. 122 (1753) ; Baker in Dyer Fl. Trop. Afr. **4**, pt. 1, 23.

Tekro Oasis, about 1400 ft., straggling bush on sand mounds, No. 21. Vernacular names : *Shau, Arak.*

Distrib.—Throughout drier parts of Tropical and North Africa through Arabia to India.

*This name appears to be invalid ; a note will appear on the subject in an early number of the K.B.

COMPOSITAE.

Pulicaria crispa *Benth. et Hook. f.*—See *K.B.* 1931, 165.

P. undulata *DC.* Prodr. **5**, 479 ; Oliv. & Hiern in Oliv. Fl. Trop. Afr. 3 : 365 ; Hutch. & Dalz. Fl. West Trop. Afr. **2**, 156.

Uweinat, about 2200 ft., dry watercourse, No. 6.

Distrib.—From Senegal to Palestine and Arabia.

BORAGINACEAE.

Heliotropium undulatum *Vahl*—See *K.B.* 1931, 165.

Uweinat, about 6000 ft., rocky gorge on mountain top, about 6 ins. high, Nos. 14 ; 39.

Lithospermum callosum *Vahl*, Symb. Bot. **1**, 14 (1790) ; Hutch. & Dalz. Fl. West Trop. Afr. **2**, 201.

Approx. Lat. 17° 00′ N., Long. 24° 30′ E., about 2200 ft., rolling sandy country, No. 44.

Distrib.—From Mauritania through N. Africa to Egypt, Palestine and Arabia.

OROBANCHACEAE.

Cistanche Phelipaea (*Linn.*) *Cout.* Fl. Port. 571 (1913) ; Hutch. & Dalz. Fl. West Trop. Afr. **2**, 231.

70 miles south-west of Bir Natrun, about 1800 ft., parasitic on roots of *Acacia flava* Schweinf., No. 48.

Distrib.—North Africa, S. Europe, eastwards to India.

LABIATAE.

Lavandula coronopifolia *Poir.* Encycl. Suppl. **2**, 308 (1813) ; Baker in Fl. Trop. Afr. **5**, 450 ; Hutch. & Dalz. Fl. West Trop. Afr. **2**, 285.

Uweinat, about 6000 ft., rocky gorge on mountain top, 6 ins. high, No. 15.

Distrib.—From French Sudan to Nubia and Eritrea, and in the Orient generally.

JUNCACEAE.

Juncus maritimus *Lam.* Encycl. **3**, 264 ; Baker in Dyer Fl. Trop. Afr. **8**, 93.

Uweinat, about 2050 ft., on salty ground near rock pool of dry watercourse, 1½–2 ft. high, No. 1.

Distrib.—Maritime and salt pans in desert areas of the north warm temperate zone.

CYPERACEAE.

Cyperus compressus *Linn.* Sp. Pl. 46 (1753) ; Clarke in Dyer Fl. Trop. Afr. 8, 347.

Approx. Lat. 17° 25′ N., Long. 24° 10′ E., about 2300 ft., rolling sand country, No. 33.

Distrib.—Most tropical and subtropical regions.

GRAMINEAE.

Aristida acutiflora *Trin. & Rupr.*—See *K.B.* 1931, 166.

A. plumosa *Linn.* Sp. Pl. ed. II, 1666 (1762).

Uweinat, frequent around foot and out on plain, common elsewhere, the most common grass in the heart of the Libyan Desert, in small drainage lines in sand and often on sand dunes, in small tufts up to 18 ins. high, Nos. 18, 25, 29.

Distrib.—Mediterranean region and in Persia and Arabia.

A. pungens *Desf.*—See *K.B.* 1931, 166.

Cenchrus barbatus *Schum.* Beskr. Guin. Pl. 43 (1827) ; Stapf & Hubbard in Prain, Fl. Trop. Afr. **9**, pt. 6, 1079.

Approx. Lat. 17° 00′ N., Long. 24° 30′ E., about 2200 ft., rolling sand country, No. 42. 42. Vernacular name : *Heskanit.*

Distrib.—Tropical Africa generally and in India.

Danthonia Forskalei *Trin.* Sp. Gram. t. 49 (1828).

Approx. Lat. 17° 25′ N., Long. 24° 10′ E., about 2300 ft., rolling sandy country, No. 34.

Distrib.—Desert regions from Algeria and the French Sudan to Persia and Arabia.

Desmostachya bipinnata (*L.*) *Stapf* in Dyer, Fl. Cap. **7**, 632 (1900).

Uweinat, about 2200 ft., Wadi bed, near rock-wall, 2–3 ft., No. 8. Vernacular name : *Halfa.*

Distrib.—Eastern Sudan, Egypt, Palestine and Syria through India to Indo-China.

Panicum turgidum *Forssk.*—See *K.B.* 1931, 166.

Phragmites communis *Trin.*—See *K.B.* 1931, 166.

var. **Isiacus** *Coss.*

Uweinat, about 2200 ft., Wadi bed, near rock wall, up to 7 ft. high, No. 9. Vernacular name : *Buzzam.*

Sporobolus spicatus (*Vahl*) *Kunth*, Rev. Gram. **1**, 67 (1829).

Tekro Oasis, about 1400 ft., low sand mounds on oasis floor, spiky grass 1–2 ft. high, No. 22.

Distrib.—From Cape Verde Islands through N. Africa to Arabia and in S. India, Tanganyika Territory and Bechuanaland.

XXXVII.—THE GENUS DENTELLA IN AUSTRALIA.

H. K. Airy-Shaw.

It must be stated at the outset that the following account can constitute but the merest sketch of the actual extent and representation in Australia of this curious little genus. Owing to the insignificant and sometimes almost microscopic dimensions of the plants, their lowly habit, their extremely delicate and fugacious corollas and, in the case of the desert species, their often ephemeral duration owing to scarcity of rain, they have undoubtedly been passed over by many collectors.

Two groups of species may be recognised in Australia, distinguished by the character of the covering of the receptacle and capsule. In the first group, which includes the widespread *D. repens* (L.) J. R. et G. Forst., and its allies, the capsule is covered with hollow, blunt, hyaline, apparently unicellular trichomes, or else is completely glabrous. The second group is exclusively Australian: in it the capsular emergences are much finer and if anything denser, acute, not conspicuously hyaline nor hollow, but more rigid and setose; the capsules themselves, when mature, are distinctly smaller than in the former group.

Thanks for the loan of specimens are due to the authorities in charge of the herbaria at Adelaide and Melbourne (though the specimens from the former proved to belong to other genera), and particularly to those at Brisbane, Sydney and Perth, who not only loaned the whole of their material but generously presented duplicates of nearly every specimen to the Kew Herbarium. Specimens of which duplicates were not presented are indicated in the enumeration by (Q.) for the Queensland Herbarium, Botanic Gardens, Brisbane; (W.) for the National Herbarium of New South Wales, Sydney; and (V.) for the National Herbarium, South Yarra (Melbourne), Victoria.

Conspectus.

Series i. *Coelotrichae*, ser. nov. Receptacula et capsulae trichomatibus cavis hyalinis obtusis patentibus obsita, vel glabra.—Typus seriei, *D. repens*.

Folia anguste usque late elliptica vel ovato- vel obovato-elliptica, circiter 2–3 mm. lata; capsulae maturae circiter 2·5 mm. diametro; trichomata plerumque 1·5 mm. longa..... 1. *D. repens*.

Folia angustissime linearia, saepe fere filiformia, plus minus acuminata, 0·3–1 mm. lata, usque 2 cm. longa; capsulae maturae minores; trichomata breviora vel nulla:

Corolla usque 1 cm. longa; ? planta monoeca..... 2. *D. Browniana*.

Corolla usque 2 cm. longa; planta dioeca.....3. *D. dioeca*.

Series ii. *Chaetotrichae*, ser. nov. Receptacula et capsulae pilis tenuibus setosis acutis adscendentibus dense obsita, nunquam glabra.—Typus seriei, *D. pulvinata*.

Folia iuniora supra plana, costa supra haud conspicue canaliculato-impressa:

Folia utrinque pustulata, uti tota planta scaberrima, usque 3 mm. lata.....4. *D. asperata*.

Folia nec pustulata nec scabra, circiter 1 (–1·5) mm. lata:

Folia anguste elliptica, usque 8 mm. longa; planta haud pulvinata.....5. *D. misera*.

Folia subrhomboideo-elliptica, usque 3 mm. longa; plantula plerumque dense congesto-pulvinata.....6. *D. pulvinata*.

Folia iuniora carnosula, pagina superiore costa alte impressa conspicue notata; plantula tenella, minuta..... 7. *D. minutissima*.

Enumeration.

1. **Dentella repens** (*L.*) *J. R. et G. Forst.* Char. Gen. Plant. Ins. Mar. Austr. 25, t. 13 (1776); J. S. Kerner, J. R. u. G. Forster's Beschr. Pfl. Ins. Süd-See, 25, Bl. iii. fig. 13 (1779); G. Forst. Florul. Ins. Austr. Prodr. 17 (1786); G. Forst. Ic. Plant. Itin. Ins. Mar. Austr. Coll. t. 35, ex Herder in Acta Horti Petrop. **9**, 495 (1886); Benth. Fl. Austr. **3**, 406 (1866), *p.p.*; Bailey, Queensl. Fl. **3**, 747 (1900), *p.p.*; Ewart and Davies, Fl. N. Terr. 255 (1917), *p.p.*; Domin in Biblioth. Bot. **22**, Hft. 89, 1169 (1929), *q.v.* for further references.

Oldenlandia repens L. Mant. Prima, 40 (1767), non Burm. fil.

Hedyotis repens Lam. Tabl. Encycl. Méth. Bot. **1**, 271 (1791).

Heymia rigida Dennst. Schlüss. Hort. Ind. Malab. 16, 21, 35 (1818).

Lippaya telephioïdes Endl. Atakta Bot. 13, t. 13 (1833).

Dentella minima Zipp. ex Spanoghe in Linn. **15**, 317 (1841), *nomen*.

D. stolonifera Montrouzier in Mém. Acad. Imp. Lyon, **10**, 218 (1860), e descr. et teste Guillaum. et Beauvis., Spec. Montrouz., in Ann. Soc. Bot. Lyon, 1913, **38**, 95 (1914).

D. Matsudai Hayata, Ic. Plant. Formos. **9**, 53 (1920), e descr.

Northern Territory. Banks of the Victoria River, dry lagoons, Dec. 1855, *von Mueller* (V.). Sturt's Creek, *von Mueller*. Calvert River, in dense matted patches in river bed, Nov. 1921, *L. Brass* 94.

Queensland. Carpentaria, "Island A," 25 Nov. 1802, *R. Brown* 3506. Gulf of Carpentaria, *von Mueller*. Dawson River and other parts of subtropical Australia, *von Mueller*. Strathleven County: bed of River Palmer, 11 Aug. 187-, *W. Hann* 65. Sandy bed of Mitchell and other rivers, 1882, *E. Palmer* 16: "prostrate habit, close to the ground, spreading, with small fleshy green leaves, with long smooth roots." In the sandy bed of the Mitchell (Lower Mitchell), 1882, *E. Palmer* 143 (V.): "prostrate in a thick bunch, has

small fleshy leaves and a green fruit, both covered with fine short hairs" Cardwell County: Rockingham Bay, moist place, salt wate. creek, 5 Jan. 1865, *von Mueller* (V.) : " white flower." Nares County : Trinity Bay, 1886, *W. Sayer* (V.) ; Cairns, *F. M. Bailey* ; Johnstone River, *T. L. Bancroft* 80. Elphinstone County : Townsville, March 1922, *C. T. White* 1618. Davenport County : Charters Towers, *C. F. Plant* 147. Herbert County : bed of Proserpine River, *N. Michael* 719 ; Proserpine, *N. Michael* 828. Clermont County : Clermont, 1 Mar. 1927, *C. T. White* 3424. Livingstone County : Rockhampton, *F. M. Bailey* 2. Clinton County : Port Curtis, *McGillivray* (Voyage of Rattlesnake) B.158. Yarrol County : Eidsvold, Dec. 1911 and Apr. 1912, *T. L. Bancroft*. Bowen County : Mount Perry, *J. Keys* 52 (Q.) and 709. Cook County : Bundaberg, *N. Michael* 1754. March County : Wide Bay, *Bidwill* 55. Stanley County : " prope Brisbane river Australiae or.," 1863-65, *Amalia Dietrich* ; Brisbane River, *F. M. Bailey* ; Ipswich, *T. F. Hall* 281 ; between Northgate and Nudgee, nr. Brisbane, 13 Apr. 1907, *C. T. White* (Q.).

It will be observed from the above enumeration of specimens that *Dentella repens* was among the plants collected in Australia at the beginning of the nineteenth century by Robert Brown. Since, however, the " Prodromus Florae Novae Hollandiae," vol. i. (1810 ; all published), which follows the system of de Jussieu, ends with the family *Goodenoviae* (included in de Jussieu's Classis ix, Ordo iv, *Campanulaceae* : Juss. Gen. Pl. 165 : 1789), the family *Rubiaceae* (Classis x, Ordo ii) finds no mention, and consequently Brown's observations on *Dentella* have never yet seen the light. No apology is therefore offered for publishing here, *in extenso*, that great botanist's careful descriptions of this species and the next, drawn up in each case from fresh specimens on the day following their collection. His acutely critical eye and scrupulous accuracy are clearly discernible in the additions and erasures which occur in the manuscript ; it is unfortunate that, for reasons of typography, it is not practicable to reproduce them here. For permission to consult Robert Brown's manuscripts, and to make the necessary extracts, I am much indebted to the authorities at the British Museum (Natural History), South Kensington.

No. 74 spec. Carpentaria Island a lect. Novr. 25 : 1802
desc. ,, 26 :

Ic. Bauer No. 457
Laciniae corollae semitrifidae
lateribus Stam : epigyna
Tubus infra medium paullo ventricosa

Dentella repens

Calyx monophyllus tubulosus sesquilinearis superus ultra medium 5-fidus laciniae aequales lanceolato-subulatae erectae viridis persistens pilis pellucidis hyalinis crassiusculis obtusiusculis sparsis patentibus.

Corolla monopetala alba infundibuliformis 5-fida marginibus laciniarum inflexis. Tubus intus Faux pilosus.

Stamina 5 basi tubi inserta ad basin separabilia inclusa tubo breviora.

Filamenta alba glabra filiformia.

Antherae oblongae albae biloculares loculis longitudine dehiscentibus.

Ovarium inferum ovatum ramentis pellucidis simplicibus filiformibus numerosis obsitum.

Stylus 1 brevis filiformis.

Stigmata duo papulosa patentia filiformia stylo longiora.

Capsula infera globosa ramentis pellucidis numerosis tecta calyce coronata bilocularis polysperma.

Receptaculum seminum nullum nisi dissepimentum medio utrinque incrassatum.

Semina numerosa angulata.

Flores axillares & in dichotomiis sessiles solitarii.

Folia opposita petiolata lanceolato-oblonga plana integerrima glabra crassiuscula nec membranacea 3 lineas longa 1½ lin : lata marginibus juniorum pilis pellucidis.

Petioli breves mediante utrinque stipula membranacea alba in acumen subulato-setaceum producta juncti.

Herbula annua diffusa ramosa glabra 2–6 pollicaris caule ramisque teretiusculis utrinque [i]-leatis radice annua descendente longa subsimplici fibras paucas breves passim dimittente.

Folia in procerioribus 5 lineas longa 21 lin : lata.

Stipulae subciliatae pilis nonnullis longiusculis.

Folia ovata v. elliptica " nuda " ciliata v. hispida.

Dentella repens occurs by rivers and streams throughout the coastal regions of the Northern Territory and Queensland. In the latter State, south of about 17° lat., it is confined to the coastal strip east of the Dividing Range, the most inland locality from which specimens have been seen being Clermont (Leichardt Div.). It has been recorded for all the other States except Victoria and Tasmania, but it has not been possible to confirm these records. The Western Australian records* certainly refer in part to *D. misera* Airy-Shaw, described below (p. 298). Specimens of true *D. repens*, however, collected by von Mueller at Sturt's Creek and on the Victoria River, Northern Territory, near the Western Australian border, are extant in the National Herbarium of Victoria, Melbourne : this would therefore make the occurrence of the species in the adjacent parts of Western Australia at least probable. Unfortunately, it has not been possible to examine J. Forrest's specimens from the Yule and Sherlock Rivers, enumerated by von Mueller.

With regard to New South Wales,† the Cunningham specimen from the Blue Mountains, referred by Bentham (*l.c.* 407) to *D. repens*,

* F. von Mueller, Pl. N.-W. Austr. 9 (1881) ; W. V. Fitzgerald, " The Botany of the Kimberleys, North-West Australia," in Journ. Proc. Roy. Soc. West. Austr. 3, 210 (1918) ; C. A. Gardner, Enum. Pl. Austr. Occ. 121 (1931).

† Benth. Fl. Austr. 3, 407 (1866) ; Moore and Betche, Handb. Fl. N.S.W. 248 (1893) ; W. A. Dixon, Fl. N.S.W. 173 (1906).

is *Mitrasacme serpyllifolia* R. Br. (*Loganiaceae*). Moore and Betche give the distribution of *D. repens* as "Dividing range to interior, from Blue Mountains to Queensland," but this is almost certainly erroneous. I have seen no specimen of any species of *Dentella* from the State of New South Wales, though considerations of climate and the general type of vegetation would lead one to expect *D. repens* to be found along the coastal belt in the north-east of the State.

The records for South Australia‡ refer, probably exclusively, to *D. pulvinata* Airy-Shaw (*vide* p. 299 *infra*). The occurrence there of true *D. repens* would be unlikely.

This highly plastic species is as polymorphic in Australia as it is in the Indo-Malayan region, which forms its headquarters. It would be useless and indeed almost impossible to give names to its innumerable variations, striking though these sometimes are. The plant with glabrous capsules, recently described§ as *D. serpyllifolia* Wall., though occurring practically throughout the Indo-Malayan range of *D. repens*, has not yet been found in Australia. (See also note at end of this paper.)

2. **Dentella Browniana** *Domin* in Biblioth. Bot. **22,** Hft. 89, 1170 (1929).

D. repens Benth. Fl. Austr. **3,** 406 (1866), *p.p.*; Bailey, Queensl. Fl. **3,** 747 (1900), *p.p.*; non J. R. et G. Forst.

QUEENSLAND. Gulf of Carpentaria, "Island G," 25 Dec. 1802, and "terra firma" (mainland), 4 Jan. 1803, *R. Brown* 3506 (type, Herb. Kew.). Sellheim River, ? *von Mueller* 111 (V.) : "fls. white."

NORTHERN TERRITORY. On the dry banks of the tributaries of the Fitzmaurice River, Oct. 1855, *von Mueller :* "Prostrata, corolla alba."

var. **setulosa** *Airy-Shaw*, var. nov. foliis et rarius caulibus setulis rigidulis breviusculis patentibus obsitis, receptaculis trichomatibus cavis dense vestitis.

NORTHERN TERRITORY. On the dry banks of the tributaries of the Fitzmaurice River, Oct. 1855, *von Mueller :* "Prostrata, corolla alba." (Growing with the typical glabrous form.)

The following is Robert Brown's description of this species:

No. 20 spec. Carpentaria Island g
Decr. 25 :
descr. ,, 26 : 1802
Ic. Bauer No. 458.

Lacin : apice trident : secund. medium lanceolat plana lateribus adscendentibus. Tubus corollae intus barbatus ab apice ⅓ longitudinis ⅓ longitud a basi. Filam basi tubi inserta brevia inclusa filam glabra. Stylus filifor : Stigm 2 filiformia. Discus epigynus umbilicatus.

Dentella [integra—*erased*] [angustifolia—*erased*] linearis.

‡ Benth. Fl. Austr. **3,** 407 (1866) ; J. M. Black, Fl. S. Austr. **535 (1929).**
§ Airy-Shaw in Bull. Misc. Inf. Kew, 1932, 289.

Calyx monophyllus superus vix ad medium quinquefidus glaber viridis ultra unam lineam longus tubulatus tubo 5-gono glabro.

Laciniae aequales erectae lanceolato-subulatae marginibus albis angustissimis pilis paucis strictis albis ciliatae.

Corolla trilinearis monopetala infundibuliformis. Tubus calyce fere duplo longior extus viridis glaber campanulatus intus supra filamen : insertionem pilosus.

Faux pilis albis conniventibus.

Limbus patens albus glaber sesquilinearis 5-partitus.

Laciniae aequales secundum medium lanceolatum utrinque planae lateribus adscendentibus undulatis apice tridentato dentibus acutis intermedio paullo productiore.

Stamina 5 tubo inclusa.

Filamenta brevissima infra medium tubi inserta.

Antherae erectae lineares filamentis plus duplo longiores pallide flavae longiter dehiscentes.

Pistillum :

Ovarium inferum turbinatum intra calycem disco parvo crasso annulari viridi glabro terminatum biloculare loculis polyspermis.

Stylus erectus albus glaber filiformis staminibus parum longior.

Stigmata duo filiformia hispida virescenti-albida aequalia semi-exserta.

Flores axillares subsessiles solitarii rudimento parvo ramuli extus stipati.

Folia compressiuscule teretia mucrone brevi viridia glabra sessilia patentia tres lineas longa.

Stipulae ad singulum oppositionem duae interpetiolares membranaceae ovato-triangulares acumine setaceo unico vel pluribus.

Herbula ramosa diffusa digitalis glabra repens rami floriferi erecti. Caules ramique 4 goni lateribus in folia continuis convexiusculis alternis concavis.

Capsula infera calyce coronata pilis albis strictis pellucidis acutis numerosis hispida bilocularis bivalvis loculis polyspermis.

Receptaculum seminum commune medio septo utrinque adnatum longitudine capsulae convexum.

Semina nigra amorpha et varie angulata parva.

Integumentum simplex membranaceo-crustaceum separabile in regione radiculae adhaerens.

Albumen album carnosum.

Embryo albus longitudine fere albuminis rectus dicotyledoneus teretiusculus.

Cotyledones ovatae foliaceae.

Radicula teres cotyledonibus paullo longior

Obs : In Carpentariae terra firma Jan : 4 1803 planta rursus lecta cujus fructus supra descriptus est, hoc in loco omnibus partibus major. Caulis palmaris usque spithamaeus & pedalis.

Folia linearia acuta crassiuscula 5 lin : longa 2/3 lineae lata glaberrima viridia internodiis longiora.

Stipulae membranaceae albae interpetiolares nectentes apice ciliis tribus pluribusve instructae.

Calyx sesquilinearis.

Corolla 5 linearis.

Folia subulata glabra.

Domin does not mention the fact that this species possesses a woody perennial rootstock, corky on the outside, up to 3 or 4 mm. in diameter, from which the annual prostrate stems arise in tufts. Bentham and Bailey (*locis cit.*) assign this character to *D. repens* through failing to distinguish the two species. The receptacle in Robert Brown's specimens is covered with short hollow trichomes,

but in von Mueller's glabrous specimens from the Fitzmaurice River this appears in the young state to be quite glabrous. In the setulose specimens mixed with the latter the receptacle is densely covered with trichomes. The Sellheim River specimen (field label in an unknown handwriting; herbarium label written up "Dentella repens Forst. *var.*" in that of von Mueller) is more or less intermediate between the species and the variety, the young foliage being glabrous and the older more or less hispid, the young receptacles either glabrous or hispid (with rather more slender trichomes than usual), and the only observed mature capsule glabrous.

3. **Dentella dioeca** *Airy-Shaw*, sp. nov. *D. Brownianae* Domin affinis, a qua floribus dioecis, receptaculo vesiculis vel trichomatibus brevibus cavis albis (more fere *D. repentis* Forst.) dense obsito, corolla in genere maxima usque 2 cm. longa discedit.

E speciminibus exsiccatis a *D. Browniana* vix nisi notis supra latis differre videtur. Radice perennante, caulibus gracilibus prostratis, foliis angustissime lineari-filiformibus, calycis dentibus apice setosis cum *D. Browniana* ad amussim congruit. Characteres tamen in diagnosi supra indicati ad speciem novam distinguendam satis valere videntur.

Receptaculum sub anthesi minimum, vesiculis obtusis albis conspicue obsitum. *Calyx* oblongo-campanulatus, circiter 3 mm. longus, basi supra receptaculo valde constrictus, 5-angulatus, dentibus subulatis circiter 1 mm. longis apice setis paucis longiusculis albis praeditis. *Corolla* late infundibuliformis, usque 2 cm. longa, ore (limbo expanso) usque 1 cm. diametro, segmentis ut videtur induplicato-valvatis plus minus obovatis margine erosulis apice rotundatis emarginato-cuspidatis, tenerrima, intus hirsuta, "pallide grisea." *Stamina* floris masculi medio vel sub medio tubo affixa, filamentis subnullis, antheris angustissime linearibus circiter 1·5 mm. longis. *Styli* (inclusis ramis stigmaticis crassiusculis sub lente fere plumoso-papillosis 1·5 mm. longis) floris feminei 6 mm. longi. *Capsulae* maturae non visae, maturescentes (?) usque 2 mm. diametro.

NORTHERN TERRITORY. Darwin, near Ten-mile Lagoon, in dry mud, 20 Dec. 1926, *Lady Rockley* 9: "A delicate pale grey flower growing in trails along the ground with very fine smooth leaves and many flowers at intervals along the fine stem. The only thing near it was the *Drosera*" [*D. petiolaris* R. Br.]. Ibid., *Lady Rockley* 8*a* (found mixed with specimens of the *Drosera*, no. 8). Ibid., 14 Feb. 1932, *Mrs. Norman Campbell* (type, Herb. Kew.): "Very little of it this year owing to the shortage of rain. It is overgrown with weeds and grass." Spring Vale, Port Darwin, *Alfred Giles* (probably this species).

In general habit this species agrees so closely with *D. Browniana* Domin that it would scarcely be possible to separate them on vegetative characters alone. Owing, however, to the very great

disparity in the size of the corollas, it seems best to regard them as distinct. Further collections may show that the small size of the corollas in Robert Brown's Carpentaria specimens is due to shrivelling or bad drying, but this seems unlikely since the specimens are in other respects well preserved.

The extremely delicate and fugacious nature of the corolla throughout the genus *Dentella* renders examination of its parts very difficult. In the specimens collected by Lady Rockley and by Mrs. Campbell, however, the corollas have been dried with considerable care, and it is therefore possible to obtain a better idea of their structure than is usually the case. They are by far the largest yet known in the genus. In Lady Rockley's specimen no. 9, five linear anthers are clearly visible near the middle of the corolla-tube, but there is no sign of a style, while in Mrs. Campbell's specimen the flowers possess a robust style with two almost plumosely papillose stigmatic branches, but apparently no vestige of stamens. The fragments found mixed (in Herb. Kew.) with Lady Rockley's specimens of *Drosera petiolaris* R. Br., which she had noted (*in litt.*) as being the only plant associated with the *Dentella*, agree in floral structure with Mrs. Campbell's gathering. Dioecism or at any rate polygamo-dioecism is, of course, well known in many genera of *Rubiaceae*, but has not yet, so far as the writer is aware, been recorded in the *Hedyotideae*. When the opportunity occurs of examining well-preserved (or, better still, living) corollas of other Australian species of *Dentella*, it may be found that the present species is not alone in having functionally unisexual flowers.

4. **Dentella asperata** *Airy-Shaw*, sp. nov. scabritie omnium partium (corolla excepta) insigni, foliis latis hispidis utrinque tuberculatis vel verruculosis facile distincta.

Herba prostrata, radice ignota. *Caules* pro genere robusti, usque 2 mm. diametro, 25 cm. longi et ultra, straminei, haud multum ramosi, partibus iunioribus valde hispidis vetustioribus parcius. *Folia* late elliptica vel subrhomboidea usque obovata, 5–6 mm. longa, 2–3 mm. lata, brevissime petiolata, apice subacuta, utraque pagina marginibusque scaberrima, pustulata vel minute tuberculata, patentia, vetustiora reflexa, siccitate fuscescentia; petioli brevissimi; stipulae conspicuae, albidae, membranaceae, late triangulares vel rotundatae, longe rigide ciliatae vel sublaciniatae, vix 1 mm. longae, 1–2 mm. latae. *Flores* ex omni nodo plerumque orti, breviter oblique pedicellati, pedicellis hispidis. *Receptaculum* hemisphaericum usque subglobosum, circiter 1 mm. diametro, dense tenuiter setoso-hispidum. *Calyx* (praecipue annulo basali ubi receptaculo adnatus) (siccitate plerumque pallidus, valdeac sed minus dense receptaculum) setoso-hispidus, alte (usque ad duas vel tres partes) fissus, segmentis subulato-acuminatis acutis, totus 2–3·5 mm. longus. *Corollae* (saltem maturae) in speciminibus infra citatis fere omnes supra medio tubo praefractae vel quasi praemorsae, sed e corolla unica,

cuius limbi segmenta duo supersunt, tubus 4 mm. segmenta 2 mm. longa videntur, haec 0·75 mm. lata, oblonga, acuta, alabastro apice extra setosa. *Antherae* subsessiles, circiter medio tubo (ubi intus pubescens) affixae, lineares, 1–1·5 mm. longae. *Stylus* filiformis, circiter 5·5 mm. longus (vel ultra ?) inclusis partibus superioribus liberis 1 mm. longis ; stigmata non visa. *Fructus* circiter 1·8 mm. diametro, ceterum ut receptaculum. *Semina* numerosa, nigra.

WESTERN AUSTRALIA (Kimberley Div.) or NORTHERN TERRITORY. Sturt's Creek, March 1856, *von Mueller*.

This is the most robust species of the group. The scabridity of the leaves recalls that of many *Boraginaceae*. Unfortunately, the basal parts were not collected and the species is at present known only from this single gathering.

5. **Dentella misera** *Airy-Shaw*, sp. nov. foliis anguste ellipticis usque 8 mm. longis et 1·8 mm. latis a ceteris *Chaetotrichis* distinguenda.

? *D. repens* F. von Muell. Pl. N.-W. Austral. 9 (1881) ; W. V. Fitzgerald in Journ. Proc. Roy. Soc. West. Austral. **3**, 210 (1918), *saltem pro parte*, non J. R. et G. Forst.

Herba perennis, prostrata, caudice lignescente plus minus decorticato usque 2 mm. diametro. *Caules* breves, densiuscule foliati, iuniores puberuli. *Folia* anguste elliptica vel ovato- vel lanceolato-elliptica, 3–8 mm. longa, 0·5–1·8 mm. lata, acuta, subtus marginibus et costa praecipue setuloso-puberula, supra glabra, raro minute setuloso-puberula, iuniora apicem versus longe ciliata. *Stipulae* membranaceae, late subdeltoideae, rotundatae, longe setoso-ciliatae. *Calyx* generis, dentibus longe setoso-ciliatis. *Corolla* manca tantum visa, tubo intus puberulo, 20-nervio (5 praecipuis cum 15 secundariis interiectis) ; nec staminibus nec stylis visis. *Capsula* subglobosa, 1·5–2·0 mm. diametro, pilis albidis tenuibus subsetosis patulo-adscendentibus dense obsita, costis decurrentibus calycis interdum ut videtur glabrescentibus. *Semina* numerosa, subcuneiformia, angulata, atra, testa sub lente punctulata.

WESTERN AUSTRALIA. Kimberley Div.: Meda, Apr. 1905, *W. V. Fitzgerald* 355 (type) : " Prostrate, and forming patches several inches across on wet, black soil, or spreading over rocks." May River, Fitzroy County, Apr. 1905, *W. V. Fitzgerald*. Fitzroy River, Sept. 1906, *W. V. Fitzgerald*.

var. **strigosa** *Airy-Shaw*, var. nov. omnibus partibus maxime foliis dense canescenti-strigosis, stipulis crebre ac longissime ciliatis.

NORTHERN TERRITORY. MacArthur River, Sept.–Oct. 1886, Lieut. Dittrich (V.).

The " type " and the variety are separated somewhat widely, geographically, but they probably represent forms of the same species.

6. **Dentella pulvinata** *Airy-Shaw*, sp. nov. inter *D. miseram* Airy-Shaw et *D. minutissimam* White et Francis fere intermedia, a priore foliis minoribus, a posteriore foliis plerumque maioribus apice acutis supra nunquam canaliculatis, ab utraque habitu dense congesto-pulvinato discedit.

D. repens J. M. Black, Fl. South Austral. 535 (1929), non J. R. et G. Forst.

Herba perennis, pulvinas parvas densas formans, caudice prostrato longe repente. *Folia* subrhomboideo-elliptica usque oblongo-elliptica, in petiolum brevem angustata, 1–3 mm. longa margine levissime incrassata, glabra vel setulis minimis hic illic sparsis. *Stipulae* in pulvina omnino celatae, ut videtur hyalinae, late subdeltoideae, laciniato-setosae usque subintegrae. *Flores* subsessiles. *Receptaculum* 0·5 mm. diametro, adscendenti-setulosum. *Calyx* campanulatus, 1·5 mm. longus, setulosus, lobis lineari-subulatis apice subobtusis subincurvis. *Corolla* (marcescens) circiter 6 mm. longa, lobis 2 mm. longis recurvis, tubo intus villoso. *Stamina* circiter medio tubo affixa, antheris subsessilibus linearibus vix 1 mm. longis. *Stylus* circiter 4 mm. longus, ramis stigmaticis longe papillosis vix 1 mm. longis. *Capsula* 1·0–1·5 mm. diametro, hispido, calyce saepe pallido.

SOUTH AUSTRALIA. Region of Lake Torrens, 1859, *McDouall Stuart* 201. Vicinity of Lake Eyre, *Andrews* 236. Ibid., *Lewis* (V.). Cooper's Creek, on the banks 20 ft. above water, ? *von Mueller* (V.). Between Stokes Range (Queensland) and Cooper's Creek, *Dr. Wheeler* (V.) (type).

QUEENSLAND. Barcoo, *Howitt* (V.).

var. **repanda** *Airy-Shaw*, var. nov. habitu laxiore haud congesto-pulvinato, foliis paullo maioribus minute setulosis distincta.

CENTRAL AUSTRALIA. Sine loc. exact., 1883, *Winnecke* (V.)

7. **Dentella minutissima** *White et Francis* in Proc. Roy. Soc. Queensl. 1921, **33**, 156 (1922).

QUEENSLAND. Gregory North : Elderslie, near Winton, 19 Jan. 1897, *F. L. Berney* (type). " Dawson River and other parts of subtropical Australia," *von Mueller* (mixed with specimens of *D. repens* in Herb. Kew.).

NORTHERN TERRITORY. Banks of the Victoria River, dry lagoons, Dec. 1855, *von Mueller* (V.; mixed with specimens of *D. repens*).

WESTERN AUSTRALIA. Fitzroy : May River, Apr. 1905, *W. V. Fitzgerald* (mixed with specimens of *D. misera* in Herb. Kew., ex Nat. Herb. N.S.W., Sydney).

Apart from the type gathering, this inconspicuous little plant seems to be represented by " accidental " collections only, such as the three enumerated above. These are of interest as showing

something of its range, both geographical and morphological. The following details are given to supplement the original description.

Caules interdum laxe repentes, internodiis usque 1 cm. longis. *Folia maiora* spatulata, usque 6 mm. longa, lamina suborbiculari usque oblongo-elliptica apice obtusa petiolum gracilem subaequante. *Folia minora* ad nodos congesta, costa supra alte canaliculato-impressa. *Stipulae* minimae, vix etiam sub lente visibiles. Tota planta interdum pilis longiusculis sparsis tecta. *Calyx* pro tantilla plantula latiusculus, campanulatus, albidus. *Corolla* fauce villosa.

The longitudinal channel formed by the impressed midrib, on the upper surface of the younger, somewhat fleshy leaves, is an easily recognised characteristic when seen under a lens.

A note may here be added in connection with the non-Australian species, *D. serpyllifolia* Wall., described in *K. B.* 1932, 289. Shortly after the publication of the description of this plant, the writer received from the herbarium at Buitenzorg, Java, a selection of specimens kindly loaned by Dr. C. G. G. J. van Steenis, some of which Dr. D. F. van Slooten had suggested showed intermediates between *D. serpyllifolia* and *D. repens*. It may, perhaps, not be out of place here to record the substance of the report sent to Buitenzorg as a result of careful examination of these specimens. All were Javanese, with the exception of one from the Philippines: this, being a new record, may be mentioned here.

LUZON. Prov. of Rizal: Morong, Aug. 1906, *Maximo Ramos* (Bur. Sci. no.) 1398.

The substance of the report was as follows:—

The question as to whether these two should be regarded as one species or as two seems to be a matter of convenience and of opinion. They admittedly differ in (apparently) one character only, but that one character is clear-cut: no specimen has been seen which has given rise to any doubt as to the group to which it belongs. Furthermore, no mixed gathering has yet been seen, unless one of the Javanese specimens (*C. A. Backer* 17702*a*, "gemengd met *D. repens*") represents part of one. Observations on this point, *i.e.*, to what extent the two forms grow together, and how far, under such circumstances, there is any correlation with variation in vegetative characters (habit, leaf-shape, etc.), would be of interest. In the absence of experiments on the genetic constitution of these plants, by selfing, etc., no finality would appear to be attainable. For the present it may be convenient to refer to the two forms by binary names, without necessarily any implicit or explicit commitment as to specific, subspecific or other rank, except that the term "variety"—implying, as it does, fluctuation or instability—is not logically applicable in the case of a pair of clear-cut, non-intergrading characters. [Parallel instances can be adduced, e.g., *Galium spurium* L. and *G Vaillantii* DC., *Asperula taurina* L. and *A. leucanthera*

G. Beck, *Meconopsis betonicifolia* Franch. and *M. Baileyi* Prain, though in the last two cases the members of each pair are geographically separated. In the *Galium* and *Meconopsis* the ovary and capsule are *either* glabrous *or* hispid, as in *Dentella*; in the *Asperula* the anthers are *either* violet *or* white.] In dried specimens of *Dentella repens*, individual capsules may be found with apparently few setae: this is almost certainly due to age or to excessive pressure, since there are almost always other capsules on the same plant showing the typical densely setose covering. No specimen has hitherto been observed in which every ovary and capsule has consistently only an occasional seta here and there.

XXXVIII—TROPICAL AFRICAN PLANTS: XII.*

Albizzia sericocephala *Benth.* in Hook., Lond. Journ. Bot. **3**, 91 (1844) [Mimosaceae]; Fourn. in Ann. Sc. Nat. ser. 4, **14**, 371 (1860); Schweinf., Reliq. Kotsch. 6, tt. **5**, 6 (1868). *Acacia sericocephala* Fenzl. in Flora **27**, 312 (1844), nomen nudum. *Inga sericocephala* A. Rich., Tent. Fl. Abyss. **1**, 236 (1847). *Albizzia amara* Oliv. in Oliv., Fl. Trop. Afr. **2**, 356 (1871), non Boiv.; Benth. in Trans. Linn. Soc. **30**, 567 (1875), pro parte africana; Fiori in Agric. Colon. Ital. **5**, 81, fig. 61 (1911). *Albizzia affinis* Fourn. in Ann. Sc.Nat., ser. 4, **14**, 371 (1860).

This well-known African species has for some time been confused by botanists with *Albizzia amara* Boiv., an Indian tree, which differs principally in having fewer and larger leaflets, and in being less pubescent. It was originally considered by Bentham as being distinct from *A. amara*, and was accordingly described as *A. sericocephala*, but later, in his monograph of the *Mimosaceae*, he reduced it to the Indian species, following Oliver, who had called it *A. amara* in The Flora of Tropical Africa a few years earlier. Subsequent authors have followed Bentham in uniting the two species. There are specimens at Kew from the Anglo-Egyptian Sudan, Abyssinia, Uganda and Kenya Colony.—E.M-R.

Vigna juncea *Milne-Redhead*, sp. nov. [Papilionaceae]; ab omnibus speciebus africanis caulibus annuis floriferis gracilibus erectis nudis, racemis terminalibus elongatis multifloris valde distincta.

Herba perennis, glabra, praecox, caudice subterraneo horizontali repente. *Caules* foliosi non visi. *Caules* floriferi annui e basi caulium maturorum (saepissime ustorum) orti, aphylli, erecti, graciles, basi et superne simplices [illegible] toto usque 50 cm. longi, infra racemum gemmis in[illegible] *Racemi* [illegible]e 20 cm. longi, floribus in fasciculos 2–3-floros [illegible] dispositis internod[illegible]s usque 3 cm. longis; pedicelli usque 3 cm. longi, apice bibracteolat[illegible] bracteolae ellipticae, acutae, vix 2 mm. longae, caducae. *Calyx* p[illegible]s minusve

* Continued from *K.B.* 1938, 579.

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infundibuliformis, usque 3·5 mm. longus, dentibus triangularibus subacutis minute ciliatis. *Vexillum* transverse ellipticum, breviter emarginatum, basi unguiculatum et auriculatum, usque 9·5 mm. altum et 11 mm. latum, latere altero majore. *Alae* oblongae, curvatae, basi angustissime unguiculatae, ungue circiter 2 mm. longa, et angustissime calcaratae, calcari circiter 1·5 mm. longo, toto usque 11 mm. longae et 4 mm. latae, subaequales. *Petala carinae* lunata, apice valde incurva et leviter lateraliter contorta, basi in unguem 2·5 mm. longam attenuata, inaequalia, circiter 1 cm. longa et 4 mm. lata. *Stamina* circiter 12 mm. longa, vexillare brevius, circiter 9 mm. longum ; filamenta superne expansa ; antherae vix 1 mm. longae. *Ovarium* lineare, circiter 5 mm. longum, circiter 12-ovulatum ; stylus linearis, 10 mm. longus, apicem versus valde barbatus, leviter curvatus ; stigma leviter obliquum, valde pilosum. *Legumen* non visum.

NORTHERN RHODESIA. Mwinilunga District : on burnt ground in *Brachystegia* woodland about 16 Km. east of Mwinilunga, 9 Sept. 1930, *Milne-Redhead* 1072 ; slender erect leafless shoots up to 30 cm. high. On burnt ground in open *Brachystegia* woodland about 35 Km. east of Mwinilunga, 10 Sept. 1930, *Milne-Redhead* 1079 (type) ; perennial with long tapering horizontal root ; stems 3–5 dm. high ; leaves not seen ; flowers dull mauve with a slightly twisted keel.

TANGANYIKA TERRITORY. Mbeya District : common after burns in *Brachystegia-Uapaca-Parinari* woodland at Mbozi, 1500 m., 28 Aug. 1933, *Greenway* 3617 ; a yellow-flowered perennial herb up to 3 dm. high, flowering when quite leafless ; seeds eaten by natives. Chinyika name :—*Chimambala*.

var. **major** *Milne-Redhead*, var. nov. a varietate typica omnibus partibus florum majoribus, carina apice minus recurvata differt.

Calyx usque 5 mm. longus. *Vexillum* usque 16 mm. altum et latum. *Alae* circiter 18 mm. longae et 6 mm. latae ; unguis circiter 3 mm. longus et calcar 2 mm. longum. *Petala carinae* 16 mm. longa et 8 mm. lata. *Stamina* circiter 17 mm. longa. *Ovarium* circiter 10 mm. longum ; stylus circiter 15 mm. longus. *Legumen* non visum.

NORTHERN RHODESIA. Mwinilunga District : on burnt ground in *Brachystegia* woodland about 64 Km. south of Mwinilunga and 16 Km. west of R. Lunga, 12 Aug. 1930, *Milne-Redhead* 889 ; perennial with running rootstock, flowering without leaves ; flowering stems 30–45 cm. high ; standard mauve, rest of the flower yellowish white ; old partly burnt leafy shoots 60 cm. long or more.

V. juncea is a most distinct and easily recognized species. But it is difficult to find a satisfactory affinity for it on account of its leaves and stipules not being known, for the classification of the genus *Vigna* in E. G. Baker's Leguminosae of Tropical Africa depends largely on foliage characters. It is however most likely to belong to the section *Liebrechtsia* (De Wild), as, in some respects, it appears related to *V. nuda* N.E.Br., although superficially it looks very

different from that species. Its flowers are very much smaller than those of *V. nuda*, but they are somewhat similarly asymmetrical on account of the keels being twisted out of the vertical plane and the standards being slightly unequal-sided. It differs from all other described African *Vignae* by its erect slender leafless stems terminated by long racemes of rather small flowers arranged 2–3 together at the nodes, which number anything from five to twelve. It is named *V. juncea* on account of its habit when in flower. The colour of the flowers appears to be variable, as the specimens from Tanganyika Territory, it will be noted, are said to have yellow flowers, whilst those of the type were dull mauve and the flowers of var. *major* are mauve and yellowish white. The flowers of var. *major* are exactly similar to those of the typical plant except that they are larger in all their parts, and the keel is slightly less inflexed at its apex. In other respects the plants are indistinguishable as far as is known.

Asclepias tanganyikensis *E. A. Bruce*, sp. nov. [Asclepiadaceae] ; affinis *A. longissimae* N. E. Br. sed floribus minoribus, calyce pubescente, coronae lobis cornutis nec papillosis differt.

Herba perennis, caulibus solitariis simplicibus vel basi ramosis teretibus striatulis pilorum linea una puberulis aliter glabris. *Folia* sessilia vel breviter petiolata, elongato-linearia, 14–17 cm. longa, 2–4 mm. lata, apice sensim acuminata, basi cuneata, margine recurvata, utrinque glabra. *Inflorescentia* 1–3-umbellata, longe pedunculata, umbellis 3–9-floris, bracteis linearibus deciduis, pedicellis 2–3 mm. longis pubescentibus. *Sepala* 3 mm. longa, circiter 1 mm. lata, lanceolata, acuta, intra glabra, extus pubescentia, margine ciliata. *Corolla* prope basin lobata, plerumque reflexa, extus minute pubescens, purpurea, intra pallido-viridis, lobis circiter 1·1 cm. longis 9 mm. latis late ovatis. *Coronae* lobi 1 mm. supra basin gynostegii exsurgati et ultra eum extendati, lateraliter compressi, 3 mm. longi, 2·5 mm. lati, subrectangulares, margine incrassato bicornuto. *Gynostegium* circiter 3 mm. longum.

TANGANYIKA TERRITORY. Iringa District : Mt. Lukota, 5600–6600 ft., *Rear-Admiral Lynes* I. h. 90 (type) ; Signal Hill, 5400–5800 ft., in poor soil under *Brachystegia*, flowers with greenish-purple petals and pale green corona, *St. Clair Thompson* 468.

Caralluma Rogersii *E. A. Bruce et R. A. Dyer*, comb. nov. [Asclepiadaceae]. *Stapelia Rogersii* L. Bolus in Ann. Bolus Herb. 1, 194 (1915). An examination of authenicated material of this species shows that the inner and outer corona-lobes are united at the base. This together with the narrow corolla-lobes and general habit of the plant justifies its transference from *Stapelia* Linn. to *Caralluma* R. Br.

In the type description the very characteristic inner corona-lobes (" squamae ") are described as " . . . erectae, fere ad basin 2-partitae,

segmento dorsali filiformi integro 0·5 cm. longo, *segmento interiore ad antheram 3-partito*, partibus simillimis filiformibus attenuatis, apice tortis intertextisque, 0·8 cm. longis . . ." In a specimen collected by Eyles (no. 7630) at Palm Forest, Lower Sabi, Southern Rhodesia, in January 1934, the interior segment of the inner corona lobe is either 2 or 3 partite.

Gymnolaena tuberosa *E. A. Bruce*, sp. nov. [Asclepiadaceae]; affinis *G. Newii* Benth. sed pedunculis brevioribus, floribus pubescentibus, foliis basi nec cordatis differt.

Frutex usque ad 2 m. altus, ramis lenticellatis costatis pubescentibus demum glabrescentibus. *Folia* breviter petiolata, lineari-lanceolata vel oblongo-lanceolata, 6–11 cm. longa, 0·7–2·5 cm. lata, apice sensim acuminata, basi late cuneata vel rotundata, supra glabrescentia, infra leviter costa media valde pubescentia. *Inflorescentiae* axillares, congestae, breviter pedunculatae, pedunculo lignoso circiter 5 mm. longo pubescente, 3–10 cymulis confertis basi cicatricibus bractearum delapsarum notatis; pedicelli circiter 3 mm. longi, pubescentes. *Calyx* 5-lobatus, pubescens, lobis ovatis circiter 1 mm. longis basi multo glandulosis. *Corolla* brunnea, dense pubescens, 2–3 mm. longa, lobis ovato-lanceolatis acutis. *Corona* et *stamina* generis typica. *Folliculi* 4 cm. longi, lanceolati, acuti, breviter pubescentes. *Semina* anguste oblonga, brunnea, compressa, circiter 8 mm. longa, 2 mm. lata, coma coronata.

TANGANYIKA TERRITORY. Coast of Speke Gulf, Lake Victoria, near Mwanza, 3730 ft., in cracks of the granite rocks near the lake-shore, among Aloes etc., a slender-stemmed shrub with tuberous roots, *Burtt* 2475 (type).

Disperma nudanthera (*C. B. Cl.*) *Milne-Redhead*, comb. nov. [Acanthaceae]. *Dyschoriste nudanthera* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 74 (1899).

C. B. Clarke (l. c.) comments on the muticous anthercells of this species, an unusual character in *Dyschoriste*. A careful examination of the plant shows that it is a *Disperma*, for the unripe capsules are flattened and two-seeded, and the calyx when old has the three posticous segments nearly free and the two anticous segments remaining fused for half their length. Moreover the muticous anthers agree very well with those of certain species of *Disperma*. The affinity of *D. nudanthera* is with *D. parviflorum* (Lindau) C. B. Cl. and *D. crenatum* (Lindau) Milne-Redhead, from both of which it differs in having one stigmatic arm supressed.

Dyschoriste procumbens *E. A. Bruce*, nom. nov. [Acanthaceae]. *D. decumbens* Bruce in Kew Bull. 1932, 99, non O. Kuntze.

Monechma ciliatum (*Jacq.*) *Milne-Redhead*, comb. nov. [Acanthaceae]. *Justicia ciliata* Jacq, Hort. Vind. **2**, 47, t. 104 (1772), non

Pers. (1805). *J. ciliaris* L. f. Suppl. 84 (1781), synonymis Burmanni et Hermanni exclusis; Ait. Hort. Kew. **1**, 27 (1789); Vahl, Symb. **2**, 15 (1791); Willd., Sp. Pl. **1**, 90 (1798). *Monechma hispidum* Hochst. in Flora **24**, 375 (1841); C.B. Cl. in Dyer, Fl. Trop. Afr. **5**, 213 (1900); Broun & Massey, Fl. Sudan 347 (1929); Hutch. & Dalz., Fl. W. Trop. Afr. **2**, 266 (1931). *Pognospermum ciliare* Hochst. in Flora **27**, Beil. 6 (1844). *P. hispidum* Hochst. in Flora **27**, Beil. 6 (1844). *Schwabea ciliaris* Nees in DC. Prod. **11**, 384 (1847); Benth. in Hook. Niger Fl. 482 (1849); A. Rich., Tent. Fl. Abyss. **2**, 154 (1851); T. Anders. in Journ. Linn. Soc. **7**, 45 (1864); Solms-Laub. in Schweinf., Beitr. Fl. Aethiop. 113 (1867); Oliv. in Trans. Linn. Soc. **29**, 130 (1875); Lindau in Engl. Jahrb. **18**, 64, t. 2, fig. 98 (1894), and in Engl. & Prantl, Pflanzenfam. **4**, 3B, 346 (1895), and in Engl. Pfl. Ost.-Afr. C. 372 (1895); A. Chev., Etudes Fl. Afr. Centr. Franç. **1**, 237 (1913). *S. spicigera* Nees in DC. Prod. **11**, 384 (1847); T. Anders. in Journ. Linn. Soc. **7**, 45 (1863). *Justicia Buetneri* Lindau in Engl. Jahrb. **20**, 68 (1894), and in Engl. & Prantl, Pflanzenfam. **4**, 3B, 349 (1895).

It will be noticed that *Justicia ciliata* Jacq. was published nine years earlier than *J. ciliaris* Linn. f., and *ciliata* was accordingly the earliest epithet to be applied to this plant. The name *Monechma ciliatum* Hochst. ex Nees (DC. Prod. **11**, 411 : 1847) appears in synonymy only, and consequently it has no standing. It referred to the plant now known as *Ecbolium Anisacanthus* (Schweinf.) C.B. Cl.

Barleria splendens *E. A. Bruce*, sp. nov. [Acanthaceae]; affinis *B. taitensi* S. Moore sed spicis longioribus, bracteis obtusis vel subacutis nec apiculatis differt.

Suffruticosa parva, 0·3–1·2 m. alta; rami, praesertim juniores, dense stellato-pubescentes et pilis flavo-brunneis longis appressis adscendentibus obtecti. *Folia* griseo-viridia, petiolata, petiolo 5–15 mm. longo; lamina lanceolata, ovato-lanceolata vel ovata, 4–9 cm. longa, 1·5–4·5 cm. lata, basi anguste cuneata, apice obtusa, supra pilis simplicibus et stellatis leviter obtecta, infra pallidior, dense albo-stellata, pilis simplicibus paucis, nervis utrinque 4–6 supra impressis infra prominentibus. *Inflorescentia* terminalis, dense spicata, usque 12 cm. longa. *Bracteae* ovatae vel late ovatae, usque 2 cm. longae, 1·5 mm. latae, basi cuneatae, apice obtusae vel subacutae, utrinque stellato-pubescentes et pilis simplicibus paucis obtectae; bracteolae 2, lineari-lanceolatae, circiter 2 cm. longae, 2·5 mm. latae, hirsutae, glanduloso-ciliatae. *Sepala* posteriora 1, ovato-lanceolata, 2–2·5 cm. longa, circiter 1 cm. lata, lateralia 2, linearia, circiter 1·5 cm. longa, 1·5 mm. lata, anteriora bidentata aliter posteriore subsimiles, omnia stellato-pubescentia pilis glandulosis et simplicibus obtecta marginibus praesertim. *Corolla* glabra, coerulea, tubo subcylindrico circiter 2 cm. longo 4 mm. lato, lobis subaqualibus oblongo-obovatis circiter 2 cm. longis 8 mm.

latis apice rotundatis. *Stamina* paulo supra basin tubum inserta, filamentis ±3 cm. longis latis compressis pilis reflexis obtectis, antheris anguste oblongis 4 mm. longis. *Ovarium* ovoideum, apice pilosum, stylo tenui glabro 3·3 cm. longo. *Capsula* circiter 2 cm. longa, 8 mm. lata, breviter rostrata, glabrescens, in parte superiore tamen paucis pilis persistentibus. *Semina* orbiculata, compressa, 6 mm. diametro, dense pilosa.

TANGANYIKA TERRITORY. Shinyanga District: Tindi Hills, 4000 ft. approximately, on the summit of granite hills covered with *Grewia-Acacia pennata* thicket, in the shade of *Commiphora kyimbilensis*, *Burtt* 2409 (type); Mantini Hills, 4000 ft., *Burtt* 2457. Manyoni District: Kilimatindi Escarpment, 3800 ft., on rocky screes, *Burtt* 3577.

Clerodendron grandicalyx *E. A. Bruce*, sp. nov. [Verbenaceae]; affini *C. cordifolio* A. Rich. sed calyce majore corollae tubo aequilongo distinguendum.

Suffrutex subscandens, ramis teretibus brunneo-pubescentibus pilis patentibus. *Folia* opposita, breviter petiolata, petiolo 5–10 mm. longo pubescente; lamina cordato-ovata, integra vel leviter undulata, usque 10 cm. longa, 7 cm. lata, basi cordata, apice abrupte acuminata, supra leviter infra nervis et costa media valde brunneo-pubescens; nervi laterales utrinsecus 5, ascendentes. *Inflorescentia* terminalis, laxe paniculata, pubescens, pedicellis gracilibus usque 1·5 cm. longis. *Bracteae* lineares, usque 1 cm. longae. *Calyx* flavo-albus, pubescens, campanulatus ad mediam partem 5-lobatus, circiter 2 cm. longus, tubo supra basin leviter inflato 1 cm. lato, lobis aequalibus lanceolatis acutis circiter 1 cm. longis corollae tubo aequilongis. *Corolla* flavo-alba, lobis patentibus anguste obovatis vel oblanceolatis apice obtusis vel subacutis 3 superioribus reflexis coccineis ornatis; tubus anguste cylindricus, 2·5 cm. longus, circiter 1 mm. latus, breviter pubescens. *Stamina* 4, valde exserta, recurva. *Stylus* filiformis, e fauce corollae circiter 3 cm. exsertus.

UGANDA. Kigezi District: Lake Mutanda, south end, 6200 ft., in secondary growth close to the water's edge, *C. G. Rogers* and *H. M. Gardner* 319 (type).

This species is distinguished by its conspicuous calyx: in other respects it is very similar to *C. cordifolium* A. Rich.

Coleus stachyoides (*Oliv.*) *E. A. Bruce*, comb. nov. [Labiatae]. *Plectranthus stachyoides* Oliv. in Trans. Linn. Soc. **29**, 136, t. 81.

An examination of the type of this plant shows that the filaments of the stamens are united in the lower part. This, together with the fact that the corolla has a short hooded upper-lip and deeply concave lower one, justifies its transference from *Plectranthus* L'Hérit. to *Coleus* Lour.

Lapeyrousia Schimperi (*Aschers. & Klatt*) *Milne-Redhead*, comb. nov. [Iridaceae]. *Tritonia Schimperi* Aschers. et Klatt in Linnaea **34**, 697 (1866); Aschers. et Solms in Schweinf. Beitr. Fl. Aethiop. 199 (1867). *Acidanthera unicolor* Hochst. in Schimp. Pl. Abyss. no. 2304; ex Bak. in Journ. Linn. Soc. **16**, 160 (1877); Martelli, Fl. Bogos. 81 (1886); Engl. in Abhandl. Preuss. Akad. Wiss. Berl. 1891, 175 (March 1892); Bak. Handb. Irid. 188 (November 1892); Klatt in Durand & Schinz, Consp. Fl. Afr. **5**, 198 (1893); Bak. in Dyer, Fl. Trop. Afr. **7**, 359 (1898). *Lapeyrousia erythraeae* Chiov. in Ann. Bot., Roma, **9**, 139 (1911).

An examination of the specimen of Schimper no. 2304 at Kew shows it to be a *Lapeyrousia* closely related to *L. porphyrosiphon* Bak. and *L. cyanescens* Bak. Chiovenda* himself identifies his *Lapeyrousia erythraeae* with authentic material of *Acidanthera unicolor* and points out that the plant does not agree with *Acidanthera*, butdoes not make any transference.

XXXIX.—MISCELLANEOUS NOTES.

PROFESSOR HENRI LECOMTE.—The death of the late Director of the Natural History Museum, Paris, on June 12th, 1934, at the age of 79, removes a charming personality familiar to all who have visited that institution. His death breaks yet another link with the past generation of botanists.

Lecomte had a wide and varied interest in botanical science which he maintained throughout his life, as can be judged from his masterly papers on plant anatomy and economic botany as well as his systematic works. One of Lecomte's earliest writings, and one of great taxonomic interest, is a joint paper with the late Professor van Tieghem on "Structure et affinités du Leitneria" published in Bull. Soc. Bot. France, **33**, 181–184 (1886), and in the same volume, pp. 311–317, another anatomical paper of his appeared, "Sur quelques points de l'anatomie de la tige et de la feuille des Casuarinées." In 1889 there followed a long and critical paper "Contribution à l'étude du liber des Angiosperms" in Ann. Sc. Nat. Paris, sér. 7, pp. 193–324. Lecomte's first systematic paper appeared in Journ. de Bot. **10**, pp. 229–235 (1896) "Sur une nouvelle Balanophorée du Congo Français."

In 1897 Lecomte became editor of "Revue de Cultures coloniales," a periodical dealing largely with economic problems, consisting of fifteen volumes, extending over the years 1897–1904. During these years, as might well be expected, he wrote many papers and independent works on Economic Botany, such as "Le cacaoyer et sa culture," 1897 (with Chalot); "Les arbres à gutta-percha," 1899; "Le Coton," 1900; and "Le Vanillier, sa culture, préparation et commerce de la vanille," 1901. At this time

* Chiov. in Nuov. Giorn. Bot. Ital. n.s. **26**, 110 (1919).

Lecomte was Professor of Natural Science at the College of Saint-Louis, Paris. In 1902 he was appointed Assistant Director of the Colonial Laboratory of the Natural History Museum, Paris, and in 1906 he succeeded the late Professor Bureau as Professor of Botany and Director of the Museum. He retained this position for a quarter of a century and during this time became a systematic botanist of world-wide repute. His interest lay mainly in the flora of Indo-China. He was general editor of that most valuable contribution to floristic botany, namely "Flore générale de l'Indo-Chine". This work was started in 1907 and is now nearing completion. In it Lecomte himself elaborated some of the most difficult families of ligneous plants, such as Sapindaceae, Anacardiaceae, Connaraceae, etc., and a large number of the Apetalae, besides the Eriocaulaceae in the Monocotyledons. From 1909 to 1928 he edited Notulae Systematicae, and contributed very largely to it; his papers dealing mainly with the flora of Indo-China and the Far East generally.

Amongst other important works written by Lecomte during this period may be mentioned "Les articulations florales" in Nouv. Mus. Hist. Nat. Paris, sér. 5, **2**, 121-244 (1910); "Lauracées de Chine et d'Indo-Chine" l.c. sér. 5, **5**, 43-120 (1913); "Madagascar: Les bois de la Forêt d'Analamazaotra" (with Paul Danguy 1922); "Les Bois Coloniaux" (1926), and "Les Bois de l'Indo-Chine" (1926).

Professor Lecomte was the recipient of many honours both at home and abroad, including Membre de l'Institut; Professeur honoraire au Muséum d'Histoire Naturelle; Officier de la Légion d'Honneur, and Commandeur de l'Ordre du Dragon d'Annam. In 1916 he was elected a foreign member of the Linnean Society of London.

In the death of Professor Lecomte Kew loses a valued friend and correspondent.

M. L. GREEN.

Report of the Botanical Society and Exchange Club of the British Isles for 1933.—The report for last year which has just appeared consists of 320 pages (including the report edited by the distributor, F. Rilstone, Esq.). It is thus somewhat smaller than that for 1932, and is illustrated by fewer plates.

The usual features—Plant Notes, Notes on Publications, New Books, etc., Abstracts of Papers bearing on the Study of the British Flora (by A. J. Wilmott and J. S. L. Gilmour), Obituaries, New County and other Records—constitute the first part of the Secretary's Report. Additions and corrections to previous reports and to the Comital Flora, occupy fifteen pages. W. H. Pearsall has papers under the titles "A Holiday in North Devon," "The British Species of Myriophyllum," "Beginning the Study of Grasses," "Some Hybrid Carices," and (with P. M. Hall) "Notes on the

British Orchidaceae." Papers on the flora of Glamorganshire are by H. J. Riddelsdell and E. Vachell. G. F. Scott Elliot has papers on "The Hedge Woundwort—*Stachys silvatica L.*" and "The Birch—*Betula alba L.*" These papers are very interesting, but surely it is unnecessary to have as many as fourteen paragraphs to a page. E. B. Bishop lists additions to the Flora of Northamptonshire, and A. H. Wolley-Dod's address to Tunbridge Wells Natural History Society is published under the title "Curiosities of Plant Life." R. W. Butcher has a useful paper on the "British Species of *Zostera*," but the microphotograph reproductions accompanying the paper are very poor. J. Parkin gives an excellent (though somewhat biased) summary of orthodox and unorthodox hypotheses regarding the nature and origin of the carpel. The attention of those who have to teach floral morphology should be drawn to this account. The article on *Crepis biennis* (in Yorkshire) should have been submitted to the Kew authorities. Mr. Pearsall would then have been told that the specimens sent to Kew by Mr. Flintoff (that is those actually in dispute) have been named *C. biennis*, not *C. oporinoides*, by the present writer, and the identification confirmed by Prof. E. B. Babcock.

Other papers in the report are:—"Variation and a Variant of *Cerastium vulgatum* from Dorset"—which may be described as a sermon followed by a long text—, "Mints that Sport," "Evidence of a Prehistoric Flora in the Ivel District," and "A Visit to the Dagenham Dumps in September 1933."

W. B. TURRELL.

Botanical Magazine.—Part 3 of vol. 157 of the Magazine was published on July 2nd and contains the following plant portraits:—*Rhododendron detonsum* Balf. f. et Forrest (t. 9359), a beautiful pink-flowered species of the *Adenogynum* subseries (*Taliense* series) discovered by Forrest in 1917 on the eastern flank of the Sung Kedei divide, Yunnan; *Lonicera hispida* Pall. ex Willd. var. *bracteata* (Royle) Rehder (t. 9360), from the N. W. Himalaya and S. E. Tibet; *Verbena corymbosa* Ruiz et Pavon (t. 9361), a fine garden plant from Chile, known for over 130 years and only recently introduced from near Valdivia by Mr. Clarence Elliott; *Deutzia rubens* Rehder (t. 9362), a member of the section *Mesodeutzia* from China; *Tulipa cypria* Stapf (t. 9363), a new species from Cyprus, the description of which was drawn up by Dr. Stapf shortly before his death; *Cypripedium cordigerum* D. Don (t. 9364), a beautiful terrestrial species from the Himalaya with green petals and sepals and a white labellum, originally sent home by Wallich in 1825 and recently introduced to cultivation by Col. Bailey through the Royal Botanic Garden, Edinburgh; *Vallea stipularis* Linn. f. var. *pyrifolia* F. Ballard (t. 9365), a new variety from the Andes of South America from Colombia to Peru; *Ephedra viridis* Coville (t. 9366), a native of the S. W. United States; *Pedicularis Delavayi*

Franch. ex Maxim. (t. 9367), from Western China; *Cotyledon rotundifolia* Haworth (t. 9368) from the Cape Province, S. Africa, and *Iris cretensis* Janka (t. 9369), figured from a plant collected by Mr. G. P. Baker in Crete: the species also occurs in Greece, Asia Minor and N. Syria.

The Life Forms of Plants.†—The works of Prof. C. Raunkiaer are of the utmost importance to the ecologist and phytogeographer. The majority have been published at various dates, in Danish, in several Danish periodicals, and, though two were written in French and one in German and accounts of the Life Form System have appeared in English (W. G. Smith in Journ. Ecol. **1**, 1913, and G. D. Fuller and A. L. Bakke in The Plant World, **21**, 1918), the difficulty of consultation of the original papers has been a main cause of Raunkiaer's system not receiving its full due. The admirable book now published by the Clarendon Press must stimulate anew interest in some of the most fundamental problems of plant life.

The book contains English translations of one book and sixteen papers by Prof. Raunkiaer dealing with his Life Form System, its application, statistical researches on vegetation, and a few other subsidiary subjects. Most of the Danish papers have been translated by Mr. H. Gilbert-Carter, of Cambridge, and the French and German ones by Prof. A. G. Tansley, of Oxford, who also contributes an introduction. One hitherto unpublished paper, "Botanical studies in the Mediterranean Region," has been translated by Miss A. Fausbøll. The Rask-Oersted Fund has contributed to the cost of publication.

The beautiful fount and format of the work make it a pleasure to read and handle. The wide lower margin enables a book rest to be used without trouble. The numerous tables are clearly printed and the reproduction of the many photographs as plates is very clear. A special word of commendation must be given to the illustrations of the second paper. It is rare to see black and white botanical drawings so concisely serving their purpose and yet so gracefully artistic.

No attempt can be made in a short notice to summarize the important contents of this book. To do this adequately would require many pages. All who have the welfare of botany at heart must feel deeply indebted to the Danish Committee, to the Rask-Oersted Fund, the Clarendon Press, and the translators. As Prof Tansley says, the book is a "remarkable monument of the life-work of one of the greatest of the minds which have concerned themselves with the deeper problems of plant geography during the first three decades of the present century." W. B. TURRILL.

†The Life Forms of Plants and Statistical Plant Geography, being the collected papers of C. Raunkiaer, Oxford, at the Clarendon Press, 1934 Pp. 632. Price 35/-.

Sixth International Botanical Congress, Amsterdam, 1935.—We have received from the Secretary the following Notice:—

The Organizing Committee of the VI. International Botanical Congress announces that the following topics preliminarily have been chosen for discussion in the sections:

AGR. Agronomy. (1) Interactions between roots and soil; interactions between plants. (2) Virus diseases. (3a) Weed flora as an indicator of soil conditions in agriculture. (3b) Grassland associations. (4a) Genetics and breeding of immune varieties. (4b) Inbreeding. (5) Importance of microbiological investigations in the study of agricultural problems. (6) Influencing the cycle of development in plants.

CYT. Cytology. (1) Structure of chromosomes. (2a) Crossing-over versus conversion. (2b) Terminology of cytology and genetics. (3a) pairing of chromosomes in polyploids. (3b) Reduction division in fungi. (4) Chain- and ring-formation of chromosomes. (5a) Submicroscopical structure of the cell wall. (5b) Vacuome, chondriome, plastids. (6) Colloid chemistry of protoplasm; vital staining.

GEN. Genetics. (1a) Experimental mutations. (1b) Genetical basis of size and form. (2a) Crossing-over versus conversion. (2b) Terminology of cytology and genetics. (3a) Sexuality in fungi. (3b) Reduction division in fungi. (4a) Genetics and breeding of immune varieties. (4b) Inbreeding. (5) Taxonomy and genetics. (6a) Plasm and genotype in their mutual relations. (6b) Lethal factors.

GEO. Geobotany, ecology and phytogeography. (1) Climax associations in N.W. Europe and N. America. (2) Cartography: (a) Vegetation maps; (b) Area maps. (3) Flora and vegetation area. (4) Plant geography in younger formations. (5) The halophyte problem. (6a) Classification and nomenclature of vegetation units. (6b) Miscellaneous papers.

MOR. Morphology and anatomy. (1a) Size and form. (1b) Genetical basis of size and form. (2a) Phytohormones; general paper. (2b) Leaf arrangements. (3) Flower morphology. (4) Female fructification and phylogeny of Conifers. (5a) Wood anatomy. (5b) Relations between anatomy and external morphology. (6) Morphology of Bryophytes.

MYC. Mycology and bacteriology. (1) Differential characters in Hymenomycetes. (2) Nomenclature of fungi. (3a) Sexuality in fungi. (3b) Reduction division in fungi. (4) Biologic forms of fungi. (5) Importance of microbiological investigations in the study of agricultural problems. (6) Phylogeny and taxonomy of Phycomycetes.

PATH. Phytopathology. (1) Biological basis of plant quarantine. (2) Virus diseases. (3) Various papers. (4) Biologic forms of fungi. (5) Immunisation. (6) Physiologic diseases.

PB. Palaeobotany. (1) Geobotanical provinces in the older formations. (2) Caytoniales and Pteridospermae and the evolution

of Angiosperms. (3) Flower morphology. (4) Plant geography in younger formations. (5) Synchronism and uniformity in palaeozoic and mesozoic floras. (6) Various papers.

PH. Plant physiology. (1) Photosynthesis. (2a) Phytohormones; general paper. (2b) (Phytohormones; various papers. (3) Oxidation, reduction and metabolism. (4) Permeability and the accumulation of mineral elements. (5a) Submicroscopical structure of the cell wall. (5b) Translocation of plastic materials. (6) Influencing the cycle of development in plants.

SYS. Taxonomy and nomenclature. (1) Various papers. (2) Caytoniales and Pteridospermae and the evolution of Angiosperms. (3) Flower morphology. (4) Female fructification and phylogeny of Conifers. (5) Taxonomy and genetics. (6) Phylogeny and taxonomy of Phycomycetes.

Botryostege.—It should have been explained, when the article on this new genus was published in Kew Bulletin, 1934, 191, that the article was drawn up by the late Dr. Stapf some years ago for inclusion in the 147th Volume of the "Botanical Magazine," which the late Mr. Reginald Cory had undertaken to publish for the Royal Horticultural Society.

The plate had also been lithographed and printed off at Mr. Cory's expense. After the material had been completed Mr. Cory considered the plate was not of sufficient interest for inclusion in the Magazine, and he very generously handed over his stock of plates to Kew, together with the article for publication in the Bulletin.

This note explains therefore why this article has now been published so long after the death of Dr. Stapf.

The Flora of Iceland and the Faeroes.—This work, reviewed in Kew Bulletin, 1934, 226, may be obtained from Messrs, Williams & Norgate, Ltd., 28–30 Little Russell Street, London. W.C.1., price 6/-.

The Phenological Report, 1933.*—The report for the year December 1932 to November 1933 has been reprinted from the "Quarterly Journal of the Royal Meteorological Society." The total number of reporting stations from whose observations the report has been compiled is 535, but more helpers are still required, especially in Central Wales, W. Ireland and N.W. Scotland. The year was, of course, remarkable for its warmth, dryness and sunshine, and the phenological effect was very evident. The usual 20 days floral difference between S. England and N. Scotland was halved. Spring migration of birds was normal, but autumn movements, especially of the swallow tribe, were decidedly early. Table XIV summarises the observations kept, with only two breaks, by a Norfolkshire family ever since 1736. The report is copiously illustrated by tables and charts.

*Royal Meteorological Society, 49, Cromwell Rosd, London, S.W.7. Price 3s.

BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1934
ROYAL BOTANIC GARDENS, KEW

XL—Dr. LEONARD COCKAYNE, F.R.S.

The Science of Botany has suffered an irreparable loss in the death of Dr. Leonard Cockayne, C.M.G., F.R.S., on July 8th, 1934, and the Dominion of New Zealand has lost one of her most distinguished citizens who had attained a world-wide reputation in the domain of Botany.

Born in Derbyshire, in 1855, the son of the late Mr. William Cockayne of Norton Lees, he was educated privately and entered Owens College, now Manchester University. In the year 1879 he left England for Australia, where he was engaged in teaching for a short time. He moved to New Zealand in 1881, and there he made his home—never returning to England. From 1881 to 1885 he was a member of the teaching staff of the Tokomairiro District High School and subsequently commenced farming near Christchurch. During this time, between 1882 and 1884, he started a private experimental station and introduced many thousands of shrubs, herbs and orchard trees. It was then that he began to study the seedlings of New Zealand shrubs, which show such remarkable juvenile forms in the seedling stage, as to both their habit of growth and leaf-form, quite distinct from the adult condition. This led him to investigate the flora of New Zealand from many points of view and it is to him we owe our knowledge of the remarkable prevalence of interspecific hybrids which occur in so many genera of New Zealand plants.

Cockayne's knowledge of the New Zealand flora was not that of the herbarium botanist, but was derived from extensive field study. He had travelled far and wide throughout the Dominion and, in addition, had explored very thoroughly the Chathams and Sub-antarctic Islands. From 1906 onwards he carried out important botanical surveys for the Land and Survey Department and he prepared reports on the reclamation of sand dunes, Kapiti Island, the Waipoua Kauri Forest, Tongariro National Park and on Stewart Island.

It was, we believe, while studying the New Zealand beeches (*Nothofagus*) that Cockayne's attention was first drawn to the prevalence of hybrids and " hybrid swarms," as he termed them, in the New Zealand flora, and in this work he was further stimulated by the late Dr. Lotsy when he visited New Zealand. These studies he continued with vigour, building up a school of enthusiastic amateur and professional botanists who, it is to be hoped, will carry on the work as a tribute to their Master's memory.

New Zealand with its rich endemic flora is, of course, an ideal region for the naturalist and, thanks to the activities of botanists from the time of Banks and Solander (1769 70) onwards, the flora has been relatively well investigated. Cockayne's great contribution has been his pioneer work in the ecological study of the vegetation and the problems of plant evolution as presented by the flora. The value of this work is due to his extensive botanical travels in the Dominion and to his keen and critical eye ; one need only examine the titles of his many contributions to realise both the wide and original nature of his research and something of the stimulus he gave to the study of the plant life in the Southern Hemisphere -of this stimulus I can speak from first-hand knowledge.

During my visit to New Zealand I was most fortunate in having Dr. Cockayne as my guide, and it was largely owing to his influence that I was able to see so much of the island. He took me across to Nelson and to the Western Mountains and the Franz Joseph Glacier and, during our journey through Arthur's Pass in particular, it would have been impossible to have had a more delightful or more instructive companion to introduce one to the remarkable number of hybrid swarms to be seen in that area. In the North Island we visited Auckland and Rangitoto Island and thence, by way of Tongariro National Park to Mount Egmont and back to Wellington via Palmerston North. Throughout our journeys his great knowledge of the New Zealand flora, and his keen interest in the native plants and the problems they present, was a revelation to a visiting botanist. The success of the plans he had outlined for my tour was due in great measure to the excellent organising powers of his son Alfred, and also to the trouble so kindly taken by Dr. Marsden and Mr. Callaghan of the Department of Scientific and Industrial Research.

Throughout our long and sometimes tiring journeys, Dr. Cockayne was astonishingly active, though he was then an old man, and the hurried tours might well have upset him. The following extract from my diary, which I wrote on board ship (Feb. 14, 1928) just before we set sail from New Zealand, recalls him vividly to my memory : " He was at times a trifle disturbed by a sudden change of plan and had a facility for losing his cap or his bag, but his sense of humour always saved the situation and we had a great time together. No matter whether we were in a crowded train or wedged in the back seat of a motor car, he would discuss abstruse botanical matters or bring forward knotty points as to hybrids, or what was meant by such and such a species. Then his son Alfred would join in with a totally opposite point of view and a fierce altercation, proving quite harmless, would ensue—an outsider might have thought blows would follow !—and all would end happily."

He was sometimes a little intolerant with regard to the work of other botanists who might not agree fully with his own views and was at times inclined to belittle their contributions to the science. He certainly did not always " suffer fools gladly " but when he came to

appreciate the worth of a fellow botanist's work, either in New Zealand or elsewhere, he would be only too ready to share his views with him.

Cockayne's special interests were undoubtedly centred in the study of plants as living organisms and hence in the major problems of biology. Apart from vegetational studies, he delighted in considering plant morphology from a dynamic standpoint. His early investigation into the form of seedlings, his research on the variation of leaves, the significance of spines, and latterly his field-studies on hybridism (with Dr. H. H. Allan), indicate not only the intensive and extensive nature of his research, but also his desire to answer the how and wherefore of every problem connected with the botany of his adopted country.

Cockayne's first synecological publications dealt with the burning and regeneration of subalpine scrub, which had been preceded by his accounts of the freezing of New Zealand alpine plants and of the seedling forms of New Zealand Phanerogams. These were followed in 1912 by his important paper " Observations concerning evolution derived from ecological studies in New Zealand " and by several others in which he laid stress on the evolutionary aspect ; but the culmination of his studies, based on his wide knowledge gained from his travels, was revealed in " The Vegetation of New Zealand " which was published as vol. 14 of Engler and Drude's " Die Vegetation der Erde " in 1921. This met with so much appreciation that the first edition was sold out in a year and a second edition was published in 1928.

His admirable book " New Zealand Plants and their Story " has perhaps done more to further the study of Botany in New Zealand, and also to stimulate interest in plant life far beyond the Dominion, than any other of his writings. In this book (the first edition of which was published in 1910, followed by the second edition in 1919 and a third in 1927), the underlying idea is that of " the plants telling their own story," but the interpretation of this story is obviously that of a master-mind. A remarkable feature of the book is the simplicity of its language with its avoidance of the tiresome words and phrases so often associated with over-popularization.

It is for New Zealanders themselves to estimate and acknowledge what they owe to Cockayne as a teacher, in that broad sense of the term as one who by inspiration and example leads the way. It is obvious to others that the influence of such a text book, of wide appeal, well produced and illustrated and yet of low price, must continue through many generations. The application of ecology to economic problems was another feature of much of Cockayne's research. Forests, sand-dunes, and pastures, especially the last, were investigated with a view to their preservation, stabilization, and improvement. That his own words*—" it seems clear that New Zealand is attempting to do its economic ecological duty "—are true, is mainly due to Cockayne himself. His wide botanical know-

* Report, Imperial Botanical Congress, 266 (1925).

ledge made his advice of inestimable value on the Royal Commission on Forestry (1913), the Cawthron Commission (1919), the Royal Pastoral Commission (1920), as well as in his position of Hon. Botanist to the New Zealand State Forest Services.

The outstanding memorial to Cockayne's genius and foresight is the establishment of the open-air " Plant Museum " at Otari (Wilton's Bush), near Wellington (see K.B. 1926, 428, and K.B. 1929, 63, 64). It seems fitting here to quote what I wrote after the inauguration ceremony : " On January 25th, 1928, I was present at the formal inauguration of this fine area by the Mayor of Wellington, and had the oppotunity of visiting the whole of the reserved area, which is very richly furnished with an almost untouched collection of native plants. As many characteristic New Zealand trees, shrubs and herbaceous plants are not to be found in the old bush, Dr. Cockayne, to whose keeness and enterprise the initiation of this important scheme is due, has arranged for the planting of as representative a collection of New Zealand plants in this remarkable open air Museum as may be likely to flourish there."

As His Excellency the Governor-General said recently at a public recognition of Cockayne's work " Dr. Cockayne had done an unexampled work in enriching the annals of natural science and in enriching and beautifying the lives and environment of his fellow-countrymen. But he had done more ; he had been a very generous benefactor who would leave behind him a legacy of economy as well as a legacy of aesthetic value."

Cockayne retained his keen interest in his botanical studies to the close of his life, and though during the last few years he was sadly hampered by impending blindness, yet he worked always with the energy and enthusiasm of a young man.

There was a strain of poetry in his nature which can be appreciated in his " New Zealand Plants and their Story " and other of his writings, and it was the poetry in him which lent wings to his imagination and gave depths to his insight. This poetical feeling is expressed in the popular names he gave to many New Zealand plants, and he attached such names, and also the Maori names, to the native plants in the Otari Museum, realising that by such names they will be remembered. It was also a happy idea of his to name the entrances, paths and other features in the " Museum " after botanists connected with New Zealand.

The following passage extracted from " The Evening Post " of Wellington, of July 9th, 1934, very fittingly sums up his vigorous personality :—

> " In field work Dr. Cockayne stood alone. A fortnight spent at Arthur's Pass in his company, collecting plants for the museum, was an experience never to be forgotten. While his writings and his work in connexion with the Otari Plant Museum place him as a man above his fellows, to my mind the inspiration he was to the young botanists of the Dominion was his outstanding characteristic. His vast knowledge was at the disposal of all ; and, as indicated, his inspiration to others in regard to botanical research has played a very great part in the interest displayed by large numbers of enthusiasts who are following in his footsteps. For many years he was as a voice crying in the wilderness, when stressing the damage done by the introduction of certain animals into our forests. His lead has, however, now been taken up by the Government, which is taking action to prevent further damage being done. A great botanist, he was also a great gardener, and I desire to pay a tribute to one who has done more than any other for New Zealand's incomparable flora, and who has brought fame in the botanical world to his adopted country."

Many honours were conferred upon him, including the Hon.Ph.D. of Munich (1903) ; the Fellowship of the Royal Society of London (1912), followed in 1928 by the award of the Darwin Medal ; the Hector Medal and Prize for Botany in 1912, and the Hutton Memorial Medal in 1914. In 1918-1919 he was President of the New Zealand Institute (now the Royal Society of New Zealand), and in 1928 he was awarded the Mueller Medal by the Australasian Association of Science for his researches on New Zealand Botany. In 1932 the Royal Horticultural Society of London awarded him the Veitch Memorial Medal. In 1929 the honour of the Companionship of the Most Distinguished Order of St. Michael and St. George was conferred upon him by His Majesty the King.

Cockayne was buried very fittingly in the Otari Museum, which is his true and lasting Memorial, near the Banks' Entrance, on a spot overlooking the primitive vegetation of the bush and facing the Cockayne Heights. May his spirit continue to stimulate his countrymen to love and cherish their native vegetation and to carry on the traditions which he has established.

A. W. H.

XLI—MUSCI COLLECTED BY THE OXFORD EXPEDITION TO BRITISH GUIANA IN 1929.

P. W. Richards.

The following paper is a complete enumeration of the mosses collected by the author in August to December 1929, while a member of the Oxford Expedition to British Guiana. The majority came from the neighbourhood of the Expedition's Base Camp on Moraballi Creek, River Essequibo (Lat. 6° 11′ N, Long. 58° 50′ W), the remainder from various places, all of them within a radius of 40 km. from the Base Camp. All the gatherings were made in tropical rain-forest at altitudes only a few feet above sea-level : a detailed account of the vegetation, soil and climate of the area has been published by T. A. W. Davis and the author (1).*

At the same time the opportunity has been taken of working out a small collection from the Cuyuni and Potaro Rivers made by T. G. Tutin on Dr. G. S. Carter's Cambridge Expedition in 1933 and a number of unnamed mosses sent for study by the Jenman Herbarium, Georgetown, British Guiana, including specimens from various parts of the colony, collected chiefly by A. W. Bartlett in 1904-7 and A. A. Abraham in 1919 (on the Cattle Trail Survey).

Up to the present the moss-flora of British Guiana has been very little known. There are a few species in the Kew and British

* For references see p. 337.

Museum Herbaria collected by Robert Schomburgk, Drake, C. S. Parker and C. F. Appun : most of these are mentioned by Mitten in his " Musci Austro-Americani " (2). In 1884 Sir E. F. im Thurn collected three species on Roraima which were identified by Mitten (3). In 1895 J. J. Quelch made a small collection of mosses near the Marshall Falls, River Mazaruni, of which there is a duplicate set at Kew : they were determined by C. Müller-Hal., who described no less than 20 of them as new (4), but most of these new species seem to be ill-founded. A few mosses were collected by Goebel while on a visit to the North-Western District in 1890-91 and these were also determined by Müller (5). The collections made by F. V. McConnell and J. J. Quelch on the Roraima Expeditions of 1894 and 1898 included 26 species of mosses, which were identified by Brotherus (6). Finally, E. H. Graham has recently published a list of some mosses collected by himself and A. E. Emerson in the neighbourhood of Kartabo Point (7).

It is of course too early to say much as to the phytogeographical affinities of the British Guiana moss-flora, but it is already clear that it is on the whole closely related to that of the Amazon and especially to that of its tributary the Rio Negro.

In the following list the specimens were collected by the author unless otherwise stated. The types of forest (" Mora ", "Wallaba " etc.) referred to in the habitat data are described in the paper on the vegetation of Moraballi Creek mentioned above.

The first set of the Oxford Expedition collection and a duplicate set of the collection sent from the Jenman Herbarium will be kept at Kew. T. G. Tutin's collection will go to the British Museum Herbarium. All previous records of each species from the Colony are given, but the determinations have not been revised by the author : these records refer to specimens in the Kew Herbarium unless otherwise stated.

In conclusion my best thanks are due to Mr. R. S. Williams of the New York Botanical Garden for much generously given help. Not only has he taken over the determination of the *Fissidentaceae*, but he has also checked my identifications of a large proportion of the remaining species. Except where species are definitely stated to be determined by him, the identifications must however rest on my own responsibility alone. I should also like to thank Mr. W. R. Sherrin for naming the Sphagna.

It is hoped to give some notes on the ecology of the bryophytes at Moraballi Creek in a later paper.

SPHAGNALES.

SPHAGNACEAE (*Det.* W. R. Sherrin).

Sphagnum trinitense *C.M.*—*S. cuspidatum* Ehrh. var. *serrulatum* Schlieph.

Berbice : Eberoabo Creek, submerged in Ite swamp, *Abraham* 140.

Distr : Tropical America and northwards to Maine and Bermuda.

S. portoricense *Hampe.*

Pomeroon River, *Bartlett* 8677.

Distr. West Indies to New Jersey.

S. antillarum *Schp.*

Potaro River : rock at top of Kaieteur Fall, *Tutin* 652.

Distr. Surinam, Trinidad.

BRYALES

FISSIDENTACEAE (*Det.* R. S. Williams)

Fissidens Garberi *Lesq. et James.*

Moraballi Creek : bases of shrubs in swampy Mora forest, *c.fr.*, 599 ; granite boulders in Morabukea forest, *c.fr.*, 719.

Distr. Haiti, Bermuda, South-eastern United States.

F. pellucidus *Hornsch.*

Moraballi Creek : trunk of large tree in well-lit Morabukea forest, *c.fr.*, 445 ; base of tree in mixed forest, *c.fr.*, 454.

Distr. Brazil.

F. prionodes *Mont.*

Moraballi Creek : common on recently disturbed clayey and sandy soil in forest, *c.fr.*, 45, 216, 258, 323, 518, 744.

Distr. French Guiana, Brazil, Ecuador, Peru.

F. Puiggarii (*Geh. et Hampe*) *Paris.*

Cuyuni River : near Akaio Landing, in " Low Bush " on clay soil thrown up by fallen tree, *c.fr.*, 831.

Distr. Brazil.

Moenkemeyera Richardsii *R. S. Williams*, sp. nov. Dioica et autoica, floribus masculis terminalibus : plantulae nanae, caulis simplex vel ramosus ; folia superiora et perichaetialia parte equitante laminae limbata, parte superiore et dorso serrulata, cellulis totis brevibus usque ad basin folii densissime papillosis ; seta 1·5–2 mm. longa ; theca suberecta, plus minusve cylindrica, circiter 1 mm. longa, operculum breve, oblique rostratum ; peristomii dentes lanceolati, simplices, rubri, papillosi ; sporae 16 μ ; calyptra papillosa.

Dioicous and *autoicous*, the *male flowers* terminal, consisting of about 6 antheridia and few or no paraphyses, with the two inner leaves longer and narrower than the stem-leaves and more or less lobed in the lower part : plants small, up to 5–6 mm. high, simple or branched, the *leaves* more or less curved-reflexed when dry, those of upper stem about 0·75 mm. long and 0·25 mm. broad, acutely or somewhat bluntly pointed, serrulate to the base, the duplicate lamina extending to above the middle and mostly terminating nearer the costa than margin, the one or two pairs of leaves just below the perichaetium mostly with distinct, hyaline borders on the duplicate lamina, the leaves farther down becoming gradually smaller and without border ; *costa* ending just below the apex ; *leaf-*

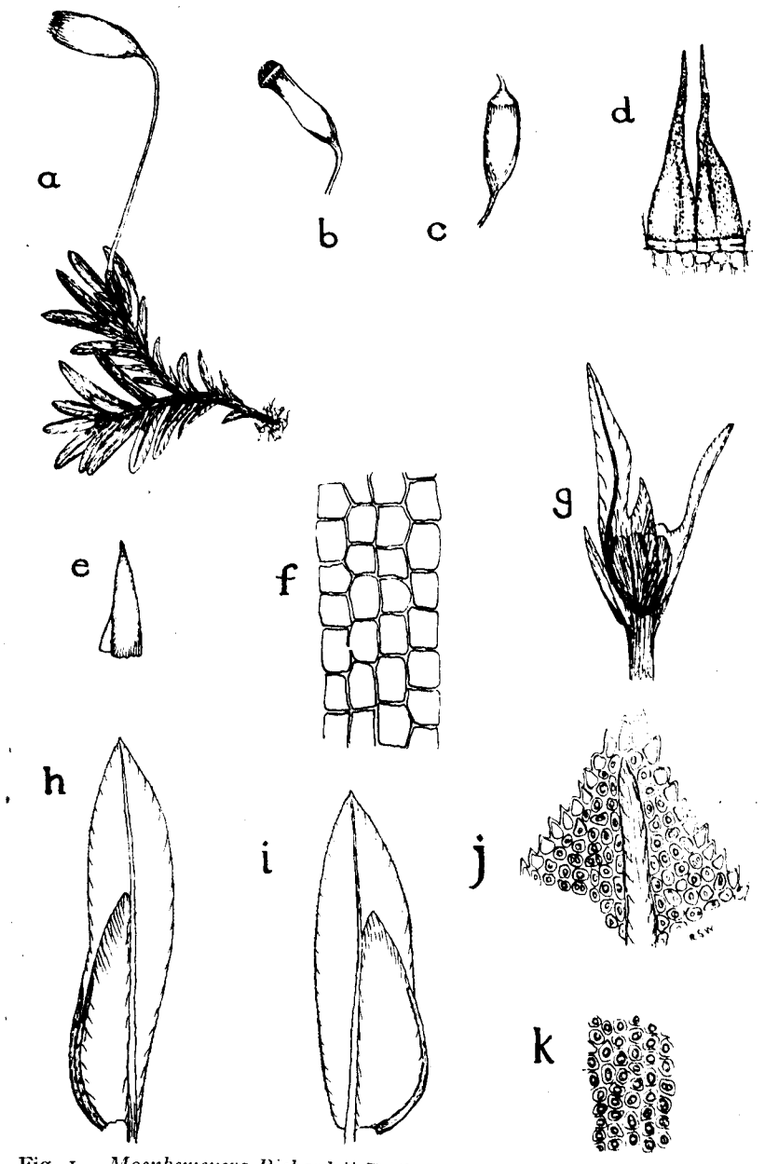


Fig. 1. *Moenkemeyera Richardsii* R. S. Williams. a, plant (× 14); b, dry empty capsule (× 14); c, capsule with lid (× 14); d, part of peristome (× 180); e, calyptra (× 40); f, median exothecial cells (× 180); g, part of antheridial bud (× 32); h, upper perichaetial leaf (× 40); i, upper stem leaf (× 40); j, apex of stem leaf (× 270); k, median cells of leaf (× 270).

cells obscure, mostly rounded or somewhat irregular, scarcely elongate, and covered on both sides with large often branching papillae extending to leaf-base; *perichaetial leaves* about like those of upper stem, but rather longer, about 1 mm., and a little narrower: *seta* 1·5–2 mm. long; *capsule* about 1 mm. long, with slightly obliquely beaked lid, more or less contracted under the mouth when empty and sometimes becoming narrowly cylindrical; the median exothecial cells large, short-rectangular, with thin walls; *peristome teeth* dark red, lanceolate with slender points, undivided and densely papillose to near base; *spores* finely punctate, up to 16 μ in diameter; *calyptra* extending to a little below the rim of capsule, more or less papillose, at least near apex.

Moraballi Creek: in swampy Mora forest, on trunk of *Miconia Plukenetii* Naud., *c.fr.*, 118 (type); in damp forest, on bark of *M. Plukenetii*, *c.fr.*, 41. Not uncommon in the district and showing a marked preference for growing on species of *Miconia* (*Melastomaceae*).

Distr. Windward Islands: Granada, Grand Etang, alt. c. 1800 ft., 1929, *Richards* 935.

Dicranaceae.

Dicranella exigua (*Schwaegr.*) *Mitt.*

Essequibo River: Bartica, sandy bank of ditch in cultivated ground, *c.fr.*, 855. *Det.* R. S. Williams.

Distr. Tropical South America, West Indies.

Campylopus gracilicaulis *Mitt.*

Berbice: "savannah lands, on white sand of *muri*", *Abraham* 145 (in part); Wiruni-Ituni Savannahs, on white sands, *Abraham* 144 (in part) and 136 (in part). These gatherings agree very closely with those of Spruce from the Rio Negro (*Musc. Amaz. et And.* 60).

Distr. Tropical South America, West Indies, Florida.

C. introflexus *Brid.*

Essequibo River: Bartica, on sandy soil, burnt scrubby land, 854.

Distr. Widely spread in the warmer parts of the world.

C. Sprucei *Mitt.*

Potaro River: forest on Kaieteur Plateau, *Bartlett* sine num.

Distr. British Guiana, *Appun* 583, *N. D. F. Pearce*.

Rio Negro (Brazil).

C. trachyblepharon (*C.M.*) *Mitt.*

Essequibo Coast: back of Onderneeming, *Bartlett* 8604. Berbice; mixed with *C. gracilicaulis*, same localities and habitats, *Abraham*, part of 144, 145 and 136.

Distr. Eastern Brazil.

Holomitrium arboreum *Mitt.*

Moraballi Creek: on Mora tree, 130 ft. from ground, *c.fr.* 275; on trunk of tree overhanging creek, *c.fr.*, 519 (in part).

Distr. Andes from Bolivia to Mexico.

LEUCOBRYACEAE.

Leucobryum crispum *C.M.*

Moraballi Creek: extensive loose tufts on slightly shaded sandy bank in forest, 195.

Distr. Roraima Range, 3500 ft., *McConnell and Quelch* 546.

Tropical South America, West Indies.

The specimens in Kew Herb. determined as this species by Mitten obviously belong to two distinct species, one of which agrees with Müller's description and the other of which is much larger (probably *L. megalophyllum* (Raddi) Mitt.).

L. Martianum (*Hornsch.*) *Hampe.*

Moraballi Creek: common on rotten wood, less frequently on living trees, *c.fr.*, 102. Essequibo River: near Bartica Grove, *c.fr.*, *Jenman* 2333. Pomeroon River, *c.fr.*, *Bartlett* 7953 and 8678. Berbice: Yawakuri River, on decaying tree trunks, *c.fr.*, *Abraham* 222. Bartica-Potaro Road, 82 miles, on fallen tree in *Dicymbe* forest, *c.fr.*, *Tutin* 284.

Distr. British Guiana, *Appun* 724 and 727. North-Western District: Amakura River, *De La Cruz* 3434.

Tropical South America, West Indies.

L. antillarum *Schp.*

Potaro River: forest on Kaieteur Plateau, *c.fr.*, *Bartlett* sine num. Det. R. S. Williams.

Distr. Tropical South and Central America, West Indies.

Octoblepharum albidum *Hedw.*

Moraballi Creek: abundant everywhere, 93. Rarely fertile except on the upper branches of tall trees. Essequibo River: Bartica, *c.fr.*, 853. Cuyuni River, *c.fr.*, *Bartlett* 8604. Georgetown Botanic Garden, *c.fr.*, *Bartlett* sine num. Pomeroon River, *Bartlett* 8676. Berbice: Yawakuri River, on stem of Turu palm, *Abraham* 168. Bartica-Potaro Road, 82 miles, in *Dicymbe* forest, *Tutin* 266.

Distr. British Guiana, *Schomburgk* sine num., *Appun* 723 and 814. Mazaruni River: near Marshall Falls, *Quelch* (ex herb. *Levier* 1282). Cuyuni River: Kartabo and Camaria Road, *Graham*, Bryologist, **36**, 65 (1933).

Pantropical.

CALYMPERACEAE.

Syrrhopodon anomalus *Broth.*

Moraballi Creek: trunk of small tree overhanging creek, 171 (in part). *Det.* R. S. Williams.

Distr. Brazil, Paraguay.

S. Leprieurii *Mont.*

Moraballi Creek: on trunk of tree in light place, moist forest, *c.fr.*, 144; trunk of tree overhanging creek, *c.fr.*, 519 (in part).

Distr. French Guiana, Rio Negro (Brazil), Bolivia.

S. rigidus *Hook. et Grev.*

Moraballi Creek: tree trunk by creek, *c.fr.*, 186. Some of the leaves bear clavate gemmae at the apex.

Distr. Tropical South America, West Indies.

S. Miquelianus *C.M.*

Moraballi Creek: trunk of small tree on edge of creek, *c.fr.*, 90; trunk of small tree overhanging creek, 171 (in part), gemmiferous, 172.

Distr. Surinam, Rio Negro (Brazil), Bolivia, Nicaragua.

S. Hobsoni (*Grev.*) *Hook. et Grev.* var. **luridus** (*Paris et Broth.*) *P. W. Richards.*—*S. luridus* Paris et Broth. Rev. Bry. **33**, 56 (1906).

Moraballi Creek: frequent on tree trunks in well-illuminated forest, 103, 220, 449.

Distr. French Guiana. The typical form has been recorded from "Guiana", Brazil, Trinidad and Cuba.

The Moraballi plant is very constant in its characters and always sterile. It agrees perfectly with a few stems of the original gathering of *S. luridus* (French Guiana, *Michel*) which I have been able to examine by the kindness of Mr. R. S. Williams, except that the cells in the upper part of the leaf are slightly larger and more elongated. As Mr. Williams suggests, however, *S. luridus* does not seem to be specifically distinct from *S. Hobsoni* and is separated from it by no well-defined structural characters. Brotherus had probably also come to this opinion, as he did not include *S. luridus* in the "Manzenfamilien", ed. 2. *S. luridus* does however differ from all forms of *S. Hobsoni* which I have examined in the leaves being straighter and more rigid when dry and with the sheathing base more widely expanded upwards, also in the dull yellowish colour (in both the wet and the dry state) and as these characters seem to be quite constant it is probably worth maintaining as a variety.

Calymperes rupicola *P.W. Richards*, sp. nov. (Sub-gen. *Hyophilina* Sect. *Climacina*).—Ut videtur *C. Glaziovii* Hampe proxima, sed multo major, foliis acutis, cancellinis multo longioribus in gradationem longam attenuatis valde differt.

Robusta, *caespites* laxi, molles, laete flavo-virentes, siccitate sordidi. *Caulis* ad 3 cm. longus, nonnunquam superne divisus. *Folia* saepissime proboscidea, siccitate flexuosa divergentia, madore erecto-patentia, 3–4 mm. longa, e basi late cuneata lingulata, ad apicem acutam attenuata, basi 0·4–0·7 mm., parte expansa superne 0·8–0·9 mm., parte lingulata 0·7 mm. lata, *margine* incrassato fere plano, apicem versus et parte expansa superne serrulata vel subserrulata, ceterum integra; *costa* valida ad basin 90–100 μ lata, per

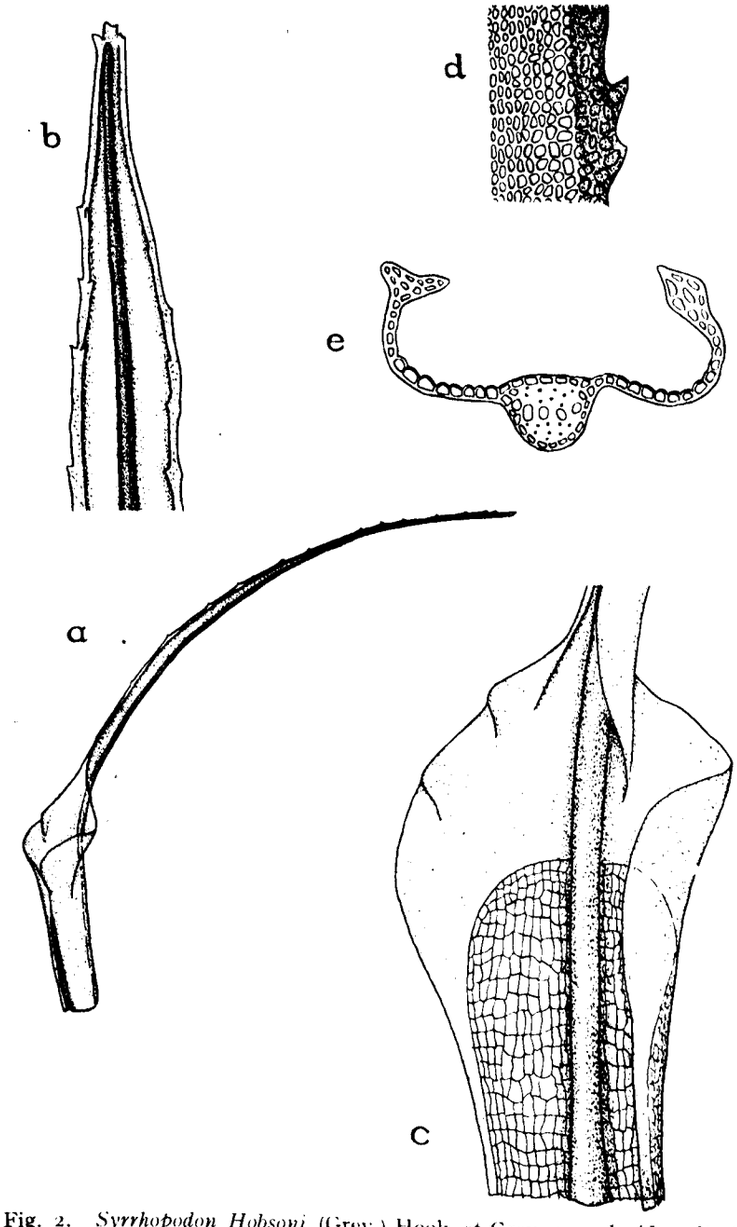


Fig. 2. *Syrrhopodon Hobsoni* (Grev.) Hook. et Grev. var. *luridus* (Paris et Broth.) P. W. Richards. a, leaf (× 15) ; b, apex of leaf, dorsal view (× 60) ; c, base of leaf (× 60) ; d, cells in upper part of leaf (× 250), e, section through upper part of leaf (× 250). a-d drawn from type of *S. luridus* (French Guiana, *Michel*), e from Richards 220.

totam longitudinem fere aequa, paulo ante apicem evanida, superne scabrida ; *cancellinis* partem expansam fere totam occupantibus, 12–15-seriatis, in gradationem costam versus desinentibus, ***cellulis chlorophyllosis*** obscuris hexagonis, 4–6 μ latis, supra papillosis, *teniola* cancellinis multo breviore, basin versus 3 cellulis lata superne latiore, *cellulis marginalibus* partis expansae basin versus longe

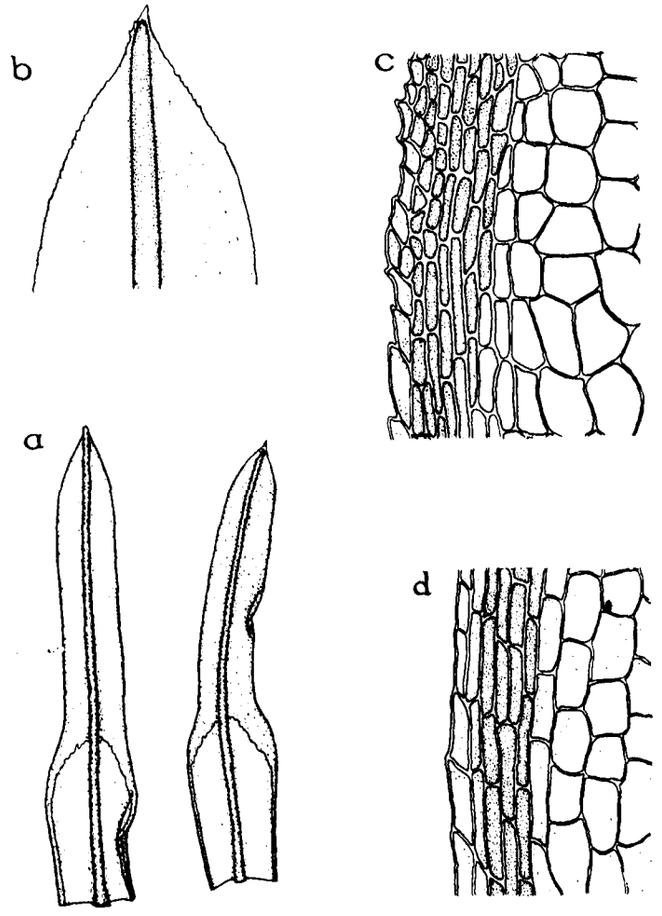


Fig. 3. *Calymperes rupicola* P. W. Richards. a, leaves (× 15) ; b, apex of leaf (× 60) ; c, marginal cells of upper part of base of leaf (× 250) ; d, marginal cells of lower part of base of leaf (× 250).

rhomboidalibus, superne brevioribus more denticulorum prominentibus : *folia proboscidea* costa longe excurrente gemmis clavatis 4–6-cellulatis praedita. Cetera ignota.

Essequibo River : first falls, on dry gneiss rocks near the river, **357.**

A specimen communicated to me under the name of *C. Heribaudii* Paris et Broth. (Prov. Chirique, Panama, 1906, collector's name illegible [Heribaud?] : ex herb. New York Bot. Garden) is very close to and may be conspecific with this plant : it differs however in having less acuminate leaves, with the lamina about half the width and the sheathing base less serrulate. *C. Heribaudii*, though mentioned by Brotherus in the " Pflanzenfamilien ", ed. **2, 10,** 239, seems to be a *nomen nudum*.

C. Sprucei *Besch.*

Moraballi Creek : on trunk of tree, 4 ft. from the ground, opening in forest, 394 (in part).

Agrees well with the portion of the type specimen in Bescherelle's herbarium (Brit. Mus.).

Distr. Rio Negro (Brazil) (part of *Musc. Amaz. et And.* 20).

C. disciforme *C.M.—C. Wullschlaegelii* Lor.

Pomeroon River, *c.fr., Bartlett* 8674. Mazaruni River, *Bartlett* sine num. Georgetown : Botanic Garden, *Cleare*.

Distr. Surinam, French Guiana, Martinique, Florida.

C. lonchophyllum *Schwaegr.*

Moraballi Creek : on tree trunks in rain-forest, *c.fr.*, 91, 145, 437. Pomeroon River, *c.fr., Bartlett* 8050 ; Aruka River, *Bartlett* 8608.

Distr. Mazaruni River : near Marshall Falls, *Quelch*. Cuyuni River : vicinity of Kartabo, *Graham*, Bryologist, **36,** 65 (1933).

Eastern Brazil to West Indies.

Drepanophyllaceae.

Drepanophyllum fulvum *Rich.*

Moraballi Creek : on trunk of *Miconia Plukenetii* Naud. and neighbouring rotten trunk, 263 ; trunk of small tree in Greenheart forest, 743.

Distr. Demerara, *Parker* in Brit. Mus. Herb., also " ex herb. *Arnott* ", Mitten, Musc. Austr. Am., 318.

Amazon to West Indies.

Orthotrichaceae.

Macromitrium mucronifolium (*Hook. et Grev.*) *Schwaegr.*

Moraballi Creek : branches of tree, about 130 ft. from ground, Mora forest, *c.fr.*, 647 ; on tree, 90 ft. from ground, Morabukea forest, *c.fr.*, 810. Essequibo River : dry gneiss rocks at first falls, 356. Bartica-Potaro Road, 82 miles, on branch of tree in *Dicymbe* forest, *Tutin* 269 (in part).

Distr. Roraima Range, 3500 ft., *McConnell and Quelch* 544. Cuyuni River : Matope Falls, on rocks, *Graham*, Bryologist, **36,** 66 (1933).

Tropical South and Central America, West Indies, Florida.

M. laevifolium *Mitt.*

Moraballi Creek : on upper branch of fallen tree, *c.fr.*, 287 ; 70 ft. from ground on tree in Wallaba forest, *c.fr.*, 436. Bartica-Potaro Road, 82 miles, on branch of tree in *Dicymbe* forest, *c.fr.*, with the last species, *Tutin* 269 (in part).

Distr. Guiana, *Schomburgk* 680.

Rio Negro (Brazil and Venezuela).

M. pentastichum *C.M.—M. pentagonum* C. M. Malpighia, **10, 513** (1896).

Moraballi Creek : on upper branches of dead Mora tree, *c.fr.*, 3 ; branches of Mora tree, 130 ft. from ground, *c.fr.*, 276.

Distr. Mazaruni River : near Marshall Falls, *Quelch* (ex herb. Levier No. 1279) part of type of *M. pentagonum* C.M.)

Surinam, French Guiana, Ecuador, Bolivia, Mexico, West Indies.

I am unable to find any characters separating *M. pentagonum* C.M. from *M. pentastichum*.

Schlotheimia Sprengelii *Hornsch.*

Moraballi Creek : on tree, 106 ft. from ground, rain-forest, *c.fr.*, 240.

Distr. Eastern Brazil, Bolivia.

Rhacopilaceae.

Rhacopilum tomentosum (*Hedw.*) *Brid.*

Potaro River : Kaieteur Falls, shady boulders in the gorge, alt. *c.* 300 ft., *c.fr., Tutin* 537 and 539.

Distr. Tropical and subtropical America.

Fontinalaceae.

Hydropogonella gymnostoma (*Bry. Eur.*) *Card.* forma nov. **obtusifolia** *P. W. Richards.*

A typo differt foliis angustioribus plerumque obtusis.

Cuyuni River : Camaria Falls, on twigs of shrubs and small trees on rocky islets in river, with ♀ flowers, 845 (type).

Distr. Venezuela : Delta of the Orinoco, near Manaos, *c.fr., Rusby and Squire* 452. The typical form has been recorded from British Guiana and Matto Grosso (Brazil).

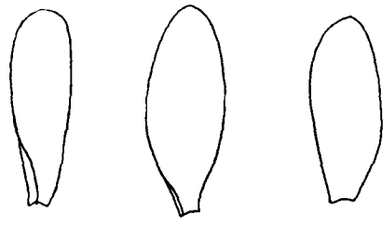


Fig. 4. *Hydropogonella gymnostoma* (Bry. Eur.) Card. forma *obtusifolia* P. W. Richards. Leaves (× 15).

The narrow, not at all acuminate, leaves of this form give it an appearance somewhat different from that of the type ("Guiana Anglica", *Schomburgk*), but careful examination shows that the Cuyuni plant has a few acuminate leaves and the type a few narrow obtuse ones. The obtuse-leaved form therefore may represent only a habitat modification or even a seasonal state.

METEORIACEAE.

Meteoriopsis patula (*Hedw.*) *Broth.*—*Meteorium viridissimum* C.M. Malpighia, **10**, 514 (1898).

Moraballi Creek : very common on twigs of undergrowth trees, especially on Mora forest, but rarely fruiting, 106, *c.fr.*, 783. Pomeroon River, *Bartlett* 8680.

Distr. Demerara, ex herb. *Lyon*, Brit. Mus. Herb., also *Appun* 405. "Massarouni" [Mazaruni River], *Appun* 127. "Orourou Maballi or Great Falls of the Demerary", *Appun* 402. Mazaruni River : near Marshall Falls, *Quelch* (part of type of *Meteorium viridissimum* C.M.).

Tropical South and Central America, West Indies.

I can find no differences between *M. viridissimum* (C.M.) Broth. and normal specimens of *M. patula*.

NECKERACEAE.

Neckeropsis undulata (*Hedw.*) *Reichdt.*

Moraballi Creek : frequent on trees, but almost confined to Mora forest, *c.fr.*, 59. Cuyuni River : near Akaio Landing, on small trees in swampy secondary forest, *c.fr.*, 828.

Distr. Tropical and subtropical America.

N. disticha (*Hedw.*) *Fleisch.*

Cuyuni River : near Akaio Landing, on shrubs and stones on river bank, 848.

Distr. Tropical and subtropical America.

PILOTRICHACEAE.

Pilotrichum scabridum *Broth.* Hedwigia, **45**, 279 (1906).

Moraballi Creek : on upper branches of tall trees and on undergrowth trees, rain-forest, widespread, but everywhere in small quantity, 60, 128, 160 and 243. Cuyuni River : Oko Creek, on small tree in Mora forest, *Tutin* 320.

Distr. Rio Madeira (Brazil), *Ule* 2348.

The Guiana specimens agree perfectly with the part of the type gathering in Kew Herb., except that the margin of the leaves is entire instead of denticulate and plane instead of usually narrowly revolute. No. 705 (Amazon) and part of No. 703 (Santarem) of the *Musc. Amaz. et And.* also appear to belong to this species.

P. bipinnatum (*Schwaegr.*) *Brid.*

Moraballi Creek : on small trees in rain-forest, common, *c.fr.*, 57. Macouria River, *Jenman* 2334. Demerara River, *c.fr.*, Jenman

Herb. 7854. Cuyuni River, *c.fr.*, *Bartlett* 8378. Pomeroon River, *c.fr.*, *Bartlett* 8048. Waini River : Short Cut, *Becket* 8528. Berbice River : Yawakuri, *Abraham* 227. Cuyuni River : Akarabisi Creek, on small tree in Mora forest, *c.fr.*, *Tutin* 451.

Distr. Various unlocalized gatherings from British Guiana, *Schomburgk* and *Appun* in Kew Herb., *Pearce* in Herb. H. N. Dixon. Potaro River : Kaieteur Savannah, *Jenman* sine num. Roraima Range, 3500 ft., *McConnell and Quelch* 548. Pomeroon River : Kamwatta, *Hohenkerk* in Brit. Mus. Herb. Cuyuni River : vicinity of Kartabo, *Graham*, Bryologist, **36**, 66 (1933).

Tropical South and Central America, West Indies.

HOOKERIACEAE.

Callicostella rufescens (*Mitt.*) *Jaeg.*

Moraballi Creek : on small tree and on rotten log in forest, *c.fr.*, 259 (in part).

Distr. Surinam, Pará (Brazil), Ecuador, Trinidad.

var. nov. **demerarae** *P. W. Richards.*

A typo differt, *colore* viridi haud fuscescente, *foliis* brevioribus minus acuminatis, cellulis brevioribus apicem versus 4–6 μ latis, 8–16 μ longis, *floribus* dioicis.

Moraballi Creek : at base of large tree in Wallaba forest, *c.fr.*, 524 (type) ; with the typical form, *c.fr.*, 259 (in part) ; 430.

No. 259 agrees well with Mitten's description of *C. rufescens* and with Spruce's specimens from Pará (*Musc. Amaz. et And.* 629). The plant here described as var. *demerarae* would at first sight appear to be a distinct species, but one of the specimens of *Musc. Amaz. et And.* 629 which I have examined (that in the Cambridge University Herbarium) seems clearly to be dioicous and on some branches of the same specimen the leaves distinctly approach the var. *demerarae* in shape and areolation. The variety also shows traces of the reddish-brown colouring on leaves and branches here and there.

C. aspera (*Mitt.*) *Jaeg.*

Moraballi Creek : fallen tree trunk in forest, *c.fr.*, 218 ; on stones in forest, *c.fr.*, 769 .

Distr. Amazon, Venezuela, Ecuador, Trinidad.

Hookeriopsis Parkeriana (*Hook.*) *Jaeg.*—*Hookeria Goebelii* C.M. Flora, **83**, 335 (1897). *Hookeria Roraimae* Broth. Trans. Linn. Soc. Bot. 2nd ser. **6**, 92 (1901). Synonyms *fide* Brotherus, Pflanzenfam. ed. 2, **11**, 243 (1925).

Moraballi Creek : frequent on small trees in all types of forest, *c.fr.*, 61, 86, 111, 348, 514. Cuyuni River, *Bartlett* 8158. Aruka River, *Bartlett* 8611. Bartica-Potaro Road : 82 miles, in *Dicymbe* forest, *Tutin* 259.

Distr. Guiana, *Schomburgk* in Kew. Herb. British Guiana, *Drake*

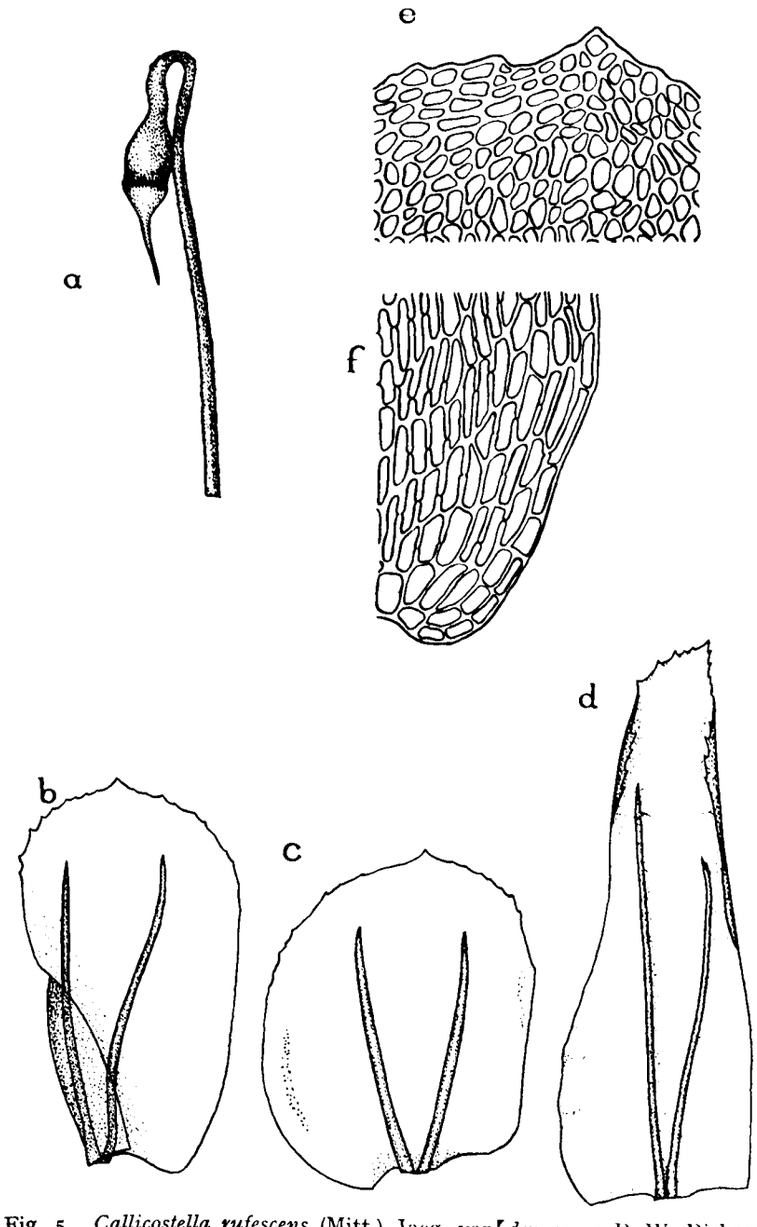


Fig. 5. *Callicostella rufescens* (Mitt.) Jaeg. var. *demerarae* P. W. Richards. a, capsule (× 15); b, lateral leaf (× 60); c, dorsal leaf (× 60); d, perichaetial leaf (× 60); e, cells at apex of leaf (× 250); f, cells at base of leaf (× 250).

in Kew. Herb. Asabaroo Creek, *Appun* 994. Cako Creek, *Appun* 1084. Parima River [Barima?], *Goebel*, Flora, **83**, 1897, p. 335 (type of *Hookeria Goebelii* C.M.). Potaro River: Kaieteur Savannah, *Jenman* sine num. in Kew Herb. Roraima Range, 3500 ft., *McConnell and Quelch* 490 and 550 (syntypes of *Hookeria Roraimae* Broth.).

Eastern Brazil to Barbados.

H. crispa (*C.M.*) *Jaeg.*

Moraballi Creek: rotten logs in forest, rather rare, 163 and 469. Both these specimens are dioicous.

Distr. Roraima, *c.fr., im Thurn* 123.

Tropical South America, Costa Rica, Trinidad.

Lepidopilum subenerve *Brid.*

Moraballi Creek: frequent on undergrowth trees, especially in Mora forest, absent in Wallaba forest, *c.fr.*, 88, 104, 121, 237, 288 295, 308, 520.

Distr. Guiana, *Appun*, Mitten, Musc. Austr. Am. 383.

French Guiana, Venezuela, Colombia, Ecuador, Mexico, West Indies.

L. radicale *Mitt.*

Moraballi Creek: on twigs of undergrowth trees in swampy Mora forest, 495.

Distr. Rio Negro (Brazil), Colombia, Ecuador, Peru, West Indies.

L. portoricense (*C.M.*) *Broth.*—*L. cubense* Mitt., non *Hookeria cubensis* Sull. *Crossomitrium portoricense* C.M.

Moraballi Creek: tree trunk, 3 ft. from ground, moist forest, with female flowers and young fruit, 321; on wood submerged in small forest stream, with male flowers, 322; large form—on twigs of shrubs in swamp forest, with female flowers and one young fruit, 309.

Distr. Cuba, Porto Rico.

The type material of this species, part of which is at Kew (Aybonito, Porto Rico, *Sintenis* F 62), consists of sterile female plants only: the following particulars may therefore be added to Müller's description:—

Dioicous. Male flowers bud-like, very numerous, the bracts narrowed to fine subulate points from an ovate sheathing base. Seta 1–1·5 cm. long, pale orange, quite smooth. Calyptra with a few scattered hairs.

I have credited this species to Cuba on the strength of *Wright* 85 in the Kew and Brit. Mus. herbaria. This gathering is the type material of *Hookeria cubensis* Sull., but consists of two distinct species, *viz.* (i) a fertile plant with rough seta and tufts of rhizoids at the apex of the leaves, (ii) a sterile female plant with differently shaped leaves without rhizoids at their apices, but with brood-filaments in their axils. Mitten, in Musc. Austr. Amer. 385, described a new species *Lepidopilum phyllorhizum* based on part of *Wright* 85 and his description clearly applies to (i). Sullivant's diagnosis of *H. cubensis* (Proc. Amer. Acad., **5**, 285: 1861) is so

vague that it will apply to both (i) and (ii) as far as the gametophytes are concerned, but since it includes a description of the fruit it must be held to apply to (i) only and the name *Lepidopilum phyllorhizum* Mitt. should therefore be treated as a synonym of *L. cubense* (Sull.) Mitt.

In Musc. Aust. Amer. 384, Mitten also describes a sterile plant under the name of *Lepidopilum cubense* (Sull.) Mitt., quoting *Wright* 85. The description is vague and very brief, but the plant meant was presumably (ii). As, for the reason just given, the name *cubense* belongs to (i), some other name must be found for (ii). I have compared (ii) with Sintenis' plant from Porto Rico and, though there are some slight differences between them, I have no doubt they are conspecific: the sterile plant in *Wright* 85 should therefore be called *Lepidopilum portoricense* (C.M.) Broth.

Brotherus in Pflanzenfam., **11**, ed. 2, 247, observes under *L. portoricense*, "Mit dieser Art stimmt *L. cubense* Sull., Kuba, in Tracht und Blattform vollkommen überein, es ist mir jedoch am spärlichen Materiale nicht gelungen, Brutfäden zu entdecken." Evidently he must have seen a sample of *Wright* 85 consisting of (ii) only, on which, as is the case on some stems, the brood-filaments were not present.

My No. 309 differs rather markedly from Nos. 321 and 322 in the greater robustness, more wide-spread red colour, the leaves longer and more strongly dentate, with longer and stronger nerves and narrower cells, also in the absence of brood-filaments: it may perhaps be a distinct variety or even species, but for the present I prefer to consider it a robust form of *portoricense*.

L. flexifolium (*C.M.*) *Mitt.*

Moraballi Creek: occasional on undergrowth trees, Mora and Morabukea forest only, *c.fr.*, 62, 84, 522, 601, 645. Cuyuni River: near Akaio Landing, on branches of small trees in swampy secondary forest, *c.fr.*, 826.

Distr. Guiana, *Appun*, Mitten, Musc. Austr. Am., 375.
Tropical South America, West Indies.

Crossomitrium sp.

Moraballi Creek: on leaves of *Carludovica* sp. in swampy Mora forest, *c.fr.*, 107. Cuyuni River: Akarabisi Creek, alt. *c.* 300 ft., epiphyllous on seedlings of *Mora excelsa* Bth., *c.fr.*, *Tutin* 449.

Until this genus is revised, no purpose can be served by attempting to give specific identifications. No. 107 comes nearest to specimens named by Mitten *Lepidopilum Patrisiae* Brid. *Tutin* 449 is very like the type gathering of *C. Spruceanum* C.M.

Thamniopsis Killipii (*Williams*) *Williams MS.—Hookeriopsis Killipii* R. S. Williams, Bryologist, **22**, 62 (1925).

Moraballi Creek: on rotting logs, frequent, *c.fr.*, 92, *det.* R. S. Williams, 284, 464.

Distr. Colombia: Cordoba, Department of El Valle, *Killip* 5246, Williams, *loc. cit.*

Harpophyllum aureum (*P. de Beauv.*) *Spruce.*

Demerara River, *c.fr.*, Jenman Herb. 7859.

Distr. Guiana, Ecuador, Central America, West Indies.

LEUCOMIACEAE.

Leucomium connexum *Ren. et Card.*, Bull. Soc. Bot. Belg. **41**, 113 (1902-3).

Moraballi Creek: rotten wood in Wallaba forest, *c.fr.*, 497, *det.* R. S. Williams; on tree trunk, *c.* 3 ft. from the ground, swampy Mora forest, *c.fr.*, 110.

Distr. Porto Rico, *Heller*, Ren. et Card., *loc. cit.*

L. compressum *Mitt.*

Moraballi Creek: rotten log in Morabukea forest, in deep shade, *c.fr.*, 89. Cuyuni River: Akarabisi Creek, alt. *c.* 300 ft., on rotting log, *c.fr.*, *Tutin* 452.

Distr. Amazon, Ecuador, Peru, Trinidad, Tobago.

THUIDIACEAE.

Thuidium antillarum *Besch.*

Demerara River, Jenman Herb. 7862. Potaro River: Kaieteur Fall, shady boulders in the gorge ½ mile below the fall, *Tutin* 538.

Distr. Roraima Range, 3500 ft., *McConnell and Quelch* 549.
Brazil, Bolivia, Central America, West Indies.

PLAGIOTHECIACEAE.

Pilosium flaccisetum *C.M.*

Moraballi Creek: common on rotten logs and tree bases in forest, also on stones and sandy banks, *c.fr.*, 87, 190, 463. Demerara River, Jenman Herb. 7866. Berbice River: Yawakuri, on wet and rotting wood, *c.fr.*, *Abraham* 220.

Distr. Amakooroo [Amakura?] River, *Goebel*, Flora, **83**, 339 (1897).
Bolivia.

This species does not seem to be distinguishable from *P. Cruegerianum* C.M. (a prior name), but the material of the latter which I have seen is insufficient to decide.

SEMATOPHYLLACEAE.

Rhaphidorrhynchium subsimplex (*Hedw.*) *Broth.*

Moraballi Creek: very common on tree trunks and fallen logs, especially in Wallaba forest and other well-illuminated places, *c.fr.*, 207, 271, etc., very variable in size and appearance. Berbice River: forest belts, on edges of leaves, *Abraham* 265; Eberoabo Creek, on decaying Wallaba trees, *Abraham* 139. Bartica-Potaro Road: 82 and 84 miles, *c.fr.*, *Tutin* 199 and 285.

According to a note attached to the two specimens of Abraham, this moss is called Adabara by the Arawak Indians and is used by them when burnt to ashes as a medicine for cuts and bruises.

Distr. British Guiana, *Schomburgk* 608 in Brit. Mus. Herl *Appun* 725, 815 and 901. Mazaruni River: near Marshall Falls, *Quelch* in Kew Herb. (ex. herb. *Levier* 1269). Cuyuni River: vicinity of Kartabo, *Graham*, Bryologist, **36,** 67 (1933).

Tropical South and Central America, West Indies.

Sematophyllum caespitosum (*Hedw.*) *Mitt.*

Moraballi Creek: submerged logs in creek, *c.fr.*, 406, 748.

Distr. Guiana, *Parker.*

Widespread in the tropical and southern subtropical zones.

S. loxense (*Hook.*) *Mitt.*

Moraballi Creek: twigs of tree, 75–80 ft. from ground, *c.fr.*, 441.

Distr. Cuyuni River: vicinity of Kartabo, *Graham*, Bryologist, **36,** 67 (1933).

Tropical South America.

S. subpinnatum (*Brid.*) *E. G. Britton.*—*S. Kegelianum* (C.M.) Mitt. *Rhaphidorrhynchium flexuosum* Mitt. in sched.

Moraballi Creek: Mixed forest, on branches of tree 81 ft. from ground, *c.fr.*, 538.

Distr. Guiana, *Parker*, Mitten, Musc. Austr. Am., 486.

Tropical South America, West Indies.

The name "*Rhaphidorrhynchium flexuosum* Mitt." appears on the labels of *Musc. Amaz. et And.* 980–3 (Kew set) and in Spruce's "Catalogue," but the name is not given, nor are these specimens quoted by Mitten in Musc. Austr. Am. The specimens however are undoubtedly a form of *S. subpinnatum.*

Acroporium pungens (*Hedw.*) *Broth.*

Cuyuni River, *c.fr.*, *Bartlett* 8086, 8090 (in part) and 8635.

Distr. British Guiana, *Appun* 404. Mazaruni River: near Marshall Falls, *Quelch* (ex. herb. *Levier* 1289).

Tropical South and Central America, West Indies.

A. guianense (*Mitt.*) *Broth.*

Moraballi Creek: frequent on undergrowth trees, rarely on larger trunks, *c.fr.*, 105. Cuyuni River, *c.fr.*, *Bartlett* 8090 (in part).

Distr. Guiana, *Parker*, Mitten, Musc. Austr. Am., 479.

Parā (Brazil).

Trichosteleum papillosum (*Hornsch.*) *Jaeg.*

Moraballi Creek: chiefly on rotten logs, not uncommon, *c.fr.*, 195, 479, 745, 791. Pomeroon River, *Bartlett* 8049.

Distr. Surinam, Brazil.

Potamium vulpinum (*Mont.*) *Mitt.*

Essequibo River: first falls, on rocks and branches of trees on river bank, 360. Cuyuni River: Camaria Falls, on branches of small trees on islets, *c.fr.*, 847; Akaiwang Falls, *c.fr.*, *Bartlett* 8279. Potaro River: Kaieteur Falls, *Tutin* sine num.

Distr. French Guiana, Rio Negro (Brazil), Orinoco Basin.

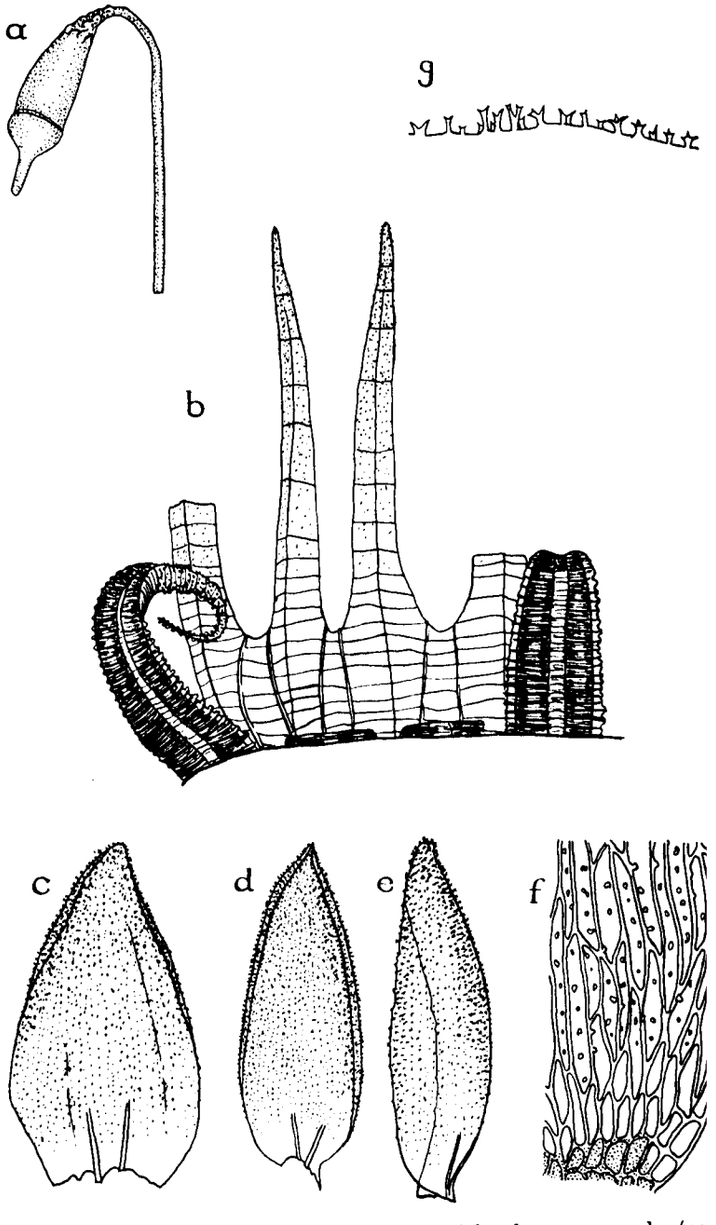


Fig. 6. *Pseudohypnella guianensis* P. W. Richards. a, capsule (× b, part of peristome (× 250); c, stem leaf (× 60); d, branch leaf (× e, branch leaf in side view (× 60); f, cells at angle of leaf (× 250 papillae near apex of leaf in profile (× 250).

Taxithelium planum (*Brid.*) *Mitt.*

Moraballi Creek : very common, *c.fr.*, 371, 425, 482, 501. Cuyuni River : Kartabo Point, sandy beach and trunks of trees on river bank, *c.fr.*, 835 ; Camaria Falls, on small trees in river, *c.fr.*, 850. Demerara River, Jenman Herb. 7856. Bartica-Potaro Road : 82 miles, in *Dicymbe* forest, *c.fr.*, *Tutin* 257.

Distr. Unlocalized gatherings from British Guiana, *Parker, Drake, Appun* 665 and 810, in Kew. Herb. Mazaruni River : earn Marshall Falls, *Quelch* in Kew Herb. (ex. herb. *Levier* 1270) : Penal Settlement, *Graham*, Bryol. **36,** 67 (1933). Cuyuni River ; Matope Falls and vicinity of Kartabo, *Graham, loc. cit.*

Tropical South and Central America, West Indies.

Nos. 835 and 850 are a large aquatic form differing widely from the forest form in general habit, in the less complanate branches, more obtuse leaves, etc. *Musc. Amaz. et And.* 953 (labelled *Taxithelium concavum* Hook. in Kew Herb.) is a similar aquatic form.

Pseudohypnella guianensis *P. W. Richards*, sp. nov. Theca minore, haud turgida, peristomio ciliis nullis, operculo rostro subulato instructo, seta breviore, a *P. verrucosa* (Doz. et Molk.) Fleisch. facile distinguenda, praeter fructum satis similis.

Planta statura quam *P. verrucosa* paulum minor : *caespites* lati, depressi, madore laete pallide virides, siccitate albescentes, nunquam nitidi. *Caulis* ruber, repens, irregulariter pinnatim ramosus, 2–3 cm. longus, *ramis* ad 0·5 cm. longis plerumque simplicibus. *Folia* quam in *P. verrucosa* angustiora, undique laxe imbricata, *caulina* late ovata basin versus paulum contracta, 0·6–0·8 mm. longa, 0·3–0·4 mm. lata, nonnunquam parum plicata, valde concava, apice subcucullata, acutiuscula vel obtusa, plerumque recurvata, margine inferne integerrima superne papillis prominentibus denticulata, costis indistinctis vix $\frac{1}{3}$ folii attinentibus, *ramea* 0·65–0·85 mm. longa, 0·3–0·4 mm. lata, magis uniformia, apice semper recurvata ; *cellulae* foliorum angustissimae, subtiliter curvatae, 4–5 μ latae, 60–80 μ longae, basin versus laxiores, basilares ad 10 μ latae, omnes utrinque praeter foliorum basin papillis numerosis praeditae ; papillae ad 12 μ longae, saepissime bifidae vel trifidae.

Autoica. Bracteae florum masculorum internae ovato-acuminatae, acutae, laeves vel superne papillosae, externae foliis caulinis similes. *Folia perichaetialia* acuminata, superne papillis longissimis numerosissimis obtecta, ceterum foliis rameis similia.

Seta 1–1·5 cm. longa, laevis, rubella. *Theca* circiter 0·7 mm. longa, 0·5 mm. lata, angusta, haud turgida, latitudinem maximam ore attingens, ad collum sensim attenuata : collum et saepe etiam seta superne grosse mamillosum : *operculum* hemisphaericum, rostro subulato circiter 0·3 mm. longo : *peristomii dentes* externi fulvi, minute striati, lamellis multis confertis, superne papillosi, externe longitudinaliter sulcati, interni flavi vel hyalini ; cilia nulla. *Sporae* virides, laeves, 7–10 μ diam.

Moraballi Creek : on log in Wallaba forest, *c.fr.*, 407 (type). Berbice River : Yawakuri, on decaying tree trunks, *c.fr.*, *Abraham* 221.

The only species of the genus known hitherto is found in the Eastern Tropics. Mr. H. N. Dixon has kindly sent me the following note on the new species : " The geographical distribution is very remarkable, but the gap is to some extent bridged if *Taxithelium truncatum* Broth. (*Homalia truncata* Welw. & Duby) from Angola is included in the genus, as it seems to me to have a good title to be ; as the sporophyte is much more like yours, with rostrate lid. The only real difference is that the large bifid papillae are hardly shown, though the marginal papillae are sometimes bifid.

" On the other hand if this species is transferred to *Pseudohypnella* there is the question of the other species of *Taxithelium* § *Limnobiella* (or *Collophyllum*) which are near *truncatum* but much further from *P. verrucosa*."

In any case, Fleischer's reasons for placing *Pseudohypnella* in the *Hookeriaceae* are insufficient : its nearest allies would seem undoubtedly to be the genus *Taxithelium* in the *Sematophyllaceae*.

HYPNACEAE.

Ectropothecium apiculatum (*Hornsch.*) *Mitt.*

Moraballi Creek : on rotten log in Mora forest, *c.fr.*, 646.

Distr. Tropical South and Central America, West Indies.

Vesicularia vesicularis (*Schwaegr.*) *Broth.* var. **amphibola** (*Spruce*) *R.S. Williams*, comb. nov. *Ectropothecium amphibolum* Spruce ex Mitt.

Cuyuni River : near Akaio Landing, in bed of small dried-up stream in forest, 823.

Distr. Tropical South America, West Indies.

Rhacopilopsis trinitense (*C.M.*) *E. G. Britton et Dixon.*—*R. Pechuelii* (C.M.) Card.

Moraballi Creek : Mora and Morabukea forest, not common, 241, 377, 692.

Distr. British Guiana, *Appun* sine num.

French Guiana, Trinidad, Tropical Africa, Madagascar.

REFERENCES.

1. DAVIS, T. A. W. and RICHARDS, P. W. " The vegetation of Moraballi Creek, British Guiana : an ecological study of a limited area of tropical rain forest." Parts 1 and 2. *Journ. of Ecol.* **21,** 350–384, (1933) ; **22,** 106–155 (1934).
2. MITTEN, W. " Musci austro-americani." *Journ. Linn. Soc. Bot.* **12,** 1869.
3. MITTEN, W. *Musci* in " The Botany of the Roraima Expedition of 1884." by E. F. im Thurn. *Trans. Linn. Soc. Bot.* 2, ser. 2, 296–297 (1887).
4. MÜLLER, C. " Musci nonnulli novi Guianae anglicae." *Malpighia,* **10,** 512–520 (1896).
5. MÜLLER, C. " Musci Venezuelenses novi. " *Flora,* **83,** 327–341 (1897).
6. BROTHERUS, V. F. *Musci* in " Report on two botanical collections made by Messrs. F. V. McConnell and J. J. Quelch at Mount Roraima in British Guiana." by N. E. Brown and others. *Trans. Linn. Soc. Bot.* ser. 2, **6,** 88–93 (1901).
7. GRAHAM, E. H. " Bryophytes of the Kartabo Region, British Guiana." *Bryologist,* **36,** 59–67 (1933).

XLII—MISCELLANEOUS NOTES.

GEORGE THORNCROFT.—We record with regret the death of Mr. George Thorncroft at Barberton, Transvaal, on July 19th, 1934, in his 77th year.

Mr. Thorncroft developed his early love of flowers after settling in South Africa, about the year 1881, and it was mainly during his residence at Barberton, from 1886 to 1892 and then from 1902 until his death, that he devoted himself so successfully to the study of the local flora.

He was greatly encouraged in his botanical work by the late Dr. J. Medley Wood of Durban, to whom he sent the bulk of his collections. He was a self-taught botanist and acquired a wide knowledge of species, and he was quick to recognise a new plant. One of his most interesting discoveries was a Labiate, which proved to be a new genus, and was named *Thorncroftia* in his honour by Dr. N. E. Brown (Bot. Mag. t. 8824). This he found in the mountains near Barberton in April, 1911, and from plants grown at the Cambridge Botanic Garden by Mr. Irwin Lynch, with whom he corresponded frequently, the Botanical Magazine figure was prepared.

He was particularly interested in succulents, and sent home many living plants of Ceropegias, Euphorbias, etc., both to the late Mr. Walter Ledger and also to Kew and to Cambridge.

In 1931, not long after meeting me at Durban, he collected seed of *Streptocarpus Dunnii*, at my request, and sent it to Kew, thus re-introducing this interesting species which had been lost to cultivation for many years since its original introduction by Mr. E. J. Dunn.

His collection amounted to some 4000 specimens which he sent to the principal South African herbaria; many were also received at Kew either direct from him or through the kindness of Dr. Medley Wood. In addition to the new genus, his name is perpetuated in the specific names of several of the new plants he discovered.

A. W. H.

ETHELBERT BLATTER.—It is with much regret that we record the death, at the early age of 57, of Father Ethelbert Blatter, S.J., at Poona on the 26th May, 1934. He had been ill for some years and was living at Panchgani, where he had been Parish Priest since 1925. His end was hastened by a riding accident in 1930 while on a botanical exploration in Waziristan.

Father Blatter was born in 1877 in the Swiss Canton of Appenzell and was educated at various schools in Switzerland. Later he pursued his studies at Jesuit Institutions in Austria, Holland and England. He first went to India in 1903 as Professor of Biology at St. Xavier's College in Bombay, of which college he became Principal in later years. He devoted himself mainly to botany, though he could have achieved distinction equally well in zoology or geology.

A very large amount of valuable botanical work came from his pen, which has been published chiefly in the pages of the "Journal of the Bombay Natural History Society," of which society he was a Vice-President, in the "Journal of Indian Botany," and in the "Records of the Botanical Survey of India." He worked for some time in the Kew Herbarium, principally on the flora of Aden and of Arabia, and had intended returning to continue his study of the latter but was prevented by illness. It is understood that his last work was the completion of his "Flora Arabica," the final part being now in the press.

A man of very genial disposition, his loss is mourned by a large number of devoted friends in all circles of society in India and elsewhere, and leaves a gap in the rank of botanists interested in the Indian flora that will be hard to fill.

C. E. C. FISCHER

S. K. MUKERJI. We have to record with regret the sudden death, following an operation for appendicitis, of Dr. S. K. Mukerji, M.Sc., D.Sc., F.L.S., Reader in Botany, University of Lucknow. Dr. Mukerji, though still a young man, had already carried out a considerable amount of valuable work in taxonomy, ecology and the exploitation of Indian medicinal plants. While working on the ecology of *Mercurialis perennis* he studied for a period in the Kew Herbarium. His early death will be a great loss to botanical science in India.

The Families of Flowering Plants: Volume II, Monocotyledons.*—Mr. Hutchinson's second volume dealing with the Monocotyledons has now been published. The families are arranged according to his new system based on their probable phylogeny, continuing the arrangement which he has worked out for the Dicotyledons. The volume is prefaced by the following foreword by the Director:—

> We have been awaiting with keen anticipation the completion of Mr. Hutchinson's work on the Families of Flowering Plants and are now able to offer him our congratulations on the appearance of his treatise on the Monocotyledons. The lapse of eight years since the "Dicotyledons" appeared has on the whole been of advantage, since it has allowed botanists time to study and digest the earlier volume and to realise that not only do they appreciate the value of his researches, but that they are also generally in agreement with his conclusions.
>
> This encouragement has naturally stimulated Mr. Hutchinson in the pursuit of his work on the Monocotyledons, in many ways a far more puzzling and involved division of the vegetable

* By J. Hutchinson, F.L.S. Macmillan & Co., Ltd., St. Martin's Street, London, W.C.2. Pp. xiii + 243, figs. 107 and maps. Price 20s. net.

kindom, and despite the many other calls upon his time he has been able to concentrate his attention on the numerous problems which a study of the Monocotyledons discloses. Perhaps the most spectacular result of his research is his treatment of the great agglomeration of genera, which up to the present have been assigned either to the *Liliaceae* or to the *Amaryllidaceae*. Mr. Hutchinson has boldly thrown aside the position of the ovary as the dominating character for separating these two families and, after careful consideration of all the evidence, he has been led to the view that much more weight should be attached to the type of inflorescence. He therefore places in the *Amaryllidaceae* all those genera which have an umbellate type of inflorescence, whether one- or many-flowered, accompanied by spathaceous bracts, a feature not met with in the true lilies. Thus *Agapanthus* and the Onions (*Allieae*), for example, despite their superior ovary, find themselves linked with the Crinums and Daffodils. Whether all botanists will agree as to the Onions or not, it is certainly usually somewhat of a shock to the " man in the street " that they may be allied either to Lilies or Daffodils !

Though the treatment of these two families may arouse some controversy among the more conservative taxonomic botanists, it is, I believe, generally felt that the present *Liliaceae* is not a very natural family. This revision of the two families, therefore, is all the more welcome.

It is pleasant to find that *Aspidistra*, beloved of Bayswater landladies, has at last received the scientific distinction which apparently it deserves. For it bears on its shoulders the *Arum* family, which is considered to be the culmination of the phylogenic line *Liliales-Aspidistreae-Arales :*

Per Aspidistra ad Astra !

As in the previous volume, there is a very useful key to the families, but in this one Mr. Hutchinson has performed a signal service by drawing up keys to the genera of most of the families, thus adding greatly to the value of the work and making it a " Genera Plantarum " in miniature for the Monocotyledons.

Another new departure, which has important phylogenetic bearings, is the separation of the petaloid Monocotyledons into two groups, one designated *Calyciferae*, with a separate calyx and corolla, emphasising the close relation of this group to the Ranalean Dicotyledons ; a fact also indicated by the numerous examples of apocarpous ovaries met with in the group.

Mr. Hutchinson is fortunate in having had the assistance of Mr. J. E. Dandy in connection with the *Hydrocharitaceae*, and of Mr. V. S. Summerhayes and Mr. C. E. Hubbard with the Orchids and Grasses respectively. The account of the *Gramineae* is particularly useful, since it is accompanied by drawings, prepared by Mr. Hubbard, of the floral details of all the tribes.

As in the previous volume, much has been pulled down, but the old materials have been rebuilt into a new edifice in harmony

with the spirit and design of the great work of Bentham and Hooker.

In commending this interesting volume to the careful consideration of my botanical colleagues, may I do so again in the words of Horace, " *Disce docendus adhuc, quae censet amiculus.*"

ARTHUR W. HILL

ROYAL BOTANIC GARDENS, KEW
April 1934

It is gratifying to learn from the above spirited foreword that botanists have not only appreciated but are now in general agreement with Mr. Hutchinson's views on the classification of Dicotyledons as expressed in his first volume of " The Families of Flowering Plants " published eight years ago. He then took the line that the most primitive flowers are *hermaphrodite*, possessing the full complement of parts with the members of each category (perianth segment, stamen and carpel) not definitely fixed in number, spirally arranged on a conical receptacle and free from one another. Consequently such families as the *Magnoliaceae* and *Ranunculaceae* appear at the base of his phylogenetic tree. This is in direct opposition to Engler and Prantl's system which commences the Dicotyledons with *unisexual* flowers of few parts, such as are to be found in the catkin-bearing trees (the *Amentiferae*). The Englerians have regarded these flowers as *primitively simple* and may, in some quarters, still do so. Hutchinson and his school, on the contrary, look upon them as *simplified* through extreme reduction.

Engler similarly begins the Monocotyledons with flowers of this type, such as occur in the reedmace (*Typha*) and the screw pine (*Pandanus*). Hutchinson naturally regards these also as greatly reduced and so advanced from the evolutionary standpoint. As a basis for his phylogenetic classification he looks instead for hermaphrodite flowers with as little modification and definiteness in their parts as possible. He finds these in the *Butomaceae* and the *Alismataceae*, and considers the resemblance their flowers bear to those of the Ranalian families to be a sign of real affinity and not merely one of parallel development. For instance, except for the presence of only a single cotyledon and the absence of endosperm in the ripe seed, the flower of *Butomus* differs little in structure from that of *Cabomba*, and the flower of *Ranalisma* from that of *Ranunculus*. Consequently Hutchinson seeks for the origin of the Monocotyledons in what has been called the Ranalian plexus.

It is now, I think, generally agreed that the Monocotyledons had Dicotyledonous ancestors, and it has even been suggested that they have had a two-fold origin from these. An attempt has been made to derive the Arum family (*Araceae*) from the peppers (*Piperaceae*). Hutchinson examines this idea only to reject it, favouring a monophyletic origin for the whole group. He sees in *Aspidistra*, as Sir Arthur humorously points out, the source of the *Araceae*.

It is unnecessary to draw attention to the main original features of this new arrangement of the Monocotyledons, as these are commented upon in the above foreword. From a glance at the attempted scheme to link together all the orders into one phylogenetic tree (p. 7), the position assigned to the *Zingiberales* (*Scitamineae*) is perhaps the least convincing. Though we are prepared to see no close relationship between this order and the orchids — merely in fact a certain parallelism—its *direct* derivation from such a specialised group as the Bromeliads seems a little forced. No mention is made of the presence of perisperm in the ripe seed of the *Zingiberales* ; but perhaps the author uses the term endosperm in a wide sense to cover all storage tissue in the seed external to the embryo itself.

Not only is the volume before us replete with information and suggestiveness, but owing to its numerous illustrations it may be deemed a work of art, and not least so in the floral design which embraces the graceful dedication to Agnes Arber of Cambridge. As in the previous volume dedicated to the memory of Bentham and Hooker, Mr. Hutchinson deftly weaves into the design his phylogenetic views, placing the primitive flowers at the base and then gradually leading up to the most advanced at the top with the orchid as representing the most evolved insect-visited flower and the grass as the most specialized for wind-pollination.

By the completion of " The Families of Flowering Plants " Mr. Hutchinson has opened a new chapter in systematic botany. Though old systems die hard, and it may be some time before his permeates the botanical world generally, yet English botanists should welcome it gladly. We have never taken kindly to the system of Engler and Prantl. That of Bentham and Hooker founded on the system of De Candolle is long out of date. It is really pre-Darwinian and so not phylogenetic ; though as it happens Hutchinson's new system is less a break-away, at any rate as regards the Dicotyledons, from that of Bentham and Hooker than from that of Engler and Prantl ; and it is fitting that it should be so.

J. PARKIN.

Michel Adanson.*—Professor Chevalier has performed a signal service in writing a short history of the life and work of Michel Adanson (1727–1806), traveller, naturalist and philosopher, whose name is remembered in the latin name of the baobab tree (*Adansonia*), which Linnaeus named in his honour. When he was only thirteen he compiled a catalogue of the plants (more than 5000), cultivated in the Royal Garden at Paris. He studied works of natural history with avidity during the following years, and in 1748, when he was only 21, he was selected to go out to Senegal as Naturalist, to make an inventory of the natural resources of the colony. He sailed from France on this enterprise on March 3rd,

* Michel Adanson: Voyageur, Naturaliste et Philosophe, by Prof. Aug. Chevalier. Larose, Éditeurs, 11, rue Victor-Cousin, Paris. Pp. 172. Price not stated.

1749, and reached Senegal on April 25th. For the next four years and four months he remained in Senegal and investigated with the greatest assiduity the vegetation, the animals, the geology and geography of the region. During his stay he made large collections of both living and dried plants which he eventually brought home and then commenced his monumental work on the Natural History of Senegal. On his return to Paris, Louis XV gave him the title of " Botaniste Royal " and granted him leave to reside at Trianon, where he carried on his studies.

His narrative "A Voyage to Senegal, the Isle of Goree and the River Gambia," which was accepted by the Academy of Sciences in 1756, and translated into English and published in London in 1759, gives a most interesting account of his activities in Senegal and is well worthy of study. Adanson was a most exact and careful investigator, and carried out his travels and made his observations in the face of difficulties unknown to travellers of the present day.

At the age of 26 he was corresponding with Linnaeus, and in 1756 he presented to the Academy his Memoir on the baobab.

In 1757 he published the first volume of his " Natural History of Senegal" and as a result, at the age of 30, he was elected a member of the Academy of Sciences and also of the Royal Society of London.

Other important works which Adanson produced were his " Ordines naturales " (1753) and " Familles des Plantes " (1763). His large collections of Senegal plants, seeds, animals, minerals, etc., to the number of 5211 objects were handed over to the Cabinet of the Royal Garden in 1765, accompanied by a catalogue. For this gift he received a pension from the King.

His main occupation from 1765 to 1772 was to find a publisher for his " Natural History of Senegal," as the editor of the first volume had become bankrupt, but none could be found. Another piece of work, his " Histoire de la Botanique " to which he devoted much labour, was published from his MS. by Alexandre Adanson and J. Payer. This, though printed in 1847, did not appear until 1864.

With the death of Louis XV in 1774 his hopes of assistance vanished and he also had to leave Trianon. He had expected to succeed Buffon at the Royal Garden, but here again his hopes were frustrated, though the post had virtually been promised to him. During the rest of his life he lived in Paris making a few travels in search of plants and other natural history objects. He was occupied all this time in collecting information in every branch of natural history, with the object of compiling a vast " Encyclopaedia of Natural Science "—a work of huge proportions which has never been published. To this work he devoted all the remaining years of his life, becoming almost a hermit and seeing hardly anyone. Working unceasingly, he read and annotated every book bearing on the subject and amassed an extraordinary amount of material. He died a lonely and disappointed man, but his work on the flora, fauna and geography of Senegal is an enduring memorial which still compels our admiration.

Dr. J. Hutchinson.—We record with pleasure the conferment of the Honorary Degree of Doctor of Laws on Mr. John Hutchinson, Botanist in the Herbarium, by the University of St. Andrews on Tuesday, October 16th. The ceremony, at which the Director was present, took place on the occasion of the installation of the Right Hon. J. C. Smuts as Rector of the University. In presenting Mr. Hutchinson to the Chancellor of the University Mr. Stanley Baldwin—the Dean of the Faculty of Arts gave the following oration :—

" Mr. Hutchinson, whose career is itself a tribute to the system of promotion that prevails at Kew, is a botanist whose detailed work on the Families of Flowering Plants marks the end of an old, and the opening of a new chapter in British systematic botany. Four years after he entered Kew Herbarium he became assistant for Tropical Africa, and his devotion to African botany was pledged. Twice at the invitation of the Government he visited and explored the country, and on these journeys had with him as fellow traveller and collector a South African systematic botanist of no mean order—the Rector of St. Andrews. On the mountains at the southern end of Tanganyika they were fortunate to find a new species* of a genus known formerly only farther south ; and one of them gave to it the other's name. We congratulate them both to-day on adding simultaneously to their vasculums a northern specimen, which, if not exactly rare, for it is something of a hardy annual now, is still coveted by many, and not easy yet to come by—the *Doctoratus Andreensis utriusque legis.*"

General Smuts was similarly honoured with the Hon. LL.D. before he was installed as Rector.

* *Pteronia Smutsii.* Hutch.

BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1934
ROYAL BOTANIC GARDENS, KEW

XLIII PLANT-HUNTING IN ALASKA.

ISOBEL W. HUTCHISON.

The territory of Alaska is about one fifth the size of the United States. It stretches from the 51st to the 72nd parallel, its northern extremity, Point Barrow, lying in about the same latitude as Norway's North Cape, though the long arm of the Aleutian Peninsula, stretching nearly to Japan, diverts the warm Japanese current southward to the shores of south-eastern Alaska and British Columbia, in which region, known as the " pan-handle," it profoundly modifies the climate. Between this region and the tundras bordering the Beaufort Sea—where the ground is constantly frozen to within about 1½ feet of the surface—Alaska possesses all varieties of climate from the sub-tropical to the arctic, and in my journey around its coasts in 1933 in search of plants and Eskimo curios, temperatures from 100 degrees Fahrenheit in the sun, to 92 degrees Fahrenheit below zero, were encountered. The diversity of plant-life is thus great.

Alaska, particularly in her coastal " pan-handle," is a land of berries. In an interesting report on the Indian villages of south-eastern Alaska, Mr. Herbert W. Krieger, of the United States National Museum, has some observations to make about them which are worth repetition :

" Berries constitute an important part of the native's food supply. No variety is cultivated, although a hardy variety of raspberry was introduced by the officers of the garrison formerly stationed at Fort Tongass when that place was the seat of a custom-house and the first port of call for American ships out of Seattle. This variety of raspberry is now cultivated in gardens at Ketchikan and is yielding large crops of berries. As a matter of record no plant other than a kind of wild tobacco (*Nicotiana attenuata* Torr. ex. S.Wats.) was formerly cultivated by the natives. To-day there is a plentiful supply of potatoes, turnips, and other vegetables cultivated in small gardens throughout the entire region.

" Berries grow wild in south-east Alaska in great abundance. There are currants, cranberries, salmonberries, strawberries, soapberries, huckleberries, and others. Huckleberries are preserved in oil. The soapberry is beaten into a cream resembling strawberry ice-cream.

" A variety of wild celery matures in May and is gathered by the natives. They peel off the outer skin and eat the inner stem as we do celery, but no salt is used. Salt appears not to have entered extensively in the list of native foods of Alaska before the days of the white man. Observations in the interior in the valley of the Yukon bear out this fact, as nowhere did the natives use salt either as a condiment or as a preservative. The inner white bark of young spruce trees or of the hemlock formed a considerable part of the food supply of the Haida and Tlingit. This was cooked. Scrapings of spruce bark were moulded into cakes and consumed later, together with oil as seasoning."

As my journey through Alaska began in June, and I left Nome, on the Seward peninsula, for Point Barrow in the first days of August, before the berries or seeds ripened, I had unfortunately no opportunity to taste any of these berries in a fresh state, but Nome housewives assured me they were delicious and much in use for preservation.

As far as my own observations went amongst the Eskimo population of arctic Alaska (where almost the only edible berries are the crowberry, *Empetrum nigrum* L. and the blaeberry, *Vaccinium uliginosum* L.), I found that this untidy, meat-loving people, who are probably the worst horticulturists in the world, nevertheless have a few favourite salads. Though they seldom make the slightest attempt to cultivate plants (and at Nome the Eskimo section of the village is distinguished only by the most extraordinary growth of tin cans and old iron I ever saw accumulated on any beach), I met several parties of women near the town gathering the young leaves of the willow, which, mixed with seal-oil, were used as a salad. On another occasion I encountered a woman on the shore gathering from the rocks the leaves of *Rhodiola alaskana* Rose (which is common around Nome). She explained to me that it was used as a beverage mixed with hot water only (oil must not be added). A species of *Claytonia* (*C. tuberosa* Pallas) is probably (though not certainly) the plant known in Alaska as the " Eskimo potato." Of this the natives eat the roots. This Eskimo " potato " is said to grow profusely on King Island, a lonely rock in the Bering Strait whose few inhabitants spend their summers in Nome. As I had no opportunity to visit King Island I was unable to verify this statement or determine the actual plant with certainty. The wild Angelica (which in Greenland is called " kvan " and the stems of which are in much demand as a food by the natives of that country) is also said to be eaten by the Alaskan natives, though I did not come across the plant in any quantity round Nome. *Oxyria digyna* (L.) Hill is another herb eaten by the Eskimos as a salad mixed with seal-oil, but with these exceptions I came across no other plant in the native larder of arctic Alaska.

Ledum groenlandicum Oeder., which covers countless acres of cleared timber land around Fairbanks, and which also occurs on the

tundras of the Seward peninsula, is called " Labrador tea " by the white people, and is said to be used as tea by the Eskimos of the eastern Arctic, though I came across no instance of its use in this way in Alaska. Perhaps too close contact with the gold-diggers of Nome has taught the native there to crave the stronger " moonshine," in the illicit distillation of which many of them are experts! Tea, however, is the national drink of the American Eskimo, just as coffee is the beverage of his Danish cousin of Greenland.

Tobacco in any form is the principal " vice " of the native, a habit which was perhaps acquired from the aboriginal Indians from whom the white men took their first love of nicotine. Chewing-gum, however, in this American territory, is beginning to run it pretty close. I heard of one little orphan whose sad plight was thus described to the missionary—" Poor little boy. No father—no mother—no chewing-gum! " If they cannot get it at the trading-store, the Indian and Eskimo (and even the white trapper) who live in the timber areas will often obtain gum direct from the resinous spruce.

The forests of Alaska are one of her most important commercial resources. The country has two distinct types of forest, the " interior " forest and the " coast " forest. The latter has largely been included in the national forest system of the United States. The Tongass Forest, of south-eastern Alaska, over 16,000,000 acres in extent, and the Chugach Forest of nearly 4,800,000 acres, covering the shores of Prince William Sound, have been placed under the supervision of the forest service. The principal trees of the interior forest are the white spruce (*Picea alba* Link), white birch (*Betula papyrifera* Marsh.), balsam poplar (*Populus balsamifera* L.), cottonwood (*Populus sp.*), black spruce (*Picea nigra* Link) and Alaska larch (*Larix alaskensis* Wight). The latter tree was first described by Mr. W. F. Wight about the beginning of this century. Its distribution is the Upper Kuskokwim River to the Yukon and Tanana rivers. It differs from *L. laricina* C. Koch (according to the description given by Mr. Wight) " in its usually shorter leaves, but more particularly in its cones. The cone scales are longer in proportion to their breadth; the bracts of the cone scales are ovate and without a projecting mucronate point at their apex.—From *L. dahurica* Turcz., the most closely related Asiatic species, it differs in its usually shorter leaves, in its smaller cones, with the cone scales less widely spreading in dried specimens, and in its narrower cone bracts."

The Sitka spruce (*Picea sitchensis* Carrière) is the most valuable tree in Alaska. As both it and the hemlock (*Tsuga Albertiana* Sénécl.) of the coastal forests are excellent pulping woods, the future of Alaska's timber industry is—we are told—in the manufacture of pulp and paper, especially newsprint paper. As the tourist gazes from the comfortable decks of his steamer upon the wooded heights which close the Inside Passage, with distant views of snow-splashed

glaciers, it is a sobering reflexion that these national forests (as his guide-book tells him) are capable of producing not less than a million tons of newsprint "annually in perpetuity," which is a quarter of the present total requirements of Uncle Sam! "Stated in another way, the annual growth of timber in south-eastern Alaska is sufficient to supply eight newsprint mills, each of 400 tons daily capacity, with raw materials and a livelihood for some 50,000 people—a number almost equal to the present total population of the territory."

The river-boats on the Yukon burn wood, and the monotony of the journey is varied by an occasional pause at a woodpile on the bank to take on fuel. The boats on the British section of the river alone consume about 8000 cords in a season—a considerable drain even on the vast resources of Yukon forests which there seems to be as yet small hurry to repay.

Near one of these woodpiles, on my way down-river from Whitehorse to Dawson, I gathered not far from the village of Carmacks some typical specimens of Yukon riverside flora. *Hedysarum americanum* (Michx.) Britton and its close relative *H. Mackenzii* Richards., *Dryas octopetala* L., *Fragaria yukonensis* Rydb., and the low red-flowered "wineberry" (*Rubus acaulis* Michx.) which is one of the most frequent species. The lovely *Anemone patens* L. also grew in profusion under the willow-scrub, but in early June the flowers were already over and it was setting its silvery seed whisk fruit. This flower is one of the first to appear through the snows of spring.

Though I was assured that only two weeks before my visit to Dawson the ground had been covered with snow, by the time I had established myself in the Royal Alexandra Hotel (its sole guest at this early season) the sudden summer had already arrived, and the thermometer at the police barracks ran up to 100 in the shade. With the sunshine the undesired mosquito also began to make her appearance, but so did the flowers, and their wealth and beauty in the woods and on the Dome mountain some 1000 feet above the town (which is already some 1080 feet above sea level) almost compensated even for these pests. One of the most conspicuous flowers to arrest the eye of a stranger is the blue *Mertensia paniculata* (Ait.) Don which the Canadians call the "bluebell." I first saw this fine flower growing in a ditch by one of Dawson's dilapidated side-walks, but was soon to see it everywhere.

My earliest excursion took me through the woods behind the town up the steep slopes to the summit of the Dome mountain—a delightful walk during which I passed through a variety of plant formations to the "Hudsonian zone" of the summit, where, the poplar and spruce woods left behind, I came out upon a height from which a magnificent view of the snow-piled fractured tops of the Rockies around the Klondike and Yukon valleys rewarded me for the somewhat arduous climb. Here I was able to fill my press with such lovers of the high places as *Arenaria arctica* Stev. (which

also carpets the hillsides of the Seward peninsula round Nome in magnificent snowy tufts from June to early July), *Cerastium maximum* L., *Dryas octopetala* L., *Lycopodium alpinum* L., *Saxifraga bronchialis* L., and *S. reflexa* Hook., the cranberry (*Oxycoccus quadripetala* Gilib.), the golden Arnica (*A. alpina* (L.) Olin and Laden) and many others. The woods on the lower slopes of the mountain were bright with lupin (*Lupinus arcticus* S. Wats.) which fills the place of the English hyacinth in the forests of Yukon and Alaska, the tall golden bushy potentil (*Potentilla fruticosa* L.), a handsome species, almost a shrub, which is common also on the treeless tundra behind Nome, wild roses, yellow and white anemones (*Anemone Richardsonii* Hook. and *A. parviflora* Michx.) and, in shadier recesses, one of the most beautiful of all Yukon's wild flowers, the creamy "pine-drop" on its blush-pink stem (*Pyrola grandiflora* Radius). It seemed a sad business to have to place it between the pressing-boards! (In passing, I may mention that, especially in hot weather, I found that very much better results were obtained with the specimens when placed immediately they were gathered between paper and boards. The latter, as supplied by Kew, are so light to carry that they are really more convenient than a vasculum.)

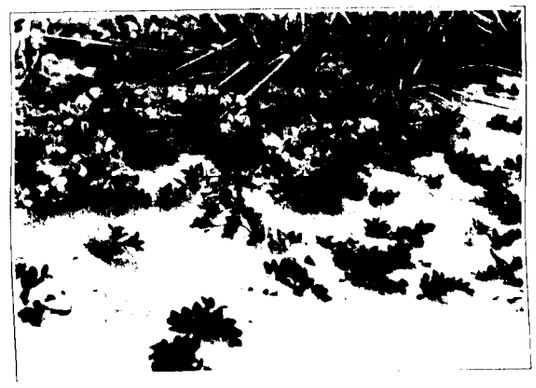
The scenery of the American section of the Yukon beyond Dawson is very similar to the Canadian. There is the same monotone of forest and distant mountain, though just before Fort Yukon is reached (where the mighty stream takes a right-angled sweep westward to her far destination on the shores of the Bering Sea) the river widens into a kind of inland lake—the Yukon Flats—some twenty miles from bank to bank. Just before this the Arctic circle is crossed at Circle City. At the latter town I gathered in the muddy banks of the river an interesting species of plantain with narrow leaves ("*Plantago media* L. or possibly a hybrid with *P. lanceolata* L.").

My river-journey ended at Nenana, a little town on the Tanana river, whence a short railroad runs to Fairbanks, the largest inland town in Alaska (Juneau, on the coast, is the capital) and the site of the College of Agriculture—"the most northerly college in the world." But I had unfortunately no time to visit this interesting building, for a plane was leaving that very afternoon for Nome, and as boats on the lower Yukon were very uncertain, I had decided to shorten my journey greatly by taking to the airways. I was anxious to reach Nome before any north-bound vessel (which were few and far between in an area where there was no longer any tourist travelling) should leave for Barrow. Nenana is memorable to me for my first sight of the showy Indian paintbrush (*Castilleja pallida* Kth.) which flourished in the railway siding near the station, and at Fairbanks I caught a first glimpse of the lovely blue Iris (*Iris setosa* Pallas) which I was afterwards to see covering the marshes round Nome.

After crossing the high range of mountains which divides the Yukon valley from the Bering Sea and Norton Sound, the pontoon plane landed us in the Nome river on the second day after leaving Fairbanks (owing to bad weather reports we had spent one night at Nulato, a little Indian village on the lower Yukon). As the ice in 1933 was particularly heavy, I was detained at Nome for five weeks, waiting for a chance to get north, so that most of my plant-collecting for Kew was done in the neighbourhood of that "city" (which later, in September 1934, was almost completely wiped out by fire).

At Nome I met Mr. Charles Thornton, United States Commissioner, and an expert botanist, who has discovered recently in the neighbourhood of Nome a new species of Senecio which now bears his name. Mr. Thornton estimates that 278 named species of flowering plants are known within 50 miles of Nome, besides about 150 species of mosses, lichens, ferns, fungi and algae. My collection for Kew from Yukon and Alaska consists of 707 specimens, comprising some 228 species, and as the majority of the Alaskan flowers were gathered within fifty miles of Nome, by the time I left for the north on 2nd August it was becoming quite an event for either Mr. Thornton (who kindly assisted me many times in the search by taking me further afield in his car) or myself to light upon any species which had not already been collected. Only twice was I able to find a plant which puzzled my guide. One of these was the little *Coeloglossum viride* (L.) Hartm., which I took near the summit of Anvil mountain but only found twice. The other was an unusual species of saxifrage (*S. spicata* Don) which I caught sight of from the car growing on the rocks above the precipitous roadway round Cape Nome on the last evening before I left for Barrow.

The Regius Keeper of the Edinburgh Botanic Gardens had asked me to keep a special look-out for any native Primulas, and on my very first walk abroad over the flat hinterland behind the town I came on an abandoned gold dredge beside a "creek" (as streams are called in Alaska) where the damp ground was covered with the very beautiful little *Primula eximia* Greene, dusted with white meal, its small violet blossoms smelling sweet as any garden "dusty miller" of home. Beside it grew *Dodecatheon frigidum* Cham. et Schlecht.—the "Shooting Star" or wild Cyclamen—a very lovely species frequent round Nome in early July. It is impossible here to do more than indicate a very few of the blossoms which rush out, flourish, fade and set seed within the brief period of the Nome summer. They certainly exceeded the expectations I had previously formed both in beauty and number. As the country is here quite treeless—save for a few willow and, more rarely, alder bushes by the rivers—the vegetation is chiefly of an alpine character, and the end of June is about the best time for flower-gathering. By the end of July, the flowering period being so short, the magnifi-



Rubus acaulis Michx. and *Lathyrus maritimus* Bigel. on Nome beach.



Boykinia Richardsonii (Hook.) A. Gr. near Nome.



Thermopsis gracilissima Standley on the summit of Anvil Mountain.

cent patches of magenta Phlox (*Phlox sibirica* L.) had already faded upon the hillsides and monkshood (*Aconitum delphinifolium* DC.) and tall blue Delphinium (*D. Menziesii* DC.) were about to replace the beautiful *Polemonium caeruleum* L. and *Epilobium latifolium* L. Sheets of the latter brilliant plant, with its beautifully contrasting sea-green anthers, cover the dry slopes of creek-beds and hillsides in July, and an occasional snow-white " albino " may be found by Snake River, where the third and rarest of Nome's Primulas, the pale pink *P. sibirica* Jacq., with its twin blossoms, is occasionally discovered. *P. stricta* Hornem. is Nome's most common primula. By the river also grows a handsome Pedicularis (*P. sudetica* Willd.) a genus of which I collected seven species round Nome.

On the summit of Anvil Mountain, and elsewhere, patches of a very attractive dwarf Rhododendron (*Therorhodion glandulosum* Standley) grew plentifully. The handsome flowers of this little plant are much larger than those of *Rhododendron lapponicum* Wahlenb. which covers so much of the Greenland mountains, and which is also to be found in Alaska. The curious green *Veratrum Eschscholtzianum* (R. et S.) Rydb.—a tall orchid-like plant—the graceful *Anticlea elegans* (Pursh) Rydb., and the interesting *Boykinia Richardsonii* (Hook.) A. Gr., with its snow-white flowers and dull-red eye, its long hispid stem rising from rather coarse leaves, were among handsome species gathered. Unfortunately, when I left Nome on 2nd August, it was still too early to gather seed of any plants save *Petasites frigidus* Fr.—a very common edging to Nome roadsides which was already putting forth its grey silky pappus. *Eriophorum Scheuchzeri* Hoppe and *E. angustifolium* Roth were also common by the high-way and in the damp tundra at the back of the town. A particularly fine Senecio (*S. palustris* (L.) Hook. var. *congestus* (R. Br.) Hook.) covered the deserted clay bottoms of Center Creek with gold in late July, and grew at times to a height of nearly four feet. By this time also the marshes were blue with *Iris setosa* Pallas, and I spent much time in the difficult art of nature-photography. Many were the films I wasted on this most fascinating of occupations ; a breath of wind ruffling *Boykinia* just as my shutter opened ; an inch too near ruining the focus of a fine group of *Saxifraga Hirculus L.* Gradually, however, as I became more conversant with the rather difficult light of this far northern land, the results began to repay me for time spent. Three of my photographs are here reproduced (Plate IX).

On August 2nd, having obtained a passage to Barrow in a small trading schooner of ten tons, with a crew of three, I set out for the far north of Alaska. Our first call was at Cape Prince of Wales —the American continent's most westerly extremity some 60 miles from Siberia. Rough weather obliged us to anchor for shelter behind the cape for a couple of days, which was fortunate, for this spot—the site of America's only tin mine—is amazingly rich in wild flowers. The hillsides were literally golden with large patches of

Saxifraga Hirculus L., and bright with Alaska's national emblem, *Myosotis alpestris* Schmidt, and shell-pink "Spring Beauty" (*Claytonia sarmentosa* C. Mey.), *Arenaria arctica* Stev. and *Polygonum bistortoides* Pursh. Going ashore, we found on the beach the wood-shack belonging to the joint-owners of the tin mine, Mr. Waldhelm and Mr. Maclean. It was apparently empty, and as "Trader's" owner, Mr. Ira Rank, and the Icelandic brothers Pete and Kari Palsson (captain and engineer), knew Mr. Waldhelm, I left on the table (for fun) a little note of thanks for the wild flowers we had gathered round his dwelling (which included two species not seen at Nome, *Lloydia serotina* (L.) Sweet and *Oxygraphis glacialis* Bunge), together with an English penny which I happened to find in my pocket! "Won't he wonder where on earth we've sprung from when he sees this!" cried Pete (for visitors to the deserted shores of Tin City are as rare as blackberries in January). But when we came back from a short walk up the hills, and were preparing to return to our tossing quarters in the little schooner, we found smoke rising from the chimney of the shack. Mr. Waldhelm, at work some miles inland, had seen our vessel and was busy in the kitchen—with true Alaskan hospitality—making a "mulligan" for our supper!

In her northern extremities, around Point Barrow, Alaska tails out into flat tundra, the coasts fringed with dangerous shoal-waters, "Trader" was caught by the ice for fifteen days some 25 miles south of Barrow village, and during our enforced imprisonment we were able to land and explore the district. The plants still in evidence in late August amid the first light snows of winter were *Saxifraga cernua* L., *Saxifraga bronchialis* L., *Petasites frigidus* Fr., *Eriophorum Scheuchzeri* Hoppe, *Carex compacta* R. Br. and the yellow arctic poppy, *Papaver nudicaule* L., which grows all up the coasts of this region, and which I actually found frozen into a solid jacket of ice in "cold storage," upon the sands near Martin Point, on the Arctic coast in October.

At Martin Point I found awaiting me my last and one of the most interesting species, Alaska's fourth (and last) Primula, *P. borealis* Duby, which the trader with whom I boarded there had gathered (in a little tin) with roots and water before his departure for Barrow 400 miles distant in July, and which was still flourishing in the deserted cabin when we reached it in mid-September! Little did Mr. Masik (an ex-member of Dr. Stefansson's Canadian Arctic Expedition) think when he gathered it to decorate his table, that it was destined to end in Kew Herbarium!

The only other plants collected in this remote region east of Barter Island at this late season after the "freeze-up," were *Papaver nudicaule L.* and a procumbent species of willow (*Salix glacialis* Anders.) which still projected from the first snows covering the spit in early October.

XLIV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXII.* N. Y. Sandwith.

The Genus Swartzia in British Guiana.

So much herbarium material of this important genus has accumulated from British Guiana in recent years that it seemed worth while to give a key to the species occurring in the colony with descriptions of those which were found to be new. It was a surprise to find that no fewer than eighteen Swartzias are natives of British Guiana, while further indeterminable material probably brings the number up to twenty. Of these, nine are unknown at present outside the colony, and three are described as new. The work has been comparatively easy owing to Bentham's excellent monograph of *Swartzia* in Martius' "Flora Brasiliensis" which included descriptions of several of the British Guiana species.

The species may be large trees of the coastal rain-forests, or small trees of river-banks and open savannahs. Some of them occur in all three habitats and vary accordingly in height. The coastal forest species seem to occur in several consociations; thus two Itikiburaballis (an Arawak name given to several species of the genus), *S. Benthamiana* and *S. xanthopetala*, occurred in Wallaba (*Eperua*) forest on sandy ridges near the Moraballi Creek, Essequibo River, while the conspicuous fluted tree, Parakusan (*S. Schomburgkii*), is locally plentiful in certain mixed forest. Wamara (*S. leiocalycina*) is apparently another mixed forest species, while Serebedan (*S. oblanceolata* or other species) was recorded from all the consociations by the Moraballi Creek. The species probably prefer a sandy soil and at least two, *S. latifolia* and *S. dipetala*, are confined to the sandy savannahs near Pirara and the Rio Branco; while three others, *S. roraimae*, *S. oblonga* and *S. pachyphylla*, are only known from high altitudes on and about Roraima. Several of the larger coastal forest species are well known as hard woods but are of little commercial importance. Record (Timbers of Tropical America, 257) mentions only one, *S. tomentosa*, which he identifies with the Wamara of British Guiana, but Kew material sent in as Wamara is *S. leiocalycina*.

Species of *Swartzia* are usually clearly defined and many easy characters can be selected for distinguishing them, as will be seen from the following key. One species, however, *S. tomentosa*, appears on present evidence to be unusually fluid in several characters, and some botanists would make at least four species out of as many collections which are here provisionally interpreted, without confidence, as varieties. Another species, *S. Benthamiana*, is almost equally perplexing and seems to be certainly polymorphic in the size of its floral parts.

The more primitive Swartzias would seem to be large forest trees with a wingless leaf-rhachis, inflorescences among the leaves, a

* Cont. from K.B. 1934, 258.

large yellow petal which is hairy on the back, very numerous stamens in two series, a long pluriovulate ovary and style, and a long many-seeded fruit. The British Guiana species which approximates most closely to this definition is certainly *S. Sprucei* which is, however, a quite small tree of river banks. *S. xanthopetala* has all the qualifications except for its cauliflory. The other species exhibit all kinds of modifications and adaptations such as low shrubby habit, winged leaf-rhachis, unifoliolate leaves, alternate leaflets, cauliflory, small glabrous white petals, apetaly, few or uniseriate stamens, short ovaries and short, often excentric, styles, and small few-seeded fruits. *S. dipetala* (*S. dicarpa*), with a small yellow petal, has two carpels and may belong to the most primitive type of the genus of which *S. polycarpa* Ducke represents the most extreme form; otherwise it is closely allied to the white-petalled *S. Benthamiana* which seems to be a representative of a much more recent type. It is obvious, however, that the species dealt with below could not be placed in any true evolutionary sequence, with indications of their closest affinities and links, without a complete survey of the whole genus and its relatives. They have therefore been placed in the order which seemed to indicate the age of at least some of them, and are otherwise grouped by considerations of facies and affinities in characters used in the artificial key. The colour of the petal of the following species is known: yellow, *Sprucei, xanthopetala, tomentosa, pachyphylla, grandifolia, latifolia, oblanceolata, dipetala, arborescens*; white, *Schomburgkii, Benthamiana, alterna.*

It may be remarked, finally, that the name of this genus, *Swartzia* Schreb., is conserved both against earlier names, such as *Tounatea* Aubl., and also against all earlier homonyms, such as the bryophytic *Swartzia* Hedw. (1789).

KEY TO THE BRITISH GUIANA SPECIES OF SWARTZIA.

Leaves all 1-foliolate; style very short, much less than 5 mm.:
- Leaflets caudate-acuminate; gynoecium wholly villous-tomentose ..... 11. **eriocarpa.**
- Leaflets not or very shortly, broadly and bluntly acuminate; gynoecium wholly glabrous..... 10. **oblonga.**

Leaves with 3 to several leaflets, the uppermost rarely reduced to a single leaflet; style long or short:
- Stamens only about 20 or fewer, subequal or those of the longer series with larger anthers the more numerous and conspicuous:
  - Leaf-rhachis winged; leaflets opposite; stamens in two series, the anthers of the conspicuous longer series small and suborbicular; style short, less than 5 mm.... 17. **arborescens.**
  - Leaf-rhachis not winged; leaflets alternate; stamens subequal, the anthers long and linear-oblong; style long, 5 mm. or longer ..... 18. **alterna.**
- Stamens very numerous, dimorphous, those of the short series with small anthers by far the more numerous and conspicuous:

Style very short (much less than 5 mm.), more or less curved or inflexed:
- Petal absent; leaf-rhachis somewhat winged, particularly below the junction of the petiolules; larger stamens with short thick filaments about as long as the anthers..... 16. **guianensis.**
- Petal present; leaf-rhachis not winged except in *S. oblanceolata*; larger stamens with long thin filaments much longer than the anthers:
  - Stipe and ovary wholly glabrous:
    - Lower surface of leaflets and inflorescence only minutely puberulous or glabrate; leaf-rhachis definitely winged 12. **oblanceolata.**
    - Lower surface of leaflets and inflorescence with a dense indumentum; leaf-rhachis not winged:
      - Lower surface of leaflets and inflorescence woolly-pilose or tomentose; buds large, more than 1 cm. long, fulvous-tomentose; petal large, more than 2·5 cm. wide. ..... 9. **roraimae.**
      - Lower surface of leaflets and inflorescence finely sericeous-tomentose; buds very small, apiculate, drying black and glabrous except at the base; petal very small..... 13. **leiocalycina.**
  - Stipe and ovary densely sericeous-tomentose:
    - Leaflets neither obovate nor obovate-oblong; ovary short, 5 mm. long or less, obovoid or obovoid-oblong:
      - Petiolules 2 mm. long or less; pistils 2 in each flower... 15. **dipetala** (*dicarpa*).
      - Petiolules 4–8 mm. long; pistils solitary..... 14. **Benthamiana.**
    - Leaflets obovate or obovate-oblong; ovary linear-falcate, more than 5 mm. long ..... 6. **latifolia.**

Style long, exceeding (often considerably) 5 mm.:
- Inflorescence with a pale whitish or ochraceous tomentum; bracts minute; petal glabrous on the back, or very obscurely and sparsely hairy on some of the veins:
  - Inflorescence finely scaly-sericeous-tomentose; buds up to 6 mm. diam. before splitting; pistil completely glabrous 7. **Schomburgkii.**
  - Inflorescence woolly-tomentose; buds 7–10 mm. diam. before splitting; ovary sericeous-tomentose..... 8. **Jenmani.**
- Inflorescence with a dark fulvous or fuscous tomentum; bracts conspicuous, boatshaped; petal conspicuously hairy on the back, at least on the veins and towards the base:

Stipe and ovary tomentose :

Leaf-rhachis winged ; bracteoles present, conspicuous :

Leaflets very coriaceous, strongly reticulate beneath with thick veinlets ; inflorescence covered with a coarse brownish-chocolate woolly tomentum ; ovary coarsely villous-woolly...4. **pachyphylla.**

Leaflets chartaceous to thinly coriaceous, finely reticulate beneath ; inflorescence covered with a fine brownish-chocolate more or less sericeous tomentum ; ovary adpressed-sericeous-tomentose **5. S. grandifolia.**

Leaf-rhachis not winged ; bracteoles absent or not apparent.....3. **tomentosa,** var. **Altsoni.**

Stipe and ovary glabrous ; leaf-rhachis not winged :

Inflorescences axillary among the leaves ; leaflets very finely pubescent or glabrescent beneath, not reticulate, only the midrib and main lateral nerves prominent, the rest inconspicuous or impressed ; bracteoles absent or not apparent ... 1. **Sprucei.**

Inflorescences arising from old branchlets below the leaves ; leaflets coarsely pilosulous or woolly beneath and conspicuously reticulate with prominent veinlets :

Bracteoles present and evident ; ovary at least 1·5–2·5 cm. long.....2. **xanthopetala.**

Bracteoles absent or not apparent ; ovary only 1 cm. long or less .....3. **tomentosa.**

ENUMERATION.

1. **S. Sprucei** *Benth.* in Mart. Fl. Bras. **15**, pars 2, 37 (1870).

Demerara River, fl. June, *Jenman* 6551. Groete Creek, towards mouth of Essequibo River, fl. Oct., *Brinsley* in *Forest Dept.* no. 1001 : tree 6 in. diam., along sides of the creek. Kurupung, Upper Mazaruni River, 1922, *Leng* 115 (New York).

Vernacular name, *itikibouraballi* (Arawak).

Distr. Amazonian Venezuela (Rio Casiquiare and Rio Pacimoni, *Spruce*).

Noted by Spruce as a small riverbank tree with yellow flowers. The lower surface of the leaflets presents a curiously smooth appearance since only the midrib and principal lateral nerves are at all prominent ; the rest of the surface is pale and glaucous, and covered with a rather thin adpressed pubescence which disappears with age. Not recorded hitherto from British Guiana.

2. **S. xanthopetala** *Sandwith* in Kew Bull. 1931, 359.

Moraballi Creek, Essequibo River, fl. Oct., *Sandwith* 388 (type). Demerara River, fl. Aug., *Jenman* 4505. Kuruabaru River, Demerara River, fl. Sept., *Hohenkerk* in *Forest Dept.* no. 812 (one of the sheets of this collection bears leaflets, and perhaps flowers, of

S. grandifolia). Kerimero Creek, Berbice River, fr. Oct., *Hohenkerk* in *Forest Dept.* no 812A.

Vernacular names, *itikiburaballi* and *kerunite* (Arawak).

Distr. At present known only from British Guiana.

A tall, cauliflorous, tree of wallaba (Eperua) forest, possessing—according to Hohenkerk—a firm to hard wood. Petal large, bright yellow. The long fruit was not mentioned in the original description, since *Forest Dept.* 812A had not been assigned to this species. It is up to 25 cm. long and 2 cm. wide, and is constricted between the numerous (6–14) seeds. The fruiting stipe is only about 1 cm. long. The surface of the fruit is rough and glabrous except for minute scattered scales and some large sessile plate-shaped glands.

3. **S. tomentosa** *DC.* Mém. Légum. 409, t. 59 (1825) ; Prodr. **2**, 423 (1825) ; Benth. in Mart. Fl. Bras. *l.c.* 34, quoad nomen tantum, excl. descr.—*Robinia panacoco* Aubl. Hist. Pl. Guiane, 768, t. 307 (1775) quoad folium tantum. *R. tomentosa* Willd. Sp. Pl. **3**, 1134 (1803) quoad folia. *Swartzia similis* R. Benoist in Bull. Mus. Hist. Nat. Par. **25**, 297 (1919).

Foliola subtus sublanato-canescenti-tomentosa. *Bracteae* parvae, 1–2 mm. longae. *Pedicelli* longiores ad 1·2 cm. longi. *Alabastra* matura ad 8·5 mm. longa, ad 7·5 mm. lata. *Filamenta* longiora glabra. *Gynoecium* omnino glaberrimum ; ovarium circiter 8 mm. longum, 1·5–2 mm. latum ; stipes ad 1·2 cm. longus ; stylus ad 9 mm. longus.

FRENCH GUIANA. Banks of R. Cabassou, etc., *Patris* (typus in Herb. Candoll., Geneva). Without locality, *Aublet* (Herb. Mus. Brit.) ; ? coll. *Aublet* (Herb. Jussieu in Herb. Paris.). Without locality, *Perrottet* (Herb. Candoll., Geneva). Without locality, *Martin* (Herb. Paris., Kew.).

var. **Altsoni** *Sandwith*, var. nov.; a *S. tomentosa* typica foliolis subtus ferrugineis potius quam canescenti-tomentosis, bracteis alabastrisque majoribus, praesertim ovario atque stipite dense albido-tomentoso differt.

Bracteae conspicuae, late ovato-concavae, 3·5–8·5 mm. longae. *Pedicelli* longiores ad 1·8 cm. longi. *Alabastra* matura 1–1·2 cm. longa, 0·9–1·1 cm. lata. *Filamenta* longiora glabra. *Ovarium* ad 1 cm. longum, 3–4 mm. latum, stipite ad 1·1 cm. longo ; stylus basi excepta glaber, ad 8 mm. longus.

BRITISH GUIANA. In forest bordering savannah, near Paramacutoi Savannah, Ireng District, 760 m., fl. May 1926, *Altson* 528 (typus in Herb. Kew.; dupl. in Herb. Novoebor.) : a small tree, 30 ft. high ; inflorescences arising from old leafless branchlets ; petal yellow, crinkled ; stamens orange ; ovary green, covered with silky-white tomentum.

Vernacular name *carwai-yek* (Patamona).

var. **Sagoti** *Sandwith*, var. nov.; a *S. tomentosa* typica foliolis subtus ferrugineis dense pubescentibus tantum nec sublanato-canescentibus, filamentis longioribus pilosis, praesertim ovario atque

stipite dense albido-tomentoso subsericeo differt.—*S. tomentosa* Benth. *l.c.* partim quoad descr., non DC.; R. Benoist in Archives de Botanique, **5,** mém. i, p. 126 (1931).

Bracteae satis parvae, ad 3 mm. longae. *Pedicelli* longiores ad 2·7 cm. longi. *Alabastra* matura ad 9 mm. longa, ad 8 mm. lata. *Filamenta* longiora pilosa. *Gynoecium* plus minusve ut in var. *Altsoni*, ovario lato atque stipite subsericeo-tomentoso.

FRENCH GUIANA. Karouany, 1857, *Sagot* 161 (typus in Herb. Kew.; Herb. Mus. Brit.; Herb. Paris.).

var. **polyanthera** (*Steud.*) *Sandwith*, var et comb. nov.; a *S. tomentosa* typica foliolis subtus pubescentibus tantum, filamentis longioribus pilosis, praesertim ovario subsericeo-albido-tomentoso differt; a var. *Altsoni* atque var. *Sagoti* ovario paullum angustiore, stipite glabro, statim distinguitur.—*S. polyanthera* Steud. in Flora, **26,** 757 (1843). *S. tomentosa* Benth. *l.c.* partim quoad descr., non DC.

Bracteae satis parvae, circiter ad 2·5 mm. longae. *Pedicelli* longiores ad 1·8 cm. longi. *Alabastra* matura ut in var. *Sagoti*. *Filamenta* longiora pilosa. *Ovarium* circiter 1 cm. longum, 2·2–2·8 mm. latum.

SURINAM. Without locality, *Hostmann* 1267 (type no., Kew).

The above treatment is offered as a provisional solution, based on present evidence, of the difficulties arising from the nomenclature and taxonomy of this species. Aublet described and figured his *Robinia panacoco* from the leaves and stipules of a *Swartzia* and from the flowers and fruit of another genus, probably—as suggested by de Candolle—of a *Lonchocarpus*. Willdenow's description of *Robinia tomentosa* is partly an adaptation of Aublet's and partly based on his (Aublet's) figure, and there is no evidence that he suspected the composite nature of *Robinia panacoco*; the name *Robinia tomentosa* was therefore superfluous and illegitimate. It was de Candolle who first identified the leaves and stipules with those of flowering material of a *Swartzia* collected in French Guiana by Patris, and proceeded to name and figure the plant as *S. tomentosa* DC., and gave a description of the inflorescence in which, unfortunately, no mention was made of the presence or absence of indumentum on the gynoecium. As the vernacular name of Patris' tree was Bois Pagaye blanc, and not Panacoco, de Candolle reasonably rejected the name Panacoco for the species, and accepted Willdenow's epithet which applied to the *Swartzia* foliage. It is not clear whether de Candolle saw Aublet's dried material or merely matched Patris' specimens with the figure and description. At any rate he was correct, for the Patris foliage (kindly lent from Geneva) agrees excellently (particularly in the " duvet blanchâtre " of the lower surface of the leaflets) with that of two sheets collected by Aublet, and corresponding sufficiently to the figure and description of the leaves of *Robinia panacoco*, in the British Museum Herbarium. The name *Swartzia*

tomentosa DC. should therefore be accepted for this foliage, but the Patris collection should be regarded as the type of the species dating from 1825, *Robinia panacoco* Aubl. being treated as a *nomen confusum* and *Robinia tomentosa* Willd. as an illegitimate name.

Unfortunately, de Candolle's correct interpretation of the leaves of Aublet's species failed to fix the identity of *S. tomentosa*, for it has been misinterpreted by subsequent writers who did not examine either Aublet's or Patris' specimens and who therefore were ignorant of two important characters present in this material, namely the whitish or greyish woolly-tomentose lower surface of the leaflets of both collections, and the completely glabrous gynoecium of Patris' plant. The former character was mentioned by Aublet, while the latter might reasonably have been inferred from de Candolle's figure. Thus Bentham in the Flora Brasiliensis described the leaflets of *S. tomentosa* as rufous-tomentose beneath, the longer filaments as pilose (they are glabrous in Patris' material) and the ovary as densely sericeous-villous. His description was based on a Pohl specimen from Brazil, which has not been seen, on the French Guiana plant collected and distributed by Sagot as *S. tomentosa*, and on the Surinam Hostmann collection which had been described in 1843 as *S. polyanthera* Steud. More recently M. Benoist has described a new species *Swartzia similis* which he distinguishes from *S. tomentosa* by its glabrous ovary. M. Benoist's type collections, a duplicate sheet of one of which is at Kew, have been examined and they have the indumentum of the leaflets of Aublet's and Patris' specimens, and the inflorescence and gynoecium of the Patris type at Geneva. *S. similis* R. Ben. is therefore conspecific with *S. tomentosa* DC., and M. Benoist's *S. tomentosa* is the plant referred here to var. *Sagoti*.

As will be seen from the description of the above three varieties, the Sagot *S. tomentosa*, the Hostmann *S. polyanthera*, and Altson's collection from British Guiana, all differ from typical *S. tomentosa*, which is now known from four collections, either in the colour or density of the indumentum on the lower surface of the leaflets, or in their gynoecium of which at least some part is densely whitish-tomentose, while in two of them the ovary is much broader. They also differ from each other in various ways, but until further collections prove a satisfactory repetition of these combinations of small differences, it seems wiser to treat all three as varieties rather than as independent species. Both pilose and glabrous long filaments are known in material of other species of *Swartzia*, and bracts might well be abnormally large in a single collection, while the densely tomentose ovaries and stipes of vars. *Sagoti* and *Altsoni* are connected with the completely glabrous gynoecium of typical *S. tomentosa* by var. *polyanthera* which has a glabrous stipe and a tomentose ovary. It may be mentioned finally that the var. *Sagoti* is apparently known in French Guiana as Panacoco, according to M. Benoist, see " Les Bois de la Guyane Française " in Archives de Botanique, **5,** mém. **1,** p. 126 (1931).

4. **S. pachyphylla** *Harms* in Notizbl. Bot. Gart. Berlin, **6**, 310 (1915).

Roraima, in " Galeriewald " at 1400 m., fl. Dec., *Ule* 8618 (type collection) : tree, 10–15 m.; fl. yellow.

Distr. Only known from this collection.

This is so closely allied to *S. grandifolia* in essential characters that the possibility of its being a mere habitat form of that species must not be excluded. On the other hand, it may represent an old specific type from which the cauliflorous *S. grandifolia* has evolved.

5. **S. grandifolia** *Bong. ex Benth.* in Hook. Journ. Bot. **2**, 85 (1840) et in Mart. Fl. Bras. *l.c.* 25.—*S. Schomburgkiana* Klotzsch in Rich. Schomb. Reisen, **3**, 1208 (1848) nomen, fide ms. in sched. Rich. Schomb. no. 1441 in Herb. Berol.

Without locality, 1844, *Robert Schomburgk* 2nd coll. 838 (1441 B) ; Pomeroon River, Sept. 1843, *Richard Schomburgk* 1441 (Berlin). Cabalebo Falls, Corentyne River (perhaps in Surinam), fl. Sept., *Jenman* 116 and *im Thurn* ; tree 20 ft. high. Berbice-Rupununi Cattle Trail, fl. June, *Abraham* 215 (New York). Dense upland forest, Tumatumari, Potaro River, fl. June-July, *Gleason* 425 ; tree 40 ft. high. Arunamai Creek, Pomeroon River, fl. March, *Forest Dept.* no. 2280 : cauliflorous tree 72 ft. high, 5 in. diam., in Mora forest on sandy soil ; petal yellow with purple veins ; stamens purple at base, yellow above, lower bundle purple.

Vernacular name, *itikibouroballi* (Arawak).

Distr. Amazonian Brazil.

The leaflets of the above specimens are less hairy beneath than those of most Brazilian collections, but no varietal significance is here attached to this fact. The size of the buds and bracts and the position of the bracteoles also vary considerably in different collections.

6. **S. latifolia** *Benth.* in Hook. Journ. Bot. **2**, 86 (1840) et in Mart. Fl. Bras. *l.c.* 32.

Dry savannahs, Pirara, *Robert Schomburgk* 724 (type) : a tree 20–30 ft. high ; calyx greenish-yellow ; petal bright yellow ; filaments and anthers yellow. Banks of Takutu River, 1842, *Richard Schomburgk* 516 (Berlin). Without locality, ann. 1843, *Schomburgk* 534 (832B). Without locality, *Appun* 1781.

Vernacular name, *arararico* (Macusi), according to Robert Schomburgk, ms.

Distr. Rio Branco, Brazil.

The racemes arise in clusters from the old wood, and are rusty tomentellous. The glabrous yellow petal is rather small, usually considerably less than 1 cm. long and broad, and the style is very short and obtuse. The leaflets have very short petiolules, are obtuse and rounded or very shortly and bluntly cuspidate at the apex rounded and usually distinctly cordate at the base, while the lower surface is glabrate to rather densely pubescent.

7. **S. Schomburgkii** *Benth.* in Mart. Fl. Bras. *l.c.* 38.—*S. subspicata* Klotzsch in Rich. Schomb. Reisen, **3**, 1208 (1848), nomen.

Without locality, *Robert Schomburgk* 2nd coll. 894 and *Richard Schomburgk* 1422 (type). The last collection is also in the Berlin Herbarium and was gathered on the Pomeroon River in Sept., 1843 ; it is labelled *S. subspicata* Klotzsch. Bartica, fl. Nov., *Jenman* 4775. Mazaruni Station (H.M. Penal Settlement), fl. July, *Forest Dept.* no. 2294 ; fr. March, *C. W Anderson* 168. Mazaruni River, *Appun* 390 ; fl. Sept., *Jenman* 707. Waini River, North-west District, fl. Nov., *C. W. Anderson* 168A.

Vernacular name, *parakusan* (Arawak).

Distr. Only the above specimens have been seen, and no records have been found for localities outside British Guiana.

Usually a large tree with deeply fluted trunk, thus resembling the Arawak Yaruru (*Aspidosperma excelsum* Benth.). C. W. Anderson noted that the wood was similarly used for making paddles, and that it splits easily, being softer and whiter than that of Yaruru. T. A. W. Davis records it as locally plentiful in mixed forests by the Barama River, North-west District. As with so many species of the larger forest trees, small examples may be met with on river-banks, since *Jenman* 707 was recorded as only 20–40 ft. high.

The petal is pure white and fairly large, the lamina normally somewhat exceeding 1 cm. in length and 1·5 cm. in width. The 7–11 leaflets have a very fine pale scaly-scurfy indumentum on the loosely reticulate lower surface ; this indumentum is similar in character and colour to that of the inflorescence. The ripe fruit is up to 6·7 cm. long and 2·2 cm. wide, with the stipe about 1·5 cm. long.

8. **Swartzia Jenmani** *Sandwith sp. nov.; S. Schomburgkii* Benth. affinis, inflorescentia necnon pagina foliolorum inferiore indumento duplici, et arcte lepidoto-furfuraceo et revera pilosulo pilis quam lepidibus multo longioribus, alabastris majoribus, ovario lanato-tomentoso, stylo breviore differt.

Arbor teste lectore magna ; *ramuli ut folii petiolus rhachis* petiolulique et lepidoto- et pilosulo-pubescentes. *Stipulae* desunt. *Folium unicum visum* magnum, paripinnatum, 10-foliolatum ; petiolus 5·4 cm. longus ; internodia rhacheos 5–6 cm. longa; petioluli longi, 1·1 cm. longi ; foliola oblonga vel ovato-elliptica, apice ad 1·2 cm. cuspidato-acuminata, basi in petiolulum abrupte acute cuneata, 10·5–17·5 cm. longa, 5·6–6·8 cm. lata, firme chartacea, supra glabra costa impressa nervis lateralibus venulisque obscuris pagina ubique dense ruguloso-verruculosa, subtus ubique densissime pallide lepidoto-tomentella praeterea satis sparse manifeste pilosula laxe reticulata nervis primariis utroque costae latere 8–9 sed secundariis numerosis parallelis fere aeque prominentibus. *Inflorescentiae* axillares ; racemi ad 20 cm. longi, 2–3 mm. crassi, ubique densissime pallide pilosulo-subsericeo-tomentosi necnon indumento lepidoto minuto sub pilis fere omnino abscondito induti ; bracteae ovatae,

infundibuliformis, usque 3·5 mm. longus, dentibus triangularibus subacutis minute ciliatis. *Vexillum* transverse ellipticum, breviter emarginatum, basi unguiculatum et auriculatum, usque 9·5 mm. altum et 11 mm. latum, latere altero majore. *Alae* oblongae, curvatae, basi angustissime unguiculatae, ungue circiter 2 mm. longa, et angustissime calcaratae, calcari circiter 1·5 mm. longo, toto usque 11 mm. longae et 4 mm. latae, subaequales. *Petala carinae* lunata, apice valde incurva et leviter lateraliter contorta, basi in unguem 2·5 mm. longam attenuata, inaequalia, circiter 1 cm. longa et 4 mm. lata. *Stamina* circiter 12 mm. longa, vexillare brevius, circiter 9 mm. longum ; filamenta superne expansa ; antherae vix 1 mm. longae. *Ovarium* lineare, circiter 5 mm. longum, circiter 12-ovulatum ; stylus linearis, 10 mm. longus, apicem versus valde barbatus, leviter curvatus ; stigma leviter obliquum, valde pilosum. *Legumen* non visum.

NORTHERN RHODESIA. Mwinilunga District : on burnt ground in *Brachystegia* woodland about 16 Km. east of Mwinilunga, 9 Sept. 1930, *Milne-Redhead* 1072 ; slender erect leafless shoots up to 30 cm. high. On burnt ground in open *Brachystegia* woodland about 35 Km. east of Mwinilunga, 10 Sept. 1930, *Milne-Redhead* 1079 (type) ; perennial with long tapering horizontal root ; stems 3–5 dm. high ; leaves not seen ; flowers dull mauve with a slightly twisted keel.

TANGANYIKA TERRITORY. Mbeya District : common after burns in *Brachystegia-Uapaca-Parinari* woodland at Mbozi, 1500 m., 28 Aug. 1933, *Greenway* 3617 ; a yellow-flowered perennial herb up to 3 dm. high, flowering when quite leafless ; seeds eaten by natives. Chinyika name :—*Chimambala*.

var. **major** *Milne-Redhead*, var. nov. a varietate typica omnibus partibus florum majoribus, carina apice minus recurvata differt.

Calyx usque 5 mm. longus. *Vexillum* usque 16 mm. altum et latum. *Alae* circiter 18 mm. longae et 6 mm. latae ; unguis circiter 3 mm. longus et calcar 2 mm. longum. *Petala carinae* 16 mm. longa et 8 mm. lata. *Stamina* circiter 17 mm. longa. *Ovarium* circiter 10 mm. longum ; stylus circiter 15 mm. longus. *Legumen* non visum.

NORTHERN RHODESIA. Mwinilunga District : on burnt ground in *Brachystegia* woodland about 64 Km. south of Mwinilunga and 16 Km. west of R. Lunga, 12 Aug. 1930, *Milne-Redhead* 889 ; perennial with running rootstock, flowering without leaves ; flowering stems 30–45 cm. high ; standard mauve, rest of the flower yellowish white ; old partly burnt leafy shoots 60 cm. long or more.

V. juncea is a most distinct and easily recognized species. But it is difficult to find a satisfactory affinity for it on account of its leaves and stipules not being known, for the classification of the genus *Vigna* in E. G. Baker's Leguminosae of Tropical Africa depends largely on foliage characters. It is however most likely to belong to the section *Liebrechtsia* (De Wild), as, in some respects, it appears related to *V. nuda* N.E.Br., although superficially it looks very

versus axillares, solitariae, pauciflorae, 5–10 cm. longae, rhachi 2–3 mm. crassa, ubique dense fulvo-villosulo-tomentosae, haud sericeae ; bracteae angustae, lanceolatae, 4–6 mm. longae, 1·5 mm. latae vel angustiores ; bracteolae ut videtur desunt ; pedicelli 0·7–1·6 cm. longi. *Alabastra* ovoideo-subglobosa, 1·3–1·5 cm. longa, 0·95–1·2 cm. diametro. *Calyx* demum in lobos 4 circiter 1·4–1·5 cm. longos intus glabros fissus. *Petalum* magnum, ungue 4–5 mm. longo, lamina orbiculari ad 2 cm. vel ultra (videtur ad 2·5 cm.) longa, ad 2·8 cm. lata, extra praecipue dimidio inferiore sparse longe pilosa. *Stamina* numerosissima ; majora pauca, filamentis circiter 1 cm. longis, antheris oblongis 2 mm. longis. *Gynoecium* omnino glabrum; stipes 8–9 mm. longus ; ovarium oblongum, plus minusve falcatum, 0·8–1 cm. longum, 4–5 mm. latum ; stylus brevis, incurvo-uncinatus, 2–3.5 mm. longus. *Fructus* non visus.

BRITISH GUIANA. Roraima, 1500 m., Dec. 1884, *im Thurn*, Set A, no. 67 (typus in Herb. Kew.) ; Set B, no. 67 (Herb. Mus. Brit.).

This very distinct plant was listed by Oliver as *Swartzia*, sp. nov. in the account of Sir Everard im Thurn's Roraima expedition, see Trans. Linn. Soc. Bot. Ser. II. 2.273 (1887).

10. **S. oblonga** *Benth.* in Hook. Kew Journ. **2**, 238 (1850) et in Mart. Fl. Bras. *l.c.* 17.—*S. capparioides* Klotzsch in Rich. Schomb. Reisen, **3**, 1104 (1848), nomen.

On the banks of mountain streams, fl. Oct.-Nov., *Robert Schomburgk* 548 (*Richard Schomburgk* 852). Presumably collected in the neighbourhood of Roraima.

Distr. No other record or collection has been seen.

11. **S. eriocarpa** *Benth.* in Mart. Fl. Bras *l.c.* 17 (1870).

Mazaruni River, *Appun* 334. Without locality, fr. July 1922, *F. L. Stevens* (New York).

Distr. No other records or collections have been seen.

12. **Swartzia oblanceolata** *Sandwith*, sp. nov.; *S. recurvae* Poepp. manifeste affinis, foliorum rhachi alata, foliolis infra reticulatis, inflorescentiae rhachi pedicellisque puberulis tantum vel fere glabratis, bracteolis minutis, alabastris glabris differt.

Arbor vel frutex ramulis glabratis vel minutissime puberulis crebre lenticellatis atque verruculosis. *Stipulae* anguste ellipticae, acutissimae, 1·1–1·7 cm. longae, ad 5 mm. latae. *Folia* haud magna, 5-foliolata vel summa 3-foliolata, fere omnino glabrata ; petiolus cum rhachi plus minusve distincte alatus, alis sub petiolulis dilatatis apicibus acutissimis terminatis ; petiolus 0·7–2 cm. longus ; internodium inter juga foliolorum 2·5–4·3 cm. longum ; petioluli 2–3·5 mm. longi ; foliola oblanceolata vel obovato-oblonga, apice breviter obtuse cuspidata, basi cuneata usque obtusa atque basi ipsa rotundata, 4·7–14·8 cm. longa, 2·7–6·2 cm. lata, tenuiter coriacea margin-ibus revolutis, supra nitidula glabra, subtus saepius glaucescentia minute adpresse pubescentia vel glabrata, utrinque intricate

reticulata, nervis primariis utroque costae latere 8–10 sed secundariis parallelis numerosis fere aeque prominentibus. *Inflorescentiae* apice ramulorum juniorum axillares et terminales, simpliciter racemosae et paniculatae; racemi arcuati, ad 18 cm. longi, siccitate saepius nigrescentes, fere ubique satis obscure pubescentes vel glabrescentes, multiflori, rhachi 1·5–2·5 mm. crassa; bracteae parvae, triangulari-ovatae vel triangulari-lanceolatae, saepe acuminatae, 1·2–2·5 mm. longae, ad 1·5 mm. latae, pubescentes; bracteolae supra medium pedicellum similes sed minores angustiores; pedicelli 0·8–1·3 cm. longi. *Alabastra* ovoidea, saepius apiculata, 8–10 mm. longa, 5–7 mm. diametro, siccitate brunnea vel nigrescentia, glabra, nitidula, manifeste costata. *Calyx* demum in lobos 3 reflexos glabros 4–7 mm. latos fissus. *Petalum* flavum, glabrum, ungue 2·5 mm. longo, lamina suborbiculari crassinervia 8–11 mm. longa 9–10 mm. lata. *Stamina* glabra; majora pauca, ad 5, filamentis ad 1·2 cm. longis deorsum dilatatis, antheris breviter late oblongis 1·5 mm. longis; minora numerosissima filamentis ad 7 mm. longis antheris elliptico-oblongis circiter 1 mm. longis. *Gynoecium* omnino glabrum siccitate nigrescens; stipes 8–10 mm. longus; ovarium obovoideo-oblongum, plus minusve falcatum, 5–6 mm. longum, 2 mm. latum; stylus brevis, incurvo-uncinatus, vulgo 2·5 mm. longus. *Fructus* pyriformis, 3·5 cm. longus, vix 1·9 cm. diametro, stipite 1·5 cm. longo.

BRITISH GUIANA. Lower Cuyuni River, above Matope Falls, fl. March 1931, *Aitken* in *Forest Dept.* no. 1090 (typus in Herb. Kew.): shrub on river-bank, with single yellow petal. Demerara River: fl. June, *Jenman* 5038; Kara-kara Creek, fl. July, *Persaud* 73; Seba, fruct. Oct., *Persaud* 164. Potaro Railway Survey, fl. Feb., *Hohenkerk* in *Bot. Gard. Herb.* 8899 (Jenman Herb., Georgetown).

Vernacular name, *siribidani* (Arawak), according to Jenman and Hohenkerk.

13. **S. leiocalycina** *Benth.* in Mart. Fl. Bras. *l.c.* 28.

Essequibo, *Appun* 34 (type). Lower Cuyuni River, fl. Feb., *Forest Dept.* 1031, 1065. *Forest Dept.* 884, leaf material only, from the Mazaruni River, seems to be referable to this species; and *Appun* 19, also from the Mazaruni River, is placed here provisionally in the absence of flowers and fruit.

Vernacular names, *wamara* and *unikiakia* (Arawak); "brown ebony," according to Appun.

Distr. At present recorded only from British Guiana.

Easily distinguished by the close rusty tomentum of the inflorescence in conjunction with the small, black, glabrous, apiculate buds. The tree seems to vary greatly in height; wood specimens have been tested for thrust blocks.

14. **S. Benthamiana** *Miq.* Stirp. Surinam. Sel. 15 (1850); Benth. in Mart. Fl. Bras. *l.c.* 28; Sandwith in Kew Bull. 1931, 361.

Santa, Demerara River, fl. Dec., *C. W. Anderson* 123. In wallaba forest, Moraballi Creek, Essequibo River, fl. Oct., *Sandwith*

488: tall tree, about 92 ft. high, 13 in. diam.; blaze with purplish-red juice; petal and filaments pure white. Mazaruni River, fl. Sept., *Jenman* 762; a low tree. Kaieteur Savannah, Potaro River, fl. Sept.-Oct., *Jenman* 1048; tree several feet high.

Vernacular name, *itikiburaballi* (Arawak).

Distr. Guiana; Amazonian Brazil and Colombia.

A perplexing and very variable species, forming a small tree on the savannahs and a large one in the wallaba forest consociation of the coastal rain forests. In the gapó of the lower Rio Negro, Brazil, it appears as a low bushy tree. The main taxonomic variations are to be sought in the degree of impression or elevation of the veins on the lower surface of the leaflets; and in the dimensions of the various floral parts. Thus in *Sandwith* 488, from wallaba forest, the floral parts are peculiarly small, the calyx divisions being up to 5·5 mm. long, the petal up to 5 mm. long by 4·5 mm. wide, and the ovary only 2 mm. long by 1·5 mm. wide, with a very short style. The Kaieteur Savannah collection, *Jenman* 1048, presents a remarkably different appearance at the other end of the scale, the calyx divisions being up to 8 mm. long, the petal 7 mm. long by 7 mm. wide, and the ovary 4–5 mm. long by 2–2·75 mm. wide, with a longer style. Amazonian sheets show the small calyx divisions and small petal of *Sandwith* 488, while the ovary and style are larger. The Surinam type (*Kappler* 1929) has not been examined during the present investigation, and Miquel's description gives no indication of the dimensions of the floral parts. French Guiana material is variable, the calyx divisions of *Sagot* 1162 being about 6 mm. long and the ovary 4·5 mm. long by 2·5 mm. wide; while a *Wachenheim* collection from Godebert, June 1921, has similar calyx divisions but the ovary is 3 mm. long by 2 mm. wide. It may be noted that Sagot matched his specimens with authentic material in the Paris Herbarium.

These variations, though occasionally presenting a facies which might appear significant to the superficial observer, seem to be mere variations in dimension which may be due to habitat, since all the essential characteristics of the species are maintained throughout the range; it has not therefore seemed advisable to describe the large-flowered form from the Kaieteur Savannah even as a variety, especially as Miquel's Surinam type has not been examined.

Among the more obvious features of this species may be mentioned the intricate network of the impressed veinlets on the upper surface of the leaflets, which usually dry a dark lead colour above and are somewhat glaucous beneath; the numerous many-flowered racemes of the compound inflorescence; the shining pale yellowish-tawny, and finely sericeous indumentum of the pedicels and buds; and the small white petal. The larger filaments are 2–4 in number and often show some scattered hairs, as do the claw and midrib of the outer surface of the petal.

15. **S. dipetala** *Willd. ex Vogel* in Linnaea, **11**, 173 (1837).—*S. dicarpa* Moric. ex Meissn. Gen. Comm. 68 (1838); Benth. in Mart.

Fl. Bras. *l.c.* 27. *S. microstylis* Benth. in Hook. Journ. Bot. **2,** 89 (1840).

Quitaro River, 1838, *Robert Schomburgk* 578. Without locality, 1843, *Schomburgk* 344 (508B). Pirara River, Rupununi Savannahs, fl. Nov., *Davis* in *Forest Dept.* no. 2253 : tree about 30 ft. high, 8 in. diam., forming a large bushy clump, growing in low bush fringing a creek in the savannah inundated during the rainy season ; flowers yellow.

Distr. Amazonian Brazil. Orinoco River, Venezuela.

Two petals have not been seen in any of the flowers of the above material, nor did Bentham find them ; but there seems to be no doubt that *S. dipetala* and *S. dicarpa* are conspecific, and *S. dipetala* was the earlier published name.

16. **Swartzia guianensis** (*Aubl.*) *Urb.* Symb. Ant. **5,** 365 (1908), descr. ex exemplis demerarensibus ampliata ; apetala, in serie *Tounateae* juxta *S. sericeam* Vogel ponenda, rhachi folii distincte alata, foliolis 5 tantum minus oblongis, ramulis rhachi folii inflorescentiisque haud rufo-tomentosis, alabastris minoribus cinereo-subsericeis, calyce intus haud villoso-tomentoso sed sericeo-pubescente differt ; a specimine typico Aubletiano foliolis subtus haud plumbeo-glaucescentibus adultis subtus costa excepta glabris differt. —*Tounatea guianensis* Aubl. Hist. Pl. Guiane, 550, t. 218 (1775). *Swartzia alata* Willd. SP. Pl. **2,** 1220 (1800) ; DC. Prodr. **2,** 424 (1825) ; Benth. in Mart. Fl. Bras. *l.c.* 30, in obs.

Arbor parva, ramulis summis gracilibus teretibus plus minusve glabratis haud lenticellatis. *Stipulae* obscurae, subulatae, 3·5 mm. longae, pubescentes. *Folia* magna, 5-foliolata; petiolus cum rhachi pubescens, distincte alatus, alis sub petiolulis dilatatis reticulato-venosis apicibus abrupte conspicue acute acuminatis vel semiaristatis; petiolus 2·5–4 cm. longus ; internodium inter juga foliolorum inferius 4–7 cm. longum, superius sub foliolo terminali 2·5–5 cm. longum ; petioluli brevissimi, circiter 2 mm. longi ; foliola oblonga vel elliptico-lanceolata, apice longe acuminata, basin versus attenuata sed basi ipsa rotundata, jugi inferioris saepe minora ac a 6 cm. longa 2·4 cm. lata, cetera 9·5–22 cm. longa, 3·5–9 cm. lata, satis tenuiter chartacea, utrinque nitidula viridia vel subtus brunnescentia, juniora subtus copiose pubescentia, adulta fere omnino glabra costa utrinque praesertim supra minute puberula excepta, costa supra impressa subtus cum nervis primariis utroque latere circiter 12 prominente, rete venularum intricato utrinque prominulo conspicuo, praeterea nervis primariis marginem versus serie duplici vel triplici nervorum limbalium anastomosantibus. *Inflorescentiae* infra folia e ligno vetere orientes ; racemi flexuosi, 15–23 cm. longi, pluriflori, ubique tomentosi, rhachi 1·5–2·5 mm. crassa brunnea ; bracteae triangulari-lanceolatae, vix 2 mm. longae, basi ad 1 mm. latae ; bracteolae ut videtur desunt ; pedicelli 3–9 mm. longi. *Alabastra* subglobosa, haud apiculata, 5–7 mm. longa atque lata, cinereo-subsericeo-tomentosa. *Calyx* irregulariter rumpens,

demum in lobos 3–4 reflexos fissus, intus sericeo-pubescens. *Petalum* deest. *Stamina* majora juxta ovarium 2, filamentis crassis 3–4 mm. longis dimidio inferiore glabris superiore adpresse pilosis, antheris magnis crassis oblongis 3·2–4 mm. longis ; minora numerosissima, glabra, pluriseriata, filamentis 1·5–6 mm. longis, antheris minimis globosis. *Gynoecium* stipite tomentoso 2 mm. longo ; ovarium oblongum vel obovoideo-oblongum, trigonum, 4–5 mm. longum, 2–2·5 mm. latum, tomentosum ; stylus excentricus, brevissimus, vix 1 mm. longus, rectus vel ovario deorsum adpressus, glaber. *Fructus* non visus.

BRITISH GUIANA. Near Arawak Matope Falls, lower Cuyuni River, in mixed forest on a small ridge between two creeks, July 1933, *Tutin* 404 : tree, about 45 ft. high, with black heart-wood ; sepals yellow-green ; stamens long and white. Near Oko Creek, Cuyuni River, March 1933, *Davis* in *Forest Dept.* no. 2342 : small tree about 50 ft. high, 4 in. diam. in mora forest ; cauliflorous.

This *Swartzia* belongs to an interesting group of species with apetalous flowers and 2 large stamens with long anthers and relatively short filaments. Other species of this group which are evidently allied to the present plant are the West Indian *S. caribaea* Griseb. and *S. trinitensis* Urb. Both of these species, however, have the calyx glabrous within, while *S. caribaea* has an unwinged leaf-rhachis, and *S. trinitensis* has smaller leaflets. *S. guianensis* (Aubl.) Urb. (*Tounatea guianensis* Aubl.; *Swartzia alata Willd.*) is represented in Herb. Mus. Brit. by three apparently mature leaves collected by Aublet. Aublet's material, as noted by de Candolle and Bentham, is densely minutely pubescent all over the lower surface except in small areas which have become glabrous, and glaucescent ; the apex of the lateral leaflets is abruptly cuspidate, while the lateral nerves leave the midrib at a rather more obtuse angle than do those of the leaflets of the British Guiana specimens. In spite of these small discrepancies, the facies and general characters of the leaves of the three collections are so similar that it seems preferable, on present evidence, to identify the British Guiana material with Aublet's species, and to give a complete description of this material.

To judge from the description, *S. Tessmannii* Harms, of Amazonian Peru, is also a member of this group. It appears to have an unwinged leaf-rhachis, much smaller and less reticulate leaflets than *S. guianensis*, and a shorter merely puberulous or subglabrous inflorescence with sparsely adpressed-pubescent calyx lobes.

Distr. French Guiana (*Aublet* in Herb. Mus. Brit.).

17. **S. arborescens** (*Aubl.*) *Pittier* in Journ. Wash. Acad. Sci. **11,** 157 (1921).—*Possira arborescens* Aubl. Hist. Pl. Guiane, 934, t. 355 (1775). *Rittera triphylla* Sw. *Swartzia triphylla* Willd.; Benth. in Mart. Fl. Bras., *l.c.* 22. *S. parviflora* DC. *S. aptera* Klotzsch in Rich. Schomb. Reisen, **3,** 1208 (1848) nomen, non DC.

Orealla, Corentyne River, fl. Oct., *Jenman* 251. Moraballi Creek, Essequibo River, fl. Oct., *Sandwith* 538. Macaw Falls,

Waini River, *Beckett* and *Kortright* in *Bot. Gard. Herb.* 8495. Without locality, *Schomburgk* 102 (175); *Richard Schomburgk* (Berlin, *S. aptera* Klotzsch ms.).

Distr. Guiana. Amazonian Brazil, Colombia and Bolivia.

A small tree of riverbanks with subulate stipules, 3-5 papery leaflets with a retuse acumen, a small golden-yellow petal, and yellow stamens. The gynoecium is glabrous. Bentham gives a misleading description of the androecium as he apparently did not notice the shorter, very slender, staminodial series which is always evident.

18. **S. alterna** *Benth.* in Hook. Journ. Bot. **2**, 89 (1840) et in Mart. Fl. Bras. *l.c.* 39.

Without locality, 1843, *Schomburgk* 293 (585).

Distr. Amazonian Brazil.

Further characterised by its short and slender inflorescence, the small flowers and the membranous calyx. Ducke notes it as a small tree, and Spruce described the petal as white.

Material of the following collections does not match that of any of the above species, but is too incomplete for satisfactory identification or description: *Jenman* 4126, fr. Sept., Upper Demerara River, "Serrabadanny," a large timber tree; *Hohenkerk* in *Forest Dept.* no. 793, Eberobo River, Berbice River, fr. May, "Shebah-danni," with a hardwood used for house posts and spars (this may be *S. leiocalycina* or an allied species); and *Hancock* (near *S. Benthamiana*).

XLV—NEW ZEALAND VEGETATION.

In this review attention is directed to a series of three addresses delivered to New Zealand audiences during the present year by His Excellency, Lord Bledisloe, Governor General of New Zealand, on questions intimately affecting every individual in the dominion, and giving much food for thought to dwellers in other parts of the British Empire.

The first address was given before the members of the Auckland Travel Club on 7th June, and in this Lord Bledisloe, as a man of world wide travel, favourably compared the scenic effects of New Zealand with those of any other country he had seen. He said, "Before coming to New Zealand, I was able to say with sincerity and conviction that I knew of no country with a greater variety of scenic loveliness than Great Britain, no County in it that excelled Gloucestershire in this respect, and no district in that County more beautiful than that which contains my own ancestral home. But my views are now entirely altered. New Zealand can claim, without fear of contradiction, to possess a greater diversity of outstanding scenic attractiveness than any territory of similar area to be found anywhere in the world." He lamented the fact that many New Zealanders knew so little of the beautiful aspects of their own country and urged all who were able to travel throughout its length and

breadth. He went on to extol the value of New Zealand as a country for tourists, and how eloquently he did so can be estimated by the following extract.

"The average visitor to your shores has never heard of any tourist objective in this country other than Rotorua. There is no more fascinating health resort in the world than Rotorua. But what does he know of New Zealand who only Rotorua knows? Have you not in this Dominion the Empire's loveliest mountain in Mt. Egmont, the world's most beautiful glacier in Franz Josef, its most impressive Fjords in Milford, Dusky, and Queen Charlotte Sounds, its most inspiring group of snow-clad mountain peaks in your Mt. Cook range, lakes lovelier than those of Switzerland in Otago and Westland (not to mention South Auckland), glow-worm caves which rival those of Slovakia, thermal wonders comparable with those in Yellow-stone Park in America, and vistas of incomparable charm such as those which feed the eye from the heights of Mt. Tongariro, from the hills on the Waitangi Estate, looking out over your lovely Bay of Islands, or from the top of Paekakariki Hill over-looking Kapiti Island and the curving foreshore of the historic coast which faces it? What rivers in the wide world—even including the Rhine, the Dart and the Wye—can rival your Whanganui River amid its sylvan glory mirrored in its peaceful pools? Where, too, in the world can finer native bush be found than that which you possess, where grander giants of choice timber (so far as the ruthless woodman's axe has spared them) than those in Waipoua Forest, or where birds with more melodious song than your tui, and your bell-bird, or with more splendid plumage than your kaka, your pukeko or your kiwi? What country outside Britain can show better high roads for motor travel, or a greater choice of exceptionally good sport, obtainable at small expense? What other country has such alluring sun-bathed, flower-decked, winter resorts (comparable with the French Riviera, Madeira or Teneriffe) as Nelson in the South Island, Tauranga on the East Coast, or Paihia or Russel in the Far North, of this Dominion? Is there any country where the clear atmosphere and actinic light are more favourable to successful photography?"

On July 31st he gave the second address at the Annual Meeting of the New Zealand Forestry League at Wellington, his subject being New Zealand's Timber, a Great National Asset. After referring to the League and its activities, he remarked upon the apathy in the past of the people of the British Isles with regard to Forestry, and gave figures indicating the vast amount of money expended annually with foreign countries upon timber, instancing how a considerable quantity of the timber purchased might have been grown in Great Britain. He also drew attention to the steps now being taken through the Forestry Commission of establishing forests in various parts of the home country. He then passed on to New Zealand's timber supply and the steps that were being taken not only to produce all the timber required in the country but to

provide a surplus for export. State forestry plantations in New Zealand, he stated, had " already attained an area of 396,000 acres, while those under other control aggregated 263,000 acres." Attention was drawn to the fact that these new forests were formed very largely of exotic species, the 396,000 acres of State forests including *Pinus radiata* (*insignis*) 180,000 acres ; Corsican Pine 49,000 acres ; Larch 8,000 acres ; Western Yellow Pine 38,000 ; and Douglas Fir 40,000 acres. Great stress was laid upon the necessity for training the young to a tree sense, and enabling them to realise the importance of trees to human life not only from a commercial point of view but also from an aesthetic view point. Lord Bledisloe drew attention to the changes that were going on in plant life, instancing how one kind of tree was undergoing considerable natural increase whereas other native species were in danger of extermination, the change frequently being started by the clearance of ground through forest fires. In a review of forest conditions he said " The truly Primitive Plant Communities of this Dominion are those which came into existence in the absence of man and also in the absence of all grazing and browsing animals—a condition unknown in any other part of the world. In the opinion of the late Dr. Cockayne, the study of that great class of New Zealand Rain Forest (a tree community dependent mainly on frequent and heavy rainfall) is a peculiarly difficult task for the scientific forester, owing to the slow but constant changes which are always in progress, new combinations of plant and timber growth coming into being only to pass away and gradually give place to other combinations. To use his own apt expressions, the study is not static but dynamic, full of absorbing interest to the ecological botanist and of perplexity to the forester, however well trained he may be. The changes which, unaided by man, take place in a primitive forest he describes as 'successions.' Humanly unaided mutability, in the form of successions, gives place gradually, but ultimately, to apparent stability. There is then formed what he calls a 'climax community' in forest growth. In the North Island, he speaks of the climax community as being dominated principally by the Tawa, but in the Far North frequently by the Taraire, and the principal trees—the kauri and the podocarps (Totara, Kahikatea, Miro and Matai)—as merely successions, and (although powerful to reinstate themselves, albeit in dwindling numbers) as being doomed ultimately to be replaced by a broad-leafed dicotyledonous tree community. In the South Island and Stewart Island he considered that the climax community was slower to come into being, but his opinion was that the podocarp community would finally be replaced by a climax with the Kamahi (Weinmannia racemosa) dominant. The cause of the incoming and final control of the climax community is that its tall trees are tolerant of shade, whereas the kauri and the podocarps demand for their proper development a considerable amount of light and also the absence of strong winds. If the above theories be reliable (and no greater authority on such subjects than Dr. Cockayne has the

Empire yet produced), the scientific forester should be able to devise plans for increasing the life of the kauri and podocarp successional communities. His main concern will be the question of how much expense may be incurred, particularly in the matter of eliminating such forest species as shut off the light. Generally, however, rain forest proper is now on ground unsuitable for farming, and the forest covering of such ground, when the economically valuable trees have been removed by the sawmiller, can be left to itself in the confident hope that there will be a considerable regeneration of the podocarp, and thus the exploited forest will once more become of economic value. It seems not unlikely that the forestry procedure of the future will be careful preservation of milled State forests or indigenous timber and their protection against the danger of fire and of browsing and grazing animals. The only possible objection to such a plan from a purely monetary standpoint is that the time factor and compound interest may be deemed to render it uneconomic. But it seems unfair to impose upon this, the most difficult of all long-term human enterprises, the burden of an unvarying compound interest rate, inapplicable to other industrial undertakings with a more rapidly recurring output. A compromise (somewhat repugnant to aesthetic taste and a sense of fitness—like putting new wine into old bottles) would be the introduction of a scattered intermediate crop of suitable shade-tolerant exotic conifers (excluding all species of the genus *Pinus*) which can be removed at a comparatively early date, say after 60 years, and thus made to pay for further assistance to the young podocarp crop in its struggle against the natural climax community."

The suggestions made by the Governor General for fostering a love of nature in children are worthy of repetition, he said " I must congratulate the League on having organised competitions in the collecting of indigenous plants by school children, for I am sure that they will stimulate the rising generation to appreciate the wealth and beauty of their native flora. But the mere unintelligent collection of plants without their individual identification is of small value in developing that most valuable human equipment—a capacity for accurate observation—or indeed in stimulating a pride in, and love of, the treasures of the forest, with which Nature has so bountifully endowed their native land. But please don't insist on young children using Latin names in this process of identification ; they are often ill-spelt, seldom accurately pronounced, and probably never remembered. For the expert botanist and for variety distinction this no doubt is necessary. But, for the ordinary school child, should not either the English or the Maori name suffice, particularly the latter, where one is available ? For instance, is not ' Rangiora ' more beautiful, and indeed more pronounceable than ' Brachyglottis repanda ' or ' Tawa ' and ' Taraire ' than ' Beilschmiedia ' ? Moreover, the scientific nomenclature of plants is constantly changing. For example, what were but yesterday known as Sophora, Veronica and Lomaria (fern) are to-day respectively

Edwardsia, Hebe, and Blechnum. Are not such popular name as Kowhai, Koromiko and Piu-piu adequate for our children's us and more likely, in an atmosphere of romantic Maoridom, to b memorised, conversationally employed and permanently correct? What prettier name could there be for one of New Zealand's commonest and loveliest flowers than 'Koromiko'? The Maor names for flowers and trees are surely amongst the most beautifu in the world. Should not your nation's children be familiar with them? These juvenile native plant competitions and the commendable policy of the League in giving prizes to school-children for essays on the values of forests will in due course substantially augment the number of zealous and active supporters of forest conservation in this Dominion."

From a botanist's point of view possibly his third address on the "Glories and Peculiarities of New Zealand Forest Vegetation" makes the greatest appeal of the three. It was delivered at Wellington College on Arbor Day, August 1st. He began by alluding to the beauty of the rural scenery of England, instancing how much was due to the "abundant presence of such trees as oak, ash elm, beech, maple and sycamore," and to the fact "that her rural boundaries are usually live hedges (bedecked sometimes with may-blossom, honeysuckle, hips and haws, sloes and holly berries) rather than, as is common here [New Zealand], post-and-wire fences." He went on to recommend Dominion farmers to emulate others who have "prudently planted trees for wind breaks and for beautification of their homes," saying "there are many areas where trees are noticeably far too scarce." In speaking of New Zealand trees, he said, "To the tree lover coming from the Old Land the most marked distinction between the trees of Great Britain and those of this Dominion is that the former are mostly deciduous (that is to say, they lose their leaves in winter) and the latter are nearly all evergreen. Moreover, to an extent unparalleled in any other territory of similar area in the world, New Zealand's trees are her own exclusive property. They are true 'New Zealanders,' for at least 89 per cent. of them are to be found in no other part of the globe. No country in the world has been more luxuriantly clothed by Nature than New Zealand. In few, if any, have the beauty and permanent value of her natural vestment been so inadequately appreciated or treasured by past generations of its human population. The more that the naturalist pries into the mysterious treasure-house of her hitherto unspoilt natural vegetation the more thrilled with wonderment and delight does he become. Nature with a bounteous profusion has indeed robed this highly-favoured land with a mantle of verdure which is of most remarkable beauty and in this vegetation there are several species of trees and other plants which for graceful form, beauty of flower, delicacy of foliage or imposing stature, are unsurpassed anywhere in the world. What country can display within the same area woodland products comparable in these respects with your Rimu, Pohutukawa, Puriri,

Totara, Black Tree-fern (or Mamaku), or the noble Kauri? If it be considered only from the utilitarian or commercial standpoint, your scenery (which is enhanced materially by the beaty of your native trees) is one of your most valuable assets, for it is a magnet which already attracts many visitors from overseas, and the tourist traffic which it stimulates is bound to increase to such proportions that it will be in the future one of the major business activities of the country. Do all in your power to keep your scenic reserves and national parks, so far as is still practicable, in their virgin and natural condition, for their interest and attraction are greatly diminished when exotic plants and animals are introduced into them.

"As one travels through this naturally beautiful land one cannot but regret that commercial competition is responsible for the frequent erection of advertisement hoardings, which are incongruous and repellent blemishes on the loveliness of the landscape. I earnestly hope that it will gradually come to be recognised, in view of the growing resentment among nature lovers and motorists against these scenic disfigurements, that the path both of patriotism and of commercial wisdom lies in their discontinuance, at least outside the confines of your towns.

"In appealing to you—on Arbor Day, 1934—to love trees, to study trees, to plant trees and to preserve trees (especially those which harbour and attract your all too scarce but melodious and beautiful birds) I want to stimulate your imagination—in these days of 'records' (on racing tracks, on cricket fields, in the air and elsewhere)—by referring especially to some of the peculiarities of your New Zealand vegetation, including its forestal equipment, which help to make it intriguingly distinctive by comparison with that of other parts of the world. New Zealand, fortunately, cannot boast climatically of extremes of heat and cold, in spite of your occasional inexorable gales its climate is most equable and health-giving. (Incidentally 'Windy Wellington' can boast of the lowest recorded death-rate of any city in the world). But in plant life it revels in extremes. It has the largest tree in the world in the Kauri (one specimen on the Tutamoe Range, near Dargaville, with a girth of 66 feet, having contained 31,416 cubic feet of timber) and the smallest pine in the world, the pygmy pine (Dacrydium laxifolium), of sub-alpine areas, the height of which is normally about twelve inches, but in exposed sites no more than two. It has the world's largest lily in the cabbage-tree (Cordyline australis), a specimen of which at Taihape proved on measurement to be 18 feet in girth. It has the erroneously called, but very lovely, 'mountain lily' (Ranunculus Lyallii) the largest buttercup in the world. In Pahau-Kakapo (Dawsonia superba), which is confined entirely to New Zealand, it has the tallest moss in the world, attaining, as it does, a height of two feet or more. In the sea-serpent kelp (Macrocystis Dubenii) it possesses the largest sea-weed in the world, which sometimes reaches to a length of two or three hundred feet. It has in the Mahoe (Melicytus ramiflorus) a violet which is a tree,

and attains a height of 30 feet, and a forget-me-not (Myosotidium nobile) with leaves as large as those of a rhubarb. It has, moreover speedwells or veronicas which in England are modest little blue flowers barely showing their heads amid the herbage of the pastures, but which here in New Zealand are not only an enormous family of numerous species with a range of colours varying from white to dark purple, but in the form of shrubs and trees (known as ' Hebes '), reach a height of 40 feet. Amongst the daisies, it possesses trees which are 30 feet high, and the wood of some of them is so remarkably durable (rendered so by a fragrant oil) that the Maoris called them ' Ake,' which means ' for ever ' or ' eternal.' Included among the daisies is the beautiful New Zealand Edelweiss (Leucogenes) which is found in no other country, and reaches the consummation of its beauty in the Lion's Foot (Leucogenes leontopodium) with as many as fifteen flower-heads congested into a densely compacted cluster surrounded by 10 to 20 lovely snow-white woolly bracts, the leaves of the plant with a surface of silvery down forming a rosette at the base of the flower stalk. Dr. Leonard Cockayne, our late deeply-respected neighbour and world famous botanist, regarded this, I am told, as New Zealand's most beautiful plant. It is, moreover, a member of the daisy family which furnishes New Zealand with the strangest curiosity of her native vegetation. Not content with the world renowned ovine products of her farms and hill-stations, she possesses ' Vegetable Sheep ' (species of Raoulia and Haastia) to be found on the shingle slips of the South Island mountains. These plants form large hummocks which are sometimes 6 feet long and 3 feet wide. They have a thick, stout, woody main stem and powerful roots which penetrate the underlying rock crevices. Their branching stems are covered at their extremities with very small, woolly, tightly-packed leaves, and forming, as they do, a tight convex mass, exactly resemble at a distance recumbent sheep. The most distinctive of these plants (Haastia pulvinaris) is found only in New Zealand and is one of the world's most famous vegetable freaks. New Zealand's bean crop is not confined to her vegetable gardens, for amongst her most lovely trees she revels with justifiable pride in her resplendent Kowhai (Sophora or Edwardsia) with its dazzling golden blossoms, which in favourable situations can boast of a height of 50 feet, with a bole 3 feet in diameter. Its nectar is beloved of the Tui (our New Zealand nightingale), and its ornamental timber, were it not for the exhaustion of its supply for fencing posts and firewood, would be of high value for decorative furniture. In the carrot and parsnip family (Umbelliferae), New Zealand can claim, without boasting of the fact, the world's most curious and uncomfortable specimen in ' the Spaniard ' or ' spear-grass ' (Aciphylla), some species of which are 6 feet high and have hard stiff leaves terminating in sharp spines, capable of penetrating the thickest sartorial integument and drawing human blood. The numerous clusters of its flowers are ensconced behind a veritable ' chevaux de frise ' of these spines. In the turnip and cabbage family (Cruciferae) there is a genus found only in the mountains of the South Island of this Dominion and known as Notothlaspi. One variety (rosulatum), popularly called the ' pen-wiper plant ' is very peculiar. Its plentiful leaves are like a chemist's spatula and clothed, when young, with white ribbon-like hairs, and imbricated to form a rosette, from which springs a thick stalk carrying numerous sweetly-scented flowers. Another plant of the same family (Lepidium oleraceum), which is strangely unbeautiful, possesses what is known as anti-scorbutic properties and is historically famous as having been used by Captain Cook as a cure for scurvy amongst his sailors. He gained, as you are no doubt aware, great credit among navigators for the comparative freedom of his crews from this devastating malady, which added so materially to the perils of long-distance voyages in the eighteenth century. The little weed called groundsel (Senecio), with which we feed our caged canaries in England, takes the form here of 20 different shrubs of considerable size and extreme beauty, both of leaf and of flowers, which vary in colour from white to dark yellow. They would be a source of joy and cheerfulness in any English garden shrubbery.

" Among other peculiarities of the New Zealand native bush are the numerous trees—eighteen in number, apart from the shrubs—whose adult and juvenile foliage are markedly different from each other. They include the Lancewood (or Horoeka), the Matai, the pokaka, the Kowhai, the Kahikatea, and the Kaikomako. The Lancewood is the most extraordinary of all, having four differently-shaped leaves at different stages of its growth."

Further descriptions of native vegetation follow and throughout the whole of the three addresses the hearers cannot fail to have been impressed by the intense love of Nature shown by Lord Bledisloe, and his great aptitude for conveying his thought to others in delightful and convincing language.

Lord Bledisloe on several occasions expressed his indebtedness and great appreciation of the help he had received from the late Dr. Leonard Cockayne, the renowned New Zealand botanist, and from Mr. E. Phillips Turner, a man equally well known in connection with New Zealand forestry; in both cases he paid high tribute to their work for the Dominion.

W. DALLIMORE.

XLVI—ON A COLLECTION OF ORCHIDS FROM THE SOLOMON ISLANDS. C. E. CARR.

The present paper deals with the orchids collected by Mr. J. H. L. Waterhouse in the islands of New Georgia and Bougainville in the Solomon Is. from 1929 until 1933.

The collection comprises 45 species belonging to 32 genera. Of these, 2 species, **Dendrobium Waterhousei** *Carr* and **Diplocaulobium solomonense** *Carr* are new to science. Four new combinations are made, namely **Desmotrichum thysanochilum**

(*Schltr.*) *Carr*, **Diplocaulobium araneola** (*Schltr.*) *Carr*, **D. arachnoideum** (*Schltr.*) *Carr* and **D. fariniferum** (*Schltr.*) *Carr*.

Only 6 species are endemic, while the fact that 32 species are common to New Guinea illustrates the close relationship of the orchid flora with that of the mainland.

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Eurycentrum salomonense *Schltr.* in K. Schum. et Laut. Nachtr. 90, t. v B. (1905).

Duke I., August 15th, 1929, No. 288. Native name : *Buburu Zimiri*.

Distrib.—Endemic.

Vrydagzynea salomonensis *Schltr.* in K. Schum. et Laut. Nachtr. 86 (1905).

New Georgia, May 21st, 1929, No. 26.

Distrib.—Endemic.

Tropidia ? disticha *Schltr.* in K. Schum. et Laut. Nachtr. 94 (1905).

Bougainville, Iru, September 28th, 1931, No. 557. Native name : *Tukurutukuru*. Bougainville, Siwai, September 30th, 1930, No. 287. In both numbers flowers are lacking.

Distrib.—N. Guinea.

Corymborchis veratrifolia *Bl.* Fl. Jav. n. ser. **1**, Orch. **125**, t. 42 E (1858).

New Georgia, August 5th, 1929, No. 225. Native name : *Sisiduru*. The leaves are employed by the natives in the preparation of medicines.

Distrib.—India, Java, Borneo, through N. Guinea to Samoa, Fiji and ? Australia.

Coelogyne asperata *Lindl.* in Journ. Hort. Soc. **4**, 221 (1849).

Bougainville, Siwai, January 15th, 1932, No. 672. "Flowers creamy with orange-brown marks." Native name (Tlop) : *Makapauna*. Bougainville, Siwai, September, 1932, No. 728.

Distrib.—Sumatra, Malay Peninsula, Borneo, N. Guinea.

Microstylis pectinata *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **19**, 29 (1908).

Bougainville, Siwai, September 30th, 1931, No. 291. "Flowers light violet ? colour." Native name : *Mengonirung* (*Eel's ear*).

Distrib.—N. Guinea.

Liparis condylobulbon *Rchb.f.* in Hamb. Gartenz. **18**, 34 (1862). *L. savaiiensis* Fleischm. & Rech. in Denkschr. Akad. Wien. Math. Nat. **85**, 255 t. 1, f. 4 (1910). *L. persimilis* Schltr. in Fedde, Repert. Beih. **1**, 206 (1914) ; Beih. **21**, t. lxxviii, fig. 286.

Bougainville, Siwai, July 30th, 1931, No. 171. "Flowers cream." Bougainville, Namatoa, 1500 feet, March 7th, 1932, No. 688.

Distrib.—Sumatra, Java, Borneo, Philippines, Celebes, N. Guinea, Samoa, Fiji.

Mediocalcar vanikorense *Ames* in Journ. Arn. Arbor. **13**, 136 (1932).

Bougainville, Siwai, Hita at 5000 feet altitude, October 26th, 1931, No. 619 A.

Distrib.—New Hebrides.

Mediocalcar alpinum *J.J.S.* in Bull. Jard. Bot. Buit. Ser. 2. **13**, 62 (1914).

Bougainville, Siwai, Hita at 5000 feet altitude, October 26th, 1931, No. 619 B. This was mixed with the preceding.

Distrib.—N. Guinea.

Agrostophyllum costatum *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **19**, 1 (1908).

Bougainville, Siwai, November 3rd, 1931, No. 626.

Distrib.—N. Guinea.

Glomera rugulosa *Schltr.* in Fedde, Repert. Beih. **1**, 287 (1914); Beih. **21**, t. cvi, fig. 396.

New Georgia, July 1st, 1929, No. 130. Native name : *Tupaida*.

Distrib.—N. Guinea.

Podochilus bimaculatus *Schltr.* in Fedde, Repert. Beih. **1,328** (1914) ; Beih. **21,** t. cxviii, fig. 444.

Bougainville, Siwai, October 26th, 1931, No. 604. Native name : *Tukuritukuri*.

Distrib.—N. Guinea.

Appendicula bracteosa *Rchb. f.* in Seem. Fl. Vit. 299 (1865).

Bougainville, Iru (Mt. Area), September 9th, 1931, No. 562. Native name : *Togarupia*.

Very careful comparison is required of this and some of Schlechter's species from N. Guinea.

Distrib.—Samoa and Fiji.

Phaius amboinensis *Bl.* Mus. Bot. Lugd. Bat. **2,** 180 (1856), *var.* **papuanus** *Schltr.* in Fedde, Repert. Beih. **1,** 375 (1914) ; Beih. **21,** t. cxxxii, fig. 496.

Buka, Skobolan, April 30th, 1931, No. 48.

Distrib.—(type) Java, Celebes, Amboina, N. Guinea. (var.) N. Guinea.

Spathoglottis Vieillardi *Rchb. f.* in Linnaea, **41,** 85 (1877).

Bougainville, Siwai, July 30th, 1931, No. 162. Native name : *Tongoruha*. New Georgia, June 24th, 1929, No. 91. Native name : *Molamola*.

Distrib.—Banda Is., New Hebrides, New Caledonia.

Pseuderia similis *Schltr.* in Fedde, Repert. Beih. **1,** 644 (1914). *Dendrobium simile* Schltr. in K. Schum. et Laut. Nachtr. 175 (1905).

Duke, August 10th, 1929, No. 253. Native name : *Totoa*.

Distrib.—N. Guinea.

Cadetia ceratostyloides *Schltr.* in Fedde, Repert. Beih. **1,** 424 (1914). *C. potamophila* Schltr. l.c. 438 : *Dendrobium ceratostyloides* J.J.S. in Nov. Guin. **8,** 50, t. xviii, fig. 57 (1909).

Bougainville, Siwai, November, 1932, No. 774. The number consists entirely of spirit material.

Distrib.—N. Guinea.

Dendrobium tumoriferum *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **39,** 11 (1910) ; et in Nov. Guin. **8,** 551, t. 88 B (1911).

Bougainville, Siwai, October 16th, 1931, No. 597.

Distrib.—N. Guinea.

Dendrobium Goldfinchii *F. Muell.* in Wing, South. Sci. Rec. **3,** 4 (Jan. 1883).

Bougainville, Siwai, September, 1930, No. 320. " Flowers white." Native name : *Tuku*. Bougainville, Siwai, August, 1931, No. 491. " Flowers creamy."

Distrib.—Endemic.

Dendrobium multifolium *Schltr.* in Fedde, Repert. Beih. **1,** 590 (1914) ; Beih. **21,** t. cxcvii, fig. 741.

Bougainville, Siwai, September, 1930, No. 340. " Flowers white."

Distrib.—N. Guinea.

Dendrobium cyrtosepalum *Schltr.* in K. Schum. et Laut. Nachtr. 169 (1905) ; et in Fedde, Repert. Beih. **1,** 597 (1914); Beih. **21,** t. cc, fig. 753.

N.E. Bougainville, Is. of Teop, April, 1932, No. 719. Native name : *Marapauna*.

Distrib.—New Ireland.

Dendrobium bilobum *Lindl.* in Hook. Lond. Journ. Bot. **2,** 236 (1843).

Bougainville, Siwai, June, 1931, No. 457. Native name : *Tuku*.

Distrib.—N. Guinea.

Dendrobium capituliflorum *Rolfe* in Kew Bull. 1901, 46.

Bougainville, Siwai, sine no. The material consists of a flowering stem in spirit.

Distrib.—N. Guinea.

Dednrobium fornicatum *Schltr.* in Fedde, Repert. Beih. **1,** 509 (1914) ; Beih. **21,** t. clxxiii, fig. 644.

Bougainville, Siwai, October 26th, 1931, No. 614. Native name : *Hita*. Flowers " very bright crushed strawberry and orange."

Distrib.—N. Guinea.

Dendrobium veratrifolium *Lindl.* in Hook. Lond. Journ. Bot. **2,** 236 (1843).

New Georgia, June 25th, 1929, No. 98. Native name : *Ubutu*. Flowers " white with mauve or lilac centre. Delicate scent."

Distrib.—N. Ireland, N. Guinea.

Dendrobium spectabile *Miq.* Fl. Ind. Bat. **3,** 645 (1855).

New Georgia, June 26th, 1929, No. 114. Native name : *Ubutu*.

Distrib.—N. Guinea.

Dendrobium (§ **Latourea**) **Waterhousei** *C. E. Carr*, sp. nov.; planta *D. punamensi* Schltr. et *D. euryantho* Schltr. affinis sed labello late cuneato lobo intermedio lobos laterales vix excedente carinis liberis altis apice haud confluentibus differt.

Rhizoma brevissimum. Caules approximati internodiis 4–6, cylindrici, apicem versus dilatati, canaliculati, usque ad c. 16 cm. longi, bifoliati. Folia oblongo-lanceolata, acuminata, acuta, membranacea, basi torta et subpetiolata, ad c. 18 cm. longa, c. 3·3 cm. lata. Inflorescentiae breves, pauciflorae, laxae, graciles, pedunculo c. 5·3 cm. longo, rachide c. 4·5 cm. longa. Bracteae pedicello adpressae, ovatae, acutae, c. 0·33 cm. longae. Sepalum dorsale oblongo-lanceolatum, brevissime acuminatum, acutum, c. 1·2 cm.

longum, c. 0·45 cm. latum. Sepala lateralia valde falcata, late ovata, breviter acuminata, acuta, c. 1·25 cm. longa, c. 0·9 cm. lata, margine antico in mentum cum ovario angulum rectum fere formantem c. 0·45 cm. longum producto. Petala oblongo-oblanceolata, brevissime acuminata, acuta, marginibus supra medium minute erosulis, c. 1·1 cm. longa, c. 0·4 cm. lata. Labellum unguiculatum, apicem versus 3-lobum, lamina supra unguem recurva late cuneata supra basin carinis 3 donata, carinis apicem versus valde dilatatis altis angustisque in ¼ parte sub apice labelli valde abrupte terminantibus, explanatum c. 1·25 cm. longum, trans lobos laterales c. 1·5 cm. latum, ungui oblongo concavo c. 0·3 cm. longo, lobis lateralibus ovatis obtusis parte libera c. 0·25 cm. longa, lobo intermedio brevissimo latissimoque lobos laterales paullo excedente reniformi apiculo subulato in sinu.

A plant of the affinity of *D. punamense Schltr.* and *D. euryanthum Schltr.* but with a very characteristic lip which is shortly clawed at the base, very broadly cuneate and shortly 3-lobed near the apex.

Bougainville, Siwai, September, 1930, No. 333 (type). Native name: *Tugorohia*, perhaps also *Togoruha*. Bougainville, Siwai, September, 1931, No. 590.

Described from dried material.

Desmotrichum thysanochilum (*Schltr.*) *C. E. Carr*, comb. nov. *Dendrobium thysanochilum* Schltr. in K. Schum. et Laut. Nachtr. **152** (1905); et in Fedde, Repert. Beih. **1, 454** (1914); Beih. **21,** t. clii, fig. 571.

Bougainville, Siwai, August 1931, No. 490. Flowers "cream with dark purple to chocolate spots. Faint honey scent." Bougainville, Siwai, November 3rd, 1931, No. 627.

Distrib.—N. Britain, N. Guinea.

Diplocaulobium solomonense *C. E. Carr*, sp. nov.; planta *D. arachnoideo* (Schltr.) Carr proxima sed labelli lobis lateralibus distinctis, lobo intermedio truncato 3-lobulato differt.

Caules elongati, 1-nodii, apicem basinque versus leviter dilatati, lateraliter complanati et sectione elliptici, ultra 48 cm. longi (supra basin fracti), flavidi, 1-foliati. Folium lanceolato-oblongum, brevissime et levissime inaequaliter bilobum, superne canaliculatum, subtus costatum, coriaceum, ad c. 15.5 cm. longum, c. 2·2 cm. latum. Inflorescentiae apicales, fasciculatae, squamis numerosis cinctae et e vagina magna carnosa vix exsertae, uniflorae, pedunculo c. 1·1 cm. longo. Sepalum dorsale subulatum, subacutum, c. 2·3 cm. longum, basi c. 0·4 cm. latum. Sepala lateralia leviter falcata, subulata, subacuta, margine antico basi leviter dilatato, c. 2·2 cm. longa, basi c. 0·45 cm. lata. Petala lineari-lanceolata, acuminata, acutissima, c. 2·1 cm. long, c. 0·18 cm. lata. Labellum 3-lobum, omnino papillosum, intus supra basin carinis 2 donatum, carinis dimidio inferiore breviter denseque pilosis ceterum papillosis supra medium altis incurvatis vix contiguis sub sinu loborum valde

abrupte terminantibus dorsoque leviter productis, explanatum c. 0·7 cm. longum, c. 0·45 cm. latum, lobis lateralibus in ⅓ sub apice labelli liberis parte libera brevi rotundata; lobo intermedio subquadrato, basin versus leviter dilatato, apice truncato et brevissime 3-lobulato, marginibus dimidio superiore valde recurvatis, intus fascia lata e carinis usque ad apicem labelli producta bicanaliculata, c. 0·23 cm. longo. Gynostemium conicum, c. 0·35 cm. longum, alis bilobulis, pede cum gynostemio angulum rectum formante apicem versus leviter incurvato c. 0·45 cm. longo. Ovarium cum pedicello c. 3·5 cm. longum.

A very distinct species of the affinity of *D. nitidissimum* Kraenzl., *D. phalangium* Kraenzl., **D. araneola** (Schltr.) Carr (*Dendrobium araneola Schltr.*), **D. arachnoideum** (Schltr.) Carr (*Dendrobium arachnoideum Schltr.*) and **D. fariniferum** (Schltr.) Carr (*Dendrobium fariniferum Schltr.*). It is at once distinguished by the structure of the lip with the midlobe very short, truncate and minutely 3-lobed.

Bougainville, Siwai, in the more mountainous parts, September, 1930, No. 339. Native name: *Nah.* "The yellow stalks are much sought after for use in plaited armlets."

Described from dried material and flowers preserved in spirit.

Bulbophyllum sessile *J.J.S.* in Fl. Buit. **6,** 448 (1905); Atlas n. cccxl.

Bougainville, Siwai, October, 1930, No. 380.

Distrib.—Tenasserim, Andaman Is., Malay Peninsula, Sumatra, Java, Borneo, N. Guinea.

Thelasis elongata *Bl.* Fl. Jav. Orch. 23, t. 7, fig. 2 (1858).

Bougainville, Siwai, January 1933, No. 827 (spirit material only). Flowers "creamy white."

Distrib.—Malay Peninsula, Sumatra, Java, Philippines, Hong-Kong, N. Guinea, Admiralty Is.,

Phreatia brachystachys *Schltr.* in K. Schum. et Laut. Nachtr. 186 (1905); et in Fedde, Repert. Beih. **1, 915** (1914); Beih. **21,** t. cccxx, fig. 1230.

Bougainville, Siwai, January 1933, No. 828 (spirit material only). Flowers "creamy white."

Distrib.—N. Ireland.

Phreatia Reineckei *Schltr.* in Fedde, Repert. **9,** 109 (1911).

Bougainville, Maisua, 1800 feet altitude, September 7th, 1931, No. 522.

Distrib.—Samoa.

Phreatia collina *Schltr.* in Fedde, Repert. Beih. **1,** 919 (1914); Beih. **21,** t. cccxxii, fig. 1239.

New Georgia, July 6th, 1929, No. 157. Native names: *Kikilapa, Ngirisi.*

Distrib.—N. Guinea.

Acriopsis Nelsoniana *Bail.* in Queensl. Agr. Journ. **3,** 160 (1898).
Bougainville, Maisua, September 9th, 1931, No. 535. Bougainville, Siwai, January 2nd, 1932, No. 668.
Distrib.—N. Guinea.

Grammatophyllum papuanum *J.J.S.* in Bull. Dep. Agr. Ind. Neerl. **14,** 11 (1911) ; et in Nov. Guin. **8,** 596, t. c, vii (1911).
Bougainville, Siwai, November 3rd, 1931, No. 622.
Distrib.—N. Guinea.

Grammatophyllum scriptum *Bl.* Orch. Arch. Ind. 48 (1848), *var.* **Boweri** *Schltr.* in Fedde, Repert. Beih. **1,** 951 (1914).
Bougainville, Siwai, November 3rd, 1931, No. 630. Flowers " liver colour with lighter markings."
Distrib.—N. Guinea.

Vanda Hindsii *Lindl.* in Hook. Lond. Journ. Bot. **2,** 237 (1843).
Bougainville, Siwai, October 20th, 1931, sine no. (spirit material only). Flowers " brown or liver colour, fringed or edged with cream.
Distrib.—N. Guinea.

Vandopsis Woodfordii *Schltr.* in Fedde, Repert. Beih. **1,** 972 (1914).
Bougainville, Siwai, November 3rd, 1931, No. 629. Flowers " creamy white with chocolate-red markings."
Distrib.—Endemic.

Renanthera Edelfeldtii *F. Muell. et Kraenzl.* in Osterr. Bot. Zeitschr. **44,** 460 (1894).
Bougainville, Siwai, October 26th, 1931, no. 616. Native name : *Papino Poku.* Flowers " rich brick red with dark markings."
Distrib.—N. Ireland, N. Guinea.

Ascoglossum calopterum *Schltr.* in Fedde, Repert. Beih. **1,** 975 (1914) ; Beih. **21,** t. cccxliii, fig. 1324.
Bougainville, Siwai, January 20th, 1932, no. 673. Native name : *Papino Poku.* Flowers " rosy pink " ; Bougainville, Siwai, no 320 (spirit material only).
Distrib.—N. Guinea.

Robiquetia Mooreana *J. J. S.* in Nat. Tijdschr. Ned. Ind. **72,** 44 (1912) ; Schltr. in Fedde, Repert. Beih. **1,** 984 (1914); Beih. **21,** t. cccxlvi, fig. 1335.
Bougainville, Siwai, October 1930, no. 374. Flowers " orange colour."
Distrib.—N. Guinea.

Schoenorchis densiflora *Schltr.* in Fedde, Repert. Beih. **1,** 986 (1914) ; Beih. **21,** t. cccxlvii, fig. 1339.
Bougainville, Siwai, November 1932, no. 777.
Distrib.—N. Guinea.

Camarotis papuana *J. J. S.* in Nat. Tijdschr. Ned. Ind. **72,** 28 (1912) ; Schltr. in Fedde, Repert. Beih. **1,** 992 (1914) ; Beih **21,** t. cccl, Fig. 1347.
New Georgia, July 11th, 1929, no. 173. Native name : *Gora Goraha Ubutu.*
Distrib.—N. Guinea.

Trichoglottis papuana *Schltr.* in Fedde, Repert. Beih. **1,** 993 (1914); Beih. **21,** t. cccl. fig. 1349.
Bougainville, Tlop, April 1932, no. 707. Native name : *Marapauna.* Flowers " creamy white with touch of purple in ' eye '."
Distribution.—N. Guinea.

XLVII—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS—XIII.*

E. M. MARSDEN-JONES AND W. B. TURRILL.

GENETICS OF COLOUR AND INDUMENTUM OF VEGETATIVE PARTS IN S. VULGARIS.

In this paper we deal with a cross and selfings made within the species *S. vulgaris* in order to test the genetical value of the peculiar " vivid green " colour of the vegetative parts of S.-P.16 (see K.B. 1931, 122) and to obtain further information concerning the genetics of indumentum. For this purpose S.-P. 16, a female plant, was used as the ovule parent and S.-P. 11 (for description of which see K.B. 1931, 121) as the pollen parent.

Selfing. S.-P. 16, being female, could not be tested by selfing but S.-P. 11 was selfed two years in succession. Unfortunately, the plant suffered very badly from *Marssonina* attack, to which it was very susceptible. As a result the seed obtained was very poor and only one seedling was raised. This one plant (N. 74) showed the following characters :—

Habit : stems erect, up to 5 dm. high, with medium anthocyanin in the vegetative parts, densely pubescent, plant hermaphrodite.

Leaves : up to 5·5 cm. long and 2 cm. broad, pubescent on both surfaces.

Inflorescence : with up to 30 flowers, more or less drooping. Bracts all ciliate, lower green, herbaceous, similar to uppermost leaves, ovate, acute, upper smaller and narrower and becoming scarious.

Calyx : ovoid, inflated contracted at apex, 1·3 cm. long, 1 cm. diam. with a trace of anthocyanin ; teeth equilaterally triangular, apex acute and apiculate.

Corolla : with petals divided $\frac{3}{4}$ length of lamina, segments and petals not overlapping or contiguous, petals 1·8 cm. long, 0·7 mm. broad, with a well-developed boss ; corolla diam. 1·9 cm.

* Continued from K.B. 1933, 485.

Filaments : white ; anthers purple.
Immature seeds : white. *Stigmata*: white.
Ripe capsules : intermediate (I–II), 7 mm. long, 7·5 mm. diam., teeth 2 mm. long, erect ; month 2·5 mm. diam.
Carpophores : 2·5 mm. long, 2 mm. diam.
Mature seeds : tubercled.

F_1 generation.

N. 37. 14 plants in the family.
Habit : uniform, erect, with stems up to 8 dm. high, with little anthocyanin in vegetative parts, except in 2 plants which had a medium amount.
Surface of vegetative parts and calyx : mat for all plants.
Indumentum : dense for all plants.
Inflorescence : with up to 63 flowers.
Calyx : in all inflated, except in No. 5 which was subinflated, green, reticulately veined with a trace of anthocyanin.
Petals : in all plants ¾ lobed, no blotch, boss.
Filaments : (in all scorable plants with hermaphordite flowers) pink and anthers purple.
Sex : 7 plants ☿ : 3 plants ♀ and ♀ : 4 plants ♀.
Immature seeds : 8 pink : 6 white. *Stigmata :* 4 pink : 10 white.
Ripe capsules : 4 of Type I : 9 intermediate (I–II) : 1 Type II.
Mature seeds : of all plants tubercled.

F_2 generation.

Habit : uniform, with erect stems up to 7·4 dm. high in **N. 75** and up to 8·7 dm. in N. 76, with foliage and inflorescence of typical *S. vulgaris* type.

N. 75. F_1 Plant 5 selfed. 44 plants in family.
Colour of vegetative parts : 1 plant with much anthocyanin : 34 with medium : 9 with little.
Surface of vegetative parts and calyx : 33 mat : 10 shining.
Indumentum : 31 dense : 13 glabrous.
Calyx shape : 2 inflated : 26 subinflated : 1 narrow.
Calyx colour : 12 medium : 18 little : 1 none.
Corolla : for all scorable plants ¾ lobing, boss, no blotch, petals and lobes not overlapping or contiguous.
Filaments : (in all scorable plants with hermaphrodite flowers) pink and anthers purple.
Sex : 1 ☿ : 4 ♀ and ♀ : 25 ♀.
Immature seeds : 17 pink : 1 white.
Stigmata : 18 pink : 12 white.
Ripe capsules : 11 Type I. : 22 intermediate (I-II).
Mature seeds : 30 tubercled : 5 weak armadillo.

N. 76. F_1 Plant 3 selfed. 89 plants in family.
Colour of vegetative parts : 14 much : 45 medium : 20 little : 10 none.
Surface of vegetative parts and calyx : 58 mat : 31 shining.
Indumentum : 60 dense : 13 medium : 1 few : 15 glabrous.
Calyx shape : 54 inflated : 13 subinflated : 0 narrow.

Calyx colour : 46 medium : 15 little : 8 none.
Corolla : for all scorable plants ¾ lobing, boss, petals and lobes not overlapping or contiguous. Blotch present in 2 plants only.
Filaments : 37 pink : 5 white ; anthers for all scorable hermaphrodite plants purple.
Sex : 36 ☿ : 6 ☿ and ♀ : 25 ♀.
Immature seeds : 48 pink : 2 white.
Stigmata : 31 pink : 32 white.
Ripe capsules : 20 Type I.: 37 intermediate (I-II) : 7 Type II.
Mature seeds : 37 tubercled : 26 weak armadillo : 1 armadillo.

Discussion.

All the plants considered in this paper are undoubtedly *S. vulgaris* and show the essential diagnostic characters of this species, such as hemicryptophytic habit, erect or ascending stems, and zygomorphic flowers. Each of the parents, and all plants of the F_1 generation and of N. 75 (F_2) had anthocyanin in the vegetative parts. N. 76 (F_2) gave the ratio 79 with : 10 without anthocyanin in the vegetative parts.

Surface of vegetative parts and calyx.

S.-P. 16 was recognized in the wild as a plant with peculiarly vivid shining green but glabrous vegetative parts. S.-P. 11 was a plant with non-shining dull green (mat) surface to the vegetative parts and the lower parts of the stems and the lower leaves densely hairy. The same gene or gene combination which is responsible for shining or mat surface in the vegetative parts is also responsible for the same kind of surface in the calyces. As in all plants of *S. vulgaris* with indumentum hitherto studied, this never extends above the last pair of foliage leaves (see K.B. 1931, 125) in any plant considered in this paper, apart from bract ciliations.

The breeding results for surface can be shown as follows :—

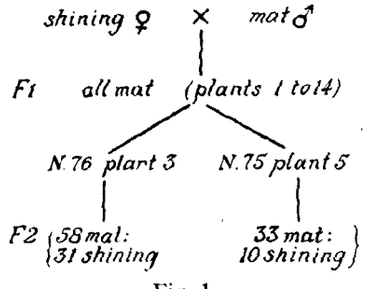


Fig. 1.

Mat is dominant over shining and in F_2 there is clear cut segregation in what probably indicates a 3 to 1 ratio.

Indumentum. Dense indumentum was completely dominant in F_1. In F_2 segration occurred as follows :—

No. 75	indumentum present	31	:	indumentum absent	13
No. 76	,,	,, 70	:	,,	,, 15

... plants of N. 75 with indumentum had this dense. 60 plants of N. 76 had dense indumentum, 13 had medium indumentum and 1 had very few hairs indeed. For presence versus absence the ratios approximate to 3 : 1 and 5 : 1 respectively.

There is no linkage, or none that is not frequently broken, between indumentum and surface type. The stock-plant parents were hairy and mat and glabrous and shining respectively, the F_1 hairy and mat, and in F_2 all four possible combinations occurred—hairy and mat (as N. 75. 15), hairy and shining (as No. 75. 18), glabrous and mat (as No. 75. 13), glabrous and shining (as N. 75. 34).

Calyx shape. The two parents had inflated calyces. The F_1 gave 13 inflated : 1 subinflated. N. 75 was obtained by selfing the subinflated F_1 plant; N. 76 by selfing one of the inflated F_1 plants, with the following results :

N. 75 2 inflated : 26 subinflated : 1 narrow
N. 76 54 ,, : 13 ,, : 0 ,,

The contrast between these ratios is marked and can undoubtedly be correlated with the calyx shapes of the immediate (F_1) parents. These figures seem to indicate that cumulative genes are necessary for the production of inflated calyx.

Calyx colour. Both parents and all F_1 plants had little anthocyanin in the calyx. The F_2 showed the following apparent segregation :

N. 75 12 medium : 18 little : 1 none.
N. 76 46 ,, : 15 ,, : 8 ,,

Corolla. $\frac{3}{4}$ lobing, boss, and petals and lobes not overlapping were constant characters in all plants considered in this paper. There was no anthocyanin blotch in the parents, F_1, or N. 75, but 2 plants with blotch appeared in N. 76 together with 62 without blotch.

Filaments. The following diagram illustrates the inheritance of filament colour in the plants considered here :—

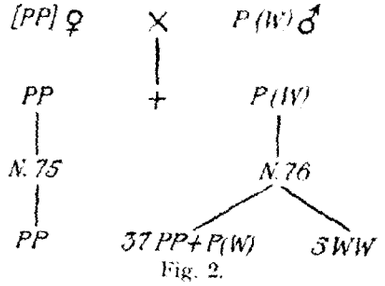


Fig. 2.

Stock-plant 16 was a female and was used as the ovule parent. Stock-plant 11, a hermaphrodite, was used in the pollen parent and must have been heterozygous for filament colour because while it had pink filaments its one offspring from selfing had white filaments. Since all F_1 plants had pink filaments stock-plant 16

was almost certainly homozygous for pink filaments, a character it could not possess. It also follows that the F_1 plants were approximately half homozygous and half heterozygous though all were phenotypically the same with pink filaments. One plant No. 5, used to produce F_2 (N. 75) was homozygous, since all its hermaphrodite offspring from selfing had pink filaments. The other, No. 3, used to produce N. 76, was heterozygous and segregated in a 7·4 : 1 ratio.

Anthers. These were purple in all plants possessing them from the parents to the F_2.

Sex. The following diagram indicates the results of our scoring :

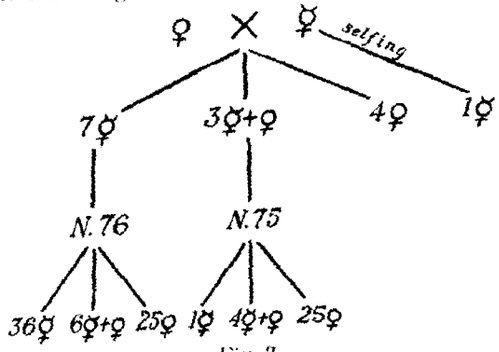


Fig. 3.

It may be noted that both ♀ and ♀ + ♀ plants have segregated on selfing to produce F_2 but in very different ratios, the former giving a predominant number of ♀ plants, the latter a predominant number of ♀ plants.

Immature seeds. The following diagram gives the results obtained :—

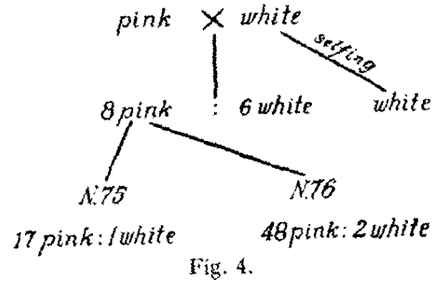


Fig. 4.

These figures suggest the action of cumulative and complementary factors but our data are as yet insufficient for more than a tentative interpretation (see K.B. 1932, pp. 234-236, 238). This is that two cumulative genes (AA′) are involved either of which gives colour with a complementary gene (B). Then the original parents with constitutions Aa A′a′ Bb and aa a′a′ Bb would on crossing give a ratio of 9 pink to 7 white. The figures obtained

were 8 : 6. Assuming that plants with the constitution Aa A'a'BB were selfed to give F_2 the ratio 15 : 1 should be obtained. This fits well for N. 75 and is reasonably possible for N. 76.

Stigmata. The results may be expressed thus :—

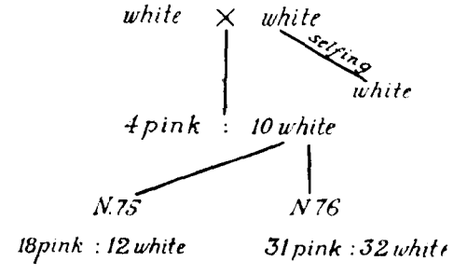


Fig. 5.

Since white F1 plants on selfing segregated in F_2 it is not unlikely that an inhibiting gene is involved (see K.B. 1932, p.p. 234-238).

Ripe capsules : the results obtained are seen from the following diagram :—

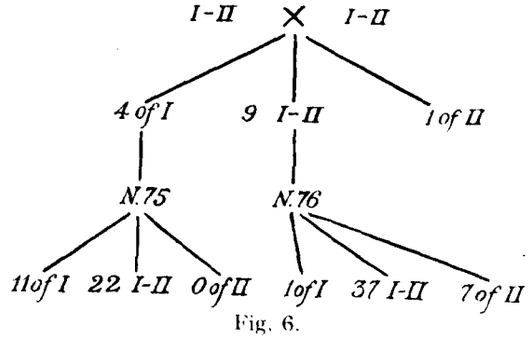


Fig. 6.

The bias towards longer narrower capsules (Type I) in N. 75 and towards shorter broader capsules (Type II) in N. 76 is clearly shown. This is what would be expected from the F_1 plants chosen as immediate parents of the F_2.

Mature seeds : the results obtained are shown in the following scheme :—

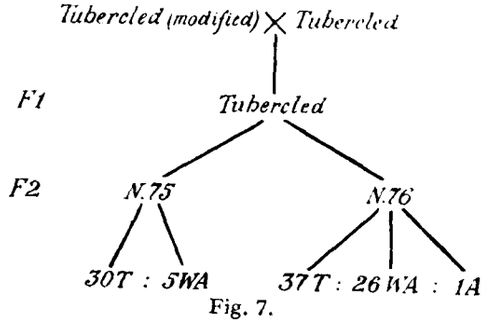


Fig. 7.

The ovule parent (S.-P. 16) had tubercled seeds, but these were modified in the direction of weak armadillo. The pollen parent (S.-P. 11) had normal tubercled seeds. The F_1 was normally tubercled and segregation occurred in F_2. We know that normal armadillo is recessive to normal tubercled and have recognized the occasional occurrence of modifying factors (K.B. 1929, 174 and 1931, 133).

SUMMARY.

1. Two plants of *Silene vulgaris* differing in a number of characters, especially in surface colour and indumentum, were crossed and their offspring genetically analyzed to the F_2 generation.

2. The conclusions reached can be summarized as follows :—

a. Surface of vegetative parts and calyx : " mat " dominant to " shining " with a 3 : 1 ratio in F_2.

b. Indumentum : hairiness dominant to glabrous, with presence versus absence showing 3 : 1 and 5 : 1 ratios in F_2.

c. There is no recognizable linkage between surface and indumentum genes, all possible combinations of characters appearing in F_2.

d. Two plants with petal blotch occurred unexpectedly in one F_2 generation. A similar occurrence has been previously reported (K.B. 1932, 234, 237).

e. The figures for colour in filaments, anthers, immature seeds, and stigmata indicate the presence of cumulative, complementary, and, probably, inhibitory factors.

f. Hermaphrodite and gynomonoecious plants segregate for sex on selfing, the former giving a predominant number of hermaphrodite and the latter a predominant number of female plants.

g. A bias in capsule shape towards the capsule shape of immediate parents is clearly shown in the F_2 generations.

h. The occurrence of a modifying factor or group of factors for tubercled testa resulted in 6 : 1 and 37 : 27 ratios in F_2.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XLVIII—NEW OR LITTLE-KNOWN PLANTS FROM SOUTH INDIA : IV.*

Impatiens Aliciae *C. E. C. Fischer*, sp. nov. [Balsaminaceae] ; *I. ligulatae* Bedd. peraffinis, foliis basi acutis, alis bilobis auricula dorsali tubulari-involuta breviore robustiore instructis, calcari subsaccato differt.

A branched *herb* ; rootstock short, horizontal, woody, rootlets fibrous ; stems slender, glabrous, 20–35 cm. high. *Leaves* opposite,

* Continued from K.B. 1934, 172.

subsessile, linear or narrowly elliptic, acuminate, base tapering or cuneate, 2·5–10 cm. long, 2·5–9 mm. wide, glabrous or minutely papillose-hispidulous and dark-green above, glabrous and glaucous below, midrib subprominent below, lateral nerves indistinct, margins distantly and minutely toothed, the basal 1–3 on either side sometimes elongated and glandular; sometimes with a pair of short, linear stipular-glands. *Flowers* axillary, solitary or twin; bracts minute; pedicels capillary, 1·5–2 cm. long and erect in flower, deflexed and up to 2·5 cm. in fruit, with a line of pubescence on one side. *Standard* oblate, more or less plicate and keeled, apex slightly emarginate, sometimes minutely apiculate, 4–5 mm. long, pink, darker at the centre. *Lateral sepals* linear-oblong, acute, 4 mm. long. *Wings* 10–11 mm. long; distal lobe much the larger, obovate, deep-pink with a splash of purple-crimson streaks on the inner side; stipe and short, falcate, acute basal lobe white with purple markings; dorsal auricle about half as long as the wing, strap-shaped, its edges folded in to form a tube near the green, spoon-shaped apex, the two auricles descending into the spur with their concave sides facing each other. *Lip* cymbiform, subacute, 7 mm. long, pink, its spur tubular-saccate, obtuse, 3 mm. long. *Capsule* ellipsoid, acuminate, 10–11 mm. long, glabrous. *Seeds*. 10–20, subglobose, 2·5–3 mm. long, black, glabrous.

Travancore: near Munnar, 5000 ft., fls. September, *E. Barnes* 616 and 617 (type in Kew Herb.). Kottayam-Munnar New Ghat Road, 2000—3000 ft., September, *E. Barnes* 618. "The dorsal auricles contained a liquid and are apparently nectaries." The specific name adopted is in honour of Mrs. Alice Barnes who accompanied and assisted Professor Barnes in his botanical trips.

Impatiens coelotropis *C. E. C. Fischer*, sp. nov. [Balsaminaceae]; *I. Walkeri* Hook. affinis, sed robustior, et petiolis longioribus 1–4 glandulis instructis, foliis majoribus glabris, nervis paucioribus, pedunculis brevioribus, bracteis majoribus deciduis, sepalis longioribus ovato-lanceolatis acuminatis, aliorum lobis distalis angustis, vexillorum carina cava, labello viride differt.

A weak glabrous *undershrub*; stems terete, nodes not swollen; erect or prostrate and geniculate, green with red patches at the insertion of the leaves, succulent, eventually becoming woody and brown, up to 1 m. or a little more high, erect stems unbranched, the prostrate emitting long slender furred roots from the nodes. *Leaves* alternate, succulent, ovate to narrowly lanceolate, acute or shortly acuminate, base cuneate, acute or rounded, often unequal-sided and decurrent on one side, 5–13 cm. long, 2·5–5·8 cm. wide, with sometimes a few scattered smaller ones, cystoliths numerous, oblong acute or subglobose, bright-green with a velvety lustre above, paler below, eventually becoming yellow and scarlet, when dry dark brown, midrib and 3–6 pairs of primary nerves slightly prominent and pale-green below, margins regularly and closely or

rather distantly serrate, serratures subappressedly apiculate, the basal 1–2 on either side frequently gland-capitate; petioles terete, channelled above, 1·5–7 cm. long, red, usually bearing 1–4 solitary or paired capitate glands above the middle. *Racemes* axillary, 3–4-flowered; peduncles solitary, 1–3·8 cm. long; pedicels 1–4 cm. long; bracts lanceolate, acuminate, 6–7 mm. long, 2·8 mm. wide, midrib stout, veined, margins entire, early deciduous leaving an elongate scar. *Flowers* up to 2·7 cm. long; buds subglobose, 4-angled (one very blunt) by the keeled standard and lateral sepals and the lip. *Standard* suborbicular, cucullate, acute, 1·5 cm. long, scarlet, its keel about 2·5 mm. wide, hollow. *Lateral sepals* thick, ovate-lanceolate, concave, acuminate, bluntly keeled, 1·4–1·55 cm. long, scarlet. *Wings* sessile, 1·5 cm. long, 2-lobed, lobes slightly overlapping, the distal oblong-falcate, obtuse, veined, the lateral semi-obovate, rounded, larger than the distal, scarlet with bullate crimson patches. *Lip* deeply cylindric-saccate, slightly compressed laterally, 1·7–1·8 cm. long, 1 cm. across, the anterior part of the mouth with a curved, acuminate beak 4 mm. long, spur 6–10mm. long, tubular, blunt, upcurved with the apex appressed to the front on the sac, bright glossy-green, becoming scarlet at the mouth with a crimson patch on the beak, veins deeply looped in the shape of the sac. *Capsule* ellipsoid-fusiform, 1·5 cm. long, green, glossy. *Seeds* up to 15, more or less kidney-shaped, compressed, 1·4 mm. long, 2 mm. wide, pale brown, minutely papillose.

Travancore: High Range, Nemakad Gap, 6500–7000 ft., fls. and frt. September, *E. Barnes* 597, 598, 599 (type in Kew Herb.), 600, 603, 604; Anaimudi Slopes, 7500 ft. fls. September, *E. Barnes* 601, 602, 605.

Professor Barnes notes: "I found this plant in several places in the same region—the Nemakad Gap of the Anaimudi Ridge. Some plants were growing among rocks under trees that bordered streams on the open grasslands. Others were amongst undergrowth in moist shola forest. Others were on a bank; these were more squat in habit and had stems not more than a foot high and leaves rather closely bunched."

Impatiens leptura *Hook f.* [Balsaminaceae].

This species was first described in the Flor. Brit. Ind. **1**, 467 (1875), based on a rather fragmentary specimen collected by Lieutenant (later Colonel) Beddome in 1861. The collector had doubtfully inscribed it as *I. cordata* Wight and added on his label "or nov. sp. H.f & T. say that *I. cordata* is only a variety of *I. viscida*—this is certainly distinct . . . . differs from '*viscida*' in the much smaller upper petal which in this is vaulted over st: cor: —*texture of leaves* and ped: not being viscid." As a note to his description of *I. leptura*, the author added "I have only fragments of this very distinct species, which is labelled *I. cordata*? by Major Beddome." The sheet as it now lies in the Kew Herbarium consists

of 3 leafy and flowering terminal shoots and a capsule containing dissections of the flowers and an unripe capsule with some seeds extracted; also pencilled sketches of the floral parts made by Sir J. D. Hooker. Further the sheet has been inscribed in ink, first "*I. elegans* Bedd." (later struck out), and then "*Imp. leptura* Hk. f. Fl. Ind. i, 467." Later in pencil is added "=*cordata* Wight." This change of opinion is confirmed in Sir Joseph's "An Epitome of the British Indian Species of Impatiens" in the Rec. Bot. Surv. Ind. **4**, pt. 3, 48 (1906) where *I. leptura* is cited as a synonym of *I. cordata* and this accounts for the entire omission of the combination in Flor. Pres. Madras, pt. I (1915).

In September 1933 Professor E. Barnes collected specimens of an Impatiens in Travancore which, though resembling *I. cordata* Wight, he was unable to reconcile completely with that species, and sent them to Kew. Comparison with the specimens in the Kew Herbarium confirmed that opinion and showed that they are identical with Beddome's sheet referred to above and lead to the opinion that Sir J. D. Hooker's first view is correct and that *I. leptura* Hook f. is distinct from *I. cordata* Wight and is a good species. Professor Barnes' specimens unfortunately also lack the lower part of the stem and the root system. The two species differ in the following characters:—

I. cordata: *leaves* rounded and cordate or emarginate at the base, lateral nerves nearly straight, arising at an acute angle from the midrib, base devoid of glandular cilia; *peduncles* 2–5 flowered; *wing petals* with the largest axis in continuation of the stipe; *lip* boat-shape; *seeds* covered with spiral long hairs.

I. leptura: *leaves* acute at the base, lateral nerves strongly arched, arising nearly at right angles from the midrib, the base usually furnished with 1–3 cup-tipped glandular ciliae; *peduncles* 2–3 flowered; *wing petals* rather larger and with the longest axis at an angle of about 45° with the stipe; *lip* bowl-shaped and rather longer; *seeds* (pilose when young?) glabrous.

As the original description is not full an amplified one based on all the material now available and on Professor Barnes' notes is appended.

An erect *herb*; stems green, rough, somewhat angled. *Leaves* alternate, ovate to elliptic-lanceolate, acute or acuminate, base cuneate, acute, 4·5–10 cm. long, 2–5 cm. wide, midrib slightly prominent below, lateral nerves in 5 pairs, rising almost at right angles to the midrib, much and regularly arched, glabrous, or rough with short, stiff hairs on the nerves above, pale and subglaucous (when dry) below, margins, except for a short distance on either side at the base, crenate with short cilia in the sinuses, the entire portion usually with 1–3 glandular, cup-tipped cilia on one or both sides: petioles 1–7 cm. long, glabrous. *Peduncles* axillary, slender, 4–6·5 cm. long, glabrous, 2–3 flowered; bracts

ovate, 4 mm. long, glabrous, green, deciduous; pedicels 1·5–2·5 cm. long, fascicled. *Standard* broadly oblong, obtuse, vaulted over the stamens and basal part of the wings, 6–7 mm. long, green becoming pinkish at the edges. *Lateral sepals* broadly ovate, acute, 4·5–5·5 mm. long, green. *Wings*. 2·5 cm. long, pink, distal lobe large, nearly semicircular, its largest axis at an angle of about 45° with the stipe (2·8 cm. long, 1·5 cm. wide), flat with the lower edge narrowly turned over forwards; basal lobe quadrately oblong, obtuse, 7–8 mm. long, darker pink, erect and partly under the standard. *Lip* bowl-shaped, acute, 1–1·3 cm. long, with a slender, tapering, incurved spur bent to one side, 2·5–3 cm. long. *Stamens* yellow. *Ovary* green, glabrous. *Capsule* (immature) ellipsoid, beaked, 1·5 cm. long. *Seeds*, several, orbicular, pilose (*fide* Hooker, to me they appear to be quite glabrous).

Anaimalais, 4500–5000 ft., *Beddome*. Travancore, a mile or two from Munnar on a bank at the side of the Kottayam-Munnar Old Ghat road, 4500–5000 ft., September, *E. Barnes* 607, 608, 609.

The locality cited by Beddome is "Anamallay Hills" and in the Fl. Br. Ind. this is amplified with the addition of "in Malabar;" but the hills in question are not in Malabar (as now understood), but extend from the S. Coimbatore District into Travancore. There is nothing in Beddome's inscription to indicate in which part of the Anaimalais he found his plant and it may well be that both collectors found it at the same place.

Impatiens platyadena *C. E. C. Fischer*, sp. nov. [Balsaminaceae]; *I. Wightianae* Bedd. peraffinis, foliis latioribus, labello longiore infundibuliforme, calcare validiore, erecto-curvato differt.

A glabrous *undershrub* with simple, erect angled stems up to 1 m. high. *Leaves* alternate, membranous, elliptic-lanceolate, acuminate, 8–17 cm. long, 3·5–7·2 cm. wide, copiously lineolate especially near the midrib, base cuneate, decurrent on the petiole for up to 1·5 cm., margins shallowly crenate-serrate, crenatures apiculate, midrib and 8–12 arching primary nerves impressed above and slightly prominent below, dark-green and rather dull above, light green and somewhat glossy below, decurrent part bearing 4–8 marginal flattened green-tipped white glands 1·7–3 mm. long; petioles channelled above, 1·5–6 cm. long, including the decurrent part of the blade. *Racemes* numerous, axillary, solitary, 4–9 cm, long in flower; peduncles slender, patent or slightly drooping. 2.5–4·5 cm. long; bracts ovate, obtuse, 8–15 mm. long, persistent. *Flowers* up to about 25 on the raceme, 1·5 cm. long. *Standard* broadly ovate, obtuse, 7–8 mm. long, cream-coloured, mottled with crimson within. *Lateral sepals* nearly semicircular, obtuse, 6 mm. long, cream-coloured. *Wings* sessile, 1·5–1·6 cm. long, distal lobe semiovate, subacute, 1–1·2 cm. long, scarlet, basal lobe short, triangular-ovate, acute or obtuse, cream-coloured, mottled with scarlet and scarlet-tipped. *Lip* narrowly funnel-shaped with an anterior acute projection of the mouth, curved

forward, 1·2 cm. long, pinkish, spur tubular, blunt, upcurved into a semicircle, about half as long as the sac, cream coloured. *Capsule* ovoid, acute and minutely apiculate, 6 mm. long (immature). *Seeds* broadly pyriform, 1·5–2 mm. long, mottled brown, minutely papillose.

Travancore: High Range, Nemakad Gap, 7000 ft., September, *E. Barnes* 613 (type in Kew Herb.), 611, 612.

XLIX—TRIANA'S FLORA NEO-GRANADINA.

T. A. Sprague.

A photostat copy of this very rare work (see *Kew Bull.* 1929, 94) has recently been presented to the Kew Herbarium by Dr. E. D. Merrill, Director-in-Chief of the New York Botanical Garden, and it is now possible to give an account of its contents. The title-page is lettered "Nuevos jeneros i especies de plantas para la Flora Neo-Granadina, por Jose J. Triana. Bogota. Imprenta del Neo-Granadino. 1854." The cover of the book, however, bears the imprint "Imprenta del Neo-Granadino—1855." Since the date 1854 is assigned to the work by Karsten (Linnaea, **28,** 276), and also by Triana and Planchon (Prodr. Fl. Novo-Granat. 209), it may be accepted as correct. In the preface Triana speaks of the various new genera and species as having been discovered during his travels and says that his friend, the German naturalist, Dr. H. Karsten, has had the generosity to associate his name with the work. Since p. 7 bears the sectional title "Viaje de Karsten i Triana" it would appear that all or most of the new plants concerned were collected during Karsten and Triana's journey from Bogota to Quindiu mentioned by Karsten in Linnaea, **28,** 275. The new plants concerned were ascribed by Karsten (l. c. 425-434) to "Karst. et Triana", whereas Triana and Planchon sometimes gave the authors' names as "Triana et Karst." (Prodr. 95, 215). Apparently the descriptions were the joint work of the two botanists.

The Flora Neo-Granadina contains descriptions of thirteen new genera and twenty-one new species, and a re-description of *Phytelephas microcarpa* Ruiz et Pav. The descriptions of the thirteen genera, and of eighteen of the new species were incorporated by Karsten in the second part of his paper "Plantae Columbianae," published in Linnaea, **28,** 387-462. The title-page of vol. **28,** bears the date "1856," but the volume was issued in five separate parts, and there is reason to believe that part 4 (pp. 385-512) appeared in 1857. Triana and Planchon, Prodr. 95, 209, cite *Dendrostylis* and *Herrania aspera* from Linnaea, "ann. 1857." Furthermore, parts 1–3 (1856) are noticed in Flora, **40,** 286 (14 Mai 1857), but part 4 is not included, which suggests that it did not appear till 1857.

For the convenience of workers on the flora of Northern South America, a complete list is supplied of the names contained in the

Flora Neo-Granadina, followed by references to Karsten's paper, in which the descriptions were reproduced, and to Triana and Planchon's Prodromus Florae Novae-granatensis.

Triana's descriptions of *Anamorpha melochiodes*, *Gulielma chontaduro* and *Oenocarpus iriartoides*, which are apparently omitted from Karsten's paper, are reproduced below.

New Genera and Species.

The following abbreviations are used in the list:—
K.L.—Karsten in Linnaea, vol. **28.**
N.J.—Triana, Nuevos jeneros i especies de plantas para la Flora Neo-Granadina.
Pr.—Triana et Planchon, Prodromus Florae Novae-granatensis, vol. **1** (reprinted from Ann. Sci. Nat., sér. **4, 17, 18**).

Anamorpha, gen. nov., N.J. 9; K.L. 443 (Büttneriaceae); Pr. 211, sub *Melochia* L.
A. melochiodes, N.J. 10.—Colombia.
A. walteroides, N.J. 10; A. waltheroides K.L. 443; Pr. 215, sub *Melochia inflata* Triana et Planch.

Comatoglossum, gen. nov., N.J. 10; K.L. 436 (Sapindaceae); Pr. 367, sub *Talisia* Aubl.
C. strictum, N.J. 11; K.L. 437; Pr. 367, sub *Talisia stricta* Triana et Planch.

Brotobroma, gen. nov., N.J. 11 (Büttneriaceae); K.L. 446, sub *Herrania* Goud.; Pr. 209.
B. aspera, N.J. 12; Herrania aspera, K.L. 447; Pr. 209, sub *Herrania pulcherrima* Goud.

Burmeistera, gen. nov., N.J. 13; K.L. 444 (Lobeliaceae).
B. ibaguensis, N.J. 13; K.L. 444.—Colombia.

Trichantha, gen. nov., N.J. 14; K.L. 437 (Convolvulaceae).
T. ferruginea, N.J. 14; K.L. 438.—Colombia.

Guilielma:—
G. chontaduro, N.J. 15.—Colombia.

Oenocarpus:—
O. iriartoides, N. J. 15.—Colombia.

Stephanogastra, gen. nov., N.J. 16; K.L. 425 (Melastomaceae).
S. purpurea, N.J. 16; K.L. 426.—Colombia.

Codazzia, gen. nov., N.J. 17; K.L. 426 (Bignoniaceae).
C. speciosa, N.J. 18; K.L. 427.—Colombia.
C. rosea, N.J. 18; K.L. 427.—Colombia.

Phytelephas :—
P. microcarpa *Ruiz et Pav.*, N.J. 18 ; K.L. 275, 277.

Calycophysum, gen. nov., N.J. 20 ; K.L. 427 (Cucurbitaceae).
C. pedunculatum, N.J. 21 ; K.L. 428.— Colombia.

Kuala, gen. nov., N.J. 21 ; K.L. 428 (Rutaceae-Diosmeae) ; Ann. Sci. Nat. sér. 5, **14**, 306, sub *Esenbeckia* H.B.K.
K. alata, N.J. 22 ; K.L. 429 ; Ann. Sci. Nat. l. c., sub *Esenbeckia alata* Triana et Planch.
K. laevis, N.J. 22 ; K.L. 429 ; Ann. Sci. Nat. l. c., sub *Esenbeckia alata* var. *laevis*.

Loevigia, gen. nov., N.J. 22 ; K.L. 434 (Melastomaceae).
L. sericea, N.J. 23 ; K.L. 434.— Colombia.

Cephalotomandra, gen. nov., N.J. 23 ; K.L. 429 (Nyctaginaceae).
C. fragrans, N.J. 24 ; K.L. 430.— Colombia.

Matisia :—
M. castaño, N.J. 24 ; K.L. 430 ; Pr. 198.— Colombia.

Diplostylis, gen. nov., N.J. 25 ; K.L. 433 (Boraginaceae).
D. fasciculata, N.J. 26 ; K.L. 433.— Colombia

Dendrostylis, gen. nov., N.J. 26 ; K.L. 431 ; Pr. 95 (Bixaceae).
D. suaveolens, N.J. 27 ; K.L. 432 ; Pr. 95.— Colombia.
D. apeibaefolia, N.J. 28 ; K.L. 432 ; Pr. 95.—Colombia.
D. pubescens, N.J. 28 ; K.L. 432 ; Pr. 95.—Colombia.

Anamorpha melochiodes [p. 10], foliis petiolatis, petiolo semi-pollicari, ovatis vel oblongo-ovatis, dentatis, puberulis ; inflorescentia axillaris apice pedunculi simplicis vel bifurcati (subbipollicaris) glomerata ; petala alba, flavipunctata.

Crescit in convalle fluminis Magdalenae inter Tenasucá et Ibagué, alt. 300–1,300 m. Floret Martio.

Guilielma chontaduro [p. 15]. Palma 30–40-pedalis ½ ped. diametro, ligni nigri, internodio trunci tomento albo tecta, spinis nigris bipollicaribus horrida ; folia 6–8 ped. longa, pinnatisecta, utrinque 80 foliola 1–2 ped. longa, 1–1½ poll. lata, apice acuminata, basi recurvata, margine et costa media superne ciliis spinescentibus parvis obsessus, terna, vel quaterna, vel quina, radio obliquo imposita, ideoque folio adspectum crispi mentientia ; basis petioli vaginam latam, truncum amplectentem formans, extus, facieque inferne radii spinis, setisque nigris tectus ; fructus aurantiaci, flavi, vel corallini, magnitudine *Guilielmae speciosae*, rotundi, (1–1½ poll. diametro) ; pericarpio carnoso eduli crasso.

Crescit inter Piedra de moler et Cartago, ornans vicinos colles. alt. 1,200 m.

Chontaduro incolarum.

Oenocarpus iriartoides [p. 15]. Truncus 60-pedalis, 1. ped. diametro, ligno rubescenti, glaber ; folia 8 ped. longa, (petiolo bipedali) radiis superne acute carinata, utrinque circiter 200 foliola, quaternatim aggregata, radio oblique imposita (folium ideoque crispum) 2-3 ped. longa, 2 poll. lata, apice acuta ; inflorescentia ex axilla foliorum, spica simpliciter composita formans, spathis duabus inclusa, flores flavi ; fructus magnitudine ovi palomae.

Crescit inter Piedra de moler et Cartago ornans vicinos colles, alt. 1,200 m.

Palma real ab incolis dicitur.

L.—MISCELLANEOUS NOTES.

Retirement of Mr. Holland.—John Henry Holland retired from the post of Botanist in the Museums on Wednesday, October 17th, having reached the age-limit after 40 years connexion with Kew.

Mr. Holland entered Kew as a student gardener in 1894. In 1896 he was appointed Assistant Curator of the Botanic Station, Old Malabar, Nigeria, becoming Curator the following year. Unfortunately he had to retire from this post owing to ill health and in 1901 he re-entered Kew as Assistant (later Botanist) in the Museums. Mr. Holland's exceptionally wide knowledge of economic botany and of the Museums collections has been of great service during his long period at Kew. He has plans for further work and his numerous friends will wish him many years of active and happy retirement.

Dr. R. Melville.—Ronald Melville, B.Sc., Ph.D., Research Assistant, Institute of Plant Physiology, Imperial College of Science and Technology, has been appointed as Botanist in the Museums in succession to Mr. Holland.

Ellen Ann Willmott.—The news of the sudden death of Miss Willmott, which occurred at her house at Great Warley, Essex, on September 27th, came as a great shock to her large circle of friends and acquaintances.

For many years past Miss Willmott had held a leading place amongst women in horticulture. From her earliest days she was closely associated with gardens and in her childhood lived at Spring Grove, Isleworth, at one time the home of Sir Joseph Banks. She inherited her love of plants from her mother and on becoming the owner of Warley Place in Essex at a comparatively early age she was enabled to indulge it to a great extent. In a few years she made Warley, already notable as being the home of John Evelyn the diarist in the latter part of the 17th century, not only one of the most beautiful but also one of the most interesting of English gardens. It was already furnished with fine trees and in

its broader aspects she beautified it further by planting daffodils and other bulbs in great quantities. One of the most striking features were the meadows of *Crocus vernus* which have been there since Evelyn's time.

Miss Willmott had claim to be one of the pioneers in the cultivation of Alpine plants; for her rock garden, built by Backhouse of York, was one of the first to be constructed on the grand scale and to break away from the dreadful "rockwork" of mid-Victorian times. Here she was successful with many rare and reputedly difficult plants. Other groups in which she specialized were lilies and roses, and she also assembled at Warley one of the most comprehensive private collections of hardy trees and shrubs in the British Isles, much augmented and kept up to date by her financial support of the Chinese expeditions of E. H. Wilson. Miss Willmott also had gardens at Aix les Bains and near La Mortola, and for many years she was in frequent communication with Kew, until lately often paying visits and exchanging plants. She took a pride in keeping her collections correctly named and often sought the aid of Kew towards that end. Miss Willmott's name is perpetuated in the annals of botany and horticulture by her sumptuous work "The Genus Rosa," which she published in two folio volumes in 1914. The beautiful coloured plates were drawn by Alfred Parsons, R.A., and the purely botanical text was contributed by the late J. G. Baker at Kew, Miss Willmott herself furnishing geographical, historical and horticultural notes.

Miss Willmott possessed a fine botanical and horticultural library containing many of the old herbals and other rare botanical works as well as a long series of British and foreign periodicals. In 1920–21 she presented to Kew the very valuable gift of her fine "Herbarium Warleyense" amounting to some 15,000 sheets, from many parts of Europe. The herbarium was particularly rich in French material, collected by French botanists, most of it purchased by her from various sources. The specimens were excellently prepared and with full data, but many required mounting or remounting. This involved considerable labour but most of the collection is now incorporated in the general herbarium.

Miss Willmott was the first woman to be elected a Fellow of the Linnean Society (1904), and also received the V.M.H. when that Honour was instituted by the Royal Horticultural Society in 1897. She was also a Trustee of the R.H.S. Gardens at Wisley. She was a capable musician and a keen attendant at various scientific meetings. In all fields in which she took an interest she was untiring in her pursuit of knowledge and she will be greatly missed in all those spheres of public and private life which owe so much to her interest and many activities.

Poa amboinica *Linn.*—The name *Poa amboinica* was published by Linnaeus in his Mantissa, **2**, 557 (1771). The epithet *amboinica* was adopted from *Phoenix amboinica montana* Rumph. Amb. **6**, 19, t. **7**,

fig. 3 (1750), which Linnaeus cited as a synonym. In the brief description the plant is stated to be very like *Poa compressa*. Since neither the description nor the figure in Rumph. Amb. is that of a *Poa* or an *Eragrostis* it is clear that Linnaeus had before him a specimen of some other species. He gave the habitat as "India." Rumphius's plant is apparently a *Sorghum*; indeed, Merrill in Rumph. Herb. Amb. 88 assigns it to *Andropogon*. Unfortunately *Poa amboinica* is not represented in the Linnean Herbarium at the Linnean Society of London.

Trinius in Steud. Nomencl. ed. 2, **1**, 652, recognised Linnaeus's description as that of an *Eragrostis* and transferred the plant as *E. amboinensis* (accepting the alteration of the specific epithet from *amboinica* to *amboinensis* made by Murray in Linn. Syst. ed. 13, 98).

Druce in Rep. B. E. C. 1916, 621, took up the older trivial in the combination *E. amboinicea* (error for *amboinica*).

Retzius pointed out that *Poa amboinica* L. included two distinct species and excluded the Rumphius synonym, retaining the name *P. amboinica* L., of which he published an amplified description in his Observationes, **4**, 20 (1786) based on a specimen he had received under that name from Koenig, which is now in the Lund Herbarium. This plant is certainly an *Eragrostis* closely resembling *E. ciliaris* Link, with which species it has been much confused. It was included as *E. ciliaris* in the catalogue of the Koenig specimens in Kew Bull. 1932, 74, no. 316.

In the Smithian Herbarium at the Linnean Society of London there is a sheet identified, apparently by Sir J. E. Smith himself, as *Poa cynosuroides*, which is not that species but agrees well with the Lund specimen. The Smithian specimen was inscribed in 1785: "Hort D. Salisbury, e seminibus ex India Or. a Konigio ad D. Banks missis."

In the Herbarium of the Natural History Museum, London, there is a sheet which also agrees with the Lund sheet. It is inscribed (possibly by R. Brown): "Mr. Schumacher states that this was sent by Koenig to Rottboell under the name of Poa amboinica . . . Retz. fascic. 4." It is not known whether he meant that this very specimen or one identical with it was sent to Rottboell and if it was this same specimen how it came to London. The sheet is also identified in another hand as "Poa pulchella Salisbury."

Poa pulchella was published by Salisbury in his Prodr. Stirp. Hort Chapel Allerton, 21. The short description there given, which agrees fairly well with the Lund sheet, ends: "Sponte nascentum prope Tranquebar, legit Joh. Ger. Koenig."

Koenig was at Tranquebar in South India from 1768 for a few years and sent plants from that region to Linnaeus. It seems certain, therefore, that Koenig sent a South Indian grass to Linnaeus which the latter considered as identical with Rumphius's grass and published the name *Poa amboinica* in 1771. He would have communicated the binomial to Koenig, who thereafter sent specimens either of the same collecting or, at least, of plants he deemed to be

identical with the one so named by Linnaeus, to Retzius and to Rottboell under that name and seeds to Banks.

The brief description furnished by Linnaeus is in no way inapplicable to the sheets referred to in the Lund, Smithian and Natural History Museum Herbaria, but that given by Rumphius and his figure are not compatible with them.

It is clear, therefore, that *Poa amboinica* Linn. Mant. **2**, 557 consists of two species, one from Amboina first described by Rumphius, and the other an *Eragrostis* collected by Koenig in South India. When separating the two, the specific epithet *amboinica* should, presumably, be retained for Rumphius's plant from Amboina and is not, therefore, available under *Eragrostis*. Nor can the specific epithet *pulchella* be retained owing to the existence of the validly published name *Eragrostis pulchella* Parl. based on a different type. However, Dr. R. Pilger has been kind enough to compare a specimen (one plant from Madras, *Barber* 4387), which agrees entirely with the sheet in the Lund Herbarium identified by Retzius as *Poa amboinica*, with the type sheet of *Poa riparia* Willd. in Ges. Naturf. Fr. Berl. N. Schrift. **4**, 185 (1803), and finds that the two agree with a trifling difference in the form of the panicle. *Poa riparia* was transferred to *Eragrostis* by Nees in 1829; it is clear, therefore, that *Poa amboinica* Retz. non Linn. should now be termed ***Eragrostis riparia*** (Willd.) Nees.

C. E. C. FISCHER.

New combinations under Copaifera.—In the course of working on *Leguminosae* of Tropical Africa, the necessity for the changing of the names of two species of *Copaifera* became apparent. As the two trees in question are of economic interest as producers of gum-resins, it seems desirable that they should be given their correct names under the International Rules of Botanical Nomenclature without delay, and the new combinations together with their respective synonymy are published herewith.

Copaifera copallifera (*Benn.*) *Milne-Redhead*, comb. nov.

Guibourtia copallifera Benn. in Journ. Linn. Soc., Bot. **1**, 150 (1857). *Copaifera Guibourtiana* Benth. in Trans. Linn. Soc. **25**, 317 (1865); Oliv. in Oliv., Fl. Trop. Afr. **2**, 314 (1871); Hutch. et Dalz., Fl. W. Trop. Afr. **1**, 338 (1928); Bak. f., Leg. Trop. Afr. 750 (1930). *Copaifera copallina* Baill., Hist. Pl. **2**, 142, 163 (1870). *Copaiba copallifera* Kuntze, Rev. Gen. **1**, 172 (1891).

Copaifera conjugata (*Bolle*) *Milne-Redhead*, comb. nov.

Gorskia conjugata Bolle in Peters, Reise Mossamb., Bot. 16, t. 3 (1861). *Copaifera Gorskiana* Benth. in Trans. Linn. Soc. **25**, 317 (1865); Oliv. in Oliv., Fl. Trop. Afr. **2**, 315 (1871); Bak. f., Leg. Trop. Afr. 751 (1930). *Copaiba conjugata* Kuntze, Rev. Gen. **1**, 172 (1891); Engl., Pflanzenw. Ost.-Afr., C, 197 (1895).

E. MILNE-REDHEAD.

Gaultheria microphylla (*Forst. fil.*) *Hook. fil.*—During recent work on the Gaultherias and Pernettyas of the southern hemisphere, suspicion that the name *G. microphylla* for the small South American species of *Gaultheria* might be incorrect was aroused by the discovery that Forster's specimens in the Kew herbarium belonged to the Epacridaceous genus *Lebetanthus*: a search in the British Museum herbarium revealed the same state of affairs.

Forster's original description of *Arbutus microphylla* reads as follows:—"Simillima praecedenti [*Arbutus mucronata* Linn. fil.]. Folia dimidio vel triplo minora, et omnino mucrone destituta, licet acuta sint; tum quoque tenuiora, serraturis magis argutis, margine non revoluto. Pedunculi pariter ac in *A. mucronata*, brevissimi, bracteis pluribus cincti. Habitat cum priore."

Lebetanthus myrsinites (Lam.) Macloskie and the small *Gaultheria* are rather alike superficially, but three points in this description apply to the former and not the latter. The leaves of the *Gaultheria* are not noticeably thinner than those of *Pernettya* (*Arbutus*) *mucronata*; the serrations are not sharper and there is a thickened—not strictly revolute—margin, much as in *Pernettya mucronata*. This description, however, fits *Lebetanthus myrsinites* very well and seems to establish the fact that *Arbutus microphylla* Forst. fil. is synonymous with it. Skottsberg,* it should be mentioned, has already noted that Forster's specimens are *Lebetanthus*, but thought that he probably collected both plants, a suggestion that does not seem justified in view of the description.

The *Gaultheria* was first described as *Arbutus serpyllifolia* by Lamarck, but the name is not available under *Gaultheria* owing to the earlier *G. serpyllifolia* Pursh.

In the "Flora Antarctica" Hooker figured this plant as *G. antarctica* Hook. fil. but called it *Gaultheria microphylla* in the text. In his own words "When figuring this species, I gave it the trivial appellation of *antarctica*, not being aware of its identity with *Pernettya serpyllifolia*, DC., and *Arbutus serpyllifolia*, Lam., all of which names must yield to that of *G. microphylla*, the plant being undoubtedly the little-known *Arbutus microphylla* of Forster." Since this is now shown to be incorrect, *G. antarctica* becomes the correct name. The more important references and synonymy are:—

Gaultheria antarctica *Hook. fil.* Fl. Antarct. **2**, t.116 (1847).

Arbutus serpyllifolia Lam. Encycl. **1**, 228 (1783); Ill. t.366, f.3 (1797).

Pernettya serpyllifolia (Lam.) DC. Prodr. **7**, 587 (1839), excl. syn. *Arbutus microphylla* Forst. fil.

Gaultheria microphylla Hook. fil. Fl. Antarct. **2**, 327 (1847), excl. syn *Arbutus microphylla* Forst. fil.; Gay, Fl. Chile **4**, 359 (1849); Macloskie in Rep. Princeton Exped. Patag. 1896–99, **8**, pt. 2, Bot. 645 (1905); Reiche, Fl. Chil. **5**, 81 (1901), excl. syn.

* Kungl. Svensk. Vet. Akad. Handl. **56** no. 5, 283 (1916).

Arbutus microphylla Forst. fil. et *Andromeda prostrata* Cav.; Skottsberg in Kungl. Svensk. Vet. Akad. Handl. **50,** no. 3, 45, t.2. fig. 8–10 (1910); Vallentin, Flow. Pl. Falk. Isl. t.40 (1921).

Brossaea antarctica (Hook. fil.) O. Kuntze, Rev. Gen. 388 (1891).

Gaultheria serpyllifolia (Lam.) Skottsberg in Kungl. Svensk. Vet. Akad. Handl. **56,** no. 5, 283 (1916) non Pursh, Fl. Amer. Sept. 1, 288 (1814). B. L. BURTT.

Flora of the Transvaal.*† The second part of Dr. Burtt Davy's "Manual of the Flowering Plants and Ferns of the Transvaal and Swaziland," which appeared in July, 1932, completes the account of the archichlamydeous families, from the *Malvaceae* to the *Umbelliferae*. The author has therefore now provided the means of determining the names of plants of nearly all those families which appeared in the earlier volumes of the "Flora Capensis," but which are largely out of date. With these two parts and the more recently published volumes of the "Flora Capensis," students of the Transvaal flora are taxonomically better provided for than any others in Southern Africa. But accounts of the large and important family *Compositae*, and of *Rubiaceae*, are still much needed.

As in part I, the general text is preceded by latin descriptions of all the new species of the families dealt with. This is followed by a table from which we learn that the order *Leguminosae*, so dominant a group in all parts of tropical Africa, is represented by as many as 461 species, 23 belonging to *Caesalpiniaceae*, 50 to *Mimosaceae*, and 388 to the *Papilionaceae*. From this table, and from the one published in the first part, it is evident that the flora of the Transvaal is mainly derived, not from the Cape flora proper, but from the great tropical flora to the north. For example there are 28 species of *Hibiscus*, 35 of *Euphorbia*, 32 of *Acacia*, 27 of *Tephrosia*, and a very large number (82) of *Indigofera*, the last mentioned having been elaborated by Dr. N. E. Brown, all these genera being mainly found in the tropics.

The increase of 57 per cent. in the number of known species as compared with the author's check-list of 1911 is phenomenal, due largely to exploration under the auspices of the Botanical Survey. Much more field work is necessary, however, especially in the mountainous Eastern Transvaal before we can have an adequate knowledge of the flora of this interesting province.

The part under review is priced at 25s. net, an increase of 10s. on the first part, the general text occupying pp. 273-522, with forty black and white illustrations, a noted improvement being the reduction in the number of abbreviations. J. HUTCHINSON.

*A Manual of the Flowering Plants and Ferns of the Transvaal with Swaziland, South Africa, by Joseph Burtt Davy. Part 2. Malvaceae to Umbelliferae. Longmans, Green & Co., Ltd., London, 1932. Pp. 529, 40 illustrations. Price 25s.

† See K.B 1926, 303.—It is much regretted that owing to an oversight a notice of the second part of this important work did not appear at an earlier date.

The British Pharmaceutical Codex, 1934.—This important work, which provides a book of reference for pharmacists and medical practitioners, shows a distinct advance on previous editions. The scope of the work has been considerably extended, as can be seen from a glance at pp. xii-xiv of the Preface, where some important additions are enumerated. The arrangement certainly facilitates consultation. Part I contains the general monographs, in alphabetical order, on the drugs and chemical substances, each monograph starting with the name followed by the synonymy, general description both macro- and microscopical, substitutes, standard, and action and uses. These monographs occupy nearly two-thirds of the entire volume. Then follows part 2, Surgical Dressings; part 3, Formulary; and part 4, Appendices containing tables, general tests, reagents, etc., concluding with a full representative index.

Although primarily intended for the pharmacist and medical man, this reference work is also indispensable to the botanist, particularly the economic botanist. The monographs dealing with the vegetable drugs embody much information which is difficult to obtain from general botanical works. Each monograph shows careful preparation, the classification is mainly in accordance with modern ideas, and the nomenclature on the whole follows the International Rules of Botanical Nomenclature, as revised at Cambridge in 1930. It is gratifying to see that for the plant yielding lavender oil the name *Lavandula officinalis* Chaix is retained and for the species yielding spike oil the name *Lavandula latifolia* Vill. As the result of an enquiry from the Pharmaceutical Society, the somewhat involved nomenclature of these two species was worked out (Kew Bull. 1932, 295), and it was suggested that *Lavandula Spica* L., a name which causes confusion, having been applied both to *Lavandula officinalis* Chaix and *L. latifolia* Vill., should be treated as a "nomen ambiguum" and placed on that list at the next International Congress to be held at Amsterdam in 1935.

Several additional monographs are included in the present edition of the Codex. Special mention may be made of *Ephedra sinica* Stapf, *E. equisetina* Bunge and *E. Gerardiana* Wall., from whose dried young branches are obtained alkaloids which are used largely in the treatment of asthma. *E. sinica* Stapf was described as lately as 1927 (Kew Bull. 1927, 133).

Another interesting addition is Azorubrum, which is used in the place of cochineal and cudbear as a colouring agent for medicines and foodstuffs. Formerly there was no synthetic dye to replace cochineal, obtained from the dried female insect (*Dactylopius coccus*) that feeds on various species of *Nopalea* (*Cactaceae*) and cudbear obtained from species of *Roccella*, lichens found chiefly on the Canary Islands, Madagascar and African coasts. Azorubrum (Bordeaux B) apparently has greater permanence of colour than cochineal and cudbear and is unaffected by dilute acids and alkalis or by exposure to sunlight.

Space does not permit the mention of the many other additions and improvements in the 1934 edition. The Codex is printed on good paper and the letter press is pleasing. The editor and authors, as well as the publishers, are to be congratulated on the production of so comprehensive an Imperial Dispensatory.

M. L. GREEN.

Welsh Flowering Plants.* —The authors of this handbook are to be congratulated on producing the first complete list of the phanerogamic flora of Wales. Introductory matter, including a useful summary of Raunkiaer's life-forms, and an analysis of the flora county by county, occupies about 30 pages. In the section on Montgomeryshire, Briedden Hill is described erroneously as "a . . . limestone mass." In fact the rocks are granitoid, chiefly Anderite, and, although the constituent felspar may contain calcium, there is no free limestone. This makes the occurrence there of *Veronica hybrida*, usually a limestone species, all the more interesting.

In the catalogue proper, much information is condensed under each species. After the Latin and English names, Raunkiaer's life-form is indicated by an abbreviation, followed by the usual habitat of the plant (sylvestral, paludal, etc.), the type of distribution in Britain as a whole (germanic, atlantic, etc.) and the Welsh counties where it has been recorded, with more detailed records for rare plants. Further information (as to status of aliens) is given by the use of different types, asterisks, etc.

As regards nomenclature, the aim of the authors has been to follow the International Rules, but the delay in the publication of the third edition must have made their task rather difficult. The generic name *Cnicus*, which was conserved in 1905 for the monotypic *Cnicus benedictus* (Internat. Rules, ed. 2, p. 103) is used for the genus correctly known as *Cirsium*. The combination *Coronopus verrucarius* (Garsault) Muschl. et Thell. is illegitimate, as was shown by Schinz and Thellung in 1909. The correct name for the species (under *Coronopus*) is *C. procumbens* Gilib.

The pronunciation of each name is given. The stressed syllable is indicated by an accent- grave in the case of a long vowel and acute for a short one. The accentuation seems to have been done with great care, only a few apparent errors having been detected. In the words *Conium* and *radicans* (*Caltha*) the stress should fall on the penultimate syllable, the "i" being long in both cases, according to Lewis and Short. To busy systematic botanists this handbook will be an invaluable guide to pronunciation, though the correct mode will sometimes come as a shock, as in *Trifólium médium* (all vowels short) and *Gálium saxátile*. Its publication should raise the present rather low standard of pronunciation in this country.

All those interested in the British flora will welcome the publication of this work, not the least valuable part of which will be the assignment of each species to one of Raunkiaer's life-forms, a task never before attempted for the flora of a large area of Britain.

* Welsh Flowering Plants. A Handbook to the Collection in the Welsh National Herbarium. By H. A. Hyde, M.A., F.L.S., and A. E. Wade, F.L.S., Cardiff, 1934. Published by the National Museum of Wales and by the Press Board of the University of Wales. Pp. vii. + 179, 2 plates and 8 figs. Price 5s.

The Myxomycetes.*—The scope of this work is indicated by the subtitle—"A descriptive list of the known species, with special reference to those occurring in North America." It is based on the second edition (1922) of the late Professor Macbride's "North American Slime Moulds," but inasmuch as the whole of the *Myxomycetes* are now dealt with it covers considerably more ground. As compared with the third edition of Lister's *Mycetozoa*, the number of genera and species is increased by the inclusion of those which have been described since 1925. It represents also another point of view, in that many species are maintained which Miss Lister considered to be synonymous with other species or at most varieties. "We have felt justified in applying a distinctive specific name to any form which shows reasonable constancy under varying conditions, even though occasional intermediate forms may appear."

The true "slime fungi" only are dealt with, the *Acrasiae*, *Plasmodiophoraceae*, and some smaller doubtful groups being omitted. Of the *Myxomycetes* proper, the two groups *Exosporeae* and *Endosporeae* are recognised. While the arrangement of the *Endosporeae* resembles in the main that of the Lister monograph, there are differences in the grouping into families and orders. Four orders, *Physarales*, *Stemonitales*, *Liceales* and *Trichiales*, correspond to the suborders of Lister. *Diderma* and *Physarina* are placed in the family *Didymiaceae*, and *Diachaea* is found in the *Stemonitaceae* instead of in the *Physaraceae*. *Amaurochaete* and *Brefeldia* are included in the *Stemonitaceae*, but a separate family *Lamprodermaceae* is constituted for *Lamproderma* and its allies. In the *Trichiales* a fourth family *Perichaenaceae* includes *Perichaena*, *Ophiotheca* (held distinct) and *Minakatella*.

One new species, *Badhamia gracilis* Macbr., is described, without a Latin diagnosis. The new name *Physarum Listeri* Macbr. is proposed for *Physarum luteo-album* Lister, non Schum.

As regards nomenclature, the authors have endeavoured to follow the International Rules as revised at Cambridge in 1930. In "Supplementary Notes" at the end of the volume, however, they explain their reasons for retaining certain well-known names which are contrary to the Rules. Some of these are later homonyms and must be rejected. Other specific epithets have been retained even although the synonymy given indicates the necessity for a

*By Thomas H. Macbride and G. W. Martin. The Macmillan Company, New York, 1934. Pp. xi + 339. 21 uncoloured plates. Price 25/-.

change, because of the tentative nature of much of the synonymy in this group.

An appendix gives a list of names which are of uncertain application or do not refer to *Myxomycetes*.

The book is clearly printed and the matter well set out, keys being given for families, genera and species. There are 21 uncoloured plates giving habit sketches and details of spores and capillitia.

E. M. WAKEFIELD.

Botany as Part of a General Education.* The appearance within five years of one reprint and a second edition of a botanical text-book shows that it has met a definite need. As compared with the first edition the work has been increased by 93 pages and 47 text-figures, and the subject matter has been partly re-arranged, the chapter on " water and dissolved material " now coming more appropriately after those on the structure of the root, stem and leaf.

The Introduction is followed by chapters on the fundamental structure of plants, the structure and functions of the root, stem and leaf, the relations of the plant to water and dissolved material and to food, and the relation of living things to energy. Chapters on growth, stimuli and responses, reproduction, heredity, and the nature of life complete the first part of the book, which is entitled " The living plant." The second part dealing with " The kinds of plants " begins with an " introduction to the plant kingdom," followed by six chapters on the Algae, Fungi and Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms respectively. Only 44 pages are devoted to the Angiosperms, ten orders of Dicotyledons and six of Monocotyledons being briefly noticed. Discussions of the origin and evolution of life, and the distribution of life, complete the main body of the book. Questions for review and discussion, and a list of books for reference, are appended. The text figures are abundant and well chosen, many of them being original.

To quote the preface, " the book is intended for general students as part of an education which all should have. It is not intended to lay the foundations for professional botany." Hence the treatment is broader than in most works of the kind. The Introduction, for example, includes sections on the scientific method and its results, and a discussion of teleology is appended to chapter X on stimuli and responses. The work will be useful to the general student and the amateur, to whom its wide scope and predominantly physiological bent will recommend it. The chapters on heredity (pp. 220-46), the nature of life (247-55), the origin of life (499-510), and the evolution of life (511-536) bring together much information not to be found elsewhere within the limits of a single volume.

The method of treatment of the subject, however, and the occasionally somewhat unorthodox or lax terminology employed make the work unsuitable for use as an academic text-book in this country. Thus the terms " spermatozoid " and " ovum " do not occur, being replaced by the wider ones " microgamete " and " megagamete ; " and the meristeles of *Pteridium* are termed fibro-vascular bundles. It is, however, refreshing to come across a botanical text-book written on more or less original lines. Teachers of elementary botany may be able to cull useful hints from Messrs. Robbins and Rickett's book.

T. A. SPRAGUE.

*Botany; a text-book for College and University Students, by William J. Robbins and Harold W. Rickett. Second edition. D. Van Nostrand Company, New York. 1934, pp. xi + 628, figs. 431. Price $3.75

Plant Distribution in the Aberystwyth District.*—Professor Newton's book is designed as an introductory survey of the vegetation of the Aberystwyth neighbourhood and should prove of great value both to those who wish to obtain a bird's-eye view of the plant communities of this little-known area and to students intending to make detailed investigations on any particular vegetational unit.

After preliminary sections on the physiography and geology of the region and on aims and methods in ecology in general, Professor Newton describes in some detail the various communities found in the area under the five headings of Maritime Coastal Associations; Cultivated Areas, including Lowland Grass-land and Arable Land; Woodlands; Bogs; and Moorland and Hillpasture. Lastly the factors influencing distribution are discussed. One of the most important is considered to be altitude, while the direction of the prevailing winds and the underlying geological formation both play their part. It is a pity that, in a scientific work, the date of publication should have been omitted.

The book, which is illustrated by photographs and by maps showing the distribution of vegetation, should receive a warm welcome from all students of ecology.

Botanical Magazine.—Part 4 of volume 157 was published on October 1st and concludes the volume for the year 1934. It contains an excellent portrait of Dr. Otto Stapf, to whom it is dedicated in the following words : " To the memory of Otto Stapf, Ph.D., F.R.S., V.M.H., F.L.S. for eleven years Editor of this Magazine Who by his remarkable knowledge of plants deep appreciation of their beauty and by his indefatigable industry in Research raised it to a pre-eminent standard of excellence and usefulness This volume is dedicated in gratitude and admiration by the Royal Horticultural Society."

The following plants are figured ; *Tulipa kuschkensis* B. Fedtschenko (t.9370), a fine scarlet tulip from Russian Turkestan ; *Pieris formosa* var. *Forrestii* Airy-Shaw (t.9371), a new variety with larger flowers than the type and with an exserted style, found in

*By Lily Newton. M.Sc., Ph.D., F.L.S., Professor of Botany. University College of Wales, Aberystwyth. Cambrian News (Aberystwyth) Ltd. No date [published 1933]. Pp. 50. Illustrated. Price 3s. 6d.

N.W. Upper Burma and Yunnan; *Muscari cyanco-violaceum* Turrill (t.9372), a new species allied to *M. Vandasii* Velenovsky, from Eastern Bulgaria; *Viburnum alnifolium* Marshall (t.9373), a native of Eastern Canada and E. United States; *Azara lanceolata* Hook.f. (t.9374), from Southern Chile and Western Patagonia, a species originally discovered by Charles Darwin during the voyage of the "Beagle" in 1834, with fine mauve-coloured fruits; *Rhododendron Bachii* Léveillé (t.9375), a member of the *Ovatum* series from Central China; *Maxillaria fucata* Reichenbach f. (t.9376), probably a native of Ecuador; *Agathosma perdita* Hutchinson (t.9377), a new species allied to *A. pilifera* Schlechtendal, from South Africa; *Iris kashmiriana* Baker (t.9378), a white-flowered *Iris* formerly known as *Iris Bartoni* Foster, found from Kashmir to Afghanistan; *Megaskepasma erythrochlamys* Lindau (t.9379), an interesting greenhouse plant with crimson bracts, a native of Venezuela, and *Ranunculus asiaticus* var. *albiflorus* Linn. (t.9380) a fine white-flowered form collected by Mr. G. P. Baker in Crete.

NICHOLAS EDWARD BROWN.—We have to record with deep regret the death on November 25th, at the age of 85, of Dr. N. E. Brown, A.L.S., Assistant in the Herbarium from 1873 to 1914. An account of Dr. Brown's work will appear in a subsequent number of the The Kew Bulletin.

The South African Botanist at Kew.—MR. R. A. DYER, M.Sc., who has been Botanist for South Africa at Kew since February 1931, has returned to take up the position of Botanist in the Division of Plant Industry, Department of Agriculture, Pretoria. DR. H. G. SCHWEICKERDT, B.Sc., Agrostologist of the Department, has been seconded to Kew by the Government of the Union to succeed Mr. Dyer.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1934
ROYAL BOTANIC GARDENS, KEW

LI—A STUDY OF POLYSTICTUS VERSICOLOR.

B. ALWYN JAY.

INTRODUCTION.

It is hardly an exaggeration to say that most of the rot of felled hardwoods in Britain, under damp conditions, has been caused, at least partially, by *Polystictus versicolor* (L.) Fr.; and Von Schrenk and Spaulding describe it as the ". . . most serious of all wood rotting fungi which attack dead wood of broadleaf trees." Also as ". . . one of the most cosmopolitan species of fungus on the sapwood, on every broadleaf species of tree known." Its fructifications are to be found on stumps of trees, gateposts, wooden fences and in fact on any untreated hardwood exposed to the weather, or under other damp conditions. It has also been reported to cause rot in the wooden frames of car bodies. The presence of the fungus has been reported from every country on the continent of Europe and also in America, where it is stated to cause a wet decay in the middle of limbs of apple (1). Bayliss (2) calls it a "pure saprophyte" but Von Schrenk and Spaulding say it is a wound parasite on hardy Catalpa, and Zeller states that it causes "heart rot canker." In this country however, it has not been reported as a parasite or even as causing decay of heart wood of standing trees. In the beech woods of the Chilterns practically every stump and felled tree shows the fruit bodies of *P. versicolor*, but I have never found the fungus in any living tree in spite of careful observation over a considerable period.

PREVIOUS WORK.

Despite the extreme economic importance of *Polystictus versicolor* there has been little previous experimental work on it published, and no really comprehensive study of its effect upon wood. Bayliss's paper in 1908 (2) deals mainly with the microscopic details of hyphae and the fungus in hanging drop cultures, etc., and gives an outline of its effect upon wood. Fritz (5) also gives notes on the fungus in culture and describes its growth on a number of different media. Walpert (8) indicates the growth of Polystictus with regard to the Hydrogen ion concentration of the medium. N. E. Stevens (7) describes the fungus as causing a rot of the hardy Catalpa; and Weir (9) and Zeller (10) deal with its rare parasitism on a few species of trees. The chemical action of the fungus upon wood has been investigated by R. G. Smith (6) and W. G. Campbell (3). Short descriptions of the fruit-bodies have been given by many authors and may in fact be found in most text books on mycology.

Fruit bodies.

The individual sporophores are small, seldom exceeding 6 to 8 cms. wide and 4 cms. deep, but they are conspicuous owing to large numbers forming dense masses and overlapping one another, often covering an entire tree stump. They may be bracket-shaped or resupinate according to their position, though even in the former instance there is no true stipe, the pileus sometimes narrowing slightly at the point of attachment. When young the sporophore is white and fleshy but with age it becomes leathery and the upper surface is divided into a number of concentric zones of varying shades of yellow and brown, which are also troughs of varying depths; the whole surface is covered with short fine hairs, giving it a velvety texture. The margin is irregularly lobed and thin; the lower surface retains its white colour throughout life; the pore orifices are round when young, becoming rather torn later. The shape of the pileus varies considerably but is generally more or less fan-shaped. Both the shape and colouring of fruit-bodies vary with their position, amount of light and moisture, and to a certain extent with the host.

The fungus in culture.

The medium almost exclusively used was malt extract agar (2% Kepler's malt extract and 2% agar-agar in water), in which the fungus grew vigorously; thicker but slower growth was obtained by the addition of 1% of malic acid, and this was used when such a growth was desired.

Plates of 2% malt agar were inoculated from a sub-culture of *P. versicolor* obtained from the Forest Products Research Laboratory, Princes Risborough, and kept in the light at laboratory temperature. Slope cultures in test tubes were also made and placed under the same conditions; the appearance of these being noted from day to day. After a fortnight both plates and slopes were covered with a smooth, closely woven mat of rather felty-looking mycelium appressed to the medium; in some plate cultures there was a slight tendency to zonation, but the zones were not very marked nor regular and consisted of a thicker growth of mycelium with no sign of secondary spore or conidia formation; also with age the zones disappeared. In the majority of cultures growth was very even, and the margin of the colony formed an unbroken circle. The colour of the mycelium was pure white with only the slightest yellowing in some cases after a month or so; in many cultures the mycelium tended to become slightly and patchily colourless and translucent, but this was not so in all cases and after six weeks to two months many of the patches became white again. The rate of growth was fairly fast, the whole plate (about 8 cms. diameter) being covered in about two weeks, at about 18° C. Tube cultures showed a similar kind of growth but that the mycelium was of a rather more feathery texture especially towards the base of the slope, due to the moister condition of the agar and its greater

thickness. The slopes were covered in six to eight days. In no case were any fruit bodies found. The fungus had the striking effect in both plate and tube cultures, of decolorising the medium, which was, when inoculated, a deep brown and became after three weeks to a month entirely colourless; this is a useful test in identifying *P. versicolor*, although this may be shown by other species.

Cultures three and four months old did not differ greatly from those one month old, except that some became more colourless and presented a rather granular appearance, the mycelium being formed into a white powder at the edge of, and, to some extent, all over the colourless portions; this powder was not formed of spores but of interweaving hyphae. Submerged in the medium of old cultures appeared small dark specks the size of a pin-hole and brown in colour. Microscopic examination showed them to be masses of disintegrated hyphae containing some yellow fluid, probably oil (a degeneration product). Drops of a brown fluid were exuded from old cultures and were particularly noticeable in tube cultures.

Microscopic details of Fungus.—(1) Young hyphae: less vacuolated than the older hyphae and also less freely branched; clamp connections are few in very young hyphae. Size 2–4μ wide.

(2) Mature Hyphae:
(a) Aerial: (taken from feathery growth on acid medium). Not very much branched and with relatively few septa but most septa provided with clamp connections. In all cases

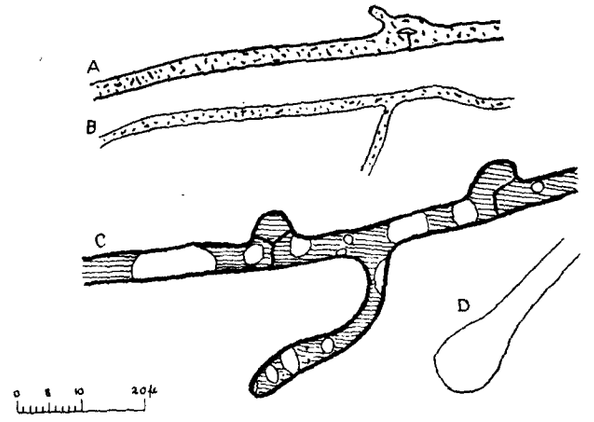


Fig. 1. A, Hypha showing granular deposits in cell sap and branch from clamp connection. B, narrow hypha. C, older hypha showing great vacuolation and clamp connections. D, swollen end of hypha.

the hyphae are hyaline. It was noticed that a large number of branches arose from clamp connections. A number of hyphal tips were swollen, and in some cases bifurcated;

there seemed to be no specific reason for this, as the tips observed were free in medium and not attempting to penetrate the membrane of a host. The average size of hyphae is 3–4μ wide.

(b) Submerged hyphae: More freely branching than aerial hyphae and with many more septa, also they are more vacuolate and larger; their average width being 3·6μ. In old cultures frequent thick walled hyphae were seen.

(3) Clamp connections: very abundant especially in vigorously growing cultures, being less frequent in very old and very young hyphae. They vary somewhat in size.

(4) Crystals: small groups of needle-shaped crystals were found in slide cultures of *P. versicolor* on 2% malt agar (filtered) after a few days growth, but were absent from plate cultures except when the medium had almost dried up, which suggests that their formation was due to the medium being exhausted quickly or to an insufficiency of moisture. Rhomboidal crystals of varying size were present in most cultures, especially old ones.

Fruit bodies in culture. Fruit bodies were not obtained in culture in spite of many experiments such as (1) growing the fungus at different concentrations of malt agar (0·5% to 10%). (2) Using liquid media. (3) making the surface of a solid medium vertical. (4) using media of various pH values. (5) growing cultures at different temperatures. (6) using aerated media such as bread and loofah soaked in a broth of malt extract. In the last experiment small knobs of mycelium formed on the bread but did not develop further.

Cultures from different sources. Cultures were made from spores of fruit-bodies taken from several hosts, beech, oak, ash, hornbeam and cherry being used. There was no difference in the mycelium either macroscopically or microscopically and the effect on the media was identical in all cases.

Basidio-spores and their germination. The basidio-spores are hyaline and appear white in mass; they are formed in great abundance, are oblong to oval in shape, 2 to 4μ wide by 6 to 8μ long, and are surrounded by a fairly thick wall; the cytoplasm usually contains one, two or more small, dark, granular masses.

Germination in sterile distilled water takes place readily in twenty-four hours, or less in a nutrient medium; it is greatly affected by air, even to the extent that in a slide culture (malt broth as medium) the spores at the edge of the cover-slip germinated in a day, but those in the middle did not germinate after many weeks, although constant fresh supplies of malt broth were introduced under the cover-slip before the old dried up. Germ-tubes may arise from any part of the spore and grow very rapidly.

Hanging-drop culture of spores: considerable growth took place for 6 to 7 days and then the hyphae walls became rather contorted in outline and the contents tended to split up in short

lengths (4 to 8μ long), but the actual wall did not break up, and the hyphae remained in this state for several months. No indication of the pale green buds reported by Bayliss was seen. Numerous rod-shaped crystals (4 to 8μ long by 1μ wide) were formed in the medium after a week or so.

Monosporous culture: made in 0·5% filtered malt agar. After twenty-four hours a primary mycelium was formed, considerably branched, unseptate and the hyphae being about 4μ in diameter. A further nineteen hours later the mycelium had more than doubled its growth and many new branches were formed, but no septa appeared nor clamp connections.

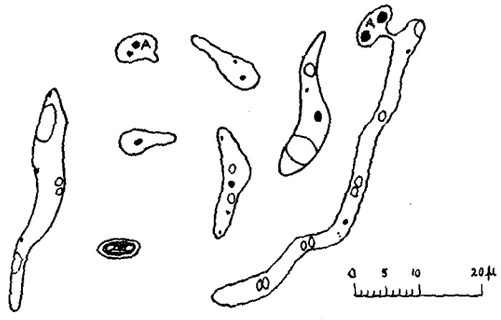


Fig. 2. Germinating basidiospores. A, granules in cytoplasm.

In less than a week a good growth of mycelium had been formed and from this a single hyphal tip was taken and placed on a plate of 2·0% malt agar where it grew strongly, without septa or clamp connections, covering the plate in under a fortnight and with the same texture as the culture described on page 410.

Finally two monosporous cultures were started on one plate of malt agar and allowed to grow together: at the meeting of the two haploid mycelia a diploid mycelium was formed.

Vitality of spores: spores retain their vitality for considerable periods and fruit-bodies collected in a dried up condition (in which state they had probably been for several months) and kept in the laboratory for a further three months, on soaking in water, yielded spores which germinated freely. A further experiment consisted of placing a drop of a thick spore-suspension in sterile distilled water on a slide and adding a cover-slip; this was allowed to dry out before many of the spores had time to germinate, and in the dry state kept for three months, at the end of which time a nutrient solution was introduced under the cover-clip. The spores then germinated quite readily.

Physiological Work.

The effect of the acidity of the medium on the fungus.—Plate cultures of 2·0% malt agar were prepared with 1·0% of the following acids added: tartaric, lactic, hydrochloric, sulphuric, nitric, acetic

and malic. Vigorous growth resulted on malic acid plates, very poor growth on tartaric acid plates and none at all on any other. Malic acid thus being found to be most favourable to the growth of the fungus, further plates and slopes of malt agar were made with 1·0% of that acid and kept under different conditions, viz. :

(1) In the light at laboratory temperature.
(2) In the dark at laboratory temperature.
(3) In the dark but incubated at 23° C.

In all cases growth was much slower than on unacidified medium but a thicker and more feathery mycelium resulted. The colonies also were irregular in outline, unlike the circular colonies previously described. There was some uneven zoning in most cultures except those grown in the light.

In order to determine more exactly the effect of the pH value of the medium on the fungus, tubes of Richards's solution plus 1·5% agar were prepared, and varying amounts of malic acid or potassium hydroxide added, samples being extracted and their pH determined; after the medium had been well mixed it was poured into plates, inoculated and incubated at 23° C. The cultures were examined periodically during four weeks, when it was found that no growth took place at pH below 3·0 nor above 7·3, while maximum growth occurred at 4·6 to 5·6. These results agree fairly well with Walpert's (8) although he used a liquid medium. He gives the limits for growth as pH 2·5 to 7·6 at 25° C.

Temperature effect of the rate of growth.—In a recent paper, Cartwright and Findlay (4) state that *P. versicolor* possesses a very wide temperature range with an optimum about 28-30° C. The following table is taken from this paper :—

TABLE A.

Temperature (°C)	9	14	20	23	25	27	30	35	38
Average daily increment (mm.)	4·6	7·1	11·2	13·5	16·0	18·3	19·1	9·4	0·8

They also observe that Petri dish cultures vary greatly according to the temperature at which they are grown : " at 20° C. a young culture consists of a rather sparse adpressed mycelium with a loose cottony margin, and later a thin leathery skin-like mat is produced, while at 35° C. it forms a rather silky, somewhat branched, bushy mat with much more initial development of aerial mycelium."

Lethal temperature.—To determine the temperature required to kill the fungus in culture two methods were employed, viz.:—

(1) Inocula were taken from slope cultures in test-tubes which had been kept in a water bath at different temperatures for a given period (15 minutes) and transferred to fresh slopes, then incubated and any growth noted.

(2) An identical method to the preceding one except that the cultures used were in malt broth.

Both these methods produce the same result. The first range of temperatures used was : 40° C., 45° C., 50° C., 55° C., and 60° C., and growth took place from all inocula (three for each temperature

variation) except that at 60° C. Hence the lethal temperature lies between 55° C. and 60° C. To obtain a more accurate result the experiment was repeated at 56° C. and 58° C., and growth occurred at both these temperatures ; thus the lowest lethal temperature for a period of 15 minutes is 60° C. The time required to kill the fungus at different temperatures was then investigated, the same technique as before being used. The following results were obtained :—

Temperature	Time in hours	Resulting growth
45° C.	1	+
	2	+
	4	+
50° C.	1	+
	2	+
	2½	+
	3	−
	3½	−
55° C.	1	+
	2	−
	3	−
60° C.	¼	−

TABLE I.

All sub cultures were incubated for a month before it was assumed that no growth would take place.

Lethal temperature of the fungus in wood.—Small pieces were cut from a block of hornbeam well rotted by the fungus and placed in Petri dishes, the atmosphere in which was kept moist by the presence of wet filter paper. These were kept almost saturated in an oven for varying times at different temperatures, and then placed on plates of 2·0% malt agar and incubated.

Temperature	Time in hours	Growth of fungus 1	2	3
50° C.	1	+	+	+
	2	−	−	−
	3	−	−	−
	4	−	−	−
55° C.	1	+	+	+
	2	−	−	−
60° C.	¼	+	+	+
	½	−	−	−
65° C.	¼	−	−	−
70° C.	¼	−	−	−

TABLE II.

Concentration of medium effect on growth.—Plate cultures of *P. versicolor* on varying concentrations of malt agar, were incubated at 23°C. and the diameter of the colonies grown measured periodically. The graph of figure 3 gives the results of this experiment, based on the measurement of four plates. It is seen that the rate of growth

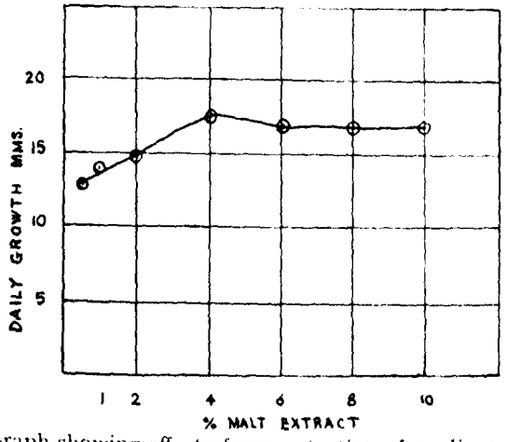


Fig. 3. Graph showing effect of concentration of medium on growth.

is least at 0·5 and 1·0%, reaches a maximum at 4·0% and is constant at the higher concentrations 6, 8 and 10%. With the increase of malt extract there is a corresponding thickening of the mycelial mat, though little difference can be noticed between the 8% and 10% cultures.

Effect of light on rate of growth.—Eight plate cultures kept in the dark showed a somewhat increased growth over eight exposed to

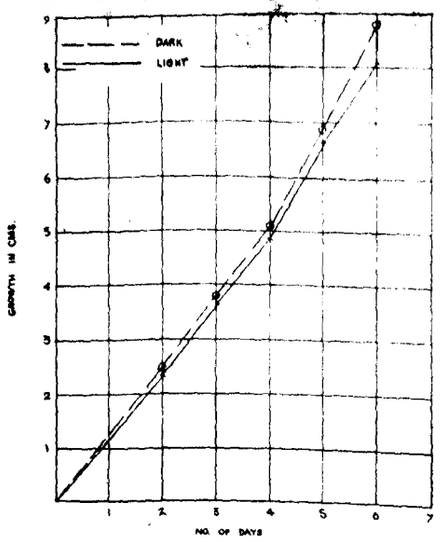


Fig. 4. Graph showing effect of light on growth.

PLATE X.

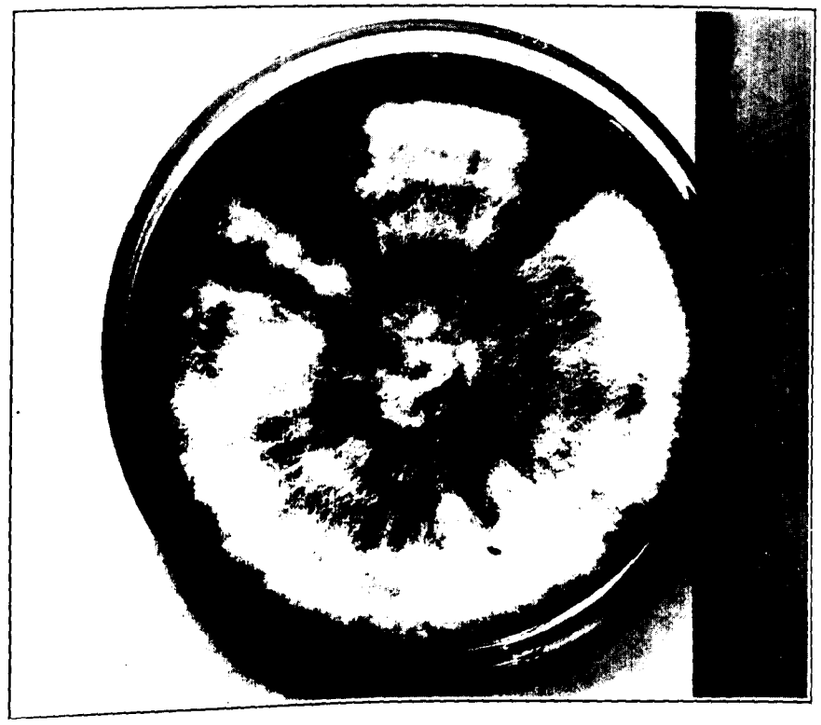
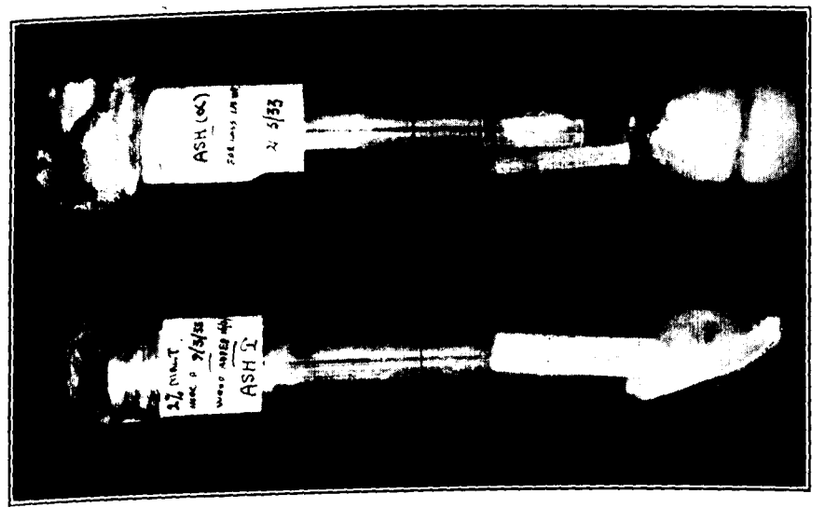
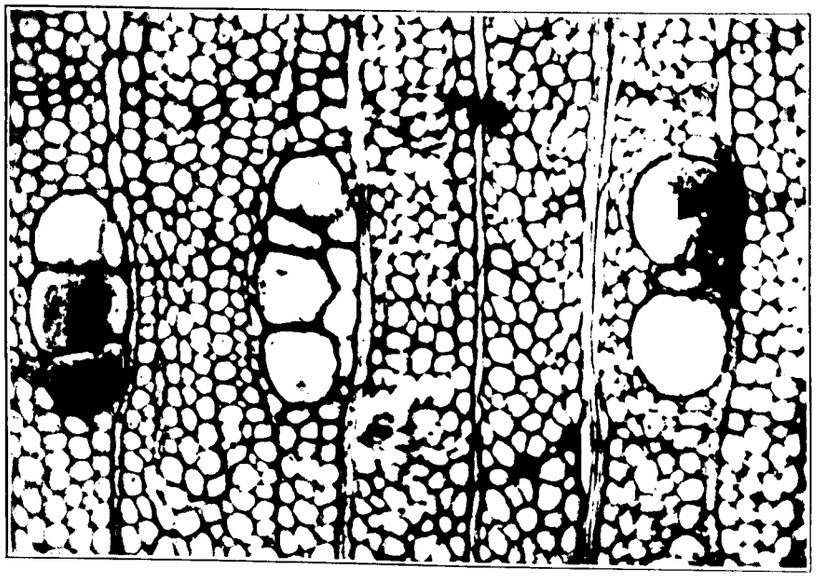


Plate culture of *P. versicolor* on acidified malt agar; 10 days growth.



A
B
Methods of inoculating wood blocks.

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(To face p. 417)

the light, though in the former case the mycelium was very slightly thinner.

The Fungus on Wood.

Naturally infected pieces of a branch of bird cherry (*Prunus Padus* L.) were kept in Petri dishes on pads of moist filter-paper. Very little mycelium was produced on the outside of the blocks, but on splitting them up when well decayed, the wood came away in concentric layers, each layer an annual ring, and between each of these rings was a thin papery sheet of mycelium, white in colour, closely woven and exactly resembling the mycelium on unacidified medium in agar culture. The fungus caused the wood to become white, first in patches, and in very decayed specimens, all over. This is due to the lignin being more vigorously attacked than the cellulose, resulting in an apparent accumulation of cellulose. This type of attack is given the name of "white rot." Small, but otherwise normal fruit bodies were produced on these blocks after some time.

A number of blocks of various common hardwoods, artificially infected with *P. versicolor*, showed a gradual bleaching and softening of the outer layers of the wood, although the splitting along rings as described above, did not occur. Upon drying the wood when in advanced state of decay it readily crumbled and some shrinkage took place, especially in the case of ash, but no cracking was observed.

In the ultimate stage of decay the wood is throughout white in colour.

Methods of inoculation of wood blocks.—Various methods of inoculating wood blocks were used in order to determine the most satisfactory and quickest means of infecting wood.

(1) Plugs of cotton wool were placed at the bottom of Roux tubes and kept moist with water, the wood being prevented from touching the wool by the constriction of the tube. A small transplant from an agar culture was then put on the wood and the tube plugged with cotton wool and incubated. (See Plate XA). This method was extremely slow, and the necessity for removing the plug from time to time to add more sterile water gave a chance of contamination.

(2) A better method than the above was to make slope cultures (of 2·0% malt agar) in Roux tubes, the slope being so arranged that the agar came just above the constriction in the tube, the slopes were then inoculated with the fungus and when good growth had taken place the wood was added, its size being such that it just reached the constriction of the tube. This allowed the wood to be attacked by the fungus without its being stained by the medium or becoming too wet. As before, the tube was plugged and incubated. (See Plate XB.) This method, although permitting more vigorous attack than the first, still took a long time before the wood was rotted to any extent.

(3) The quickest and most thorough attack of wood by the fungus was obtained by laying the wood blocks on a strongly growing mycelium on malt agar, in conical flasks, or boiling tubes. By this method considerable decay was produced in two months.

All three of the above methods were tested with blocks of ash and oak.

Details of the fungus mycelium in wood.—Numerous small blocks of elm and oak (*Q. pedunculata* Ehrh.) cut so that the rays were parallel with the sides, were exposed to attack by the fungus in the manner described in method (3) in the preceding paragraph. They were removed at periods varying from 1 to 13 weeks, sectioned, stained by the picro-aniline blue method and mounted. Rotted blocks of ash, hornbeam, beech and red oak were also examined. The fungus penetrates the wood along the vessels and medullary rays, which latter are the first objects of attack; later on the wood parenchyma cells are vigorously attacked and the smaller vessels are filled with dense strands of interweaving hyphae. The hyphae are hyaline and their size varies considerably, some being very small, 2 to 3μ wide, and others much larger, 5 to 7μ wide, but generally they are about 3 to 4μ in width. Clamp connections are fairly frequent though not so much so as in agar culture, and very rarely "medallions" (clamp connections of a symmetrical structure), are formed. Hyphae appear to pass from one cell to another by pits or by penetrating the wall with equal readiness; in the latter case they may or may not be constricted, though in the majority of

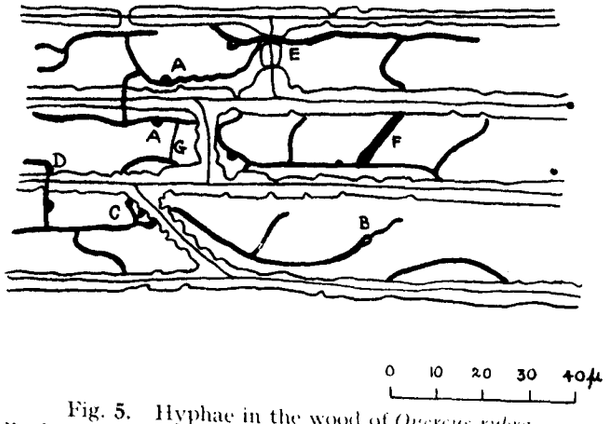


Fig. 5. Hyphae in the wood of *Quercus rubra*.
Ray cells showing clamp connections at A. B, medallion (?). C, hyphae swollen at the tip before penetrating cell wall. D, constricted hypha passing through cell wall. E, hypha passing through pit. F, thick hypha. G, thin hypha.

cases they are slightly constricted. Often the hyphal tips swell in contact with the cell wall before piercing it. In the case of oak (not in any other wood observed) a zone line appears, caused by the elements of the wood being filled with a gummy substance of a

red-brown colour; this marks the limit of progress of the mycelium. In more advanced stages of attack, the cell walls are not stained evenly by safranin, showing their delignification; the phloroglucin test, however, indicates the presence of some lignin, though the reaction is very much slower than with sound wood.

Wood blocks were placed on monosporous cultures in order to discover if the haploid mycelium of *P. versicolor* had any destructive effect upon wood. On sectioning the blocks after only 2 weeks, it was found that the fungus had penetrated the wood and was attacking it as vigorously and in the same manner as the diploid mycelium described above. No clamp connections were seen.

Loss in weight of wood attacked by P. versicolor.—In order to discover the maximum loss of dry weight caused by the fungus in wood, blocks of ash, beech and elm were dried at about 90°C. until no further loss of weight resulted, the dry-weights were then noted, the blocks soaked in water and laid on actively growing cultures of the fungus in flasks; they were kept moist over a period of 4 months by the frequent addition of sterile water. Very vigorous fungous attack was obtained and at the end of the period the blocks were soft to the touch, the ash especially being a pulpy mass; in all cases bleaching of the wood was very noticeable. After removal the blocks were dried and their dry weights compared with those determined before the experiment. The greatest loss of weight was 80% in one ash block.

Reaction of the Fungus to Wood Preservatives.

Preservatives in agar cultures.—Sodium fluoride. The fluoride used was the commercial form used in the actual preservation of timber. It was made up into an aqueous solution and sterilised in the autoclave to avoid any possible contamination. Calculated amounts were then added to sterile eight-ounce bottles and corresponding volumes of 2·0% malt agar were run in from a sterile burette; by shaking the bottles vigorously the preservative was well mixed with the agar and the mixture was then quickly poured into plates (four for each concentration); when the agar had set the plates were inoculated with small square transplants (about 5 or 6 mm. square) from an actively growing plate culture, and then incubated at 23°C. The concentrations of sodium fluoride used were 0·005%, 0·05%, 0·2%, 0·5%, 0·7%, and 1·0%. After a week the cultures were examined and vigorous growth had taken place at 0·005% sodium fluoride, the colonies being 4 to 5 cms. across and of a thick texture; the 0·05% plate showed growth of a thinner nature and less extensive (under 4 cm.). On none of the other plates could any growth at all be seen, and a further ten days incubation produced no signs of growth. The approximate toxic (inhibition) point having been ascertained (i.e. between 0·05 and 0·2%) a more exact percentage was sought by making a further series of plates in the manner already described of 0·08%, 0·1%, 0·15% and 0·18% of the preservative; after eight days incubation the plates

showed very slight growth in all cases, though the mycelium in the 0·18% concentration was only just visible through a lens; hence the toxic point is 0·2% sodium fluoride.

Creosote. As with sodium fluoride, a commercial sample of coal-tar-creosote B.S.S. Type A was used. Since it cannot be simply diluted with water it was emulsified with 20·0% gum arabic by shaking the desired quantities together in glass-stoppered bottles for long periods. Using this emulsion, the method of the previous experiment was used in preparing a series of plates containing the following concentrations of creosote: 0·005%, 0·05% 0·1%, 0·5%, 0·8%, and 1·0%. A fluffy growth of mycelium was formed after seven days incubation on the 0·005% and the 0·05% plates but none on any other plates. Further incubation produced no sign of growth. The toxic point of creosote to *P. versicolor* is therefore between 0·05% and 0·1%.

Formalin vapour. A strongly growing plate-culture was inverted over the mouth of a large beaker, in the bottom of which was a pad of filter-paper soaked in formalin; the plate and mouth of the beaker were then covered with a piece of paper which was held in place by means of a rubber band; this prevented any of the vapour of the formalin from escaping. At half hourly intervals the plate was removed and three transplants taken from it and sown on 2·0% malt slopes, which were incubated and examined weekly. Exposure of half an hour to the vapour seemed to act as a stimulant on the fungus, resulting in a very thick growth, but only slight growth was obtained, after several weeks, from inocula exposed for an hour to the vapour and none at all from those exposed for two hours.

Lethal effect of wood preservatives. In order to ascertain the amount of wood-preservative necessary to kill the fungus and not merely to inhibit growth (as in the previous experiment), the old inocula on the preservative plates where no growth had taken place were placed on 2·0% malt agar slopes and incubated at 23 C. The following results were obtained:

Sodium fluoride				Creosote				Zinc chloride	
0·2%	0·5%	0·7%	1·0%	0·2%	0·5%	0·8%	1·0%	0·5%	1·0%
+	–	–	–	+	–	–	–	–	–

TABLE III.

Wood treated with preservatives.—In order to determine the smallest amount of preservatives necessary to prevent the growth of *P. versicolor*, sticks of various hardwoods (2½ ins. x ½ in. x ⅛ in.) were soaked in different concentrations of commercial sodium fluoride for four hours in a vacuum, dried and placed on slope cultures of the fungus in boiling tubes (7 x ¾ ins.). After four

months the sticks were removed, their oven-dry weights determined and compared with those found before the experiment.

A similar experiment was carried out, using commercial coal-tar creosote emulsified with gum arabic and small milk-bottles instead of boiling tubes. The results of these experiments are given in the following tables:

	Air dry wt: gms.	Calculated oven dry wt: gms.	Wet wt: after 4 months gms.	Oven-dry wt: after experiment gms.	Loss in dry wt: gms.	% loss in wt:	Average % loss in wt:
Controls soaked in water—							
1.	5·72	5·47	6·34	3·18	2·29	41·8	
2.	5·42	5·20	8·37	4·93	0·3	6·0	
3.	5·69	5·46	8·83	5·02	0·44	8·0	
Soaked in 0·1% NaF—							
4.	4·78	4·60	7·60	4·09	0·51	11·0	7·7
5.	5·63	5·40	8·81	5·08	0·32	5·9	
6.	5·28	5·07	8·34	4·75	0·32	6·3	
Soaked in 0·5% NaF—							
7.	5·20	4·99	7·18	4·99	–	–	–
8.	5·77	5·46	7·31	5·48	–	–	
9.	5·44	5·22	7·56	5·17	–	–	
Soaked in 1·0% NaF—							
10.	5·96	5·72	7·94	5·77	–	–	–
11.	5·26	5·05	7·24	5·11	–	–	
12.	4·73	4·54	6·34	4·57	–	–	
Soaked in 2·0% NaF—							
13.	5·53	5·31	7·83	5·36	–	–	–
14.	4·94	4·75	7·28	4·79	–	–	
15.	4·68	4·50	7·37	4·54	–	–	

TABLE IV.

Beech blocks + NaF.

Air-dry wt : gms.	Calculated oven-dry wt : gms.	Oven-dry wt : after experiment gms.	Loss in dry wt : gms.	% loss in wt.	Average % loss in wt :
Controls soaked in water—					
1. 4·685	4·12	2·32	1·81	43·9	
2. 4·01	3·53	1·71	1·82	51·6	46·5
3. 4·98	4·38	2·41	1·97	45·0	
Soaked in 0·1 % NaF—					
4. 3·84	3·38	2·50	0·85	25·1	
5. 4·21	3·70	2·80	0·90	24·3	22·1
6. 4·87	4·29	3·53	0·77	17·9	
Soaked in 0·5 % NaF—					
7. 4·30	3·78	3·64	0·14	3·7	
8. 3·53	3·11	2·95	0·16	5·1	4·6
9. 4·34	3·82	3·63	0·19	5·0	
Soaked in 1·0 % NaF—					
10. 4·14	3·64	3·48	0·16	4·4	
11. 3·92	3·45	3·32	0·13	3·8	3·3
12. 3·80	3·34	3·28	0·06	1·8	
Soaked in 2·0 % NaF—					
13. 4·65	4·09	4·07	—	—	
14. 3·71	3·26	3·26	—	—	—
15. 4·42	3·89	3·89	—	—	

Ash blocks + NaF. TABLE V.

Air dry wt : gms.	Calculated oven-dry wt : gms.	Oven-dry wt ; after experiment gms.	Loss in dry wt : gms.	% loss in wt :	Average % loss in wt:
Controls soaked in water—					
1. 3·04	2·83	1·32	1·48	52·3	
2. 4·19	3·90	1·83	2·07	53·1	50·3
3. 3·40	3·16	1·72	1·44	45·3	
Soaked in 0·1 % NaF—					
4. 3·70	3·44	3·12	0·32	9·3	
5. 3·43	3·19	2·98	0·21	6·6	
6. 3·54	3·29	3·10	0·19	5·8	
Soaked in 0·5 % NaF—					
7. 3·39	3·15	3·01	0·14	4·4	
8. 3·67	3·31	3·21	0·10	3·0	3·8
9. 3·42	3·18	3·06	0·12	3·8	
10. 3·02	2·81	2·69	0·12	4·2	
Soaked in 1·0 % NaF—					
11. 3·72	3·46	3·39	0·07	2·0	
12. 3·41	3·17	3·12	0·05	1·6	2·9
13. 4·04	3·76	3·64	0·12	3·2	
14. 2·67	2·48	2·36	0·12	4·8	
Soaked in 2·0 % NaF—					
15. 3·49	3·25	3·23	0·02	0·6	
16. 4·06	3·78	3·75	0·03	0·8	0·7
17. 3·48	3·24	3·22	0·02	0·6	
18. 3·66	3·40	3·37	0·03	0·9	

Elm blocks +NaF. TABLE VI.

Air dry wt : gms.	Calculated oven-dry wt.: gms.	Oven-dry wt : after experiment gms.	Loss in dry wt : gms.	% loss in wt :	Average % loss in wt :
Controls soaked in water—					
1. 8·33	7·23	6·50	0·47	6·6	
2. 29·74	22·53	12·55	9·98	44·3	
Soaked in 0·1 % Creosote—					
3. 8·23	7·14	6·75	0·38	5·4	4·3
4. 8·02	6·96	6·73	0·23	3·3	
Soaked in 0·5 % creosote—					
5. 7·38	6·40	6·17	0·23	3·6	4·6
6. 7·77	6·74	6·36	0·38	5·6	
Soaked in 1·0 % creosote—					
7. 8·87	7·70	7·48	0·22	2·8	3·8
8. 8·42	7·31	6·96	0·35	4·8	
Soaked in 2·0 % creosote—					
9. 8·00	6·95	6·85	0·09	1·3	0·8
10. 8·46	7·34	7·32	0·02	0·27	

TABLE VII.

Beech blocks + creosote.

(It will be noticed in the foregoing tables that the control blocks of one species show widely divergent figures for loss of weight in one or two cases, and so have not been averaged. This divergence may be due to some difference in original moisture content of the wood or to other, unknown factors.)

The heartwood of oak (*Quercus pedunculata*) was treated similarly to the foregoing woods, but its resistance to the fungus was so great that a loss of only 2·6% was obtained in the control sticks, 1·6% in tllose soaked in 0·1% sodium fluoride, and no loss at all in any other concentration of preservative.

PREVENTION OF DECAY BY P. VERSICOLOR.

Since *P. versicolor* is most destructive to wood exposed to the weather where dry conditions are impossible, the best methods of prevention are either to creosote such permanent erections as fences etc. or to remove felled trunks as soon as possible from the forest in order that they may be dried before the rot begins. Where creosote impregnation is impossible, as in the case of car-bodywork, treatment with sodium fluoride solution is to be recommended. A four per cent. concentration of this preservative should be ample, as long as water is prevented from reaching the wood, which will both tend to wash out the preservative and produce favourable conditions for the fungus growth.

ACKNOWLEDGMENTS.

I wish to thank Mr. K. St. G. Cartwright (of the Forest Products Research Laboratory) both for suggesting this work and for the very

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SUMMARY.

1. The economic importance, occurrence and distribution of *Polystictus versicolor* L. are described.

2. An account is given of previous work on the fungus. Fruit bodies and the fungus in culture are described and the microscopic details of the hyphae given.

3. Cultures from different sources are found to be identical. The germination of the basidio-spores is figured.

4. The effects of various pH values, temperature and concentrations of malt extract on the growth of the fungus are examined.

5. The fungus in wood is described, together with details of the hyphae in the cells and the effect upon the wood substance.

6. Experiments indicate the reaction of the fungus to preservatives in agar culture and wood, and suggestions are made for the prevention of decay caused by the fungus.

REFERENCES.

1. *Ann. Rept. California Agric. Exper. Stat.* 1922–1923, 179 (1924).
2. BAYLISS, J. S. " Biology of Polystictus versicolor." *Journ. Econ. Biol.* **3**, 1 (1908).
3. CAMPBELL, W. G. " The Chemistry of White Rots of Wood." *Biochem. Journ.* **24**, 1235 (1930).
4. CARTWRIGHT, K. St. G. and FINDLAY, W. P. K. " Studies in the Physiology of Wood-Destroying Fungi." *Ann. Bot.* **48**, 481–495 (1934).
5. FRITZ, C. W. " Cultural Criteria for the Distinction of Wood-Destroying Fungi." *Trans. Roy. Soc. Canada*, **17**, 242 (1923).
6. SMITH, R. G. " A chemical and pathological Study of Decay of the Xylem of the Apple caused by Polystictus versicolor Fr." *Phytopath.* **14**, 114 (1924).
7. STEVENS, N. E. " Wood Rots of the Hardy Catalpa." *Phytopath*, **2**, 114 (1912).
8. WALPERT, F. S. " The Growth of certain Wood-Destroying Fungi in Relation to the H-ion Concentration of the Media." *Ann. Missouri Bot. Gard.* **11**, 71 (1924).
9. WEIR, J. R. " The Genus Polystictus and the Decay of Living Trees." *Phytopath*, **13**, 184 (1923).
10. ZELLER, S. M. " Cankers of Apple and Pear in Oregon and their Control." *Oregon. Agric. Exper. Stat.* Circ. 73 (1926).

LII—NOTES ON AFRICAN GRASSES : XVII.*

C. E. HUBBARD.

Arundinella Ecklonii *Nees* var. **major** *C. E. Hubbard*, var. nov. ; a typo differt culmis robustis 1·5–3 m. altis, foliorum laminis usque ad 1·8 cm. latis, panicula 30–52 cm. longa.

FRENCH GUINEA : Fouta Djalon ; Mali, *Chevalier* 34601 bis ; between Lobé and Mali, *Chevalier* 34593 (type).

Trichopteryx fruticulosa *Chiov.* var. **Whytei** *C. E. Hubbard*, var. nov. ; a typo differt glumis laxe pilosis vel glabris, lemmate superiore 2–2·5 mm. longo setis lateralibus 0·5–2·5 mm. longis, aristis 8–10 mm. longis columna 2·5–3 mm. longa, antheris 2 mm. longis.

TANGANYIKA TERRITORY : Mbeya District ; Unyamwaya, 1800 m., *Davies* 168 ; Kyimbila District, *Stolz* 1229, 1361.

NYASALAND : Kondowe to Karonga, 600-1800 m., *Whyte* (type) ; Nyika Plateau, 1800–2100 m., *Whyte*.

Trichopteryx gracillima *C. E. Hubbard*, sp. nov. ; affinis *T. marungensi* Chiov., sed foliorum laminis anguste lanceolatis, aristis paullo brevioribus, glumis minute pubescentibus differt.

Gramen perenne (?). *Culmi* geniculato-ascendentes, usque ad 45 cm. alti, gracillimi, filiformes, ramosi, multinodes, minute pubescentes. *Foliorum vaginae* internodiis multo breviores, 1·2–4 cm. longae, minute pubescentes ; ligulae ad seriem ciliorum redactae ; laminae anguste lanceolatae, basi contractae, acutae, usque ad 2·5 cm. longae et 3·5 mm. latae, planae, firmae, minute pubescentes, marginibus scaberulis cartilagineis. *Panicula* laxa, 5–10 cm. longa, usque ad 3·2 cm. lata ; rhachis filiformis, inferne minute pubescens, superne asperula ; rami capillares, flexuosi, apicem versus laxe divisi, asperuli, inferiores binati vel solitarii, usque ad 4·5 cm. longi, intermedii fasciculati vel semi-verticillati ; pedicelli usque ad 6 mm. longi. *Spiculae* lanceolatae et acuminatae vel anguste oblongae et hiantes, 3·5–4 mm. longae, badiae. *Glumae* tenuiter chartaceae, trinerves, pilis brevissimis e tuberculis minutis ortis pubescentes ; inferior lanceolata, acuta vel obtusa, 2·5–3 mm. longa ; superior lanceolata, acuminata, apice acuta, usque ad 4 mm. longa. *Anthoecium inferum* ♂ : lemma glumae superiori simile, spiculam aequans, margines versus sparse pubescens ; palea linearis, 3 mm. longa, obtusa. *Anthoecium superum* lineare, albidum, demum brunneum : callus minutus, truncatus, barbatus ; lemma 2 mm. longum, bilobum, lobis 0·5 mm. longis in setam scaberulam capillarem circiter 2 mm. longam plerumque attenuatis, membranaceum, 5-nerve, infra medium pubescens, infra lobos pilis brevibus albis dense barbatum ; arista geniculata, 8–9 mm. longa, columna scaberula 3·5–4 mm.

* Continued from K.B. 1934, 202.

longa ; palea linearis, 2·5 mm. longa. *Antherae* 2, 2 mm. longae. *Caryopsis* 1 mm. longa.

UGANDA : Nabugabo, in swamp, in tufts of other grasses, 1200 m., *Thomas* 952.

Trichopteryx Glanvillei *C. E. Hubbard*, sp. nov. ; affinis *T. Stolzianae* Henrard, sed nodis barbatis, gluma superiore laxe pilosa, aristae columna breviore differt.

Gramen annuum. *Culmi* fasciculati, erecti vel geniculati, usque ad 10 cm. alti, gracillimi, 4–8-nodes, simplices vel ramosi, breviter pilosi. *Foliorum vaginae* usque ad 1·6 cm. longae, imbricatae vel inferiores demum internodiis paullo breviores, pubescentes vel pilosae, nodis breviter barbatis ; ligulae ad seriem ciliorum redactae ; laminae lanceolatae vel anguste ovatae, basi rotundatae, acutae, usque ad 2·2 cm. longae et 6 mm. latae, planae, patentes vel demum reflexae, dense pubescentes vel supra glabrescentes, marginibus scaberulis cartilagineis. *Panicula* contracta, usque ad 3.8 cm longa ; rhachis superne minute scaberula ; rami capillares, flexuosi scaberuli, laxe divisi ; pedicelli usque ad 6 mm. longi. *Spiculae* lanceolatae, demum hiantes, 3·5–4 mm. longae, flavido-brunneae *Glumae* membranaceae, trinerves, pilis albis rigidis e tuberculis minutis ortis laxe vel sparse praeditae ; inferior anguste ovata ve ovato-oblonga, obtusa vel acuta, 2–2·5 mm. longa, mucronulata superior lanceolata, acute acuminata, spiculae aequilonga. *Anthoecium inferum* sterile : lemma glumae superiori simile, oblongo lanceolatum, dorso pilis brevibus paucis praeditum, scabridulum palea oblongo-lanceolata, 2 mm. longa, hyalina, carinis minut ciliolatis. *Anthoecium superum* anguste oblongum, demum atro brunneum : callus minutus, truncatus, barbatus ; lemma 1·5 2 mm. longum, bilobum, lobis in setam capillarem scaberulam usque ad 5 mm. longam attenuatis, demum tenuiter coriaceum, obscure 5–7-nerve, breviter pubescens, infra lobos pilis brevibus albis dense barbatum ; arista geniculata, scaberula, 8–10 mm. longa, columna scaberula 3 mm. longa ; palea lanceolato-oblonga, 2 mm. longa, inter carinas minute pubescens. *Antherae* 2, 0·6 mm. longae. *Caryopsis* oblonga, 1 mm. longa.

SIERRA LEONE : Bintumane, on the summit, 1890 m., *Glanville* 335.

Loudetia angolensis *C. E. Hubbard*, sp. nov. ; affinis *L. arundinaceae* Steud., sed spiculis minoribus, panicula contracta et densa angustiore, ramis brevioribus, foliorum laminis angustioribus et brevioribus differt.

Gramen perenne, e rhizomate brevi ortum ; innovationes extravaginales ; gemmae cataphyllis glabris coriaceis obtectae. *Culmi* erecti vel basi geniculati, usque ad 1·6 m. alti, validiusculi, teretes, simplices, 3–4-nodes, glabri laevesque. *Foliorum vaginae* striatae, nodis breviter barbatae, basales latae, persistentes, inferiores plus minusve hispidulae vel glabrae, superiores glabrae, internodiis

breviores ; ligulae ad seriem ciliorum brevium redactae ; laminae lineares, in apicem subobtusum attenuatae, usque ad 24 cm. longae et 7 mm. latae, planae vel convolutae, rigidae, hispidulae vel glabrescentes, scaberulae. *Panicula* anguste oblonga, contracta, densa, 20–45 cm. longa, 2·5–5 cm. lata ; rhachis scaberula ; rami verticillati vel semi-verticillati, densi, usque ad 9 cm. longi, divisi, tenuiter filiformes, scaberuli ; pedicelli 1–8 mm. (vel ultra) longi. *Spiculae* lanceolatae vel anguste oblongae, 6–7·5 mm. longae, brunneae. *Glumae* chartaceae, trinerves, pilis albis appressis e tuberculis minutis ortis laxe hirsutae ; inferior lanceolata vel ovata, obtusa vel truncata, 3-4 mm. longa ; superior lineari-lanceolata, truncata, spicula paullo brevior. *Anthoecium inferum* ♂ : lemma glumae superiori simile sed latius, spiculae aequilongum, minus hirsutum vel glabrum ; palea linearis, truncata, 4–6 mm. longa, apicem versus carinis minute ciliolata. *Anthoecium superum* lineare : callus truncatus, 0·5–0·7 mm. longus, barbatus ; lemma 4·5 mm. longum, acute bilobum, lobis usque ad 1 mm. longis, tenuiter coriaceum, 5–7-nerve, pubescens ; arista geniculata, 1·8–2·5 cm. longa, columna scaberula 6 mm. longa ; palea linearis, 4–4·5 mm. longa. *Antherae* 2, 2 mm. longae.

ANGOLA : Benguella ; country of the Ambuellas and Ganguellas, *Gossweiler* 2458, 2458A(type), 2659.

Loudetia Thomasii *C. E. Hubbard*, sp. nov. ; affinis *L. arundinaceae* Steud., sed culmis gracilibus 2-nodibus brevioribus, foliorum laminis angustioribus, spiculis et aristis brevioribus differt.

Gramen perenne, dense caespitosum. *Culmi* erecti, usque ad 90 cm. longi, graciles, rigidi, simplices, 2-nodes, glabri laevesque. *Foliorum vaginae* inferiores persistentes, superne pilis e tuberculis ortis laxe hirsutae, superiores glabrae laevesque ; ligulae ad seriem ciliorum densorum redactae ; laminae anguste lineares, basin versus angustatae, in apicem tenuiter acutum attenuatae, usque ad 30 cm. longae, 3–5 mm. latae, planae, firmae, glabrae, subtus scaberulae, supra laeves. *Panicula* angusta, usque ad 35 cm. longa, laxa ; rhachis superne scaberula ; rami fasciculati, gracillimi, scaberuli, usque ad 9 cm. longi ; pedicelli inaequales, laterales usque ad 1 mm., terminales 2–4 mm. longi. *Spiculae* lanceolatae vel anguste oblongae, 6·5–7 mm. longae, brunneae. *Glumae* firme chartaceae, trinerves, pilis albis appressis e tuberculis minutis ortis sparse setulosae ; inferior late ovato-oblonga, apice truncata vel rotundata, 2–3 mm. longa ; superior lanceolata, acuminata, apice truncata, spicula paullo brevior. *Anthoecium inferum* ♂ : lemma glumae superiori simile, sed obtusum, spiculae aequilongum, glabrum ; palea linearis, 5mm. longa. *Anthoecium superum* lineare : callus truncatus, 0·4 mm. longus, minute barbatus ; lemma 4 mm. longum, acute bilobum, lobis circiter 0·5 mm. longis, tenuiter coriaceum, pubescens, 7-nerve ; arista geniculata, 8–16 mm. longa, columna 4–7 mm. longa minute scaberula brunnea ; palea linearis, lemmati aequilonga. *Antherae* 2, 1·5 mm. longae.

UGANDA: Toro District; Kyegegwa, on granite outcrop, dominant grass on deeper soil, 1260 m., *Thomas* 1027.

Loudetia phragmitoides (*Peter*) *C. E. Hubbard*, comb. nov. *Trichopteryx phragmitoides* Peter in Fedde, Repert. Beih. **40, 1**, Anhang, 96 (1930).

Distrib. French Guinea to Sudan and southwards to Angola and Portuguese East Africa.

It has not been possible to examine the specimen on which *Trichopteryx phragmitoides* was based. There is little doubt, however, that it represents the same species as the African plant which has been commonly identified with the tropical South American species *T. flammida* (Trin.) Benth. It differs from the latter in having a usually hairy upper glume, a sterile lower floret and more especially in the shape of the awn, which is shorter and differentiated into a well-marked column and bristle, whereas in *T. flammida* the awn has no definite column and at maturity is bent at a right angle from the apex of the floret.

Loudetia coarctata (*A. Camus*) *C. E. Hubbard*, comb. nov. *Tristachya coarctata* A. Camus in Bull. Soc. Bot. France, **80, 774** (1933).

Distrib. French Guinea.

Loudetia densispica (*Rendle*) *C. E. Hubbard*, comb. nov. *Trichopteryx densispica* Rendle in Cat. Afr. Pl. Welw. **2**, 214 (1899).

Distrib. Angola.

Loudetia Vanderystii (*De Wild.*) *C. E. Hubbard*, comb. nov. *Trichopteryx Vanderystii* De Wild. in Ann. Soc. Sci. Brux. **39**, Mém. 160: 1920 (Notes Fl. Katanga, **5**, 38).

Distrib. Belgian Congo.

Loudetia pennata (*Chiov.*) *C. E. Hubbard*, comb. nov. *Trichopteryx pennata* Chiov. in Ann. Istit. Bot. Roma, **7**, 69, t. 6 (1897).

Distrib. Abyssinia.

Loudetia Gossweileri *C. E. Hubbard*, sp. nov.; affinis *L. coarctatae* (A. Camus) C. E. Hubbard, sed glumis glabris laevibus, spiculis majoribus, anthoecii superi callo pungente longiore differt.

Gramen perenne, dense caespitosum; innovationes intravaginales. *Culmi* erecti, 75–105 cm. alti, graciliusculi, teretes, rigidi, subglauci, simplices, obscure 2–3-nodes, glabri laevesque. *Foliorum vaginae* basales persistentes, basin culmorum dense obtegentes, dense pilosae vel glabrae, intermediae et superiores internodiis multo breviores, nodos versus flavidae, arcte appressae, superne praecipue prope margines pilosae vel glabrae laevesque; ligulae ad seriem ciliorum brevium redactae; laminae anguste lineares, tenuiter acutae, usque ad 30 cm. longae, 1–2·5 mm. latae, planae vel siccitate involutae, rigidae, erectae, supra arcte nervosae et pubescentes, subtus glabrae

laevesque. *Panicula* spiciformis, densa, 2·5–15 cm. longa, 6–8 mm. lata (aristis exclusis); rhachis minutissime pubescens vel asperula; rami appressi, usque ad 6 mm. longi, 4–1-spiculati, minute pubescentes vel asperuli; pedicelli laterales brevissimi. *Spiculae* anguste lanceolatae, acuminatae, 15–18 mm. longae, pallide flavido-brunneae. *Glumae* chartaceae, trinerves, glabrae, apicem versus nervis minute scaberulae; inferior anguste lanceolata, acute acuminata, 12–13 mm. longa; superior lineari-lanceolata, acute acuminata, spiculae subaequilonga. *Anthoecium inferum* ♂: lemma glumae superiori simile sed anguste lanceolatum, acuminatum, apice setaceo-acutum; palea lineari-lanceolata, bifida, 9·5 mm. longa, supra medium carinis minute ciliolata. *Anthoecium superum* lineare: callus pungens, 1–1·5 mm. longus, dense barbatus; lemma 5–5·5 mm. longum, minutissime bilobum, tenuiter coriaceum, 7-nerve, appresse pubescens; arista flexuosa, usque ad 7 cm. longa, columna 9–11 mm. longa pubescente; palea lemmati aequilonga. *Antherae* 2, 3·5–4 mm. longae.

ANGOLA: Benguella; country of the Ganguellas and Ambuellas, *Gossweiler* 2734, 3760.

Loudetia acuminata (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx acuminata* Stapf in Kew Bull. 1897, 297.

Distrib. Northern Nigeria and Cameroons.

Loudetia flavida (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx flavida* Stapf in Kew Bull. 1897, 298.

Distrib. Tanganyika Territory southwards to Transvaal.

Loudetia migiurtina (*Chiov.*) *C. E. Hubbard*, comb. nov. *Trichopteryx migiurtina* Chiov. Pl. Nov. Aethiop. 30 (1928).

Distrib. Italian Somaliland.

Loudetia lanata (*Stent et Rattray*) *C. E. Hubbard*, comb. nov. *Trichopteryx lanata* Stent et Rattray in Proc. Rhod. Sci. Assoc. **33**, 39 (1933).

Distrib. Angola and Southern Rhodesia.

Loudetia Demeusei (*De Wild.*) *C. E. Hubbard*, comb. nov. *Trichopteryx Demeusei* De Wild. in Ann. Soc. Sci. Brux. **39**, Mém. 149: 1920 (Notes Fl. Katanga, **5**, 27).

Distrib. Belgian Congo and Angola.

Loudetia cerata (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx cerata* Stapf in Bull. Soc. Bot. France, 1911, **58**, Mém. **8**, 220 (1912).

Distrib. Central Shari and Upper Oubangui.

Loudetia annua (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx annua* Stapf in Kew Bull. 1897, 298.

Distrib. Northern Nigeria, Cameroons and Sudan.

Loudetia longipes *C. E. Hubbard*, sp. nov. ; affinis *L. lanatae* (Stent et Rattray) C. E. Hubbard, sed spiculis paullo longioribus, glumis glabris, foliorum laminis supra laxe pilosis demum glabris, culmis altioribus 2-nodibus differt.

Gramen perenne caespitosum. *Culmi* erecti, 90–140 cm. alti, teretes, rigidi, validiusculi, simplices, 2-nodes, nodo infero prope basin jacente, nodo supero prominente, glabri laevesque, internodio supremo (pedunculo) usque ad 75 cm. longo. *Foliorum vaginae* nodis dense barbatae, inferiores basi tomentosae in fibras demum fissae et basin culmorum dense obtegentes, ceterae glabrae laevesque ; ligulae ad seriem ciliorum densorum redactae ; laminae anguste lineares, tenuiter acutae, usque ad 40 cm. (vel ultra) longae, convolutae, usque ad 6 mm. latae (explanatae), rigidae, supra laxe pilosae demum glabrae laevesque. *Panicula* laxissima, 22–32 cm. longa, 12–15 cm. lata ; rhachis inferne laevis, apicem versus minute scaberula ; rami patentes, filiformes, minutes scaberuli, sparse divisi, usque ad 14 cm. longi, basi pilosi, superiores solitarii, ceteri 2–4-nati ; pedicelli valde inaequales, laterales usque ad 14 mm. longi, terminales 10–26 mm. longi. *Spiculae* anguste lanceolatae vel oblongo-lineares, 13–14 mm. longae, pallide brunneae. *Glumae* coriaceae, trinerves, glabrae ; inferior oblongo-ovata, truncata vel obtusissima, 5–6·5 mm. longa ; superior lineari-lanceolata, apice truncata, spiculae aequilonga. *Anthoecium inferum* ♂ : lemma lanceolatum, apice obtusum, 10–11 mm. longum, trinerve, glabrum ; palea linearis, truncata, 7–7·5 mm. longa. *Anthoecium superum* lineare : callus pungens, 2 mm. longus, barbatus ; lemma 6–7 mm. longum, minute et acute bilobum, coriaceum, 7-nerve, pubescens ; arista geniculata, 5–6·3 cm. longa, columna minute pubescente 7 mm. longa ; palea 6·5 mm. longa.

ANGOLA : Benguella ; country of the Ganguellas and Ambuellas, *Gossweiler* 4033.

Loudetia crassipes *C. E. Hubbard*, sp. nov. ; affinis *L. Demeusei* (De Wild.) C. E. Hubbard, sed glumis glabris, panicula et aristis brevioribus differt.

Gramen perenne caespitosum. *Culmi* erecti vel leviter geniculati, usque ad 90 cm. alti, graciles, simplices, 2-nodes, glabri laevesque. *Foliorum vaginae* inferiores basi lanatae, superne glabrae, in fibras demum fissae et basin culmorum dense obtegentes, ceterae nodis breviter barbatis exceptis glabrae laevesque, internodiis multo breviores ; ligulae ad seriem ciliorum redactae ; laminae lineares, in acumen tenue attenuatae, usque ad 22 cm. longae, 2–3 mm. latae, planae vel convolutae, firmae, glabrae, subtus laeves et virides, supra purpureae et prominenter nervosae, marginibus scaberulae. *Panicula* contracta, densa, 10–18 cm. longa, usque ad 2 cm. lata ; rhachis laevis ; rami binati vel solitarii, erecti, gracillimi, minute scaberuli, inferiores usque ad 3·8 cm. longi ; pedicelli inaequales, laterales usque ad 2·5 mm. longi, terminales usque ad 6 mm. longi. *Spiculae* anguste lanceolatae, 10–12 mm. longae,

brunneae. *Glumae* chartaceae, glabrae, trinerves ; inferior anguste oblongo-ovata, obtusa, 6 mm. longa ; superior lineari-lanceolata, apice truncata, spiculae aequilonga. *Anthoecium inferum* ♂(?) : lemma glumae superiori simile, lanceolatum, subacutum ; palea linearis, 8 mm. longa. *Anthoecium superum* lineare : callus pungens, usque ad 1·5 mm. longus, barbatus ; lemma 5–6 mm. longum, bilobum, lobis acutissimis circiter 0·6 mm. longis, tenuiter coriaceum, 7-nerve, minute pubescens ; arista geniculata, gracillima, usque ad 5 cm. longa, columna minute pubescente 9–10 mm. longa ; palea lemmati aequilonga.

ANGOLA : Benguella ; country of the Ganguellas and Ambuellas, *Gossweiler* !

Loudetia hordeiformis (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx hordeiformis* Stapf in Kew Bull. 1897, 297.

Distrib. Gambia, French Sudan, Ivory Coast, Gold Coast, Northern Nigeria, Central and Lower Shari.

Loudetia camerunensis (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx camerunensis* Stapf in Kew Bull. 1897, 296.

Distrib. Cameroons Mtn.

Loudetia simplex (*Nees*) *C. E. Hubbard*, comb. nov. *Tristachya simplex* Nees, Fl. Afr. Austr. 269 (1841).

Distrib. French Guinea, Northern Nigeria and Sudan, southwards to Transvaal, Natal and Orange Free State.

Loudetia ternata (*Stapf*) *C. E. Hubbard*, comb. nov. *Trichopteryx ternata* Stapf in Morot, Journ. de Bot. **19**, 106 (1905).

Distrib. French Guinea and Dahomey.

Loudetia ambiens (*K. Schum.*) *C. E. Hubbard*, comb. nov. *Trichopteryx ambiens* K. Schum. in Engl. Bot. Jahrb. **24**, 335 (1897).

Distrib. Ivory Coast, Dahomey, Northern Nigeria and Portuguese Congo.

Loudetia glabrata (*K. Schum.*) *C. E. Hubbard*, comb. nov. *Trichopteryx glabrata* K. Schum. in Engl. Bot. Jahrb. **24**, 336 (1897), in obs.

Distrib. Gold Coast and Cameroons.

Loudetia Bequaertii (*De Wild.*) *C. E. Hubbard*, comb. nov. *Trichopteryx Bequaertii* De Wild. in Ann. Soc. Sci. Brux. **39**, Mém. 146 (1920).

Distrib. Tanganyika Territory, Belgian Congo and Northern Rhodesia.

Loudetia togoënsis (*Pilger*) *C. E. Hubbard*, comb. nov. *Trichopteryx togoënsis* Pilger in Engl. Bot. Jahrb. **34**, 128 (1904).

Distrib. French Guinea, French Sudan and Central Shari.

Loudetia capillipes *C. E. Hubbard*, sp. nov.; affinis *L. ambienti* (K. Schum.) C. E. Hubbard, sed panicula breviore flexuosa laxa, rhachi et ramis pilosis vel villosis, culmis gracilibus, foliorum laminis subsetaceis brevioribus et angustioribus differt.

Gramen perenne caespitosum. *Culmi* erecti, usque ad 75 cm. alti, graciles, simplices, 1–2-nodes, paniculam nodosque versus pilosi vel glabri laevesque. *Foliorum vaginae* internodiis breviores, arcte appressae, laeves, inferiores basi villosae, superne sparse hirsutae vel glabrae, ceterae glabrae; ligulae ad seriem ciliorum minutorum redactae; laminae subsetaceae, tenuiter acutae, erectae, usque ad 20 cm. longae, involutae, usque ad 1 mm. latae (explanatae), flexuosae, firmae, laxe hispidulae vel glabrescentes. *Panicula* laxa, ovata vel oblonga, 7–18 cm. longa; rhachis flexuosa, gracillima; rhachis et rami pilis mollibus patentibus albis e tuberculis minutis ortis pilosi vel villosi, plerumque purpurei; rami capillares, valde flexuosi, plerumque simplices, inferiores 2–5-nati, usque ad 4·5 cm. longi; pedicelli 1·5–4 mm. longi, ut ramis villosi. *Spiculae* apice ramorum per triades fasciculatae, lanceolatae vel oblongae et hiantes, 6–7·5 mm. longae, brunneae. *Glumae* tenuiter chartaceae, trinerves; inferior lanceolata, acuta, 4–5 mm. longa, marginibus et nervis lateralibus pilis patentibus albis usque ad 4 mm. longis e tuberculis ortis hirsuta; superior lanceolata, acuminata, apice truncata vel obtusa, spiculae aequilonga, marginibus ciliata. *Anthoecium inferum* ♂: lemma oblongo-lanceolatum, truncatum vel obtusum, gluma superiore paullo brevius, trinerve; apice ciliolatum; palea linearis, 5–6 mm. longa, carinis minute ciliolata. *Anthoecium superum* lineare: callus emarginatus, circiter 0·6 mm. longus, villosus; lemma 3–3·5 mm. longum, acute bilobum, lobis usque ad 1 mm. longis, tenuiter coriaceum, 7-nerve, breviter pubescens; arista flexuosa, 2·5–2·8 cm. longa, columna 10–13 mm. longa minute pubescente; palea linearis, 3·5–4 mm. longa. *Antherae* 2, 1·5–2·5 mm. longae.

FRENCH GUINEA: Timbo, on marshy rocky ground, *Pobéguin* 1757.

Loudetia trigemina *C. E. Hubbard*, sp. nov.; affinis *L. capillipedi* C. E. Hubbard, sed rhachi et ramis glabris vel fere glabris, culmis 4-nodibus, gluma inferiore spiculae paullo breviore, lemmati inferiore 7-nervi differt.

Gramen perenne. *Culmi* erecti vel basi geniculati, usque ad 1 m. alti, graciles, simplices, 4-nodes, nodos inferiores versus pilis brevibus hirsuti, ceteri glabri laevesque. *Foliorum vaginae* internodiis breviores, inferiores basi villosae, ceterae (summa excepta) superne molliter pilosae vel glabrescentes, nodis glabrae; ligulae ad seriem ciliorum minutorum redactae; laminae lineares, tenuiter acutae, usque ad 30 cm. longae et 3 mm. latae, planae vel siccitate convolutae, pilis brevibus e tuberculis minutis ortis pilosae vel glabrescentes vel glabrae laevesque. *Panicula* laxa, 8·5–10 cm. longa; rhachis gracillima, nodo infimo minute villosa, ceterum

ibra, laevis; rami tenuiter filiformes, asperuli, sparse divisi, eriores 2–4-nati, usque ad 3·8 cm. longi; pedicelli inaequales, que ad 1·5 mm. longi, apicem versus pilis rigidis albis praediti. iculae apice ramorum per triades fasciculatae, lanceolatae vel nceolato-oblongae, 6–6·5 mm. longae. *Glumae* chartaceae, lanceo- ae; inferior truncata, superiore paullo brevior, trinervis, minu- sime hispidula, nervis lateralibus pilis rigidis albis e tuberculis tis praedita; superior acuminata, truncata, spiculae aequilonga, 5-nervis, asperula, infra medium ad margines pilis brevibus paucis tuberculis ortis praedita. *Anthoecium inferum* ♂(?): lemma nceolatum, obtusum, 5 mm. longum, membranaceum, 7-nerve, perulum; palea lineari-oblonga, 3·5–4 mm. longa, carinis ciliolata. *nthoecium superum* lanceolato-lineare: callus truncatus, 0·4 mm. ngus, longe barbatus; lemma 2·5 mm. longum, bilobum, lobis nceolatis acutis circiter 1·8 mm. longis, tenuiter coriaceum, 7-nerve, pubescens; arista geniculata, usque ad 1·8 cm. longa, lumna scabrida 5–6 mm. longa; palea 3–3·5 mm. longa, carinis liolata. *Caryopsis* 2 mm. longa.

NORTHERN NIGERIA: Wana, in crevices on granite rocks, *epburn*.

oudetia eriopoda *C. E. Hubbard*, sp. nov.; affinis *L. simplici* Nees) C. E. Hubbard, sed spiculis paullo brevioribus, anthoecii iperi callo truncato vel leviter emarginato, aristis et antheris evioribus differt.

Gramen perenne. *Culmi* erecti, circiter 90 cm. alti, graciles, retes, simplices, 2-nodes, basin versus hirsuti vel glabri laevesque. *oliorum vaginae* pilis e tuberculis ortis plus minusve hispidae, odis barbatae, inferiores basi dense villosae vel lanatae, demum fibras fissae et basin culmi dense obtegentes; ligulae ad seriem liorum brevium redactae; laminae lineares, tenuiter acutae, cm. (vel ultra) longae, 5 mm. latae, planae, ut vaginae hirsutae. *anicula* ovata, laxa, 22 cm. longa, 7·5 cm. lata; rhachis inferne evis, superne minute scaberula; rami laxe divisi, fasciculati, enuiter filiformes, scaberuli, inferiores usque ad 9 cm. longi; edicelli inaequales, usque ad 6 mm. longi. *Spiculae* lineari-lanceo- tae et acuminatae vel lineari-oblongae, 7–8 mm. longae, rubro- runneae. *Glumae* chartaceae, trinerves, glabrae; inferior oblongo- vata, truncata vel obtusissima, 3–3·5 mm. longa; superior linear- nceolata, truncata, spiculae aequilonga. *Anthoecium inferum* ♂: mma lanceolatum, acuminatum, apice obtusum, usque ad 7·5 mm. ngum, glabrum, trinerve; palea linearis, truncata, 5 mm. longa, upra medium carinis minute ciliolata. *Anthoecium superum* lineare: allus truncatus vel leviter emarginatus, 0·5 mm. longus, dense arbatus; lemma 3·5–4 mm. longum, minute et acute bilobum, enuiter coriaceum, 7-nerve, minute pubescens; arista geniculata, ·5—3·2 cm. longa, columna usque ad 8 mm. longa minute ubescente; palea anguste linearis, 4·5 mm. longa. *Antherae* 2, ·5 mm. longae.

CAMEROONS: Tibati Highland; Assum, *Tessmann* 2728.

Tristachya fulva *C. E. Hubbard*, sp. nov. ; affinis *T. chrysothrici* Nees, sed spiculis et aristis brevioribus, panicula laxiore differt.

Gramen perenne. *Culmi* erecti, usque ad 1·2 m. alti, graciles, simplices, rigidi, 2-nodes, pilosi vel glabri laevesque ; internodia longe exserta, summa usque ad 60 cm. longa. *Foliorum vaginae* arcte appressae, hispidae vel marginibus pilis e tuberculis minutis ortis ciliatae, nodis pilis flavidis usque ad 8 mm. longis dense barbatae; ligulae ad seriem ciliorum minutorum redactae ; laminae anguste lineares, setaceo-acutae, usque ad 35 cm. longae, convolutae vel explanatae et usque ad 2·5 mm. latae, rigidae, supra laxe pilosae, subtus hispidulae. *Panicula* laxa, 12–20 cm. longa, 13–38 triades spicularum gerens ; rhachis gracilis, flexuosa, scabrida vel scaberula, nodo infero breviter villosa ; rami filiformes, sparse divisi vel simplices, scabridi, apicem versus flexuosi et pilis fulvis vel aureis patentibus e tuberculis minutis ortis setosi, inferiores 2–3-nati, usque ad 4·5 cm. longi ; pedicelli 1–2 mm. longi, ut rami setosi. *Spiculae* lanceolatae, 11–17 mm. longae, aureo-brunneae. *Gluma inferior* anguste lanceolata, setaceo-acuminata, 7–13 mm. longa, rigida, trinervis, nervis lateralibus pilis rigidis patentibus fulvis usque ad 3·5 mm. longis e tuberculis brunneis ortis dense setosa, apice scabrida ; gluma superior lineari-lanceolata, acuminata, truncata, spiculae aequilonga, trinervis, chartacea, supra medium margines versus pilis brevibus e tuberculis ortis hispidula. *Anthoecium inferum* ♂ : lemma lanceolatum, acuminatum, apice acutum, 10–12 mm. longum, 3-nerve, glabrum vel circa medium minute hirsutum ; palea linearis, 8–9 mm. longa, carinis minute ciliolatis. *Anthoecium superum* lineare : callus oblique truncatus vel emarginatus, 0·6–1 mm. longus ; lemma 4·5–5 mm. longum, lobis acutis angustis 1 mm. longis bilobum, tenuiter coriaceum, 7-nerve, dense pubescens ; arista 3·8–5 cm. longa, columna scabrida 1·4–2 cm. longa ; palea 5–6 mm. longa. *Antherae* 2, 4 mm. longae. *Ovarium* glabrum.

FRENCH GUINEA : Timbo, on dry ground, *Pobéguin* 1758.

Tristachya Welwitschii *Rendle* var. **superbiens** (*Pilger*) *C. E. Hubbard*, var. nov. *T. superbiens* Pilger in Engl. Bot. Jahrb. **40,** 82 (1907).

Distrib. Angola.

Tristachya Welwitschii *Rendle* var. **major** *C. E. Hubbard*, var. nov ; affinis var. *superbienti* C. E. Hubbard, sed culmis 1·8–2·4m. altis pruinosis, foliorum laminis 9–14 mm. latis glaucis glabris, panicula 28 cm. longa circiter 45 triades spicularum gerente.

SOUTHERN RHODESIA : Salisbury, 1140 m., *Eyles* 3403.

Tristachya Rehmannii *Hack.* var. **Helenae** (*Buscal. et Muschl.*) *C. E. Hubbard*, var. nov. *T. Helenae* Buscal. et Muschl. in Engl. Bot. Jahrb. **49,** 458 (1913).

Distrib. Nyasaland, Northern and Southern Rhodesia.

Tristachya Rehmannii Hack. appears to be confined to the Transvaal, where it is widely distributed. It differs from var. *Helenae* in having scaberulous culms, finely grooved leaf-sheaths which are scaberulous in the grooves and minutely villous at the nodes, a relatively shorter lower glume, a longer palea to the lower floret (up to 2 cm. long), on the average longer awns (6·3–8·8 cm.) and columns (1·8–4 cm. long).

Tristachya Rehmannii *Hack.* var. **pilosa** *C. E. Hubbard*, var. nov. ; a typo differt culmis pilosis (internodio superiore excepto), nodis dense sericeo-villosis, aristis brevioribus.

ANGOLA : Benguella ; country of the Ganguellas and Ambuellas, *Gossweiler* 2455.

Tristachya Kerstingii *C. E. Hubbard*, comb. nov. *Trichopteryx Kerstingii* Pilger in Engl. Bot. Jahrb. **34,** 128 (1904).

Distrib. Dahomey and Northern Nigeria.

Danthoniopsis barbata (*Nees*) *C. E. Hubbard*, comb. nov. *Tristachya barbata* Nees, Fl. Afr. Austr. 269 (1841). *T. somalensis* Franch. in Révoil, Çomali, 67 : 1882 (Sertulum Somalense). *Sorghum barbatum* Steud. et Hochst. ex Steud. Nomencl. Bot. ed. 2 612 (1841), in syn. *Loudetia barbata* A. Br. ex Steud. Syn. Pl Glum. **1,** 238 (1854), in syn. *Trichopteryx somalensis* Engl. in Abh Preuss. Akad. Wiss. 1891, **2,** 130 (1892). *T. barbata* Hack. ex Durand et Schinz, Consp. Fl. Afr. **5,** 846 (1894).

Distrib.—Sudan, Eritrea, Somaliland and Tropical Arabia (Yemen).

It is very probable that *Tristachya Bricchettiana* Chiov. in Ann Istit. Bot. Roma, **6,** 162, t.14 (1897) should be referred to this species The type-specimen in the Florence Herbarium consists of two smal pieces of rootstock and culm, and a packet containing immatur inflorescences. According to Chiovenda it differs from *Tristachy barbata* Nees in having pubescent glumes and a glabrous membran ous upper lemma ; in other respects it is similar to that species The spikelets are, however, far too young and too badly preserve to ascertain the structure of the upper lemma. The fertile floret are full of fungal hyphae and the lemma and palea in a state c disintegration. It is true that the lemma is membranous but thi is always the case in young material of the species. Lateral beard may also be present on the lemma as the hairs when young remai matted together and superficially resemble a piece of tissue ; the would then be difficult to recognise in a decomposing floret.

Tristachya Stocksii Boiss. Fl. Orient. **5,** 552 (1884), from Sin and Baluchistan, was reduced to a synonym of *Tristachya barbat* Nees by Hooker (Fl. Brit. Ind. **7,** 272). It appears to me to b a distinct species differing from the latter by the shorter truncat long-bearded callus of the fertile floret, the almost continuou transverse longer beard of the upper lemma and the mo slender and shorter awns.

Danthoniopsis Dinteri (*Pilger*) *C. E. Hubbard*, comb. nov. *Trichopteryx Dinteri* Pilger in Engl. Bot. Jahrb. **51**, 414 (1914).

Distrib. Angola, South West Africa, Northern Transvaal.

Danthoniopsis pruinosa *C. E. Hubbard*, sp. nov.; affinis *D. minori* Stapf et C. E. Hubbard, sed culmis erectis vel geniculato-ascendentibus 5–multi-nodibus pruinosis lignosis, rhachi asperula, spiculis minoribus flavido-brunneis vel pallide brunneis, lemmate inferiore trinervi differt.

Gramen perenne; innovationes extravaginales. *Culmi* erecti vel geniculato-ascendentes, usque ad 1·2 m. (vel ultra) alti, teretes, lignosi, nodos versus pruinosi, 5-multi-nodes, simplices vel ramosi, paniculam versus minute pubescentes vel glabri laevesque. *Foliorum vaginae* latae, laxae, internodiis longiores, basales sericeo-pilosae, ceterae glabrae vel pilis e tuberculis ortis laxe pilosae; ligulae ad seriem ciliorum densorum redactae; laminae lineares, basi contractae, in apicem setaceum attenuatae, usque ad 23 cm. longae, 4–11 mm. latae, planae, glaucae, glabrae vel pubescentes, nervis et marginibus asperulae. *Panicula* linearis vel anguste oblonga, contracta et densa, usque ad 25 cm. longa, 1·2–3·8 cm. lata; rhachis teres, superne asperula; rami geminati vel semi-verticillati, filiformes, glabri, scaberuli, divisi, inferiores usque ad 6.5 cm. longi; pedicelli 1·5–5 mm. longi. *Spiculae* lanceolatae vel anguste oblongae, 5–7 mm. longae, flavido-brunneae vel pallide brunneae. *Glumae* chartaceae, glabrae, trinerves, nervis scaberulae; inferior ovata vel elliptico-ovata, acuta, mucronata, 3·5–5 mm. longa; superior anguste ovata vel elliptico-ovata, acuta, spicula paullo brevior. *Anthoecium inferum* ♂: lemma lanceolato-oblongum, obtusum, mucronatum, 4·5–6·5 mm. longum, membranaceum, trinerve, glabrum; palea linearis, obtusa, 4–4·5 mm. longa, carinis superne ciliolata. *Anthoecium superum* lineare: callus truncatus, 0·5 mm. longus, dense barbatus; lemma 3·5 mm. longum, bilobum, lobis acutissimis 2 mm. longis, tenuiter coriaceum, 5-nerve, appresse pilosum, infra quemque lobum fasciculis pilorum longorum tribus transverse barbatum; arista geniculata, 8–12 mm. longa, columna brunnea 3–4 mm. longa fere laevi; palea linearis, 4·5 mm. longa, carinis anguste alatis. *Antherae* 3, lineares, 2–3 mm. longae.

NORTHERN RHODESIA: Pemba, on hills of gneissic granite, 1200 m., *Trapnell* 997 (type).

SOUTHERN RHODESIA: Marandellas, *S. Rhod. Govt. Herb.* 3008; Matopo Hills, 1350 m., *Rogers* 5194, 7944, *Hitchcock* 24256.

Brachyachne chrysolepis *C. E. Hubbard*, sp. nov.; affinis *B. patentiflorae* (Stent et Rattray) C. E. Hubbard, sed culmis nonnunquam ramosis, spica et spiculis longioribus, glumis latioribus, lemmate breviter mucronato differt.

Gramen perenne, dense caespitosum, usque ad 33 cm. altum. *Culmi* erecti vel leviter geniculati, gracillimi, teretes, 2–3-nodes, simplices vel e nodo infimo ramosi, glabri laevesque. *Foliorum*

vaginae plerumque basales; vaginae internodiis breviores, arcte appressae, glabrae laevesque, basales purpureae; ligulae brevissimae, truncatae; laminae angustissime lineares, apice subpungentes, usque ad 12 cm. longae et 1 mm. latae, planae vel siccitate convolutae, supra minute asperulae et pilis debilibus paucis praeditae, subtus glabrae laevesque. *Spica* solitaria, erecta, stricta, gracilis, usque ad 9 cm. longa, aureo-flava; rhachis laevis, 0·8–1 mm. lata. *Spiculae* oblanceolato-oblongae, demum leviter hiantes, 4–4·5 mm. longae. *Glumae* carinatae, uninerves, anguste oblongae vel anguste lanceolato-oblongae, obtusae; inferior carina scaberula; superior carina angustissime alata, laevis. *Lemma* explanatum late elliptico-oblongum, obtusissimum vel fere truncatum, breviter mucronatum, 3 mm. longum, tenuiter membranaceum, nervis dense ciliatum; palea lemmati subaequilonga, carinis ciliolata. *Rhachilla* usque ad 2 mm. ultra anthoecium producta.

UGANDA: Bugishu; Buligenye, in cracks in rocks, 1380 m., *Thomas* 376.

LIII—ON THE FLORA OF THE NEARER EAST XV*.

A CONTRIBUTION TO THE FLORA OF CENTRAL ALBANIA, D. A. CHAYTOR and W. B. TURRILL.

Since the war there has been an increasing interest taken in the flora of the Balkan Peninsula. Many parts of this large area, however, still remain either untouched botanically or merely skimmed by passing travellers. Resident collectors and investigators have facilities, with which the traveller cannot compete, for adding to our botanical knowledge. Central Albania has been largely neglected botanically even by travellers, with the notable exception of Dr. Fr. Markgraf of Berlin-Dahlem. The following contribution is based on a first collection by Mrs. R. V. Pennington who resides in the Tiranë (Tirana) district. A considerable number of additions to Dr. Markgraf 's list (Fedde, Repert. Beih. **45**, 1927) are recorded, a fair number of species new to Albania, and one species (*Helianthemum jonium* Lacaita et Grosser) new to the Balkan Peninsula.

The sequence followed for the families is that of Bentham and Hooker's Genera Plantarum; the genera and species are placed alphabetically within each family.

Ranunculus sardous Cr. Durazzo, on very poor grass land near sandy shore, 12.5.34, No. 9.

Ranunculus sardous Cr. var. *subglaber* Koch. Durazzo, on sandy dunes, near sea level, 13.5.34, No. 22.

Thalictrum aquilegifolium L. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 42.

Aethionema saxtile R. Br. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 101.

* Continued from Kew Bull. 1933, 240.

Alyssum alyssoides L. Dajti and Tiranë hills, among rocks, 920 m., 28.5.34, No. 77.

Allyssum repens Baumg. The material is too young to determine the subspecies or variety. Dajti, meadows in limestone hills, 1220 m., 26.5.34, No. 28. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 117.

Arabis hirsuta (L.) Scop. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 104, No. 116.

Erysimum pusillum Ch. et B. Dajti above Tiranë, 1670 m., 27.5.34, No. 90.

Rapistrum hispanicum (L.) Cr. Durazzo, 77 m., 7.5.34, on slope of hill by road-side, No. 2.

Thlaspi ochroleucrum Boiss. et Heldr. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 112.

Reseda Luteola L. Durazzo, on slope of hill by road-side outside the town, 77m., 7.5.34, No. 1.

Cistus villosus L. Near Dajti and Tiranë hills, limestone rocks, 28.5.34, No. 65.

Fumana vulgaris Spach. Dajti above Tiranë, 27.5.34, No. 96.

Helianthemum jonium Lacaita et Grosser var. *psilosepalum* Gross. et Lac. Flor. Ital. exicc. 1277 (in Herb. Kew pro parte) et in Nuov. Giorn. Bot. Ital. xvii, 609 (1910). Near Durazzo, 13.5.34, on sandy dunes with thin layer of vegetable mould, near sea level, No. 18. The discovery of this plant on the Albanian side of the Adriatic adds another species to the flora of the Balkan Peninsula. Previously, so far as is known, it has only been found in South Italy in the neighbourhood of Taranto.

Helianthemum nummularium (L.) Mill. Near Dajti and Tiranë hills, limestone rocks, 920 m., 28.5.34, No. 66.

Viola gracilis S. et S. sensu Becker. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 35.

Polygala nicaeensis Risso. subsp. *mediterranea* Chod. Dajti, meadow in limestone hills, 1220 m., 26.5.34, Nos. 43, 44, 45.

Cerastium brachypetalum Desp. var. *glandulosum* Koch. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 32.

Cerastium litigiosum De Lens. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 108.

Dianthus cruentus Gris. Dajti and Tiranë hills, among rocks, 920 m., 28.5.34, No. 53.

Moenchia mantica (Torn) Bartl. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 56.

Saponaria calabrica Guss. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 36. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 102.

Silene cucubalus Wib. Near Dajti and Tiranë hills, in meadow, 28.5.34, No. 73.

Silene italica L. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 76.

Hypericum perforatum L. var. *angustifolium* (DC.) Gaud. Sand dunes near Durazzo, 10.6.34, No. 135.

Linum angustifolium Huds. Near Dajti and Tiranë hills, in meadows, 920 m., 28.5.34, No. 67. On way down from Dajti to Tirane, 460 m., 28.5.34, No. 129.

Linum capitatum Kit. Near Dajti and Tiranë hills, in meadows, 920 m., 28.5.34, No. 71.

Geranium molle L. Durazzo, on very poor grass land near sandy shore, growing in some scrub, on slope near sea, 12.5.34, No. 10.

Geranium sanguinem L. Limestone slope up to peak of Dajti, 1070 m., 27.5.34, No. 100.

Dorycnium herbaceum Vill. Durazzo, on sandy dunes with thin layer of vegetation mould, near sea level, 13.5.34, No. 15. Dajti above Tiranë, 1670 m., 27.5.34, No. 97. Sand dunes near Durazzo, 10.6.34, No. 136.

Dorycnium hirsutum L. Near Durazzo, on poor grass land near sandy shore, near sea level, 12.5.34, No. 17.

Hymenocarpus circinnatus (L.) Savi. Durazzo, on very poor grass land near sandy shore, slope near sea, 12.5.34, No. 6.

Lotus corniculatus L. Dajti, above Tiranë central Albania, on summit of limestone range. 27.5.34, 1670 m., No. 99.

Medicago marina L. Durazzo, on sandy dunes with thin layer of vegetation mould, near sea level, 13.5.34, No. 16.

Psoralea bituminosa L. Lushnija, May 1934, sine numero.

Trifolium campestre Schreb. Durazzo, on very poor grass-land near sandy shore, slope near sea, 12.5.34, No. 5.

Trifolium Pignantii Fauché et Chaub. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 62.

Trifolium resupinatum L. Near Durazzo, on sand dunes with thin layer of vegetation mould, near sea-level, 13.5.34, No. 14.

Trigonella corniculata L. Durazzo, near sea level, on sandy dunes, 12.5.34, No. 21.

Agrimonia Eupatoria L. On way down from Dajti to Tiranë, 460 m., 28.5.34, No. 126.

Amelanchier cretica (Willd.) DC. Dajti above Tiranë, 1670 m., 27.5.34, No. 87.

Filipendula hexapetala Gilib. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 57.

Potentilla hirta L. var. *laeta* Foecke. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 31. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 54.

Rosa spinosissima L. var. *spinosa* (Neilr.) J. B. Kell. Dajti above Tiranë, 1670 m., 27.5.34, No. 83.

Sorbus Aria (L.) Cr. var. *cretica* (Lindl.) Schneid. Dajti above Tiranë, 1670 m., 27.5.34, No. 89.

Saxifraga Grisebachii Deg. et Dörfl. Dajti above Tiranë, 1670 m., 28.5.34, No. 88.

Saxifraga rotundifolia L. var. *hirsuta* Sternb. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 39.

Saxifraga rotundifolia L. var. *vulgaris* Engl. Dajti above Tiranë, 1670 m., 27.5.34, No. 94.

Bunuim alpinum W. et K. var. *montanum* (Koch) Burn. sensu Wolff Pflanzenreich iv, 228, 204. (1927). Slope down Dajti range above Tiranë, 610 m., 28.5.34, No. 122.

Cnidium silaifolium (Jacq.) Simk. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 103.

Oenanthe incrassens Ch. et B. Durazzo, on very poor grass land near sandy shore, slope near sea, 12.5.34, No. 11.

Orlaya grandiflora Hoffm. Near Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 68.

Lonicera alpigena L. subsp. *Formanekiana* (Hal.) Hayek var. *adenophora* Hal. Dajti above Tiranë, 1670 m., 27.5.34, No. 81.

Lonicera caprifolium L. Slopes of Dajti. On pure clay bank washed down by rain, scentless, only found in one spot, 460 m., 28.5.34, No. 49.

Galium Cruciata (L.) Scop. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 38. Dajti and Tiranë hills, in meadow, 28.5.34, No. 59.

Galium lucidum All. subsp. *corrudaefolium* (Vill) Hayek. Dajti and Tiranë hills, among rocks, 920 m., 28.5.34, No. 58.

Putoria calabrica (L. f.) DC. Slopes of Dajti on pure clay bank washed down by rain, scentless, only found in one spot, 460 m., 28.5.34, No. 48.

Knautia drymeia Heuff. var. *Nympharum* (Boiss. et Heldr.) Szabó. Dajti above Tiranë, 1670 m., 27.5.34, No. 92.

Knautia integrifolia (L.) Bertol. var. *hybrida* (All.) Szabó. Dajti Range, on way down from Dajti to Tiranë, 460 m., 28.5.34, No. 132.

Scabiosa crenata Cyr. Near Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 72.

Achillea grandifolia Friv. Limestone slope leading to peak of Dajti. 1070 m., 27.5.34, No. 113.

Anthemis montana L.var ? Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 55. Durazzo, on sandy dunes, near sea level, 13.5.34, No. 20.

Carduus nutans L. Dajti above Tiranë, 1670 m., 27.5.34, No. 86.

Centaurea Triumfetti All. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 33. Dajti above Tiranë, 1670 m., 27.5.34, No. 82.

Doronicum Columnae Ten. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 41.

Leucanthemum vulgare Lam. subsp. *pallens* (Gay) Briqu. On way down from Dajti to Tiranë, 460 m., 28.5.34, No. 130. Sand dunes near Durazzo, 10.6.34, No. 138.

Pallenis spinosa Cass. Durazzo, on grass hillside near ruins, 60 m., 10.5.34, No. 3.

Silybum Marianum (L.) Gaertn. Durazzo, on very poor grass land near sandy shore, slope near sea, 12.5.34, No. 4.

Tragopogon balcanicum Vel. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 52.

Asyneuma limoniifolium (L.) Janch. Near Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 64.

Campanula lingulata W. et K. Near Dajti and Tiranë hills, 920 m., 28.5.34, No. 74.

Campanula ramosissima S. et S. On way down from Dajti to Tiranë, 460 m., 28.5.34, No. 127.

Vinca major L. var. *pubescens* Urum. in Oesterr. Bot. Zeitschr. **50,** 17 (1900) e descr. On the way to Lushnija, c. 150 m., loose stony soil, May, 1934, No. 128. This is a very interesting plant and while undoubtedly allied to *V. major* L. may prove to be not merely a variety but a distinct species. Urumoff's original description is very meagre ; for example, no measurements are given. The type of the variety came from Mikre on the northern slopes of the Stara Planina (Balkans) in North Bulgaria. Hayek in Denk. Akad. Wiss. Wien Math.-Naturwiss. Kl. **99,** 191 (1924) uses the varietal name for a plant from Kula Lums 250 m., northern Albania, with the words " Die Blüten sind bedeutend kleiner als an der typischen Form." Markgraf, in Fedde Repert. Beih, **45,** 203 (1927) records *V. major* L. from " Arrenwald am Lum i Tiranës, 120 m.," Unfortunately Mrs. Pennington's material is insufficient for us to describe the plant fully and till more is received we propose to use Urumoff 's name with a considerable doubt regarding the true status of the plant.

Vincetoxicum Huteri Vis. et Aschers. Limestone slope leading to peak of Dajti, 27.5.34, No. 114, 1070 m.

Blackstonia perfoliata (L.) Huds. Durazzo, on very poor grass land near sandy shore, slope near sea, No. 8.

Centaurium umbellatum Gilib. Sand-dunes near Durazzo, 10.6.34, No. 134.

Alkanna boeotica DC. Limestone slope leading to peak of Dajti 1070 m., 27.5.34, No. 107.

Alkanna tinctoria (L.) Tsch. Durazzo, on sandy dunes near sea level, colour vivid bright deep blue, 13.5.34, No. 19.

Cynoglossum columnae Ten. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 105.

Cynoglossum creticum Mill. Near Durazzo, on poor grass land near sandy shore, on slope near sea, 12.5.34, No. 13.

Lycopsis variegata (L.) Lehm. Dajti and Tiranë hills, 920 m., 28.5.34, No. 60.

Moltkia petraea DC. Dajti, growing on limestone rock on steep wall of rock, 1220 m., 26.5.34, No. 46.

Myosotis alpestris Schmidt. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 110.

Myosotis arvensis (L.) Hill. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 30.

Symphytum Leonhardtianum Pugsley in Journ. Bot. **69,** 95

(1931). Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 37. We are uncertain if this species is really distinct from *S. tuberosum* L. The only character given in the differential diagnosis (l.c. 96) which seems to have much taxonomic value, so far as can be judged from herbarium material, is the shape and size of the calyx-segments and plants showing intermediate conditions of even this character are at Kew.

Calystegia sepium (L.) R. Br. Nr. Tiranë, growing on hedge, 275 m., 28.5.34, No. 50.

Calystegia soldanella R. Br. Near Durazzo, 13.5.34, near sea-level, on sandy dunes, No.23.

Convolvulus elegantissimus Mill. Near Dajti and Tiranë hills, in meadows, 920 m., 28.5.34, No. 70. and No. 75.

Alectorolophus major (Ehrh.) Rchb. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 34.

Digitalis lanata Ehrh. On way down from Dajti to Tiranë, 28.5.34, No. 131.

Linaria peloponnesiaca Boiss. et Heldr. On slope above the plain of Musakir near Lushnija, 3 ft. high, 154 m., 14.5.34, No. 24.

Parentucellia viscossa (L.) Cav. Near Durazzo, in the sand dunes along the shore, 10.6.34, No. 139.

Scrophularia canina L. Dajti, on slope down Dajti Range above Tiranë, 620 m., 28.5.34, No. 124.

Veronica austriaca L. subsp. *Jacquinii* (Baum) Maly. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 29. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 109.

Ramondia serbica Panč. Dajti, growing in crevice of rock, only found in two spots and very few plants at either, 1200 m., 26.5.34, No. 47.

Globularia cordifolia L. subsp. *cordifolia* (L.) Hay. Dajti and Tiranë, 1670 m., 27.5.34, No. 80.

Calamintha alpina (L.) Lam. Dajti above Tiranë, 27.5.34, No. 85. Dajti above Tiranë, 1670 m., 27.5.34, No. 98.

Lamium garganicum L. subsp. *garganicum* (Gris.) Briqu. Slope down Dajti range above Tiranë, 620 m., 28.5.34, No. 123.

Lamium maculatum L. Dajti, meadow in limestone hills, 1220 m., 26.5.34, No. 40.

Salvia officinalis L. Near Dajti and Tiranë hills, among rocks, 920 m., 28.5.34, No. 63. Dajti, limestone range of hills, flowers found in meadows there, 1220 m., 26.5.34, No. 25.

Salvia Tenorii Spreng. Pugil i. 2 (1813) sensu Hal. Lushnija, May 1934, sine numero. The Albanian material (see also Alston and Sandwith 1255) is not quite the equivalent of the Italian. There is, however, no doubt that it is conspecific with some at least of the Greek material included in the species of Halácsy (Consp. i. 488 ; 1902).

Stachys recta L. Dajti and Tiranë hills, in meadow, 920 m., 28.5.34, No. 61. The material is insufficient to determine the variety with certainty.

Teucrium polium L. Sand dunes near Durazzo, 10.6.34, No. 133.

Euphorbia Myrsinites L. Dajti, in meadows and among limestone rocks of range Dajti above Tiranë, Central Albania, 920 m., 28.5.34, No. 51. Dajti above Tiranë, 1670 m., 27.5.34, No. 84.

Euphorbia polychroma Kern. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 115.

Gymnadenia conopsea R. Br. Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 118.

Orchis coriophora L. Near Durazzo, growing in amongst some low shrubs on grass slope near sea, 12.5.34, No. 7.

Orchis morio L. Dajti, limestone hills, in meadows, 26.5.34, 1220 m., No. 27. Dajti and Tiranë hills in meadow, 920 m., 28.5.34, No. 78. Dajti and Tiranë hills in meadow, 920 m., 28.5.34, No. 79, (floribus albis).

Orchis palustris Jacq. Sand dunes near Durazzo, 10.6.34, No. 137.

Orchis tridentata Scop. Dajti, limestone hills, 1220 m., 26.5.34, No.26.

Platanthera bifolia (L.) Rchb. Near Dajti and Tiranë hills, in meadows, 920 m., 28.5.34, No. 69.

Serapias laxiflora Chaub. On way down from Dajti to Tiranë, 460 m., 28.5.34, No. 125.

Gladiolus paluster Gaud. Near Durazzo, near sea level, on sand dunes with thin layer of mould vegetation, 13.5.34, No. 12.

Iris pallida Lam.x *variegata* L. (?) (±*I. neglecta* Horn. Bot. Mag. t. 2435). Dajti above Tiranë, 1670 m., 27.5.34, No. 91. This plant is identical with *Alston and Sandwith* 385 from near summit of mountain east of Krystallopegae (Smrdesh), 1520 m. There is a large range of bearded Irises found, often in apparently wild spots in the Balkan Peninsula. At present the incomplete collecting, the often poor herbarium specimens, and the insufficiency of localized material in cultivation make it impossible to do more than suggest that hybridization has been a cause of the diversity of characters and character combinations. How far the present distribution of these Irises is due to their cultivation by Turks and Slavs it is difficult to say, but vegetative propagation by dispersal of small pieces of rhizome is an easy matter.

Iris Sintenisii Janka. Lushnija, May, 1934, sine numero.

Asphodelus albus Mill. Dajti above Tiranë, 1670 m., 27.5.34, No. 93.

Muscari comosum (L.) Mill. Dajti, on limestone slope leading up to the peak of Dajti, slope open and exposed, 1070 m., 27.5.34, No. 119.

Muscari neglectum Guss. Dajti above Tiranë, 1670 m., 27.5.34, No. 95.

Polygonatum sp. (? *P. officinale* All.) Limestone slope leading to peak of Dajti, 1070 m., 27.5.34, No. 106.

LIV–GRAMINEAE AUSTRALIENSES : II.* C. E. HUBBARD.

Bothriochloa decipiens (*Hack.*) *C. E. Hubbard*, comb. nov. *Andropogon pertusus* var *decipiens* Hack. in DC. Monogr. Phan. **6**, 483 (1889). *A. decipiens* Domin in Biblioth. Bot. **20**, heft 85, 266 (1915).

Distrib.—Queensland and New South Wales.

This species was included under *Andropogon pertusus* Willd. by Bentham (Fl. Austral. **7**, 530 : 1878). *B. decipiens* differs from *B. pertusa* (Willd.) A. Camus in having more hairy racemes, longer and narrowly lanceolate sessile spikelets and in the narrow linear pedicelled spikelets being sterile and reduced to the lower glume. In New South Wales and Queensland *B. decipiens* is considered unpalatable, except in its early stages of growth. In some districts, where overstocking and consequently heavy grazing has taken place, it dominates the grazing land. This is especially the case in many parts of coastal southern Queensland.

Bothriochloa decipiens var. **cloncurrensis** (*Domin*) *C. E. Hubbard*, comb. nov. *Andropogon decipiens* Domin var. *cloncurrensis* Domin in Biblioth. Bot. **20**, heft 85, 266 (1915).

Distrib.—North and Central Queensland.

Allied to *B. decipiens*, but a stouter grass with taller culms and longer leaf-blades.

Bothriochloa Ewartiana (*Domin*) *C. E. Hubbard*, comb. nov. *Andropogon Ewartianus* Domin in Biblioth. Bot. **20**, heft 85, 269 (1915).

Distrib.—Western Queensland.

Bothriochloa erianthoides (*F. Muell.*) *C. E. Hubbard*, comb. nov. *Andropogon erianthoides* F. Muell. Fragm. Phyt. Austral. **10**, 75 (1876).

Distrib.—Queensland and New South Wales.

Distinguished from all other Australian species by the densely villous racemes, the long silky hairs from the joints, pedicels and calli almost concealing the spikelets.

Vetiveria elongata (*R. Br.*) *Stapf* ms., comb. nov. *Holcus elongatus* R. Br. Prodr. 200 (1810). *Sorghum elongatum* Beauv. Agrost. 178 (1812). *Andropogon elongatus* Spreng. Syst. Veg. **1**, 287 (1825). *Chrysopogon elongatus* Benth. Fl. Austral. **7**, 538 (1878).

Distrib.—Northern Australia, Northern Queensland.

Vetiveria filipes *C. E. Hubbard*, sp. nov.; affinis V. *elongatae* Stapf, sed culmis brevioribus, foliorum laminarum marginibus minus scabridis, panicula laxiore, ramis longioribus gracilibus laxe spiculatis, spicularum sessilium callo breviter barbato, aristis longioribus differt.—*Chrysopogon elongatus* Benth. var. *filipes* Benth. Fl. Austral. **7**, 539 (1878). *Andropogon elongatus* Spreng. var. *filipes* Hack. in DC. Monogr. Phan. **6**, 565 (1889).

Distrib.—Central and Southern Queensland [Balonne River, *Mitchell* (type)].

*Continued from K.B., 1934, 128.

Germainia flosculosa (*F. Muell.*) *C. E. Hubbard*, comb. nov. *Anthistiria flosculosa* F. Muell. Fragm. Phyt. Austral. **10**, 75 (1876).

Distrib.—Queensland : Port Curtis District ; Gladstone, *Moore*.

It has been possible, through the courtesy of the Director of the Melbourne Herbarium, to examine the material on which this species was based. Bentham (Fl. Austral. **7**, 542) was unable to deal with this plant satisfactorily and briefly referred to it in a note under *Anthistiria*. Although the specimen is fragmentary, there is no doubt that it is a species of *Germainia*. The addition of an Australian species considerably extends the distribution of this genus. It is now known from Assam, Burma, S.E. China, Indo-China, Siam and Queensland. *Germainia* may be distinguished from *Themeda* (*Anthistiria*) by the solitary espatheate terminal inflorescence, the false involucre of up to 9 awnless male spikelets surrounding and more or less enclosing the 3 central fertile awned spikelets. It is hoped that Queensland botanists will be able to rediscover this very interesting species.

Ottochloa gracillima *C. E. Hubbard*, sp. nov.; affinis *O. nodosae* (Kunth) Dandy, sed spiculis multo minoribus, foliis et paniculis brevioribus, culmis gracillimis debilibus differt.

Gramen perenne. *Culmi* e basi procumbente geniculato-ascendentes, e nodis inferioribus radicantes, usque ad 30 cm. alti, debiles, gracillimi, teretes, simplices vel laxe ramosi, multinodes, tenuissime striati, uno latere pilis mollibus e tuberculis minutis ortis pubescentes vel glabri laevesque. *Foliorum vaginae* internodiis multo breviores, tenuissime striatae, marginibus ciliolatae ; ligulae brevissimae, membranaceae ; laminae lineares vel lineari-lanceolatae, basi abrupte contractae, in apicem acutum vel subobtusum attenuatae, 1–7 cm. longae, 1·5–6 mm. latae, planae, patentes, tenues, virides, supra aspere nervosae vel fere laeves, pilis paucis sparsis praeditae vel glabrae vel fere glabrae. *Panicula* laxa, 3–9 cm. longa ; axis primarius gracillimus, flexuosus ; rami 3–6, laxe spiculati, minute scaberuli, inferiores usque ad 3·5 cm. longi, plerumque ramulis brevibus 2–4-spiculatis ramosi, superiores breviores simplices ; pedicelli laterales usque ad 1 mm. longi. *Spiculae* anguste ellipticae vel oblongo-ellipticae, obtusae, dorso compressae, 2–2·3 mm. longae, pallide virides. *Glumae* subsimiles, ovatae, obtusae vel subacutae, tenuiter membranaceae ; inferior 1 mm. longa, 3-nervis ; superior usque ad 1·3 mm. longa, 3–5-nervis. *Anthoecium inferum* : lemma spiculae aequilongum, anguste ellipticum, obtusum, membranaceum, 7-nerve, glabrum vel margines versus pilis paucis brevissimis praeditum. *Anthoecium superum* anguste ellipticum : lemma obtusum, apiculatum, minute granulosum.

QUEENSLAND: Moreton District; Blackall Range, April 1918, *White*; Palmwoods, on grassy banks under trees in cleared Eucalyptus forest country, May 1930, *Hubbard* 2807; One Mile Creek, Lawnton, edge of rain-forest, near water, Jan. 1931, *Blake* 128B; Ferny Flats, April 1918, *Shirley & White*; between Northgate and Nudgee, April 1907, *White*; Kedron Brook, April 1918, *White*; Ekibin Creek, Feb. 1913, *White*; Mt. Coot-tha, Taylor Range, in partial shade of shrubs and trees in Eucalyptus forest, April 1930, *Hubbard* 2005; Mt. Petrie, Eucalyptus forest, damp shady depression, April 1930, *Hubbard* 2144; near Mt. Gravatt, in shade of bushes and trees, in rather damp places in Eucalyptus forest, March 1931, *Hubbard* 8070, *White* 7265; Cooper's Plains, in Eucalyptus forest, forming dense masses under bushes, April 1930, *Hubbard* 2341; Sunnybank, March 1918, *White*; Moggill, on hills in open Eucalyptus forest, in shade, April 1931, *Hubbard* 8600 (type), *White* 7617; Tambourine Mountain, Feb. 1917, *Longman & White*. Wide Bay District: Kin Kin, March 1916, *Francis & White*.

Brachiaria Gilesii (*Benth.*) Chase in Contrib. U.S. Nat. Herb. **22,** 35 (1920). *Panicum Gilesii* Benth. Fl. Austral. **7,** 477 (1878). *Urochloa Gilesii* D.K. Hughes in Kew Bull. 1923, 319.

Distrib.—Central Australia, South Australia, New South Wales and Queensland.

The orientation of the spikelets indicates that this species should be placed in *Brachiaria*. The lower glume is adaxial, whereas in *Urochloa* it is abaxial.

Brachiaria notochthona *Stapf* in Prain, Fl. Trop. Afr. **9,** 597 (1920), in obs. *Panicum helopus* Benth. Fl. Austral. **7,** 476 (1878), non Trin. *Panicum notochthonum* Domin in Fedde, Repert. **10,** 60 (1911). *Urochloa notochthona* D. K. Hughes in Kew Bull. 1923, 319.

Distrib.—New South Wales and Queensland.

The spikelets in this species are also adaxial and the species was correctly placed in *Brachiaria* by Stapf.

Brachiaria Whiteana (*Domin*) *C. E. Hubbard* comb. nov. *Panicum Whiteanum* Domin in Biblioth. Bot. **20,** heft 85, 305 (1915).

Distrib.—Queensland.

Brachiaria praetervisa (*Domin*) *C. E. Hubbard*, comb. nov. *Panicum adspersum* Benth. Fl. Austral. **7,** 481 (1878), non Trin. *Panicum praetervisum* Domin in Biblioth. Bot. **20,** heft 85, 309 (1915). *Urochloa praetervisa* Hughes in Kew Bull. 1923, 319.

Distrib.—South and Central Australia.

Paspalidium caespitosum *C. E. Hubbard*, sp. nov.; a *P. gracili* (Trin.) Hughes differt culmis dense caespitosis, spiculis paullo minoribus.

Gramen perenne, dense caespitosum. *Culmi* erecti, circiter 45 cm. alti, gracillimi, teretes, simplices vel ramosi, 3–6-nodes, glabri laevesque. *Folia* pilis e tuberculis minutis ortis pubescentia vel glabrescentia; vaginae internodiis demum breviores; ligulae ad seriem ciliorum minutorum redactae; laminae anguste lineares, tenuiter acutae, usque ad 12 cm. longae, convolutae vel involutae, explanatae usque ad 1·5 mm. latae, subrigidae, erectae, virides. *Inflorescentia* angustissima, erecta, usque ad 16 cm. longa; axis primarius gracillimus, laevis; racemi 7–10, inferiores usque ad 2·5 cm. longi et 3-4·5 cm. distantes, superiores breviores et minus distantes, simplices vel longiores basi ramosi; rhachis triquetra, angulis scaberulis, flexuosa, seta 1–2 mm. longa terminata; pedicelli brevissimi, apice discoidei. *Spiculae* biseriatae, contiguae, ovato- vel elliptico-oblongae, subacutae, 1·8–2 mm. longae, glabrae, pallidae. *Glumae* membranaceae; inferior late oblata, rotundato-obtusa, 0·6–0·8 mm. longa, 1–3-nervis; superior late elliptica, obtusa, spiculae duas vel tres partes aequans, 5-nervis. *Anthoecium inferum* sterile: lemma spiculae aequilongum, late ellipticum, obtusum, membranaceum, 5-nerve; palea minuta vel nulla. *Anthoecium* superum ♀, ellipticum, acutum, apiculatum, spiculae aequilongum: lemma et palea tenuiter crustacea; lemma 5-nerve, tenuissime rugulosum; antherae 0·8–1 mm. longae.

QUEENSLAND: Darling Downs District; near Goondiwindi, May 1933, *Hirschfeld*.

According to Dr. E. Hirschfeld this species is known locally as "Brigalow Grass." He states that it is confined to Brigalow (*Acacia harpophylla*) country, where it spreads rapidly and lasts throughout the summer months.

Paspalidium Clementii (*Domin*) *C. E. Hubbard*, comb. nov. *Panicum Clementii* Domin in Journ. Linn. Soc., Bot. **41,** 272 (1912) et in Biblioth. Bot. **20,** heft 85, 303 (1915).

Distrib.—Western Australia.

Miss Hughes in her paper "The Genus Panicum of the Flora Australiensis" (K.B. 1923, 331) listed *Panicum Clementii* Domin as an "Imperfectly known Species," failing to connect a specimen determined by Domin as "Panicum n. sp." with the plant he later described as *Panicum Clementii*. This specimen, which was collected by Dr. E. Clement in Western Australia between the Ashburton and Yule Rivers, agrees perfectly with Domin's description and there seems no doubt that it is the type of his species. *Paspalidium Clementii* is closely allied to *P. gracile* (R.Br.) Hughes, but differs in being a loosely tufted annual, with compressible culms, thin and broader leaf-blades, and obscurely nerved obtuse spikelets. *P. gracile* is a perennial, with rigid wiry culms, narrower and firmer leaf-blades, densely clustered spikelets, the latter prominently nerved and with apiculate tips.

Paspalidium constrictum (*Domin*) *C. E. Hubbard*, comb. nov. *Panicum constrictum* Domin in Biblioth. Bot. **20,** heft 85, 302 (1915).

Distrib.—Central Queensland.

The type-specimen, kindly lent for examination by Dr. Domin, shows that this species is allied to *Paspalidium gracile* var. *rugosum* Hughes. It differs in its hairy leaves, slightly larger subovoid spikelets and 9-nerved upper glume. In the original description of *P. constrictum*, the nervations of glumes two and three have been transposed.

Paspalidium tabulatum (*Hack.*) *C. E. Hubbard*, comb. nov. *Panicum tabulatum* Hack. in Engl. Bot. Jahrb. **6,** 234 (1885).

Distrib.—Western Australia.

This is an annual species with loosely tufted very slender culms. It differs from *Paspalidium Clementii* in its narrower almost setaceous leaves and larger acute spikelets.

Brachyachne convergens (*F. Muell.*) *Stapf* in Hook. Ic. Plant. **31,** sub tab. 3099 (1922). *Cynodon convergens* F. Muell. Fragm. Phyt. Austral. **8,** 113 (1873). *Capriola convergens* O. Kuntze, Rev. Gen. Pl. **2,** 764 (1891). *Microchloa convergens* Domin in Fedde, Repert. **10,** 119 (1911).

Distrib.—Queensland and Northern Australia.

The genus *Brachyachne* was first proposed by Stapf in the key to the genera of tropical African grasses (Prain, Fl. Trop. Afr. **9,** 20 : 1917). Later he described a new species, *B. fulva* (Hook. Ic. Plant. **31,** tab. 3099 : 1922) from the Belgian Congo and at the same time transferred *Cynodon convergens* F. Muell. to *Brachyachne*. His new genus was apparently based on *Cynodon* Pers. sect. *Brachyachne* Benth. (Benth. et Hook. f. Gen. Pl. **3,** 1164 : 1883). It is closely allied to *Cynodon* and differs by both glumes being keeled and longer than the thin delicate lemma.

Brachyachne tenella (*R. Br.*) *C. E. Hubbard*, comb. nov. *Cynodon tenellus* R. Br. Prodr. 187 (1810). *Capriola tenella* O. Kuntze, Rev. Gen. Pl. **2,** 764 (1891). *Microchloa tenella* Domin in Fedde, Repert. **10,** 119 (1911).

Distrib.—Queensland and Northern Australia.

Brachyachne ciliaris (*Benth.*) *C. E. Hubbard*, comb. nov. *Cynodon ciliaris* Benth. Fl. Austral. **7,** 610 (1878). *Capriola ciliaris* O. Kuntze, Rev. Gen. Pl. **2,** 764 (1891). *Microchloa ciliaris* Domin in Biblioth. Bot. **20,** heft 85, 364 (1915).

Distrib.—Western Queensland, Central Australia, northern South Australia, New South Wales.

Tripogon loliiformis (*F. Muell.*) *C. E. Hubbard*, comb. nov. *Festuca loliiformis* F. Muell. Fragm. Phyt. Austral. **8,** 128 (1873). *Leptochloa loliiformis* F. Muell. l.c., in syn. *Diplachne loliiformis* F. Muell. ex Benth. Fl. Austral. **7,** 618 (1878).

Distrib.—Queensland, New South Wales, South, Central and Western Australia.

Eragrostis lanipes *C. E. Hubbard*, sp. nov.; affinis *E. eriopodae* Benth., sed spiculis brevioribus usque 10-floris, lemmatibus arcte imbricatis latioribus marginibus infra medium ciliatis, palearum carinis dense ciliatis differt.

Gramen perenne, dense caespitosum, usque ad 50 cm. altum. *Culmi* erecti vel leviter geniculati, teretes, graciles, simplices, 2-nodes, glabri laevesque, basi bulbiformi cataphyllis late ovatis acutis brevibus papyraceis basi lanatis dense obtecti. *Folia* glabra, subglauca ; vaginae internodiis breviores, arcte appressae, asperulae ; ligulae ad seriem ciliorum minutorum redactae ; laminae anguste lineares, in apicem subobtusum attenuatae, usque ad 10 cm. longae et 2·5 mm. latae, rigidae, planae vel siccitate involutae, scaberulae vel subtus fere laeves. *Panicula* aperta, laxa, 10–20 cm. longa, 3–8 cm. (vel ultra) lata ; rhachis stricta, rigida, glabra, laevis ; rami rigidi, stricti, laeves, demum horizontaliter patentes, inferiores usque ad 7 cm. longi et usque ad 4·5 cm. distantes, superiores breviores ; ramuli paucispiculati, usque ad 1 cm. longi, laxe dispositi ; pedicelli brevissimi. *Spiculae* oblongae vel ovato-oblongae, obtusae, 4–6 mm. longae, 2–3 mm. latae, purpureae vel purpureo-variegatae, usque 10-florae ; rhachilla demum disarticulans. *Glumae* explanatae late elliptico-oblongae, apice rotundatae, uninerves, basi ciliolatae ; inferior 1·3–1·5 mm. longa ; superior 1·5–2 mm. longa. *Lemmata* explanata late ovata vel late elliptico-ovata, apice rotundata, mucronulata, 2–2·3 mm. longa, carinata, prominenter 3-nervia, tenuiter coriacea, marginibus infra medium ciliata. *Paleae* oblongae, apice late rotundatae vel truncatae, 2 mm. longae, membranaceae, carinis dense ciliatae. *Antherae* 3, 1 mm. longae.

WESTERN AUSTRALIA : Tenindewa, between Geraldton and Mullewa, *Palmer*.

Poa queenslandica *C. E. Hubbard*, sp. nov.; affinis *P. australi* R.Br., sed culmis laxe caespitosis plerumque geniculatis ramosis 5–9-nodibus, foliorum laminis planis latioribus laevibus vel fere laevibus differt.

Gramen perenne, laxe caespitosum. *Culmi* geniculato-ascendentes vel erecti, 50–120 cm. (vel ultra) alti, graciles vel validiusculi, 5–9-nodes, simplices vel ramosi, glabri laevesque. *Foliorum vaginae* internodiis demum breviores, laxae, striatae, glabrae laevesque ; ligulae truncatae, tenues, usque ad 4 mm. longae ; laminae lineares, tenuiter acutae, usque ad 40 cm. longae, 4–15 mm. latae, planae, virides, glabrae, laeves vel supra apicem versus et marginibus scaberulae. *Panicula* laxa, 12–30 cm. longa, usque ad 16 cm. lata, viridis ; rhachis laevis ; rami patentes, inferiores 5–6-nati, gracillimi, minute scaberuli vel laeves, laxe divisi ; pedicelli laterales usque ad 8 mm. longi. *Spiculae* lanceolatae vel oblongae, 3–5 mm. longae, laxe 2–4-florae. *Glumae* subobtusae vel acutae, carinis scaberulae ; inferior lanceolata vel ovata, 1·5–2 mm. longa, 1–3-nervis ; superior ovata vel ovato-elliptica, 2–2·2 mm. longa, 3–nervis. *Lemmata* ambitu lanceolato-oblonga, obtusa vel subacuta, 2·5–3 mm. longa,

prominenter 5-nervia, asperula, basi minute pilosa. *Paleae* carinis scaberulae, lemmatibus aequilongae vel leviter longiores. *Antherae* 1–1·3 mm. longae. *Caryopsis* 1·8 mm. longa.

QUEENSLAND: Moreton District; Mt. Mistake, *Bailey*, *White*; Darling Downs District; Killarney, *White*; Spring Creek, near Killarney, on mountain slope, in rain forest, at foot of water-fall amongst basaltic boulders, March 1931, *Hubbard* 5783 (type).

Enneapogon avenaceus (*Lindl.*) *C. E. Hubbard*, comb. nov. *Pappophorum avenaceum* Lindl. in Mitch. Journ. Trop. Austral. 320 (1848).

Distrib.—Queensland, South and Central Australia, New South Wales.

Enneapogon Lindleyanus (*Domin*) *C. E. Hubbard*, comb. nov. *Pappophorum Lindleyanum* Domin in Biblioth. Bot. **20**, heft 85, 379 (1915).

Distrib.—Queensland, Northern Ausfralia and Central Australia.

Glyceria Drummondii (*Steud.*) *C. E. Hubbard*, comb. nov. *Porroteranthe Drummondii* Steud. Syn. Pl. Glum. **1**, 287 (1854).

WESTERN AUSTRALIA: Swan River, *Drummond*, 277! 390! without precise locality, *Palmer* 22!

This very distinct species was referred to by Bentham (Fl. Austral. **7**, 658: 1878) under *Glyceria fluitans* (L.) R. Br., where he stated that it appeared to be a variety or small leafy state of that species. It differs from *G. fluitans* noticeably in the structure of the spikelets. The glumes are very much reduced, the lower being 0·5–1 mm. and the upper 1·5–2·5 mm. long; the lemmas taper upwards and are ovate-oblong when opened out; the paleas are 8–9 mm. long, conspicuously longer than the lemmas and have scaberulous keels; the internodes of the rhachilla are elongated and up to 4 mm. long. Finally, the specimens available suggest that it may be an annual rather than a perennial.

Glyceria australis *C. E. Hubbard*, sp. nov.; affinis *G. acutiflorae* Torr., sed spiculis latioribus, rhachilla flexuosa, paleis brevioribus lemmatibus subaequalibus carinis angustius alatis differt.

Gramen perenne aquaticum, usque ad 60 cm. (vel ultra) longum. *Culmi* e basi procumbente ascendentes, e nodis radicantes, graciles, teretes, simplices, 4–6-nodes, glabri laevesque. *Folia* glabra, laevia, prominenter transverse nervosa; vaginae laxae, striatae, demum internodiis breviores; ligulae usque ad 5 mm. longae, truncatae, tenuiter membranaceae; laminae lineares, obtusae, usque ad 18 cm. longae, 2–5 mm. latae, planae, firmae, virides. *Panicula* angusta, laxissima, interrupta, usque ad 27 cm. longa; rhachis gracilis, laevis; rami binati vel apicem versus solitarii, simplices, 1-spiculati, valde inaequales, 0·2–2 cm. longi. *Spiculae* lineares, 20–35 mm. longae, laxe 7–12-florae, pallide

virides, glabrae. *Glumae* lanceolatae, acutae, tenuiter membranaceae, 1-nerves; inferior 4–5·5 mm. longa; superior 6–7 mm. longa. *Lemmata* explanata lanceolata, acuminata, 7–10 mm. longa, apice marginibusque hyalinis exceptis firme membranacea, 7-nervia, asperula. *Rhachilla* flexuosa, gracillima, internodiis 2–3 mm. longis. *Paleae* lineares vel lineari-lanceolatae, apice bicuspidatae, lemmati subaequilongae, carinis inferne anguste alatis scaberulis. *Antherae* lineares, 3 mm. longae. *Caryopsis* anguste oblonga, 3·5 mm. longa.

NEW SOUTH WALES: Guyra, in railway reserve, in wet low-lying ground, 1320 m., *McKie* 709; Guyra Lagoon, in marshy place, *McKie* 709A; Paramatta, *Woolls*; Port Jackson, *Brown* 6296 (type).

The last two specimens cited above were identified with *Glyceria fluitans* (L.) R. Br. by Bentham (Fl. Austral. **7**, 657). They differ from that species in the prominently transversely nerved leaves and in the longer lanceolate acuminate lemmas. The remainder of the specimens cited by Bentham, from Tasmania and Victoria, are very closely connected with *G. australis*. They differ in the leaf-blades being usually obscurely and only slightly transversely nerved. They may represent a distinct form or only variations in the same species.

LV—MISCELLANEOUS NOTES.

OTTO VERNON DARBISHIRE.—We much regret to record the death of Professor O. V. Darbishire, M.A., Ph.D., F.L.S., which occurred at Bristol on October 17th, 1934, in his sixty-fifth year. Darbishire was one of the select band of professional botanists trained under Professor S. H. Vines, of Oxford. He also studied at Bangor, and at Kiel, where he commenced investigations on lichens and algae and later became Privat-Docent in the University and Assistant to Professor J. Reinke. He was at school at Dresden and Florence and always retained a broad international outlook in general as well as in botanical affairs. His great love of music was perhaps associated with the many years spent in Germany.

Darbishire's principal interests were cryptogamic botany, (especially marine algae, and lichens) ecology and physiology. For eleven years (1898–1909) he was Lecturer in Botany at Manchester University, during which time he published many important papers on lichens. After a short period (1910–1911) as a lecturer at Armstrong College, Newcastle-on-Tyne, he was appointed Lecturer at Bristol University and subsequently became Professor, the first holder of the Melville-Wills Chair of Botany. At Bristol his interest in the lower plants was again evident in the strong cryptogamic department which he built up. In spite of heavy administrative duties, he was able to continue research on his favourite subjects.

During his summer vacations of 1902 and 1903 Darbishire commenced and largely completed the re-arrangement of the entire

lichen collection at Kew, employing the classification of Reinke, Zahlbruckner's work not then being available. He was also an enthusiastic field botanist and whilst at Manchester frequently visited the Lake District and the Marine Biological Station at Port Erin in connection with lichen and algal work respectively, and to the stimulus of these excursions the present writer is indebted for a great interest in both groups. The final re-arrangement of the lichens at Kew was accomplished jointly. Though his visits to Kew became much less frequent in later years, he was always a very warm supporter of the establishment and almost every year sent or brought a class of his undergraduate students for a week's visit to the Gardens.

A. D. COTTON.

Meconopsis.*—" The purpose of this volume is to *summarise* in *convenient* form our present *knowledge* of the genus " (preface, p. ix). Mr. Taylor is to be congratulated upon having achieved the three admirable objects expressed by the words which we have italicized, in a manner at once attractive, exhaustive and convincing.

The " enumeration of the groups, species and hybrids," occupying the main body of the work (pp. 20–111), is preceded by a particularly lucid introduction (pp. 1–11) ; a generic description and distribution map (p. 12 ; the map would have been much more useful on a larger scale, with rivers and/or political boundaries); a "conspectus of species and their groups " (pp. 13, 14) ; and a " key to the species " (pp. 15–19), based on natural affinities. Since a conspectus of the natural grouping of the species is provided, a key constructed on entirely artificial characters, especially those most easily observable and likely to be most frequently observed, would perhaps have been more practical.

For each species, in the " enumeration," are given copious references under the accepted name and synonyms (including pre-Linnaean authors in the case of *M. cambrica*) ; an adequate description in English ; statement of geographical range ; and a discussion of points of interest. Four species are described as new: *M. gracilipes*, *M. pseudovenusta*, *M. Georgei* (but the Latin for " George " is *Georgius, -ii* !) and *M. neglecta*, whilst *M. villosa* is a new combination resulting from the reduction to *Meconopsis* of the genus *Cathcartia* Hook. f. For each of the ten Asiatic series of subgenus *Eumeconopsis*, and for the distinct subgenus *Discogyne* G. Taylor (consisting of two species only), a distributional map is provided, all of which are unfortunately open to the same criticism as that brought against the general map, above. Bare, unnumbered

* An Account of the Genus Meconopsis, by George Taylor, B.Sc., F.L.S., F.R.S.E.; with notes on the cultivation of the introduced species by E. H. M. Cox ; with a foreword by Sir William Wright Smith. Frontispiece, 29 plates from photographs and 12 distributional maps. Pp. xiv+130. New Flora and Silva Ltd., London, 1934. Price 20/-

parallels of latitude and longitude, and distant coast-lines, scarcely constitute an adequate system of reference.

The account is rounded off with Mr. Cox's " notes on the cultivation of the introduced species ; " an exhaustive index ; and, last but not least, a series of twenty full-page reproductions of photographs of as many species, from life (tt. i–xvii, xxiv, xxv, xxviii), supplemented by eight half-page photographs of herbarium specimens (tt. xviii–xxiii, xxvi, xxvii), whilst the final full-page plate shows a bed of young plants of four species. The photographs are good, and well reproduced—such, indeed, as we have come to associate with the name of " New Flora and Silva." In a monograph of this description, it is unusual to get complete and practical details on cultivation, and a careful study of the cultural advice tendered should not only enable lovers of *Meconopsis* to grow them more successfully, but also encourage beginners who have hitherto been afraid to take up their cultivation.

The reviewer is not in a position to offer detailed criticism of the author's taxonomy. If, however, straws indicate which way the wind blows, a " fair wind and a prosperous voyage " might be anticipated from the following passages, indicative of an eminently sane approach to the subject. " Many species are so highly polymorphic and unstable under cultivation that it may be permissible to treat the various forms merely as incipient taxonomic units which have not yet become sufficiently fixed to warrant nomenclatural recognition. The factors of time and geographical isolation may eventually bring such stability as will lead to an easier comprehension of their status. Alternatively, the flux of forms referred to certain species may be the result of continued interbreeding so that any specific differences which may formerly have existed have been obscured by repeated hybridization " (p. 3). " In many instances it will be difficult to persuade horticulturists that certain forms which they may be growing are really not specifically distinct, but the interrelation of such forms often only becomes obvious on reference to a wide range of material, such as is furnished by herbarium specimens of wild plants" (p. 4). The reviewer quotes these remarks with unqualified sympathy, having reached identical conclusions from the study of a widely different group of flowering plants.

H. K. AIRY-SHAW.

Silviculture of the Mixed Deciduous Forests of Nigeria.*—Mixed deciduous forests in Nigeria occur as a belt of varying width running parallel with the coast. This belt is situated between the typical rain or evergreen forest in the south of the colony and the deciduous forests occurring to the north. The mixed deciduous

*Silviculture of the Mixed Deciduous Forests of Nigeria with Special Reference to the South Western Provinces, by W. D. MacGregor, B.Sc., Oxford Forestry Memoirs, no. 18 (1934). Oxford University Press. Pp. 108, figs. 70. Price 15s.

forests are intermediate ecologically between these two types. They contain a large number of important timber trees and their regeneration in Nigeria is regarded as a problem of importance.

In this memoir the writer records the silvicultural knowledge that he has accumulated regarding this type of forest. Rates of growth of the important species, in both the natural forest and the plantation, are given, and various aspects of experimental silviculture dealt with. The greater part of the memoir is devoted to descriptions of the silvicultural characters of individual species, 26 indigenous and 15 exotic species being considered. In this section many new and interesting facts of general botanical interest are recorded. Those relating to the indigenous species, some of which are of wide distribution throughout West Africa, are of special significance. Information regarding times of flowering and fruit formation, seed characteristics, germination, shade requirements and seedling characters are given. The descriptions of seedlings are accompanied by a number of well executed black and white illustrations showing various stages in germination and the development of the seedling. A number of good photographs is included in the text. The work will be regarded as a useful contribution to the forestry and botany of West Africa, and is all the more creditable when it is remembered that silvicultural research was initiated in Nigeria only in 1928.

F. N. HOWES.

Hand-List of Trees and Shrubs.—The fourth edition of the " Hand-List of Trees and Shrubs (excluding *Coniferae*), cultivated in the Royal Botanic Gardens, Kew " has now been published. It has been prepared by Mr. W. J. Bean, late Curator of the Gardens, and includes many additions that have been received since the third edition appeared ten years ago.

The present list differs from the last in having the genera arranged in alphabetical order, thus bringing it into line with the other hand-lists prepared at Kew. As the families are mentioned under each genus the interests of both botanists and horticulturists are fully ensured.

In order to economise space, a slightly smaller Clarendon type is used for the retained names of genera, species and varieties; synonyms are given in Roman type. As in the last edition, approximate flowering dates are given and evergreens are indicated. Plants that are inclined to be tender at Kew are marked by an asterisk, and in the present list the word " climber " is given in the case of climbing plants.

On the whole the concepts of genera are similar to those of the former list, but a few changes have been made, particularly in the old genus *Pyrus* which has now been subdivided into *Pyrus*, *Malus*, *Sorbus* and *Aronia*. The " hardy Tecomas," which were formerly *Tecoma* spp., are now included under *Campsis*. *Helianthemum* is also re-arranged and subdivided according to modern ideas.

The Hand-List is obtainable at or from the Royal Botanic Gardens, Kew, or from H.M. Stationery Office, price 5s. 6d. net.

The Original Drawings of Francis and Ferdinand Bauer.—In response to an enquiry from Dr. Claus Nissen of Mainz concerning the whereabouts of the original drawings of the brothers Bauer, the following note was compiled and is published here as being of interest to botanists in general.

Though Francis Bauer was resident draughtsman for fifty years at the Royal Botanic Gardens, Kew, so far as can be ascertained only seven of his original drawings are preserved here. These seven drawings were made for " Delineations of exotick plants cultivated in the Royal Garden at Kew," published by W. T. Aiton, London, 1796, and are as follow: *Erica corifolia*, *E. Leeana*, *E. coccinea*, *E. vestita*, *E. pyramidalis*, *E. tubiflora* and *E. Banksii*. There is an article on this work by James Britten in the Journal of Botany, 1899, 181, in which a list of the plates is given. We learn from this that 17 of the original finished drawings are in the Department of Botany of the British Museum (Natural History), South Kensington. By error it is stated in the article that there are 13 original drawings for the work at Kew: there are only 7.

The originals of 20 water-colour drawings illustrating the " Germination of Wheat " (1813), and 25 water-colour drawings illustrating the " Diseases of Corn " (1813), with many others, were included in the Banksian collection, and went to the British Museum in 1827, but the extensive series of drawings made at Kew after Banks's death and bequeathed to George IV, was presented to that institution in 1841 by H.M. Queen Victoria. His original drawings for the plates to Sir W. J. Hooker's " Genera Filicum," and other works including Aiton's " Hortus Kewensis " (1789), with 127 drawings of British orchids, and some illustrating the form and structure of various parts of plants, are also preserved in the British Museum. Other original drawings by Francis Bauer were purchased for the Museum in 1879, while some, illustrative of microscopic anatomy, done for Sir E. Home, were presented in 1893 by the executors of Sir R. Owen. One of the twenty-five copies of vol. 1 of A. B. Lambert's " Genus Pinus," coloured by Francis Bauer, is also in the British Museum.

There are no original drawings at Kew by Ferdinand Bauer, who accompanied Robert Brown on Flinders's voyage to Australia and brought back a series of water-colour drawings of the plants and animals observed. Forty-nine of his drawings of animals and 203 of plants were presented to the British Museum* by the Lords

* Brown's bequest also included 40 drawings of animals by Ferdinand Bauer, making a total of 89 drawings of animals by him in the Department of Zoology, British Museum.

Commissioners of the Admiralty in 1843, and two porfolios of his drawings were bequeathed to the same institution in 1858 by Robert Brown. Brown's bequest included 16 that were duplicates of drawings received from the Admiralty, thus making a total of 236 of Ferdinand Bauer's drawings of Australian plants in the British Museum. His original drawings for some of the plates to A. B. Lambert's " Genus Pinus " are also preserved in the Museum. An article on Ferdinand Bauer's drawings of Australian plants, by James Britten, was published in the *Journal of Botany*, 1909, 140–146. Ferdinand Bauer's original water-colour drawings, over a thousand, of the plants collected in Greece by Sibthorp, and published in Sibthorp's " Flora Graeca," three volumes of paintings of animals, birds, fishes and reptiles of Greece, which have not been published, and 131 drawings of places visited on Sibthorp's journey are in the Herbarium of the University of Oxford.

Several hundred original and published drawings and other effects of the brothers Bauer were sold by auction by Messrs. Christie & Manson, in London, on Nov. 24, 1841. No information is available as to who purchased them or their present whereabouts.

The brothers Bauer are included in J. Britten & G. S. Boulger's " A Biographical Index of Deceased British and Irish Botanists," ed. 2, revised by A. B. Rendle, 1931. In this work references are given to all the more important articles relating to them that have appeared in England.

Imperial Botanical Conference.—An Imperial Botanical Conference, commencing on August 28th and lasting 2–3 days, according to the programme which may finally be arranged, will be held in London next year. The subjects set down for discussion are of general interest to Empire botanists and include such topics as pasture research within the Empire, the ecology of tropical forests, the application of ecological methods to the study of native agriculture, problems of fruit storage and transport with special reference to tropical conditions, the furtherance of schemes for the closer co-ordination of botanical research within the Empire, etc. It is hoped that this Conference will furnish a convenient meeting ground for home and overseas botanists who are on their way to attend the International Botanical Congress which meets at Amsterdam in the week following. The Director of the Royal Botanic Gardens, Kew, is the Chairman of the Organising Committee of the Conference, and the Hon. Secretary is Professor W. Brown, Imperial College of Science and Technology, South Kensington, London, S.W.7., from whom further particulars may be obtained.

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ROYAL BOTANIC GARDENS, KEW

BULLETIN OF MISCELLANEOUS INFORMATION

APPENDIX, 1934

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1934

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix 1934

ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1934.

General.

STAFF.—Mr. J. H. HOLLAND, F.L.S., retired on October 17th having served for 33 years as Assistant in the Museums, and Mr. R. MELVILLE, B.Sc., Ph.D., Ph.C., was appointed to fill the vacancy.

Mr. R. A. DYER, Assistant for South Africa, returned to Pretoria after his period of 3½ years working in the Herbarium and his place has been filled by the appointment of Mr. H. G. SCHWEICKERDT, B.Sc., Ph.D., by the Government of the Union of South Africa.

Dr. N. E. BROWN. Kew and South African Botany in particular suffered a great loss in the death on November 25th of Dr. N. E. BROWN, A.L.S., for many years Assistant in the Herbarium. His last paper completed shortly before his death, on the genus *Freesia*, has recently been published in the new journal emanating from Kirstenbosch—" The South African Journal of Botany."

The death on January 29th of Dr. D. H. SCOTT, Hon. Keeper of the Jodrell Laboratory (1892-1906), was a deeply deplored loss.

We also record with regret the death on April 23rd of Mr. WALTER IRVING, who was in charge of the Herbaceous Department from 1893 to 1928 (K.B. 1928, 301).

Mr. A. D. COTTON, Keeper of the Herbarium and Library, received the Honour of the O.B.E. in the King's Birthday Honours, and the University of St. Andrews conferred the Hon. Degree of LL.D. on Mr. J. HUTCHINSON, Botanist in the Herbarium, on the occasion of the installation of General the Right Hon. J. C. Smuts, F.R.S., as Rector of the University on October 16th, 1934.

The DIRECTOR was elected a Corresponding Member of the Botanical Society of New York, and an Honorary Member of the Pennsylvania Horticultural Society.

OFFICIAL VISITS.—Mr. H. C. SAMPSON visited the Tana River region in the Northern Frontier Province of Kenya Colony, at the request of the Rt. Hon. the Secretary of State for the Colonies, to examine and report on the possibilities of agricultural development in that area. For this purpose he was seconded to the Colonial Office. His mission, in which he was associated with Mr. D. G. HARRIS, C.S.I., late Consulting Engineer to the Government of India, occupied five months. At the request of the Kenya

Government, Mr. Harris and he also visited other areas where the Government had minor irrigation and drainage prospects in view. These areas included the Kano Plains in Central Kavirondo, the country south of Lake Baringo in the Kamasia Reserve, and the Lumi River area at the foot of Mount Kilimanjaro. The Governor and the Secretary of State for the Colonies have expressed their thanks to these officers for their valuable services. In the course of the expedition Mr. Sampson was able to make some interesting collections and has added considerably to our knowledge of the regions.

BANANA RESEARCH.—During the year a further series of varieties was received from the Department of Agriculture, Madras, and, after passing through quarantine, suckers of Burmese, Bombay and a few Madras varieties were despatched to the Imperial College of Tropical Agriculture, Trinidad. Improvements were made in the ventilation of the Banana Quarantine House.

PUBLICATIONS.—Ten numbers of the Kew Bulletin were published during the year, and the Review of the work during the year 1933 was published as a separate appendix. The List of Seeds, also, as before, was published as a separate pamphlet.

The new (fourth) edition of the Hand-List of Trees and Shrubs (excluding Conifers) cultivated at Kew, was published in August, and the new (fourth) edition of the Hand-List of Rock Garden Plants in September. The latter now contains a list of Monocotyledonous plants and also an appendix of trees and shrubs suitable for cultivation in rock gardens. The second volume of Dr. Hutchinson's "Families of Flowering Plants" (Monocotyledons) was published during the year.

The Gardens.

VISITORS.—The number of visitors to the Gardens in 1934 was 1,170,369—weekdays (not students' days) 552,583; students' days 96,000; Sundays 521,786—a decrease of 55,688 as compared with the figures for 1933.

The greatest monthly attendance was in May with 329,477, and the lowest in December with 7,545. The highest daily attendance was 73,644 on Whit-Monday, May 21st; the lowest was 6 on January 9th.

GENERAL.—The summer of 1934, as of the previous year, was characterized by prolonged spells of dry weather which again entailed much extra labour in watering. In spite of this, however, the quantity used (31,731,000 gallons) was considerably less than during 1933, due to the flow to the streams in the rock garden being reduced to the minimum. The plants generally do not seem to have suffered through the dry weather to any extent, although it is too early to say how some of the older trees may ultimately be affected. As a result of the hot summer the plant of *Diospyros kaki* on a southern wall produced a very large crop of fruit, whilst *Ilex macrocarpa*, for the first time at Kew, gave a heavy yield of its purple-black berries. *Aegle sepiaria* also fruited well, and *Catalpa Fargesii* and *C. Duclouxii* flowered freely for the first time.

DECORATIVE DEPARTMENT.—Pits 17D and 17E have been reconstructed on modern lines and, as an experiment, all the wood used is of western red cedar (*Thuja plicata*). A new concrete staging has been built in the bulb pit and the interior woodwork of pits 18A, B, C, and F has been painted. In addition to the painting of the interior of the structure, the hot water pipes in 17C have been overhauled and rearranged. A sectional boiler—in place of three old saddle boilers—has been installed in the large stokehole, and the roof spanning the potting and packing sheds has been rebuilt, the old tiles being used again.

HERBACEOUS DEPARTMENT.—Amongst the more interesting plants which have flowered in this department during the past year may be mentioned the following: *Primula eburnea* and *Cypripedium cordigerum* collected in Bhutan by Ludlow and Sheriff and presented by Mr. J. Ramsbottom; *Lewisia brachycalyx*, *Campanula Piperi*, *Calceolaria Darwinii* and *Hypseocharis tridentata*, the last-mentioned collected by Miss D. Stafford in the Peruvian Andes. The Duchess Wall has been repointed and the opportunity taken to remove new bricks from several patched areas and to replace them by old bricks similar to those of the rest of the wall.

ARBORETUM.—The ground under the trees at the east end of the lake, which was cleared of undergrowth last winter, has been sown down to grass, thus greatly improving the appearance of this part of the gardens. The water pumping station near the Arboretum Nursery being no longer required for that purpose, the opportunity was taken to provide accommodation for the motor lorry, carts, etc., under one roof. A petrol pump has also been installed in the stable yard. In the Depot Nursery the trees and shrubs which formed a very inadequate screen on the Brentford side have been cleared out and replanted with young *Quercus Ilex* and suitable evergreen shrubs. At the same time a portion of the ground was reclaimed for the Arboretum Nursery and a service road was constructed right around the nursery.

Two hybrid Rhododendrons raised at Kew, viz. *Rhododendron impeanum* and *R. Willulare*, were exhibited at the Royal Horticultural Society and gained a First Class Certificate and an Award of Merit respectively. Later in the year the former was awarded the Cory Cup.

TROPICAL DEPARTMENT.—Palm House. The hot water pipes in the S.W. end have been overhauled, relevelled and installed with new six and twelve-inch mains. The iron work under the paths and beds has been repaired or renewed where necessary.

"T" Range.—The roof of the Nepenthes House has been overhauled thoroughly and painted. This work necessitated the clearing of the house, thus affording opportunity for introducing fresh compost for the replanting of the beds.

Ferneries.—The roof of the wing of House 2 has been renewed and painted both inside and out, whilst exterior and interior painting has also been done in 3, 5, 6 and 6A.

Orchid Pits.—New hot water mains have been installed to supply 14, 14C and 15C while the hot water pipes in 15A and 15B have been relevelled. The exterior and interior of 14, 14C, and 15A, B, and C have been repainted, and new rain water tanks constructed in 14, 15A and 15B. New concrete benches have been constructed in all the orchid pits, each being fitted with movable narrow-slatted wooden staging made of western red cedar.

Insectivorous House.—The original slate staging has been replaced by a concrete trough which will allow the plants either to be planted out or plunged in pots in a bed of peat and sphagnum, thus producing a more natural and pleasing effect; at the same time the hot water pipes were rearranged.

Clusia grandiflora produced a quantity of its beautiful flowers, while the *Phyllocactus* spp. in the Sherman Hoyt Cactus House have flowered very freely, the conditions evidently suiting them.

The workmen's mess rooms in the Office and Stable Yards have been redecorated, glazed sky-lights installed in the roofs, and the old wooden tables replaced by small tables with enamelled tops.

The Curator's office block and Students' Library were repainted and additional accommodation for the clerical staff was provided.

STUDENT GARDENERS.—The position regarding the movements of students still continues to be satisfactory and shows a further improvement upon that of last year.

Outgoing Students.—Nineteen men completed their training and secured appointments as follows:—Home.—Parks Departments—eight; nurseries or private gardens—six.

Overseas.—Tanganyika Territory—one; Italy—one; South Africa—one; Bolivia—one; New Zealand (Wellington Botanic Garden)—one.

One student returned from La Mortola but afterwards secured a permanent appointment on the Riviera.

New Entrants.—Nineteen men—all British subjects—were appointed to full course vacancies and were recruited as follows:—

Parks Departments—four; Botanic Garden, Cambridge—one; nurseries or private gardens—ten; Reading University—one; Canada—one; New Zealand—one, and South Africa—one.

Under the exchange of students arrangement, men were entered from Berlin Botanic Garden, Rouen, and La Mortola respectively, Kew students proceeding to the establishments whence they came.

Five volunteer students were admitted, for varying periods, as follows:—Great Britain—one; South Africa—one; Holland—two; Switzerland—one.

RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1934:

	Inches.		Inches.
January	1·24	July	1·49
February	·23	August	1·82
March	2·13	September	1·03
April	1·47	October	.91
May	·44	November	1·56
June	1·23	December	4·70

Total 18·25 inches.

The total for 1933 was 18·54 inches.

WATERFOWL.—Monsieur Jean Delacour presented two pairs of Paradise Shelducks, also some Australian and Madagascan Mallards. It is believed that none of these species has been previously introduced at Kew.

CONTRIBUTIONS TO THE GARDENS, 1934.—During the year, 1073 separate consignments of living plants, bulbs, seeds, etc., were received, a slight decrease as compared with the figure (1107) for 1933. The following is a summary of the items of most interest:—

Public Institutions:—

Auckland, Institute and Museum, New Zealand.—Plants and seeds of *Xeronema Callistemon*, also seeds of hybrid Gaultherias.

Bermuda, Department of Agriculture.—Two Wardian cases containing Begonias, stove subjects and ferns, also a consignment of bulbs of *Lilium longiflorum* var. *eximium*.

Bristol, Department of Botany, the University.—Plants: *Wolfia arrhiza, Hydrocharis Morsus-ranae, Leucojum aestivum.*

British Museum (Nat. Hist.).—Seeds and plants collected in Bhutan by Mr. F. Ludlow and Captain G. Sheriff.

Cambridge, Botanic Garden.—Plants, species and varieties of *Phyllanthus, Adiantum, Selaginella, Saururus*, etc., and various seeds.

Coimbatore, Agricultural College.—A consignment of banana suckers.

Coimbra, Botanic Gardens, Portugal.—Propagating material of three species of *Peperomia*, also *Mesembryanthemum spectabile*: seeds of *Anthurium dentatum* and *Quercus* spp.

Cologne, Botanic Garden.—Plants of *Marsilia quadrifolia*, also 20 packets of seeds and fern spores.

Cyprus, Department of Agriculture.—Seeds of *Rhus coriaria*.

Darjeeling, Lloyd Botanic Gardens.—96 packets of seeds of Himalayan plants.

Dunedin, Botanic Gardens.—A collection of plants of *Hymenophyllum* spp., in excellent condition, also large consignments of seeds.

Durban, Natal Herbarium.—Seeds of *Tephrosia macropoda.*

Edinburgh, Royal Botanic Garden.—Miscellaneous collections of plants, seeds and cuttings.

Falkland Islands, the Acting Colonial Secretary.—Plants of *Calceolaria Fothergillii* and *Primula farinosa* var. *magellanica.*

Genoa, University Botanic Garden.—A generous collection of seeds and fern spores.

Georgetown, Department of Agriculture, British Guiana.—11 packets of tropical seeds and rhizomes of *Zingiber officinalis.*

Gothenburg, Botanic Garden.—Interesting collections of plants and seeds.

Grahamstown, Albany Museum.—Plants of new species of *Euphorbia* and *Ceropegia.*

Hobart, Botanic Garden.—Seed of a species of *Epacris,* probably new to Tasmania.

Hong Kong, Botanical and Forestry Department.—Seeds of *Aleurites montana* from the experimental plantations in the Colony.

Hong Kong, the University.—Several consignments of seeds, including *Camellia drupifera, Bauhinia glauca, Mucuna Champdioni, Gelsemium elegans, Argyreia speciosa.*

Hyde Park, London.—Plants, including shrubs from Nepal, seeds of *Gentiana superba, G. argentea* and many Australian subjects.

John Innes Horticultural Institution, Merton.—Several consignments of plants including *Primula sinensis* varieties, *Calceolaria* hybrids, a collection of cuttings of scented leaf Pelargoniums and various seeds.

Jamaica, Department of Agriculture.—Plants of *Arracacha esculenta.*

Khartoum, Government Gardens.—A Wardian case of plants, also seeds of *Balanites aegyptiaca.*

Kimberley, McGregor Memorial Museum. Seeds of *Acacia, Arctotis, Gazania* spp., etc., also bulbs of *Dipcadi* sp.

Kirstenbosch, National Botanic Gardens.—92 packets of seeds.

Laguna, Philippine Islands, Los Banos Economic Garden.—Seeds of *Macrozanonia macrocarpa,* also *Spathiphyllum* species.

London County Council, Parks Department.—A collection of trees and shrubs.

Mount Everest Expedition, 1933.—Seeds of a new species of *Mandragora,* collected at Tinkye-la (16,000 ft. altitude).

Nairobi, Coryndon Memorial Museum.—Plants and cuttings of species of *Epidendrum, Caralluma, Stapelia* and *Huernia.*

New York, Botanic Garden.—Several large and interesting consignments of plants and seeds.

Nigeria, Forests Department.—Fruits of *Parinari macrophylla.*

Oxford, Imperial Forestry Institute.—Seeds of *Dombeya Johnstonei.*

Oxford University Expedition to New Hebrides.—Plants of *Er* spp., and *Coelogyne* sp ?

Peiping, Fan Memorial Institute of Biology.—Seeds of *Rehder dendron macrocarpum.*

Peradeniya, Royal Botanic Garden.—Large shipments of sto and economic plants, orchids and ferns, also palm seec Special reference must be made of the receipt of a plant *Palavicinius decipiens.*

Port Elizabeth, Parks & Town Attractions Department.—Sever very generous consignments of seeds, plants and bulbs. particular, mention must be made of a plant believed to be rare species of *Pachypodium* or *Rathbonia.*

Pretoria, Division of Plant Industry.—A collection of succulen also seeds of *Aloë rubrolutea.*

Singapore, Botanic Garden.—A Wardian case of plants comprisi species of *Scyphostegia, Dipteris* and *Spathoglottis,* also seeds *Boea* sp. from Langkawi Islands. *Dipteris,* unfortunately, d not survive the journey.

Southampton, University College.—Plants, including *Stanhop costaricensis, Aspasia principissa* and *Scaphyglottis brachiata.*

St. Louis, Missouri Botanical Garden.—A collection of tubers species and varieties of *Nymphaea.*

Stellenbosch, University Botanic Garden.—184 packets of seed

Stockholm, Botanic Garden.—28 packets of seeds and cutting including *Victoria regia* var. *Cruziana.*

Sydney, Botanic Garden.—27 packets of seeds, a bulb of *Crinu* " Granthum " and corms of 8 species and varieties of *Watsoni*

Tanganyika, Department of Agriculture, Morogoro.—Seeds wild coffee from Iringa Province.

Trinidad, Department of Agriculture.—A collection of orchic and several packets of seeds including *Mora excelsa.*

Trinidad, Imperial College of Tropical Agriculture.—Cacao poc for germination experiments.

Tucson, Arizona, Desert Laboratory.—Seeds of *Larrea mexican*

Warsaw, Botanic Garden.—Plants of *Rhoeo discolor, Marsil quadrifolia,* and *Selaginella denticulata,* also 21 packets of seed

Washington, U.S. Department of Agriculture.—A collection tubers of species and varieties of *Xanthosoma* and *Colocasi* also seeds—various.

Wisley, Royal Horticultural Society's Gardens.—Collections trees, shrubs, alpines, etc.

Private Donors :—

Lord Aberconway, Bodnant.—Large consignments of seeds fro China.

Mr. B. P. Allinson, London.—Plants of *Dioscorea pyrenaica.*

Mr. W. K. W. Baldwin, Toronto.—A collection of native ferns.

Mr. E. K. Balls, Knebworth.—Seeds collected in Turkey in 1934.

Col. C. Beddington, Ospedaletti, Italy.—A miscellaneous collection of succulents.

Mr. Robert Berkeley, Worcester.—A large number of species and varieties of *Pelargonium* from the collection of the late Miss E. Willmott, Warley.

Major W. T. Blake, London.—Seeds collected in different parts of Africa.

The Lord Bledisloe, Government House, New Zealand.—Seeds of *Leptospermum scoparium*.

Mr. E. G. Bryant, Prieska, South Africa.—Bulbs of *Urginea Burkei*, *Crinum* sp., plants of *Euphorbia* sp. and tuber of *Telinum caffrum*.

Mr. B. D. Burtt, Tanganyika Territory.—Plants of *Stapelia* and *Caralluma* species, also seeds of *Lupinus Princei*.

Messrs. Burkwood & Skipwith, Ltd., Kingston-on-Thames.—Shrubs.

Mr. J. Cadman, Royal Colonial Institute, London.—Seeds of *Astrocaryum tucuma* and *Orbignya Dammeriana*.

Miss M. Chadwick, Stratford-on-Avon.—Seeds, including *Gentiana carinata*, a rare species which flowered in September 1934.

Mr. T. North Christie, Morayshire.—A collection of seedlings of *Primula* spp., plant of *Rhododendron lepidostylum* and bulblets of *Vallota purpurea*.

Mr. P. L. Dunsdon, Caledon, South Africa.—Seeds, including *Pelargonium roseum*, *Arctotis Fosteri*, *Cheiridopsis Pillansii*, *Ursinia*, *Greleum*, *Dimorphotheca* and *Gazania* spp.

Mr. Charles Ely, East Bergholt.—A collection of plants and cuttings of hardy subjects.

Lady Muriel Jex-Blake, Nairobi.—Plants of *Edithcolea grandis*, *Kalanchoë marmorata*, a collection of botanical orchids, bulbs of *Brunsvigia* sp.(?), seedlings of *Gladiolus* species and seeds.

Captain Esme Erskine, Gore, Western Abyssinia.—Seeds of *Clematis incisodentata* (?), *Impatiens orchestris* and probably *Cyanotis hirsuta*.

Mr. R. G. Evans, Nova Scotia.—Plants of *Sarracenia* sp.

Mr. Nils Fogelvist, Kalmar, Sweden.—Plants of *Orchis* and *Gymnadenia* spp. and varieties.

Mr. C. S. Garnett, Derby.—Plants, *Coryanthes Hunteriana* and *Cymbidium alaifolium* ; tuber of *Hedychium* sp.

Mrs. S. K. Garnett-Botfield, Wolverhampton.—Bulbs of *Scilla Adlami* collected in Natal, a rare species.

Sir Eric Geddes, Hassocks.—Plants of *Lycopodium*, *Pellaea*, *Asplenium* and *Cheilanthes* spp.

Mr. A. V. Giblin, Hobart, Tasmania.—Seeds of *Cyathodes acerosa*, *Eucalyptus Perriniana* and *E. coccifera*.

Mr. P. J. Greenway, Tanganyika Territory.—A Wardian case of orchids, also miscellaneous seeds, corms and roots.

Colonel C. H. Grey, Cranbrook.—Plants, including alpine subjects collected in Utah, Montana, and Central California.

Mr. E. R. Guest, late of Iraq.—Seeds—various.

Mr. Cecil Hanbury, La Mortola.—Plants and seeds.

Mr. F. J. Hanbury, East Grinstead.—Plants, including a number of alpine subjects.

Mr. H. Harris, London.—A miscellaneous collection of plants, bulbs and seeds collected in South Africa.

Mr. G. B. Hinton, Mexico.—Several large consignments of seeds, in particular *Quercus* spp.

Mr. Murray Horne, Hereford.—Plants of *Dyssodia speciosa*, new to cultivation in England.

Captain Collingwood Ingram, Beneden, Kent.—Plants of *Prunus prostrata*, *P. mutabilis* var. *rubra*, *Eucryphia* hybrid and seeds of *Tetrapathaea tetandra*.

Messrs. George Jackman & Son, Woking.—Collection of trees and shrubs.

Mr. C. Jinarajadasa, Madras.—Seeds collected in Costa Rica, Cuba and Panama.

Major L. Johnston, Hidcote, Glos.—Varied collections of plants, seeds and cuttings, including consignments from the Riviera.

Captain H. A. Johnstone, London.—A large collection of palm seeds from Pará.

Miss M. Karsten, Gelderland, Holland.—A collection of South African succulents.

Dr. A. F. G. Kerr, Hayes, Kent.—Plants of *Eulophia Keithii* and *Saccolabium miniatum* from Siam, also ?*Decaschistia* sp. from French Laos. Seeds of *Afgekia sericea*.

Colonel W. G. King, Hendon.—A seedling of *Entada scandens* raised from seed collected in 1910.

Knap Hill Nursery Ltd., Woking.—Plants, bulbs and seeds.

Mr. C. H. Lankester, Costa Rica.—Several interesting consignments of botanical orchids and various seeds.

Mr. B. Levy, S. Rhodesia.—Plants, including *Tavarissia grandiflora*, *Caralluma Lugardii*(?), *Huernia* and *Stapelia* spp., also *Anacampseros fissa* ; seeds—4 packets.

Captain C. C. Lilley, Kpandu, Gold Coast.—A most interesting collection of bulbs and tubers including species of *Lissochilus*, *Angraecum*, *Eulophia*, *Haemanthus*, *Amorphophallus* and *Crinum*.

Mrs. F. S. Loch, Chalchidiki, Greece.—Seeds from Rat Island, including *Matthiola sinuata*, a dark form of *Cercis siliquastrum*, and *Verbascum banaticum*.

Mr. R. H. Macaulay, Argyll.—Plants of *Gentiana sino-ornata* and *Gentiana Macaulayi*.

Mr. James MacGregor, Glasgow.—Plants and seeds—alpines.

Mr. E. Magor, Lamellen, Cornwall.—Seeds of *Nandina domestica* var. *rubro-marginata* ; seedlings of *Crawfurdia trinervis* and *Leucothoë Keiskei*.

Mr. T. B. McClelland, Puerto Rico.—Plant of *Phlebotaenia Cowellii*.

Lt.-Col. L. C. R. Messel, Nymans.—Shrubs.

Dr. John Muir, Riversdale, South Africa.—Drift seeds for growing on for determination, believed to be Convolvulaceous.

Mr. H. Murdock, Perth, Western Australia.—A collection of seeds of native plants.

Mr. C. T. Musgrave, Godalming.—Plants and seeds.

Mr. H. Nalder, Cork.—A collection of plants of *Cotyledon* species and varieties.

Col. George S. T. Napier, Horeham Road, East Sussex.—Bulbs, corms and seeds.

Mr. Hugo Naudé, Worcester, South Africa.—Plants, cuttings and seeds of *Pelargonium* and *Arctotis* spp.

Mr. G. C. Nel, Stellenbosch University, South Africa.—Plants of *Roridula gorgonias*, which unfortunately were dead.

Sir Francis Newdigate, Nuneaton.—Plants of the "Geraldton Wax Flower," *Chamaelaucium uncinatum*.

Major Albert Pam, Broxbourne.—Corms, bulbs, rhizomes and tubers from South America.

Mr. Theodore Payne, Los Angeles.—Seeds of *Dendromecon rigidum* from San Fernando Valley, Sierra Nevada Mountains and Encinitas.

Miss M. Peal, Ealing.—Stove and greenhouse plants.

Messrs. Perry's Hardy Plant Farm, Enfield.—Plants, including a collection of aquatics—bulbs and seeds.

Mr. R. L. Proudlock, Alnwick.—A collection of plants from Iceland.

Mr. Percival W. Reynolds, Tierra del Fuego.—Seeds.

Mr. G. C. Richards, Arica, Chile.—Plants of "Azapa" Orange.

Mr. J. E. H. Roberts, London.—Collections of alpine plants and seeds including many species of *Sedum*.

Mr. G. A. Rock, Jamaica.—Plants of *Dendrophylax Fawcettii*.

Mr. Lionel de Rothschild, Exbury.—Plants, including a collection from the Southern Appalachian Expedition: cuttings and seeds.

The Right Hon. The Lord Rothschild, Tring.—Plant of *Doryanthes Guilfoylei*.

Messrs. L. R. Russell, Ltd., Richmond.—Plants, including *Dipladenia Brearleyana* and *D. boliviensis* also tubers of *Gloriosa Russelliana*.

Hon. Mrs. E. F. Ryder, Beaulieu.—Plants, bulbs and seeds.

Messrs. Sanders, Bruges.—A collection of orchids and Begonias.

Mr. C. J. Sibbett, Cape Town.—Plants of *Satyrium carneum* and *S. corrifolium*; seeds, including *Mesembryanthemum* sp.

Dr. A. J. Simey, Penrith.—Plant of *Asplenium lanceolatum*.

Miss Dora B. Stafford, Enfield.—Plants, bulbs and seeds collected in Peru.

Dr. F. Stoker, Loughton.—Alpine plants.

Mrs. Susan Stoker, British Columbia.—Bulbs of *Calypso bulbosa*, *Romanzoffia sitchensis* (seed also) and *Romanzoffia unalaschensis*.

Mrs. H. P. Thompson, Weybridge.—Plants of *Sempervivum* species from the Balkans.

Mrs. E. M. Tweedie, Kitale, Kenya.—Plants, including *Stapelia* species and corms of *Gladiolus* spp.

Brig. Gen. F. E. W. Venning, New Milton.—Seeds from Kashmir.

Messrs. K. Wada, Japan.—An interesting collection of seeds, including 9 species and varieties of *Lilium*, *Rhododendron Komiyamae*, *R. Metternichii*, *Leucothoë Keiskei*, *Menziesia ciliicalyx*.

Mr. Arthur Wade, Poole Range, Western Australia.—Seeds from the Fitzroy River area, including a climber, probably *Ipomoea* sp. from an extinct volcano.

Captain F. Kingdon Ward.—Seeds, plants, and bulbs.

Captain G. F. Warre, Roquebrune, A.M., France.—Plants and seeds.

Dr. J. Cromar Watt, Aberdeen.—Plants, tubers and seeds.

Mr. A. G. Weeks, Limpsfield, Surrey.—Plants of *Gentiana* species.

Mr. F. A. Weinthall, Roseville, New South Wales.—A collection of orchids.

Mr. W. A. West, Beirut, Syria.—Bulbs of *Colchicum*, *Crocus* and *Tulipa* spp., also rhizomes of *Iris antilibanotica*.

Mr. H. J. Yeats Wilson, Victoria, Australia.—A collection of Australian seeds.

Mr. R. W. Younger, Magallanes.—A collection of un-named plants, packed dormant and received at Kew in particularly good condition—considering the length of the voyage and that the plants had started into growth.

DISTRIBUTION OF PLANTS AND SEEDS.—In connexion with the usual annual distribution of seeds, 173 consignments were despatched at the commencement of the year, comprising 6027 packets of herbaceous plants and 3936 packets of trees and shrubs. The aggregate shows a decrease of 181 packets as compared with the figures for the previous year.

Species specially distributed were *Leptospermum scoparium*, from New Zealand, *Artemisia brevifolia*, from Kashmir, *Pinus Torreyana*, from San Francisco, *Matthiola sinuata*, from Chalchidiki, Greece, *Sesbania speciosa* and *Aesculus indica*.

Shipments of plants overseas—mainly in Wardian cases—were as follows: Agricultural Departments of Bahamas (*Coffea stenophylla*); Bermuda; British Honduras; Gold Coast; Nyasaland; St. Helena; Trinidad (two consignments), and Uganda. Botanic Gardens of Christchurch, New Zealand (large collection of cuttings of species and varieties of *Salix*); New York; Peradeniya; Singapore, and Wellington (New Zealand). Government House Gardens of Tanganyika Territory and Zanzibar; Government

Gardens, Khartoum ; The University, Hong Kong ; East African Agricultural Research Station, Amani (2 consignments) ; Imperial College of Tropical Agriculture, Trinidad (Banana suckers) ; and Mr. H. B. Sharp, Kenya. In addition a consignment of *Cassava* cuttings from Trinidad was reshipped to Nigeria (likewise a large collection of seeds of *Sorghum* species and varieties from Tanganyika), also a large consignment of seeds of mahogany from Barbados to Egypt.

Other recipients of plants, etc., included the following :—

Institutions :—

Adelaide University, South Australia.—A collection of seeds of drug-producing plants.

St. Andrews University, Department of Botany.—A collection of orchids.

Belize, Department of Agriculture, British Honduras.—Propagating material of ginger and arrowroot (Queensland and West Indian varieties).

Benmore Gardens, Argyllshire.—Plants of *Magnolia Wilsonii*, *Davidia Vilmoriniana*, *Aesculus indica* and *Rhododendron viscosum*.

Berlin-Dahlem, Botanic Gardens.—Grafts and cuttings of hardy trees and shrubs.

Government Gardens, Bikaner, India.—Seeds of *Victoria regia*.

Bristol University.—A collection of stove and greenhouse plants.

Cambridge University Botanic Garden.—Plants, seeds and cuttings, including *Sarracenia* spp., *Cephalotus follicularis*, *Darlingtonia californica*.

Chelsea Physic Garden, London.—A collection of Pinguiculas and herbaceous plants.

Coimbra Botanic Gardens, Portugal.—Seeds of *Victoria regia* and *Quercus* spp.

East London College, Department of Botany.—Herbaceous plants and seeds.

Edinburgh, Royal Botanic Garden.—Plants, seeds and cuttings, including *Nepenthes* spp.

Egypt, Ministry of Agriculture, Giza.—Plants including *Medinilla magnifica*, *Dahlia imperialis* and *Tibouchina semidecandra*.

Fleetwood, Lancs., Parks Department.—Plants, seeds and cuttings, including *Davidia Vilmoriniana*, and *Magnolia Wilsonii*.

Glasgow Botanic Gardens.—Plants of *Pelargonium* spp., *Streptocarpus Rexii* and *Pinguicula* spp.

Glasnevin Botanic Gardens.—Plants, seeds and cuttings, including *Coleonema virgatum* and *Derris elliptica*.

The Green Cross Society, 47, Victoria Street, S.W.1.—136 packets of seeds of British native plants.

Harpenden, Plant Pathological Laboratory.—Seeds and seedlings of *Lilium* spp.

Hastings, Parks and Gardens Department.—A collection of *Mesembryanthemum* spp.

Hyde Park, London.—Plants, seeds and cuttings, including *Meconopsis chelidonifolia* and hardy trees and shrubs.

John Innes Horticultural Institution, Merton.—Plants, seeds and cuttings.

Kenya Colony, Department of Agriculture, Nairobi.—Tubers of *Helianthus tuberosus* and *Cyperus esculentus*.

King's College, Cambridge.—Flowering shrubs.

Kirstenbosch, National Botanic Gardens, South Africa.—Seed of *Rhus coriaria*.

Kornik, Department of Dendrology and Pomology, Poland.—A collection of cuttings and scions of hardy trees and shrubs.

Leningrad, Jardin Botanique, U.S.S.R.—Seeds of *Victoria regia*.

London County Council, Parks Department.—A collection of alpine and herbaceous plants.

The National Physical Laboratory, Teddington.—A collection of hardy shrubs.

Nigeria, Department of Agriculture, Ibadan.—Plants of *Agave amaniensis*, received at Kew from Amani.

Nyasaland, Department of Agriculture, Zomba.—Tubers of *Dioscorea* spp.

Police Training College, Hendon.—A collection of trees and shrubs.

Reading University.—A collection of trees and shrubs.

Richmond, Surrey (Terrace Gardens).—Trees and shrubs.

Rothamsted Experimental Station, Harpenden.—A collection of Azaleas.

The Royal Aircraft Establishment, South Farnborough, Hants.—A collection of hardy trees and shrubs.

The R.A.M.C. Nursing Sisters' Home, Woolwich.—A collection of 250 hardy trees and shrubs ; also herbaceous plants.

The Royal Military School of Music, Kneller Hall, Twickenham.—Hardy trees and shrubs.

St. Helena, Department of Horticulture and Forestry.—Plants of *Pelargonium radula* var., and bulbs of *Urginea* spp.

Swansea, Parks Department.—Camellias.

Toronto University, Department of Botany.—Plants of *Pinguicula* spp., and *Drosera capensis*.

Trinidad, Department of Agriculture.—Tubers of *Dioscorea* ; garden varieties of *Hippeastrum* and *Amaryllis Belladonna*.

Washington, U.S. Department of Agriculture.—Seeds of *Phoenix reclinata*.

Wellington Botanic Gardens, New Zealand.—Trees, shrubs and seeds of herbaceous plants.

Wisley, Royal Horticultural Society's Gardens.—Seeds of *Iris* from the Mississippi Delta, alpines and herbaceous plants.

Private Recipients :—

Lord Aberconway, Bodant.—Plants, including *Agapetes macrantha* and *Ceanothus cyaneus*.

Mr. G. P. Baker, Sevenoaks.—*Iris* spp.

Mr. W. Balchin, London.—A collection of *Eucalyptus* spp.

Mr. L. S. Bartlett, Ascension Island.—A collection of seeds of herbaceous and decorative plants, and seeds of *Quercus Ilex*, *Hippophae rhamnoides*, and *Rosa* spp.

Col. C. Beddington, Ospedaletti, Italy.—A collection of succulents.

Mr. D. J. Bethell, Bahr el Ghazal, Sudan.—A collection of plants suitable for planting in the Bahr el Ghazal.

Lady Muriel Jex-Blake, Nairobi.—A miscellaneous collection of plants.

Dr. F. Boergesen, Copenhagen.—Rhododendrons and hardy shrubs.

Sir Bernard Bourdillon, Uganda.—*Pelargonium* spp.

Messrs. Burkwood & Skipwith, Ltd., Kingston-on-Thames.—Cutting of hardy trees and shrubs.

The Chandra Nursery, Sikkim.—*Oncidium* spp., and *Bifrenaria aurantiaca*.

Mr. C. W. Chorley, Kampala, Uganda.—*Drosera* spp., (for research in control of tsetse fly).

Prof. P. Chouard, Paris, France.—Bulbs of *Scilla* spp.

Hon. Mrs. P. Spender-Clay, Lingfield.—*Lilium* spp., and plants of *Aster Pappii*, and *Veronica gentianoides*.

Lord Clinton, East Budleigh.—Plants of *Aesculus indica*.

Dartington Hall, Totnes (per Mr. R. S. Lynch).—Hardy trees, shrubs and herbaceous plants.

M. Delacour, Clères, France.—*Echinocereus* spp., and *Echinopsis* spp.

Mr. P. L. Dunsdon, Caledon, C.P., S. Africa.—Seeds of Liliums.

Captain A. Dunston, Donhead St. Mary.—*Euphorbia* spp.

Mr. Chas. Eley, East Bergholt.—Alpines, Liliums and hardy shrubs.

Mr. Guy Fenwick, Stamford.—Plants of *Davidia Vilmoriniana* and *Aesculus indica*.

Mr. N. Fogelvist, Kalmar, Sweden.—Orchids.

Dr. P. L. Giuseppi, Felixstowe.—Plants of *Dahlia Merckii*, and *Caryopteris clandonensis*.

Commander F. Gilliland, Londonderry.—Plants of *Arundinaria Murielae* and *Bambusa quadrangularis*.

Sir Louis Greig, Richmond Park.—A collection of *Rhododendron* spp., and varieties.

Mr. N. G. Hadden, West Porlock.—A collection of alpines.

Mr. Cecil Hanbury, La Mortola.—Seeds and plants.

Mr. F. J. Hanbury, East Grinstead.—Bulbs of *Amaryllis Hathor*.

Marquess of Headfort, Kells, Co. Meath.—Plants, including *Stewartia malachodendron* and *Disanthus cercidifolius*.

Messrs. Hillier & Sons, Winchester.—Seeds, plants and grafts of hardy trees and shrubs.

Captain Collingwood Ingram, Benenden, Kent.—Hardy trees and shrubs, including *Prunus* in variety and Liliums.

Hon. Robert James, Richmond, Yorks.—Plants of *Abelia triflora* and *Camellia saluenensis*.

Major L. Johnston, Hidcote, Campden.—Bulbs, plants and cuttings.

Lady Clare King, London.—Herbaceous plants and seeds.

H.M. The King (for Windsor Great Park).—Hardy trees and shrubs.

Knap Hill Nursery Ltd., Woking.—Plants, seeds and cuttings of hardy trees and shrubs.

Mr. F. A. Lesser, Department of Puno, Peru.—Tree seeds for trial in Peru at an altitude of 4,000 metres.

Mr. B. Levy, Wankie, Southern Rhodesia.—A collection of succulents and seeds of Liliums.

Mr. H. Q. Levy, Jamaica.—A collection of orchids.

Mr. T. Ashton Lofthouse, Linthorpe.—A collection of alpines.

Hon. D. Bowes-Lyon, Hitchin.—A collection of trees and shrubs.

Captain N. McEchearn, Pallanza, Italy.—A large collection of hardy trees and shrubs.

Colonel Meinertzhagen, London.—Plants from the garden of H.M. the King of Bulgaria.

Lt.-Col. L. C. R. Messel, Nymans.—Plants of *Magnolia Wilsonii* and *Davidia Vilmoriniana*.

Mr. F. W. Millard, East Grinstead.—Plants and cuttings of *Salix* spp. and alpines.

Sir F. W. Moore, Rathfarnham, Co. Dublin.—Plants of *Camellia saluenensis* and *Rhododendron* spp.

Mr. J. B. Murray, Brooklyn, U.S.A.—Seeds of *Ilex* spp.

Mr. C. T. Musgrave, Godalming.—Alpines and herbaceous plants.

Mr. James MacGregor, Glasgow.—Hardy trees and shrubs.

Mr. G. W. Olive, Dauntsey's School, West Lavington.—A large collection of herbaceous plants and seeds.

Mr. Courtney Page, The National Rose Society, Haywards Heath.—Plants of *Rosa* spp.

Major A. Pam, Broxbourne.—Seeds of *Iris* spp.

Mrs. N. E. Parry, Newton Abbot.—Plant of *Rhododendron Parryi*.

Messrs. Perry's Hardy Plant Farm, Enfield.—A collection of aquatic plants.

Earl of Powis, Welshpool.—Plants of *Aesculus indica*.

Sir John Ramsden, Ravenglass, Cumberland.—Plants of *Clematis Armandii* and *Acer* spp.

Lady Rankine, Zanzibar.—Plants, including *Tibouchina semidecandra*, *Ixora Dixiana*, seeds and corms.

Mrs. J. M. Richardson, Chesham Bois, Bucks.—A collection of arctic plants. (The recipient is a descendant of the arctic explorer, Sir John Franklin).

Mr. J. E. H. Roberts, London.—A collection of plants and cuttings of *Sedum* spp., and varieties.

Mr. G. A. Rock, Jamaica.—Orchids.

Mr. Lionel de Rothschild, Exbury.—Seeds of *Iris* spp., and plants including *Rhododendron nipponicum* and *Hibiscus Scottii*.

Messrs. L. R. Russell, Ltd., Richmond.—Stove plants and Nymphaeas.

Messrs. B. Ruys, Ltd., Dedemsvaart, Holland.—Plants of *Rhododendron impeanum*.

Hon. Mrs. E. F. Ryder, Beaulieu.—Seeds and plants, including *Berberis Nevinii*.

Mr. F. S. Sandeman, Kingennie, Angus—Seeds of Liliums.

Messrs. Sanders, St. Albans.—Cuttings of *Begonia* spp., and plants of *Calanthe Regnieri*.

Mr. F. W. Schumacher, Jamaica Plain.—Seeds of Rhododendrons.

Mr. T. Sharp, Westbury.—Succulents.

Messrs. W. C. Slocock, Ltd., Woking.—Plants, seeds and cuttings of trees and shrubs, including *Nothofagus* spp.

Dr. C. Skottsberg, Göteborg, Sweden.—*Pelargonium* spp., succulents and greenhouse plants.

Mr. H. J. Solomon, Sydney, Australia.—Plants of *Cotyledon* spp. and *Echeveria devensis*.

Abbé Souillet, Milly-Gennes, M. et L., France.—Seeds of *Lilium* and *Nomocharis* spp.

Mr. H. Stacey, London.—Acorns of *Quercus Ilex* and *Q. Cerris* for Lundy Island.

Major F. C. Stern, Highdown.—Plants, including *Coronilla viminalis* and *Prostranthera coccinea*.

Mr. J. E. H. Stooke, Hereford.—*Nomocharis pardanthina* var. *Farreri*.

Messrs. Sutton & Sons, Slough.—A collection of seeds of *Lilium* spp. and plants of hardy trees and shrubs.

Lt.-Col. E. Tennant, Elgin.—Plants, including *Zephyranthes candida* and *Rosa virginiana*.

Mr. R. D. Trotter, Ockley, Surrey.—Hardy trees and shrubs.

Messrs. R. Veitch & Son, Ltd., Exeter.—Hardy trees, shrubs and herbaceous plants.

H.R.H. The Prince of Wales, Fort Belvedere.—Plants of *Aesculus indica*, *A. californica* and a collection of *Camellia* spp. and varieties.

Messrs. R. W. Wallace & Co., Ltd., Tunbridge Wells.—Grafts of Rhododendrons and trees and shrubs.

Major H. F. Ward, Nairobi.—Plants, including *Ipomoea digitata*, and *Aphelandra* spp.

Captain G. F. Warre, Roquebrune, A.M., France.—A collection of plants, including *Pelargonium* spp., trees and shrubs.

Mr. A. G. Weeks, Limpsfield, Surrey.—*Gentiana Farreri* and alpine plants.

Mr. F. A. Weinthal, Roseville, New South Wales.—Orchids.

Mr. H. J. Yeats Wilson, Australia.—A collection of alpines and herbaceous plants.

Mr. P. D. Williams, Lanarth.—Plant of *Telopea truncata*.

Lt. Colonel M. Wingfield, Oxford.—Dendrobiums.

Bedgebury.

The effects of the abnormally dry winter of 1933-34 following the dry summer of 1933 resulted in the drains, ditches and springs drying up very early, and although there was an average rainfall in August, with heavy showers breaking up dry periods later, it was not until late November that water began to rise in springs and there was a slight flow in the ditches. However, no plants suffered seriously and it was only necessary to provide water for a few large rhododendrons planted during late spring.

Two rooms in Park House were renovated for the use of the Pinetum committee from Pinetum funds. The rooms have been furnished and a beginning has been made in building up a collection of dried specimens and cones of conifers for the use of students. The rooms are now available for anyone wishing to study at Bedgebury. Moreover, an arrangement has been made with Mrs. Nelmes, the wife of the Forester, whereby a bedroom will be available for anyone wishing to stay for a few days.

A range of brick sheds below Park House has been transferred to the committee for Pinetum use. As the sheds were in poor condition they were reroofed and put into reasonably good repair.

A good deal of work has been carried out in the removal of tree butts and young birch stools from the Pinetum, and the ground around Park House has been cleaned up, part of it trenched and planted with decorative trees and shrubs, and the other ground levelled and prepared for sowing with grass seed next spring. Two additional acres of ground have been prepared for planting with various spruces and firs in February.

Cold winds in early spring killed a young tree of *Pinus patula*, indicating that there may be great difficulty in establishing this species.

Young trees of *Pinus Montezumae*, *P. palustris* and *P. Torreyana* appear to have become well established although earlier planted trees failed. They were kept in pots until one year old then planted out and protected in winter. They have been planted three years. *Keteleeria Davidiana* is not yet established although two plants are alive. One plant of *Taiwania cryptomerioides*, planted in 1926, continues to grow slowly and seems to have improved in health during the last two years.

Honey fungus (*Armillaria mellea*) continues to take toll of the trees and more than a dozen well-grown young specimens died from its attack during the year. Unfortunately many dead tree butts exist throughout the Pinetum, and the harmful effects of this fungus may be felt for many years. A few losses have also occurred through Weymouth pine rust (*Cronartium ribicolum*).

Dreyfusia nüsslinii on silver firs, the larvae of *Dichomeris marginella* on junipers, pine-shoot moth caterpillars (*Retinia* spp.), and pine saw-fly caterpillars (*Lophyrus pini*) on pines, have been the most troublesome insect pests. Green spruce aphis was less trouble-

some than usual, though it appeared on a few trees in late summer and seemed to be spreading in autumn. It is difficult to control in showery weather, for spraying is then of little use.

Visitors to the Pinetum continue to increase, and there is evidence that the collection of conifers is becoming well known and appreciated. A visit was paid in May by the Society of Foresters of Great Britain, and the members were greatly interested in both the Pinetum and the forest plots.

Notices have been posted in conspicuous places prohibiting smoking in the Pinetum with a view to reducing the possible risk of fire when vegetation is dry. The danger of fire is one of the most difficult problems with which the Pinetum committee has to contend, and it is very necessary that visitors should understand the need for extreme care in this direction.

Two years ago a number of surplus water lilies were taken from Kew and planted in Marshall's Lake : they flowered very freely from early summer until late autumn and attracted many people. *Rhododendron ponticum*, as undergrowth, was also very effective in June.

The Museums

Routine work has taken up most of the time of the staff, but arrangements were made for the Keeper to serve on several forestry committees, and Mr. F. N. Howes was delegated to act for Kew on the Minor Forest Products Committee of the Imperial Economic Committee, and on the Crude Drugs Committee of the Pharmacopoeia Commission.

Numerous additions have been made to the collections and several hundreds of specimens of hardy trees and shrubs have been collected, dried and mounted to add to the Arboretum Herbarium.

At the request of the Director of the Science Museum, South Kensington, a model in box-wood of a two-decker frigate, constructed from a draft by Sir John Henslow (at one time Chief Surveyor of His Majesty's Navy), and for many years on view in Museum 3, has been transferred on loan to the Science Museum. This type of ship was used in the navy in the early part of the reign of King George III.

Mr. J. H. Holland, F.L.S., who had occupied the position of Assistant since 1901, retired under the age limit on October 17th (K.B. 1934, 397). Mr. Holland entered the Gardens as a student gardener in 1894, and in 1896 was appointed Assistant Curator of the Botanic Station at Old Calabar, Niger Coast Protectorate (now Nigeria). In 1898 he was promoted to Curator in the same place, but he had to retire for health reasons in 1901. In October of that year he came back to Kew. He contributed numerous articles to the " Kew Bulletin " and is the author of " The Useful Plants of Nigeria." He revised and brought up to date Nicholls' " Text-Book of Tropical Agriculture " in 1929, and for some time

previous to retirement he has worked upon an enumeration of economic plants which it is hoped will be published in the " Kew Bulletin" at an early date.

Mr. Holland is succeeded upon the Museums' staff by Mr. R. Melville, B.Sc., Ph.D., Ph.C. (K.B. 1934, 397).

During the year the heating arrangements in Museum 2., which for many years were unsatisfactory, were remodelled and a new floor was put down in the Museum store.

The Keeper attended the annual meeting of the Royal English Forestry Society at Exeter in June, and read a paper on "Amenity Planting and the Preservation of Natural Woodlands " before the Forestry Subsection of the British Association in Aberdeen in September. Mr. F. N. Howes attended the annual meeting of the Museums Association at Bristol in July.

Duplicate Museum specimens have been distributed to Miss E. L. Acton, the Training College, Darlington ; Dr. C. J. Bond, Leicester ; Professor Braid, West of Scotland Agricultural College, Glasgow ; Mr. Daniel, Chiswick Products, Chiswick ; Miss P. Das, Maria Grey Training College, Brondesbury ; Director, Science Museum, South Kensington ; Mr. F. Dukes, Edgbaston ; Captain Eckford, South Kensington ; Mr. A. Ellis, Liverpool ; Professor S. J. Record, Yale University ; and Professor R. B. Thomson, University of Toronto.

PRESENTATIONS TO MUSEUMS.—Mr. R. Baker, Oxford ; wood specimens of *Glochidion ramiflorum*, New Hebrides.

Mr. A. Benthall, Teignmouth : seeds of *Araucaria Bidwillii* grown in Tangiers.

Miss C. Brand, Richmond : polished seed of *Lodoicea sechellarum*.

Mr. I. H. Burkill, Leatherhead : jelly-like substance prepared from jack fruit (*Artocarpus integer*).

Director of Agriculture, Ceylon : sample of *Artemisia brevifolia* used in a factory at Baramulla, Kashmir, in making santonin.

Messrs. Chivers & Sons, Ltd., Histon : bottled fruits.

Director of Agriculture, Cyprus : seeds of *Rhus Coriaria*.

Mr. J. Dean, Victoria, B.C.: framed photographs of *Erythronium grandiflorum* and *Arbutus Menziesii* ; also specimens and photographs of *Juniperus bermudiana*.

Miss M. C. Donkin, Reigate : Linnean Society medal, presented to Sir J. D. Hooker, 1898.

Miss A. Eastwood, Curator of Botany, California Academy of Sciences : seeds of *Pinus Torreyana*.

Director of Agriculture, Fiji : fruits of *Parinari macrophylla*.

Director, Forest Products Research Laboratory, Princes Risborough : specimens of Indian-grown wood of *Swietenia macrophylla*, etc.

Messrs. Gill & Duffus, St. Dunstan's Hill, London : pecan kernels as shipped from the United States in sealed vacuum tins.

Grace Produce Co., Ltd., Liverpool : two samples of vegetable ivory nuts.

Mr. F. N. Howes, Museums, Kew : specimens of various economic products.

Mr. C. R. James, Natal : pecan nuts grown in Natal.

Mr. L. W. Jennings, Manor Park, London : sample of " salip misiri " from *Eulophia* or *Orchis* spp.

Miss M. S. Johnston, Kew : fifty-three photographs of geographical and geological subjects taken in North America, and a table top inlaid in New Zealand woods.

Dr. A. Kerr, Hayes, Kent : collection of medicinal woods from Siam.

Messrs. Rowntrees, York : fruit and seeds of *Allanblackia floribunda* and *Pentadesma butyracea*.

Director, Botanic Garden, Singapore : specimens of wood.

Mr. J. R. Shabetai, Ministry of Agriculture, El Giza, Egypt : dried plants of *Artemisia herba-alba*.

Director of Agriculture, Tanganyika Territory : coffee fruits from the Uzungwa Forest, Iringa Province.

Jodrell Laboratory

The most noteworthy event has been a much needed extension at the east end of the laboratory, consisting of an artist's studio, photographic darkroom, and attendant's room, necessitating the demolition of the old attendant's room, photographic darkroom and greenhouse. A new and well-lighted greenhouse, in which plants will be grown for experimental purposes, has been erected at the south-west end of the building. The central heating and electric light systems have been modernized and the laboratory has been redecorated throughout.

The routine work has consisted chiefly in examining microscopically a wide range of botanical material with a view to establishing its identity. Early in the year a considerable amount of time was devoted to the detection of adulterants in commercial packets of herbs. The most striking discovery in connexion with this work was that packets of marjoram frequently contained a high proportion of what appeared to be *Cistus* leaves. It was also found to be possible by a quick examination of commercial samples of seed to separate those of Indian mustard (*Brassica juncea* Hook. fil. et Thoms.) from Indian rape (*Brassica napus* L. var *dichotoma*). Seeds which had been separated in this way were subsequently sown and the resulting plants identified at the Herbarium, demonstrating that an almost perfect separation had been effected. The wooden case of a clock, one of a large consignment the works of which had been put out of order by the deposition of a varnish, was found to be made of the wood of a species of *Dipterocarpus*. It seemed probable that the trouble was caused by the resinous

substance in the wood reacting with the lubricating oil of the clockwork to form a varnish which clogged the works. A portion of the wood of the tree under which Livingstone's heart was buried was identified as a species of *Parinari*. Chemical tests were carried out which proved that the flesh of the fruit of the cherry laurel (*Prunus lauro-cerasus*), unlike the kernels of the fruits or the leaves, does not contain a poisonous cyanophoric glucoside.

The collection of microscopical slides of different woods has been considerably enlarged by the incorporation of slides of over 200 Burmese woods, and of collections of woods from the Argentine, China and Central Africa. Further exchanges of slides have been made with the Imperial Forestry Institute, Oxford. Two sets of slides of Lauraceous woods were prepared for the Forest Research Institute, Kepong, Federated Malay States.

The various special investigations mentioned in the report for 1933 have been continued and some of them have been finished. The work on the structure of sandalwood and some other scented woods was completed, and an account is shortly to be published in the " Kew Bulletin." Papers dealing with the wood-destroying fungus *Polystictus versicolor*, K.B. 1934, 409, and with the structure of some Lauraceous woods from the Federated Malay States, by Mr. B. A. Jay, a visitor to the laboratory, have also been prepared. The work on the anatomy of *Centaurea*, carried out in connexion with the experimental work at Potterne, and a study of the embryology and seedling anatomy of *Ranunculus Ficaria*, have been continued. At the suggestion of the Director, the embryology and seedling anatomy of *Pinguicula* spp. is also being investigated on the same lines. Mr. W. R. Philipson continued his researches on the anatomy and morphology of certain grasses, and has published a paper (New Phytologist **33**, 359 : 1934) on the morphology of the lemma. Miss Taylor (Mycology), Dr. M. R. F. Manton (Cytology) and Prof. I. C. Skottsberg (Cytology) also worked in the laboratory during the year.

The Herbarium.

The number of specimens received during 1934 was slightly below the usual amount, no collections of outstanding size being purchased or presented. The most important feature of the year was the re-arrangement of the Library on a subject basis, a task which, though causing considerable inconvenience during the process, will greatly facilitate the consultation of the volumes. (See p. 42). For a note on Mr. Snowden's Sorghum work see p. 47.

Europe, North Africa, and the Orient.

The year 1934 saw a reduction from the great number of specimens received for incorporation in the Herbarium in the previous year. 16,631 numbers (sometimes a single number needing 2 or 3 sheets in mounting), have been presented or purchased. This figure

includes 13,478 received for identification or verification, apart from single specimens or small parcels sent by correspondents. 14,028 sheets have been mounted and the laying in has been brought approximately up to date.

The genera *Fraxinus*, *Potentilla*, and *Lavandula* have been rearranged.

Excellent progress has been made with the identification of new material and a large proportion of the collections sent in by correspondents has been determined.

Large additions to the British collections have been made by members of the Herbarium staff and include plants from Suffolk, Gloucestershire, Norfolk, Warwickshire, Oxfordshire, Lincolnshire, Bristol district, Surrey, Alderney, and Ireland. Mr. and Mrs. H. Montford gave a valuable set of plants from Skye. Messrs. A. B. and A. K. Jackson presented a set of specimens from the herbarium of Mr. T. E. Routh, and Mr. H. J. Goddard continued to send plants from J. Ralfs's collection. Mr. C. H. Wright added to our material from Devonshire and Col. H. H. Johnston sent 50 specimens from the Orkney Islands. Miscellaneous British plants were received from Messrs. J. E. Cooper, H. S. Redgrove, F. Rilstone, Mrs. C. I. Sandwith, Mrs. M. L. Wedgwood, Miss M. Whiting, and Mr. J. E. Lousley. Specimens were also received from the Botanical Society and Exchange Club of the British Isles and from the Watson Botanical Exchange Club.

Important collections of plants (totalling over 2,000 numbers) from the Balkan Peninsula have been received during 1934. These include Greece (Mr. S. C. Atchley and Dr. P. L. Giuseppi) ; Albania (Mrs. R. V. Pennington and Dr. F. Lemperg) ; Thrace and Macedonia (Mr. H. G. Tedd) ; Montenegro (Mrs. F. S. Copeland and the Rev. and Mrs. H. P. Thompson), and Bulgaria, Yugoslavia, and Dobruja (Dr. E. Anderson). In addition the Director, accompanied by Dr. W. B. Turrill and Mr. N. Y. Sandwith, spent some three weeks on the Athos Peninsula, South Macedonia, investigating the spring flora and vegetation. Over 600 numbers of dried specimens and about 100 packets of seeds resulted from this visit.

Valuable sets of Central European plants have been presented by Mr. J. E. Lousley, and collections from the East Pyrenees by Mr. J. W. Wyatt ; from Majorca by Mrs. C. Moore Kennedy ; from Switzerland by Miss G. Thring ; from Iceland by Mr. R. L. Proudlock, and from France by Mr. S. Garthside and Miss M. E. Edmonds. Mr. H. D. Ripley has continued to add to the material collected by him in Spain.

The following collections have been received in exchange : Czechoslovakia, Flora Exsiccata Reipublicae Bohemicae Slovenicae, cent. 9, from the Masaryk University, Brno ; Estonia, 1st Map of Estonian Plants from Tartu University ; Palestine, Flora Palestinae Exsiccata, cent. 3, from The Hebrew University, Jerusalem ; Herbarium Florae U.S.S.R. (nos. 2801–2850), from the Leningrad

Academy of Sciences ; and a valuable contribution, especially of critically named willows, from the Riksmuseum, Stockholm.

The most important collections from the Orient are those of Mr. E. K. Balls, made in Asia Minor. His 1738 numbers consist of well-collected and excellently preserved specimens. They add a great deal to our knowledge of the interesting and rich flora of eastern Asia Minor. Collections from Cyprus (Forestry and Agricultural Departments), Syria (Col. R. Meinertzhagen), Persia (Mr. A. C. Trott), Arabia (Mrs. H. R. P. Dickson and Mr. J. Fernandez), and Madeira (Dr. M. Grabham) have filled in gaps in our representation of the floras of these areas. A very valuable series of specimens collected in Morocco by Mr. A. Trethewy were presented by him.

The more important purchases, apart from Mr. E. K. Balls' collection, were of plants from the Aegean Islands (Dr. K. H. Rechinger) ; Tiliae Exsiccatae Criticae, fasc. 5 (Mr. T. O. Weigel) ; Tripoli and Lipari Is. (Prof. J. Bornmüller) ; Anatolia (Dr. W. Kotte) and Hauran (Vester & Co.). The Royal Horticultural Society presented the type material of Botanical Magazine plates and a valuable set, made by the late Dr. O. Stapf, of 389 sheets of peonies was presented by Mrs. Stapf.

One valued feature of the year's work is the continued interest of collectors in various places of botanical interest. Personal contact has been made between many of these collectors and members of the staff, which has led to continuity in collecting, improvement in methods of preparation, and many other advantages.

Miss D. A. Chaytor gave her services for a considerable part of the year. She assisted in the general routine work and has helped in the preparation of two papers. She is now engaged in a revision of the genus *Lavandula*.

Mr. W. R. Philipson, with the aid of a grant from the Department of Scientific and Industrial Research, is continuing his revision of the British species of *Agrostis* and their life-histories.

Publications.—Aubrieta glabrescens Turrill sp. nov. (Gard. Chron. 9 June, 1934, 384).

The occurrence of Fraxinus Pallisae in Western Thrace (K.B. 1934, 44).

The correlation of morphological variation with distribution in some Species of Ajuga (New Phyt. **33**, 218 : 1934).

Modern aspects of taxonomic botany and recent researches on some British plant species (Sci. Journ. R. Coll. Sci. **4**, 75 : 1934).

Variation and a variant of Cerastium vulgatum from Dorset (B.E.C. 1933 Report, 583 : 1934).

Botany of the Cambridge Expedition to Edge Island, S.E. Spitzbergen, in 1927, Part 1 (K.B. 1934, 30).

Additions to the Flora of Cyprus (K.B. 1934, 271).

On the Flora of the Nearer East : XV (K.B. 1934, 437).

CHINA, JAPAN AND NORTHERN ASIA.—Several thousand sheets have been mounted and a number of " types " and other specimens have been sent on loan to monographers, including all the material of *Meconopsis*, which has been examined by Dr. G. Taylor. The Chinese material of the genus *Salvia* has been determined by Dr. Elfriede Stibal of Vienna, and has been rearranged in the Herbarium in accordance with her recently published revision.

The most important collection received during the year is one presented by the University of California, Berkeley, consisting of 2323 numbers collected by Mr. J. F. Rock on the Tibetan borders of China. 560 of these specimens belong to the genus *Rhododendron* and 263 to the genus *Primula*. The Herbarium has been enriched by a further collection made by native collectors of the late Mr. George Forrest in South-West China (presented by Lord Aberconway); Hainan plants (coll. Dr. Eryl Smith) presented by Dr. A. F. G. Kerr; gentians from Kwangtung, presented by the Sun Yatsen University, and 17 syntypes of bamboos presented by the Tokyo Botanic Gardens.

Material of all available species of *Cyananthus* and of *Gentiana* from this area has been fixed for cytological investigation.

Research and Publications.—A key to the species of Deutzia Sect. Mesodeutzia (K.B. 1934, 177).

Botryostege: A new genus of Ericaceae, by the late Dr. O. Stapf (K.B. 1934, 191).

INDO-MALAYA.—Good progress was made in mounting and incorporating the accumulation of specimens from the Malay Archipelago and the Philippine Islands, but there remains a large quantity on hand owing to the receipt of further large consignments. The penultimate part of the " Flora of the Presidency of Madras," comprising the *Gramineae*, has been completed and was despatched to the press at the end of the year. The final part, containing the index, addenda, errata, etc., should be ready early in 1935.

The determination of the collection made by members of the 1933 Expedition to Mount Everest, comprising 353 numbers, was begun in January. Some 85 specimens from the highest elevations and from the Rongbuk Valley were first dealt with so that the names could be included in the expedition report, which was published during the summer. Over three-quarters of the collection has been determined, and two new species from Sikkim were recognised.

The elaboration of the collection made by the Oxford University Expedition to Sarawak in 1932 has occupied a considerable portion of the year. All the material loaned to specialists for determination (see report for 1933) has now been returned, and an account of the *Loranthaceae* by Dr. B. H. Danser, of Rijks Universiteit, Groningen, has already appeared (Rec. Trav. Bot. Neerl. *sp.* **31**, 237–247: 1934). The identification of the *Gamopetalae* is now practically completed.

The results of work on this collection up to date have amply fulfilled the expectation, expressed last year, of a high proportion of novelties. It is hoped to figure two new genera in " Hooker's Icones Plantarum," and an article dealing with one of them in its wider aspects is now in the press for publication in the " Kew Bulletin."

Identification of Mrs. N. E. Parry's Garo Hills collection of 1929–30 and of Capt. Kingdon Ward's collection in Assam in 1928, continued; of the former about a quarter remains to be done and the latter was nearly completed.

Capt. Kingdon Ward's *Ericaceae* (collections 1924–31), have continued to provide material for investigation. A paper on the genus *Agapetes*, with special reference to his collections, will shortly appear, in the " Kew Bulletin," and five species of this genus (including four collected by him)* will be figured in the next number of " Hooker's Icones Plantarum."

Valuable acquisitions have been received from Professor E. Barnes, who has been making an intensive search in restricted areas in the South Indian Hills, devoting his attention mainly to specified groups. His carefully preserved specimens (many in formalin), with ample notes, have yielded several new species of *Arisaema*, *Impatiens* and *Sonerila* and cleared up confusion in some cases.

A large number of duplicates of Malay Peninsula and Archipelago plants was received from the Singapore Botanic Gardens; from Buitenzorg Botanical Gardens, through Dr. J. Lam, Director of the Rijks Herbarium, Leiden, and from the Arnold Arboretum. Duplicates from Mr. W. Koeltz's collection of Himalayan plants were received from the New York Botanical Garden. A further consignment of specimens was sent by the Forestry Department of British North Borneo, which will be determined in 1935.

A large number of sheets of South Indian species was presented by the Botanic Gardens, Calcutta; the Agricultural College, Coimbatore, and the Conservatore of Forests, Travancore.

The following smaller contributions were also received :—

INDIA.—*Presented:* Madras, by Mr. P. V. Mayuranathan (through the Madras Museum) and by Mrs. Macfarlane; Bombay, by Mr. C. McCann; Chittagong Hill Tracts, by the Rev. W. J. L. Wenger; Lushai Hills, by the Rev. R. A. Lorrain; various localities, by the Forest Botanist, Dehra Dun.

CEYLON.—*Presented* by the Rev. R. W. Barney (grasses).

INDO-CHINA.—*Presented:* Siam, by Dr. A. F. G. Kerr, Mr. H. B. Garret and the United States National Museum, Washington.

PHILIPPINE ISLANDS.—*Purchased:* Mr. A. D. E. Elmer.

Publications.—Plants new to Assam: VI (K.B. 1934, 90).

The genus Notholirion (Royal Hort. Soc. Lily Yearbook, **15**: 1934).

Contributions towards a Flora of British North Borneo, by H. N. Ridley (K.B. 1934, 119).

* See K.B. 1935, 24.

New or little-known plants from South India : III & IV (K.B. 1934, 165 and 389).

Firmiana and Erythropsis by H. N. Ridley (K.B. 1934, 214).

Poa amboinica (K.B. 1934, 398).

Africa.

There has been little diminution in the number of specimens received from Tropical Africa, about 11,500 having been mounted and laid in. With the assistance available it has only been possible to deal promptly with the smaller collections, preference being given in the case of larger consignments to those most carefully selected and prepared. Although much more material is required from almost every part of the continent, the naming and subsequent work on badly prepared specimens without field notes is unprofitable, and except from very little known areas adds little or nothing of scientific value to the Herbarium. Collections sufficiently adequate for making 3-4 sets of duplicates with good field notes are most welcome, the critical work of the staff being thus made beneficial to other establishments by the exchange of duplicates.

The advantage of the separation of the tropical African species in the herbarium into the five geographical areas, especially in the case of large genera, continues to be demonstrated, and this arrangement is gradually being completed.

Work on the orchids and *Gramineae* for the final part of the "Flora of West Tropical Africa" has been continued, and a large part of the MSS. of the Appendix, containing an account of the useful plants of the area, is ready for printing. It is hoped to publish this and the last part of the Flora during the present year. Preliminary revision work on certain groups, such as *Acanthaceae, Leguminosae, Amarantaceae*, etc. is being carried out as time permits.

West Tropical Africa.—From this area over a thousand specimens were received, mostly for determination. Over a hundred grasses (including *Sorghum*) were communicated from the Gambia by the Director of Agriculture ; from Sierra Leone, 107 specimens by the Director of Agriculture ; from Liberia, 200 by the United States National Museum ; from the Gold Coast, 345 specimens, some 280 of which were communicated by Dr. F. R. Irvine and 50 by Mr. C. Vigne ; from Nigeria, about 160 specimens were received from the Forestry and Agricultural Departments and 120 from Messrs. A. J. Carpenter, I. D. Hepburn, D. R. Rosevear, and the Imperial Forestry Institute, Oxford.

Cameroons and Congo.—About 450 specimens, mostly named, have been received in exchange, mainly from the Brussels Botanic Garden, and specimens of *Lobelia* and *Senecio* from Dr. L. Hauman.

North-East Tropical Africa.—Sudan ; Grasses, *Cyperaceae*, etc. from Mr. H. B. Johnston, in connection with locust investigations ; 20 specimens from Major G. Aylmer.

East Tropical Africa.—Uganda : Giant Senecios from Dr. G. N. Humphreys and Mr. P. M. Synge ; about 550 specimens from the Department of Agriculture, 90 from the Uganda Forestry Department, and about 50 grasses from Mr. H. B. Johnston. Kenya : about 1400 specimens for naming, chiefly from the Coryndon Memorial Museum, the Scott Agricultural Laboratories, the Forestry Department, Mr. A. M. Champion, Miss M. J. Mortimer, Mrs. D. R. Tweedie, and Mr. H. C. Sampson.

From Tanganyika Mr. Greenway has continued to send large collections (about 750 specimens) from the Amani Institute, and over 200 collected by him on Mt. Kilimanjaro ; and Mr. B. D. Burtt has contributed about 320 specimens (including valuable material of *Commiphora*) ; 325 duplicates of Mr. Burtt's plants were also received from the British Museum (Natural History) ; Mr. C. Gilbert Rogers contributed a further 50 plants collected by him on Mt. Kilimanjaro ; over 500 specimens were received from the Department of Agriculture, including 180 specimens collected by Mr. H. Gillman in the Bukoba district and 325 Sorghums ; Mr. H. Cary Gilson also contributed specimens from this area.

South Tropical Africa.—From Northern Rhodesia Mr. Trapnell has contributed nearly 300 specimens, including about 50 examples of *Sorghum*, and from Southern Rhodesia further consignments have been received from the Department of Agriculture (100 specimens), Mr. F. Eyles (187), and Mr. A. P. G. Michelmore (82). Mr. G. Gossweiler sent 25 specimens from Angola. About 70 specimens were received from the Director of Agriculture, Nyasaland. Except for collections made by the early explorers, the flora of Nyasaland is still very poorly represented in the herbarium, and good general collections are very much desired from this area.

Besides the above, a valuable set of duplicates of older collections was received from the Berlin Botanic Gardens and further general collections in exchange from the Imperial Forestry Institute, Oxford.

Mascarene Island.—The Imperial Institute contributed 16 specimens of essential oil plants from the Seychelles, and Mr. R. E. Vaughan a small collection of orchids from Mauritius.

Research and Publications.—Besides naming and laying-in of the current collections, the determination and enumeration of Mr. J. B. Gillett's fine collection from Somaliland and Abyssinia has been nearly completed. These plants have filled up many blanks in the representation of the flora of that region, especially of species described in recent years by Italian botanists.

Another part of the *Gramineae* for the Flora of Tropical Africa (pt. VI. of vol. IX.) was published on January 1st and considerable

progress has been made with pt. I of vol. X., for which the account of the genera of tribes *Arundinelleae* and *Aveneae* has been prepared.

The Type of Ormocarpum Kirkii (K.B. 1934, 42).

The Giant Lobelias of East Africa (K.B. 1934, 61 and 274).

Ochrocarpus madagascariensis (K.B. 1934, 88).

Notes of African Grasses : XV and XVII (K.B. 1934, 107 and 425).

A Botanical Reconnaissance in the Virunga Volcanoes of Kigezi Ruanda, Kivu, by Mr. B. D. Burtt (K.B. 1934, 145).

New Trees and shrubs from Tropical Africa, by Messrs. A. C. Hoyle and H. Dunkley (K.B. 1934, 182).

African Orchids : VI (K.B. 1934, 205).

Further note of the genus Kraussia (K.B. 1934, 231).

New Material of Monotes Kerstingii from the Gold Coast, by Dr. Helen Brancroft (K.B. 1934, 233).

The Flora of the Libyan Desert (K. B. 1934, 281).

Tropical African Plants : XII (K.B. 1934, 301).

New combinations under Copaifera (K.B. 1934, 400).

Danthoniopsis Chevalieri, by C. E. Hubbard with A. Camus (Rev. Bot. Appl. Agric. Trop. 1934, 780).

SOUTH AFRICA.—About 1000 specimens were received from the National Herbarium, Pretoria, mostly for verification. Many of these (over 600) were collected as usual by Dr. E. E. Galpin. Another valuable contribution was a consignment of over a hundred specimens gathered in South-west Africa by E. Schoenfelder and R. Bradfield, whilst from Lund, Sweden, 160 specimens (including 115 grasses collected by Mr. T. Norlindh in S.W. Africa) and from Uppsala, 215 specimens collected by Mr. I. Ortendahl in S.W. Africa have been received. Further collections have been received for naming from Mr. F. R. Long, Port Elizabeth (312) and Miss Wilman, Kimberley (257). A further fine series of 530 specimens was received from Captain T. M. Salter, R.N. The Bolus Herbarium contributed 200 specimens and Dr. H. G. Fourcade 100. The Rev. F. A. Rogers contributed 58 South African grasses and nearly 200 specimens (including a collection of Kalahari duplicates) were received from the Transvaal Museum. 126 specimens were purchased from Mr. E. G. Bryant, Prieska Division. Specimens have also been received from Dr. J. Muir, Prof. R. H. Compton and Mr. J. B. Gillett.

Work was continued by Mr. R. A. Dyer on the Flora of Albany and Bathurst.

Research and Publications.—The Distribution of Ipomoea Pes-caprae and Calystegia soldanella in South Africa, by Dr. J. Muir (K.B. 1934, 44).

Notes on African Grasses XVI by A. P. Goossens (K.B. 1934, 195).

Notes on the Flora of Southern Africa : V (K.B. 1934, 264).

During the year 7082 sheets were mounted and 6015 sheets were incorporated in the Herbarium.

Much work has been carried out on the flora of British Guiana. A second consignment of several hundred undetermined sheets was received from the Jenman Herbarium, Georgetown, and was dealt with, many being kindly presented as duplicates. The identification of recent collections of the Forest Department was continued, and a small collection from Roraima was also named. Assistance was given to Mr. T. G. Tutin in the naming of the important collection of the Cambridge University Expedition to British Guiana. In addition to the work of identification, revisions of the British Guiana representatives of *Swartzia* and *Byrsonima* were prepared.

Mr. G. B. Hinton has continued to forward large consignments of fine herbarium specimens from the State of Temascaltepec, Mexico. The work of naming his vast collection has been undertaken since June by a member of the temporary staff who has made excellent progress and has succeeded in identifying and incorporating over two thousand numbers. Material of several critical families has been sent to specialists.

Other collections named during the year include those of Miss I. W. Hutchison from Alaska, of Mrs. M. E. Blake from Patagonia, and of Prof. F. E. Fritsch from the United States, and work has been begun on the plants of Miss D. B. Stafford's second Peruvian expedition.

Good progress has been made with the incorporation of old unidentified collections such as those of Hassler and Steinbach, and the following genera have been written up and re-arranged by recently published monographs : *Duguetia, Rollinia, Anaxagorea, Byrsonima, Talisia, Astronium, Malesherbia, Evolvulus* and *Aegiphila.*

Among the valuable series of specimens received through presentation, purchase or exchange, particular mention must be made of those of Dr. A. Ducke, from the Amazons regions, which include very numerous additions to the Herbarium.

The following collections were also received :—

NORTH AMERICA.—*Presented :* Canada, by Bernice P. Bishop Museum, Hawaii (coll. Dr. H. St. John) ; Miss K. J. H. Stewart (a collection made in Peterborough, Ontario, about 1840) ; J. W. Wyatt (Rocky Mountain plants, coll. A. Butler) ; Rev. H. A. Turner (Baffin Land plants) ; Canada and United States, by the Botanical Society and Exchange Club of the British Isles ; United States, by the California Academy of Sciences (California and Oregon plants) ; New York Botanical Garden (California plants) ; Dr. F. A. Rodway, Nowra, New South Wales (California plants, coll. L. S. Rose) ; State College of Washington (N.W. Pacific plants) ; University of California, Berkeley (California and Nevada plants) ; University of California, Los Angeles (Southern and Lower California plants) ;

University of Montana (a large collection of Montana and Idaho plants collected by Drs. J. E. Kirkwood and C. L. Hitchcock, respectively) ; N.W. Greenland (Thule), by the Gray Herbarium (coll. W. E. Ekblau). *Purchased :* New York Botanical Garden, Florida plants ; H. A. Gleason Jnr., N. Michigan plants.

CENTRAL AMERICA.—*Presented :* By the Arnold Arboretum (British Honduras plants) ; by the University of Michigan Botanical Garden (British Honduras and Guatemala plants). *Purchased :* Wm. A. Schipp, British Honduras plants ; C. L. Lundell, British Honduras and Guatemala plants.

EAST TROPICAL SOUTH AMERICA.—*Presented :* By the British Guiana Forest Dept. (British Guiana plants). *Purchased :* New York Botanical Garden, Brazilian plants (coll. B. A. Krukoff).

WEST TROPICAL SOUTH AMERICA.—*Presented :* Colombia and Peru plants by Madrid Botanic Gardens. *Purchased :* New York Botanical Garden, Colombian plants (coll. A. E. Lawrance) ; University of California, Berkeley, Peruvian plants (coll. Mrs. Ynez Mexia.).

TEMPERATE SOUTH AMERICA.—*Presented :* Argentine plants by Señor A. L. Cabrera, Dr. H. Castellanos and Prof. A. Parodi (grasses).

Research and Publications.—The following papers have been published during the year :—

Specimens collected by Bradbury in Missouri Territory, by H. W. Rickett (K.B. 1934, 49).

Eugenia aeruginea DC., a misidentified type specimen (K.B. 1934, 124).

Ceratophytum tetragonolobum (K.B. 1934, 222).

Plant Hunting in Alaska, by Miss Isobel W. Hutchison (K.B. 1934, 345).

The genus Swartzia in British Guiana (K.B. 1934, 353).

Gaultheria microphylla (K.B. 1934, 401).

AUSTRALIA AND NEW ZEALAND.

During 1934 further collections have been presented by Dr. F. A. Rodway, about 400 specimens in all, the majority from New South Wales and Tasmania. A collection of New South Wales orchids was presented by Mr. F. A. Weinthal, and parts of the type of the very remarkable subterranean species *Cryptanthemis Slateri* were received from the Rev. H. M. R. Rupp.

In addition to specimens sent in connection with critical determinations and special enquiries, over 500 specimens have been received from Mr. C. T. White, Botanic Museum and Herbarium, Brisbane, more than 400 of these being grasses.

In connection with the investigation of the New Zealand and Australian species of *Gaultheria* and *Pernettya*, further material has been received from Miss L. M. Cranwell of the Auckland Institute

and Museum, New Zealand, and a paper embodying the results of these investigations has been published (Journ. Linn. Soc. **49**, 611 :1935,).

In addition to the above the following collections were presented :

AUSTRALIA.—Queensland, by the Arnold Arboretum ; Western Australia, by the Imperial Forestry Institute, Oxford ; by Mr. C. B. Palmer (grasses) ; by Mr. C. A. Gardner (co-types of new species) ; South Australia, by Mr. J. M. Black ; Victoria, a small set of Victorian plants by Sir Reginald McLeod.

NEW ZEALAND.—A collection illustrating the two forms of *Zoysia* and their range from sea-level to high altitudes inland, by Dr. H. H. Allan.

Research and Publications.—The genus Dentella in Australia (K.B. 1934, 290).

Notes on Orthothylax, by C. Skottsberg (K.B. 1934, 401).

Gramineae Australienses I & II (K.B. 1934, 126 and 444).

NEW GUINEA AND OCEANIA.

A small but interesting collection of some 50 specimens made on Nauru Island (Micronesia) was received from Mr. A. Burges. This is the first collection received at Kew from this island and nearly all the species proved to have a wide distribution in the Pacific.

The Hawaiian collections have been enriched by the presentation of 456 specimens (including 114 ferns) by the Bernice P. Bishop Museum, Honolulu, and about 50 from the Field Museum, Chicago. Over 300 specimens have been purchased from Dr. O. Degener, including many to be cited in his forthcoming " Flora of Hawaii."

In addition to over 50 specimens of *Ficus* from Fiji collected by Mr. A. C. Smith, presented by the New York Botanical Garden, Mrs. J. C. Parham has sent several collections from the same islands, amounting in all to over 200 specimens.

The work of determining the collections made by Mr. J. H. L. Waterhouse in the British Solomon Islands and Bougainville Island has been commenced, and identification of those presented by the Yale School of Forestry mentioned in the reports for 1932 and 1933 is well in hand. The orchids of both these collections were identified by Mr. C. E. Carr during six months' stay at Kew and a number of new species described. 123 specimens of Ficus from the Kajewski and Brass collections made in Bougainville and the Solomon Islands have been received from Brisbane Botanic Gardens. Nearly 300 of the late Dr. Rudolf Schlechter's New Guinea plants (including a number of co-types) have been purchased.

An interesting collection from the Owen Stanley Range, Papua, was presented by Miss L. E. Cheesman ; in addition a number of valuable duplicates of older collectors were received from the

Botanic Garden, Berlin-Dahlem, mostly from New Guinea (Kaiser Wilhelmsland). A number of duplicates of New Guinea plants was also received from the Buitenzorg Botanic Gardens through Dr. J. Lam, Rijks Herbarium, Leiden.

Research and Publications.—On a collection of orchids from the Solomon Islands, by C. E. Carr (K.B. 1934, 375).

Pteridophyta.

The largest collection received during the year was presented by the Department of Agriculture, British Guiana, consisting of about 2000 sheets belonging formerly to the herbarium of G. S. Jenman. The specimens are mainly extra-American and consist of sheets collected by, among others, Cunningham, Cuming, Gardner, Glaziou, Griffith, Hartweg, Jameson, Linden, Mosen, Schomburgk, Seeman and Spruce. A small proportion of the sheets have been injured by insects and these with some unlocalised specimens are unsuitable for incorporation in the Herbarium. Many type numbers are contained in the collection.

Other collections include nearly a hundred numbers from Papua collected by Miss L. E. Cheesman; a collection of Mexican ferns presented by Mr. R. Kempthorne, which apparently, at one time, belonged to the herbarium of Mr. H. Schlumberger of Mulhouse and which, therefore, were probably collected by Frederick Mueller; two books of Madagascar ferns sent by Mrs. C. Lyndon, one of which contained specimens collected by Miss Helen Gilpin, a missionary, whose main collection was already at Kew. Further excellent material has been received from Mr. G. B. Hinton from Mexico and a small number of duplicate sets of ferns have been received from various botanical establishments.

More than 1600 sheets were laid in during the year although many hundreds more have been arranged in alphabetical sequence of genera for future incorporation.

Research.—As far as routine work would allow, work on the fern flora of West Africa for the "Flora of West Tropical Africa" has been continued.

Musci, Hepaticae and Charophyta.

A special effort has been made during the year to make available the many valuable collections which have accumulated in the stores, and over four thousand sheets have been mounted.

Proposals for nomina conservanda of *Hepaticae* have been considered and after consultation with the members of the International Sub-committee, a scheme has been decided upon which it is hoped will be approved at the Amsterdam Congress.

Mr. G. O. Allen has kindly continued to co-operate in naming the *Charophyta* in place of the late Mr. James Groves, and almost all arrears of specimens have been dealt with.

The research on bryophyte ecology on the mountains in the Inner Hebrides has been continued and extended to the Outer Hebrides.

During the year a large number of Colombian mosses, collected by Messrs. E. P. Killip and A. C. Smith, was presented by the New York Botanical Garden. Series I, Musci Selecti et Critici, and Series 7, Hepaticae Selectae et Criticae, were purchased from Dr. Fr. Verdoorn.

Publications.—The Bryophyta of Scolt Head Island, in "Scolt Head Island" [published for the Norfolk and Norwich Naturalists' Society], 146.

Riccia Beyrichiana in Arctic Europe (Journ. Bot. **72**, 59).

The Vegetation of the Island of Rum (Proc. Linn. Soc. 146th Session, 27).

Musci collected by the Oxford Expedition to British Guiana in 1929, by P. W. Richards (K.B. 1934, 317).

Thallophyta.

Algae and Lichens.—Considerable time has been occupied with naming critical material for research workers at Universities in this country. Of the two principal algal collections one concerns specimens brought up during diving operations in Loch Swen and the other marsh algae of Strangford Lough. In both cases these are connected with ecological investigations.

Prof. T. A. Stephenson, of Cape Town, has continued his ecological survey of marine algae along the South African coast and his collections have been supplemented by others sent by Mr. W. E. Isaac, who is engaged in similar work.

The set of Phycotheca Boreali Americana, consisting of 46 volumes and containing over 2000 specimens, has been removed from the Library shelves. The volumes are being cut up and the specimens remounted on herbarium sheets preparatory to incorporation in the general collection.

Among the lichens laid in was an interesting set of Philippine species determined by Wainio and including many syntypes.

Publications.—Indian Rhodophyceae especially from the shores of the Presidency of Bombay: IV, by F. Boergesen (K.B. 1934, 1).

The Lichens of Scolt Head Island, in "Scolt Head Island" Published for the Norfolk and Norwich Naturalists' Society], 151.

Fungi.—Additions to the Herbarium include Sydow's Mycotheca Germanica (Fascicles 53–56) and Fungi Exotici Exsiccati (Fascicle 19); the 7th Century of Reliquiae Farlowianae, presented by the Farlow Herbarium, Harvard University; a set of named specimens, including fragments of several types, presented by Mr. J. S. L.

Waldie, illustrating his work on the micro-fungi of forest trees ; and 156 specimens, chiefly *Uredineae* and *Ustilagineae*, distributed by the United States Department of Agriculture in co-operation with the University of Minnesota.

Among the larger consignments from abroad received for naming were fungi from India (Mr. C. E. Parkinson), Uganda (Mr. C. G. Hansford), Australia (Dr. Ethel I. McLennan) and South Africa (Division of Plant Industry, Pretoria). Of special interest was the receipt from Miss A. M. Bottomley (Division of Plant Industry, Pretoria) of further fertile material of a *Helicobasidium* which appears to be identical with *H. compactum* Boedijn. The latter was described from Java as a root parasite of coffee ; the South African fungus is reported as causing damage to *Pinus longifolia*.

Miscellaneous enquiries, which sometimes entail much time and trouble in elucidation, continue to be very numerous. The autumn of 1934 was a good season for fleshy fungi in this country, with the result that a very large proportion of time, especially during September and October, had to be given up to naming Agarics, etc. sent in by correspondents. One of the most interesting sendings was *Pleurotus mutilus* Fr. from mushroom beds, found by Mr. W. M. Ware. This is the second species reported by Costantin as causing the trouble known as " Chanci." The other is *Clitocybe dealbata*, which was found in some quantity last year by Mr. Ware and Mr. W. Buddin.

Eight new coloured plates of common British fungi have been prepared by Miss Wakefield for the new edition of Bulletin 23 of the Ministry of Agriculture, on " Edible and Poisonous Fungi." In connection with the preparation of a new edition of the " List of Common Names of Plant Diseases," by the Plant Pathology Committee of the British Mycological Society, considerable time has been given to the elucidation of some difficult problems of nomenclature and to the verification of authors and dates.

During the last two months of the year the provision of temporary help has enabled laying in to be brought up to date, and a further distribution of duplicates to be made. A start has also been made on providing new genus and species covers in the Herbarium where necessary, and repairing damage to specimens or packets. In some cases where bulky specimens such as polypores cause the sheets to be widely separated, the delicate pencil labels and notes of Berkeley are becoming almost obliterated. To save further damage it is proposed to go through the whole of the *Polyporaceae* and enclose all such specimens in large paper packets, with a duplicate label outside. This will make the rapid comparison of specimens less easy, but is the only sure method of preventing irrepable damage.

Professor A. H. R. Buller worked in the Herbarium from January until his return to Canada in September. During his year in England he published vols. 5 and 6 of his " Researches on Fungi."

Dr. J. Ehrlich, of Harvard University, who is engaged on a critical cultural and taxonomic study of *Nectria*, has for some months been working through the Kew collections and annotating the specimens which he has examined.

Mr. W. B. Grove spent some time checking references and specimens for his forthcoming work on British Coelomycetes.

Publications.—Entomogenous Fungi of British Guiana, by T. Petch (K.B. 1934, 202). Fungi collected in British Guiana, chiefly by the Oxford University Expedition, 1929 (K.B. 1934, 238). A study of Polystictus versicolor, by Mr. B. Alwyn Jay (K.B. 1934, 409).

Biological and Genetical Herbaria.

About 2300 sheets have been added to these collections during the year. These include: (1) additional material illustrating the ecological survey of Richmond Park ; (2) large series of specimens to show the range of variation in salt marsh vegetation ; (3) further specimens connected with breeding work in *Silene*, *Centaurea*, *Taraxacum* and *Solanum* ; (4) a set of scored specimens to illustrate variation in an inland population of *Silene maritima*.

Summary

The routine work, apart from naming, accomplished during 1934 is summarised as follows :—

Mounted	63,750 (approx.)
Incorporated	55,250 (approx.)
Duplicates distributed	9,016
Specimens received on loan	7,795
Specimens sent on loan	6,172
Specimens presented or purchased ...	50,915

Illustrations and Portraits.

Less routine work than usual has been done this year owing to the structural alterations and additions to the Jodrell Laboratory, mentioned elsewhere. A large studio and a new dark room and attendant's room have been erected ; the work has caused considerable disorganisation, but the results are a valuable addition to the Laboratory.

Numerous type and authentic specimens borrowed from other Herbaria have been photographed for the Kew collection, and about 450 sheets of herbarium specimens and a fairly large number of living specimens have been photographed for other institutions.

Miss M. W. Tanner has been at Kew during most of the year

and has rendered valuable assistance to the artist. Three oth visitors have worked for short periods on botanical illustrations :- Mr. R. H. Fry of Bristol, Miss H. M. Abecassis of Lisbon and Mi M. Paton of London.

The work of remounting the collection of drawings on Herbariu sheets, referred to in Kew Bulletin, Appendix, 1933, was complete during the year, and additional drawings and photographs wer incorporated as they were received. These included :— 74 origina water-colour drawings prepared for the Botanical Magazine, pre sented by the Royal Horticultural Society ; 30 plates from Dr. Pol Evans of the Flowering Plants of South Africa ; numerous Indiar flower paintings bequeathed by Miss Carlina Leggett, and plates o Dioscorea species to appear in the Annals of the Royal Botanic Garden, Calcutta, presented by Mr. I. H. Burkill. An excellent named collection of 658 paintings of wild flowers of the Riviera and Switzerland (contained in cases) by Miss Sidney E. Forster, was presented by her niece, Miss A. E. Pepys. These have been catalogued and placed in the Library. A portfolio of 30 water-colour drawings of Cape wild flowers was received from Admiral Sir A. W. Moore and this also has been included in the Library. 59 photographs of type-species received from the New York Botanic Garden and 18 photographs of types in the De Candolle Herbarium received from Dr. A. F. G. Kerr, were placed in envelopes, mounted and laid into the Herbarium. A number of drawings and photographs received from many other sources were also incorporated.

Part 2 of vol. 3 of the fifth series of Hooker's Icones Plantarum appeared in November. The plates for this work were prepared by the artists on the staff.

Nomenclature and Bibliography.

The enquiries received concerning nomenclatural questions were more numerous than in any previous year and the replies frequently involved much research.

In view of the change in the International Rules of Botanical Nomenclature concerning homonyms, whereby all later homonyms are rejected, a comprehensive paper is being prepared by Mr. A. Rehder (Arnold Arboretum), Dr. R. Mansfeld (Berlin), and Miss M. L. Green (Kew). A systematic search for later generic homonyms is being made, and a case either for the rejection or conservation of these names is being made out. The paper should be published shortly and will be submitted to the International Botanical Congress, Amsterdam.

The new edition of the Handlist of Rock Garden Plants was published in December. All the names have been carefully revised, the taxonomy is mainly in line with modern monographers and the nomenclature conforms to the International Rules of Botanical Nomenclature as revised at Cambridge in 1930. The scope of the list

is different from that of the last edition since it includes both Monocotyledons and Dicotyledons, as well as an Appendix of Trees and Shrubs suitable for Rock Gardens.

Publications.—Nomenclature : The Type of Ormocarpum Kirkii (K. B. 1934, 42).

Penstemon—the valid publication of the generic name (K.B. 1934, 43).

The validation of New Combinations by indirect citation of the synonyms concerned (K.B. 1934, 136).

Generic Names published in Zinn's Catalogus (K.B. 1934, 217).

Pseudogeneric names (K.B. 1934, 222).

New combinations from the Hand-List of Trees and Shrubs— (K.B. 1934, 224).

Poa amboinica Linn. (K.B. 1934, 398).

New combinations under Copaifera (K.B. 1934, 400).

Bibliography : Triana's Flora Neo-Granadina (K.B. 1934, 394).

Index Kewensis.

The compilation of the Ninth Supplement of the " Index Kewensis " progressed steadily during 1934. At the present time there are about 16,000 new names in the card catalogue, arranged alphabetically and available for consultation.

A large portion of the time of the compilers each year is given up to the investigation of omissions from the original " Index Kewensis " and subsequent supplements, notices of these omissions being very frequently received from correspondents both at home and abroad. This year, thanks to the Bentham-Moxom Trustees, some extra help has been received and many works, hitherto entirely omitted from the Index or included only in an unsatisfactory way, have been searched, and the new names contained in them will appear in the current supplement. Of these, special mention may be made of Engler & Drude, " Vegetation der Erde " (1908-21) which, owing to its encyclopaedic nature, had not previously been examined for new names. The result of this examination is the addition of over 500 names to the current supplement. The edition of " Roxburgh, Flora Indica " (1820-24), gone through for the Index appears to have been that of 1832, reference to the earlier edition in almost all cases having been omitted. It is therefore considered advisable to insert in the present supplement all new names from these two editions, quoting also the reference, if any, to the " Hortus Bengalensis " (1814) where many of the names appear for the first time as *nomina nuda*.

References to Vilmorin's " Blumengärtnerei," ed. Siebert & Voss (1894–1896) have been received frequently, and therefore during the past year the volumes were purchased for the Library. Well over 500 names, mainly horticultural, have been abstracted from it and included in the present supplement.

Experimental and Transplant Work.

Genetical Research was continued at the Potterne Biological Station and at Kew on *Silene*, *Centaurea*, and *Saxifraga*. A large number of F_2 families was scored in *Silene* and many living specimens were analysed to find the range of variation in an isolated inland population of *S. maritima*. F_2 families of interspecific crosses in *Centaurea* were scored. Research was commenced on statistical genetics in *Saxifraga granulata*. Work on *Anagallis* at Potterne is being carried out by Mr. E. M. Marsden-Jones, Honorary Associate of the Royal Botanic Gardens. Investigation of micro-species of *Taraxacum* is continuing at Kew and a study of inflorescence inheritance in *Solanum dulcamara* has been completed.

The transplant experiments are being continued and a third report has been sent for publication in the "Journal of Ecology."

Publications.—Researches on Silene maritima and S. vulgaris: XIII. (K.B. 1934, 383.)

Further Breeding Experiments with Saxifraga (Journ. Genetics, **29**, 265 : 1934).

Visitors.

The number of signatures in the Visitors' Book for 1934—**5,925**—shews a considerable increase over 1933.

Miss M. M. Whiting again gave valuable voluntary help in arranging and classifying the Indo-Malayan material and similar assistance was given to the African Department for a few months by Miss M. R. F. Taylor, and to the European Department by Miss D. A. Chaytor. During the latter part of the year great assistance was given voluntarily by Miss M. D. Ker in labelling collections of Australian plants, and by Miss M. Gossling in sorting and laying in specimens in the Mycological Department. Mrs. E. Milne-Redhead has also kindly given assistance in preparing figures in connection with articles appearing in the Kew Bulletin.

Amongst frequent or regular visitors were members of the staffs of the Department of Botany, British Museum, and of the Imperial Mycological Institute. The Staff employed by the Royal Horticultural Society in connection with the preparation of the Index Londinensis and the Botanical Magazine have worked in the Herbarium and Library throughout the year.

In addition, the most noteworthy or frequent visitors to the Herbarium were the following :—

Dr. Edgar Anderson, Arnold Arboretum ; Mr. F. W. Andrews, Sudan.

Mr. E. G. Baker ; Prof. E. Barnes, Madras ; Miss E. C. Barnett ; Mr. W. J. Bean ; Mr. S. Bloembergen, Groningen ; Dr. F. Boergesen, Copenhagen; Mr. L. A. Boodle ; Prof. C. E. B. Bremekamp, Utrecht;

the late Dr. N. E. Brown ; Miss E. M. Bruce ; Prof. A. H. R. Buller, Winnipeg ; Mr. I. H. Burkill ; Mr. B. D. Burtt, Tsetse Research Dept., Tanganyika Territory.

Mr. A. J. Carpenter, Nigeria ; Mr. C. E. Carr, late of Singapore ; Mr. C. C. Chang, Nanking ; Prof. E. E. Cheesman, Trinidad ; Prof. P. Chouard, Paris ; Mr. A. B. Cormack ; Dr. E. J. H. Corner, Singapore.

Dr. J. M. Dalziel ; Mr. A. G. Davis, Guelph, Canada ; Mr. F. C. Deighton, Sierre Leone ; Mr. H. N. Dixon ; Mr. H. Dunkley.

Mr. H. L. Edlin. Dr. J. Ehrlich, Cambridge, Mass.

Mr. F. Fagerlind, Stockholm ; Dr. H. R. Fletcher ; the late Mr. J. Fraser ; Mr. C. X. Furtado, Singapore.

Miss S. Garabedian, Cape Town ; Mr. H. S. George, Central Provinces, India ; Mr. F. D. Golding, Nigeria ; Dr. W. Balfour Gourlay ; Mr. P. J. Greenway, Amani, Tanganyika Territory ; Col. C. H. Grey ; Mr. W. B. Grove ; Mr. Evan R. Guest, late of Iraq.

Mr. R. E. Holttum, Singapore ; Dr. D. Hooper ; Mr. W. A. Horst; Mr. A. C. Hoyle.

Miss J. B. Imlay ; Dr. F. R. Irvine, Accra, Gold Coast.

Mr. A. Bruce Jackson.

Miss M. C. Karsten, Terborg, Holland ; Dr. A. F. G. Kerr.

Dr. J. Lanjouw, Utrecht ; Mr. I. M. Lamb ; M. Jacques Leandri, Paris ; Mrs. M. R. Levyns, Cape Town ; Miss G. J. Lewis, Cape Town ; Mr. J. E. Lousley ; Miss M. J. Lynn.

Mr. E. M. Marsden-Jones ; Dr. A. Meebold, Munich.

Mr. C. Norman.

Miss A. A. Obermeyer, Pretoria.

Mr. T. Petch ; Mr. W. R. Philipson ; Mr. W. R. Price ; Dr. A. A. Pulle, Utrecht.

Mr. H. J. A. Rea; Prof. H. N. Rickett, Missouri; Mr. H. N. Ridley; Mr. C. Gilbert Rogers.

Dr. C. Skottsberg, Göteborg ; Mr. A. Skovsted, Trinidad ; Dr. C. Piper Smith, San Jose, California ; Dr. N. J. G. Smith, Grahamstown ; Mr. J. D. Snowden ; Miss M. S. Sprague ; Mr. W. T. Stearn ; Dr. C. G. G. J. van Steenis, Buitenzorg ; Mr. Duncan Stevenson, late of N. Rhodesia.

Mr. T. G. Tutin.

Dr. H. Uittien, Utrecht.

Dr. F. Verdoorn, Leiden.

Mr. E. F. Warburg ; Mr. R. O. Williams, Trinidad.

Distribution of Duplicates.

The following were the principal institutions to which duplicates were distributed :—

Great Britain and Irish Free State.—British Museum (Natural History) ; Dublin, Trinity College ; Edinburgh, Royal Botanic Garden ; Oxford, Imperial Forestry Institute.

Europe and Orient.—Berlin, Botanic Gardens and Museum; Brno, Masaryk University; Brussels, Botanic Garden; Florence, Botanical Institute; Jerusalem, The Hebrew University; Leiden, 's Rijks Herbarium; Leningrad, Botanical Museum of the Academy of Sciences; Madrid, Botanic Garden; Paris, Natural History Museum; Sarajevo, State Museum; Sofia, University, Department of Botany; Stockholm, Botanical Museum; Tartu, University Botanic Museum and Garden; Utrecht, University Botanic Museum and Herbarium; Zürich, Botanic Garden and Museums.

Africa.—Amani, East African Agricultural Research Station; Nairobi, Coryndon Memorial Museum; Pretoria, Division of Plant Industry.

Asia.—Peiping, Fan Memorial Institute of Biology; Tokyo, Imperial University Botanic Gardens.

Australia.—Brisbane, Botanic Museum and Herbarium.

Oceania.—Honolulu, Bernice P. Bishop Museum.

America.—Harvard University, Arnold Arboretum and Farlow Herbarium; Iowa, State University; Pennsylvania, State College; Washington, D.C., United States National Museum.

The Library.

The retirement, in the autumn of 1933, of Mr. S. A. Skan (see K.B. 1933, 462), for so many years *de facto* Librarian of the Royal Botanic Gardens, reduced the effective strength of the Library staff from three members to two. Considerable difficulty has accordingly been experienced in coping with the essential routine work, and this was enhanced by the absence of the Acting Librarian for a period of 4½ months owing to a serious accident. Mr. Skan also filled the office (without the title) of official Bibliographer, and his unrivalled knowledge of the Library being no longer available the situation has been met by a re-arrangement on a subject basis of all the books and pamphlets. This innovation has been greatly appreciated by all engaged in research in the Herbarium and Library, the practical convenience of placing together all books relating to one subject being obvious. Though highly desirable this change entails, however, a serious (though fortunately non-recurrent) addition to the routine work, namely, entering in the Catalogue and its card-index Supplement the new press-marks of about twenty-three thousand volumes. No subject arrangement however perfect, can remove the necessity for press-marking since a particular book might be placed under any one of two or more different subjects with which it deals, and different sizes must perforce be placed on shelves of different heights and depths.

During the year, 541 volumes were bound, rebound or repaired this number including 214 volumes representing War arrears bound under a special arrangement.

The extensive use made of the Library is indicated by the fact that as many as five hundred volumes are often absent from the shelves at the same time.

The most important publications presented to the Library during 1934 are as follows:—

From the Bentham-Moxon Trustees: 33 books in 35 volumes, including 14 scarce 16th century works. One of the most interesting is a copy of Manlius de Bosco, *Luminare maius*, Venice, 1506, issued, with a common title-page, along with Quiricus de Augustis, *Lumen Apothecariorum*, and Paulus Suardus, *Thesaurus Aromatariorum*, which, however, bear a second pagination. The *Luminare maius* was a pharmaceutical work highly esteemed in the Middle Ages, and mentioned in the *Botanologicon* of Euricius Cordus. Bibliographical details of the three books are given in Haller, *Bibliotheca Botanica*, 1, 238 (1771).

Paulus Aegineta, *Opus de Re Medica* is represented by translations by J. Guinterius, Paris, 1532, and Albanus Torinus, Basel, 1532. Stephanus, *Medicae artis principes*, Paris, 1567, is a very useful "omnibus" edition of the works of the chief Greek and Latin physicians after Hippocrates and Galen, including various authors cited by Brunfels and Fuchs, such as Oribasius, Aëtius, Actuarius and Celsus. Nicander's *Theriaca et Alexipharmaca*, Florence, 1764, has metric Latin and Italian translations accompanying the Greek text. Mesue's *Opera* is now represented by an edition printed at Lyons in 1534, the two editions previously in the Library being those published at Venice in 1562 and 1602 respectively. A notable lacuna was filled by the acquisition of Maranta, *Methodi cognoscendorum simplicium libri tres*, Venice, 1559. Another early medical work is Mattioli, *Epistolarum Medicinalium Libri Quinque*, Lyons, 1564.

The Kew set of Bock's works has been enriched by the acquisition of a copy of his *Kreuter Buch*, Strassburg, 1556, this being the first edition published after the author's death. Two other notable additions to the set of early herbals are Dodoens, *De Stirpium Historia Commentariorum Imagines*, Antwerp, 1559, an important edition containing additional figures, and the rare edition of his *Cruydt-Boeck* published at Leyden in 1608, which is not recorded in Pritzel.

Eobanus Hessus, *De tuenda bona valetudine*, Frankfurt, 1564, is an early work on dietetics, containing a section entitled "De natura cerevisiarum," in which twenty-four herbs are mentioned as ingredients of various "beers." Georgius Fabricius, *Rerum Misnicarum libri VII*, Leipzig, 1569, is a history of Meissen, Saxony, containing an alphabetical list (pp. 233–262), under their Latin names, with German synonyms, of the plants found cultivated or wild in the neighbourhood. Rapin's *Hortorum Lib. IV*, Meursius, *Arboretum Sacrum* and Politianus, *Rusticus* are included in a volume published at Utrecht in 1672.

Linnaeus, *Musa Cliffortiana*, Leyden, 1736, is a noteworthy acquisition. Other Linnean items are his *Genera Plantarum*, ed. 3, Paris, 1743; *Materia Medica*, ed. Schreber, Vienna, 1773, and *Termini Botanici*, ed. Giseke, Hamburg, 1781.

Among modern and nineteenth-century items presented by the Trustees are several useful illustrated works. Stupper's *Medicinisch-pharmaceutische Botanik*, Vienna, 1841, contains 120 coloured plates of medicinal plants included in the Austrian pharmacopoeia. Dupuis and Reveil's *Flore Médicale usuelle et industrielle du XIXe siècle*, ed. Lanessan, Paris [s.a.] is a useful work of reference containing 150 coloured plates. The set of Bonnier's *Flore complète de France Suisse et Belgique* presented by the Trustees in 1933 is now completed by the gift of the twelfth volume, comprising the Gramineae, Gymnospermae and Pteridophyta.

Barbazita's paper, *Saggio della flora Lucana*, Naples, 1847, contains the original description of *Seseli lucanum*. Hoehne's *Monographia das Asclepiadaceas Brasileiras*, fasc. I–II, Rio de Janeiro, 1916, deals with the genera *Oxypetalum* and *Calostigma*, and is illustrated by 58 photographic reproductions and 16 plates showing floral analyses.

Seyffert's *Dictionary of Classical Antiquities* ed. Nettleship and Sandys, London, 1894, includes a considerable amount of information regarding the daily life of the Greeks and Romans. Hartmann's *L'Agriculture dans l'Ancienne Egypte*, Paris, 1923, is illustrated by 76 figures, mostly reproductions from the ancient tombs, and has full bibliographical references. Fournier's *Voyages et Découvertes Scientifiques des Missionaires naturalistes français*, Paris, 1932, includes accounts of botanical collectors such as Bodinier, Cavalerie, David, Delavay, Esquirol, Farges, Faurie, Huc, Perny and Soulier. Massart's *Une Mission biologique belge au Brésil* contains an ecological account of the Lower Amazons region illustrated by 681 figures of vegetation and individual plants. The *Mémoires de la Société de Biogéographie* I–IV include essays on the origin of the present floras and faunas of I. Corsica, II. High Mountains, III. British Isles, IV. Pacific Isles.

The Library is also indebted to the Bentham-Moxon Trustees for the continuation of various periodicals received in exchange for Hooker's Icones Plantarum.

The trustees of the British Museum have presented the following works:—*Catalogue of the books, manuscripts, maps and drawings in the British Museum (Natural History), vol. vii, supplement, J–O*, 1933, *Catalogue of the works of Linnaeus*, by B. H. Soulsby, 1933, and the *London Clay flora*, by Eleanor M. Reid and Marjorie E. Chandler, 1933.

Lieut. Col. Sir. David Prain has sent the continuation of various periodicals, in addition to numerous pamphlets, as in other years.

From the Royal Horticultural Society has come its *Lily Year Book* (no. 3) for 1934.

The Rhododendron Association has presented its *Year Book*, with *Supplement*, 1934.

Some further publications, and a collection of portraits of botanists, have come from the estate of the late Dr. O. Stapf.

The New York Botanical Garden continues to send *Addisonia* and *Brittonia*, among other publications.

Volumes I and II of the *Flora U.R.S.S.* and other works have been given by the Botanical Institute of the Academy of Sciences, Leningrad.

The following books have been received from their publishers for review in the Kew Bulletin:—Cambridge University Press:—Agnes Arber, *The Gramineae*; Jonathan Cape:—Edith Grey Wheelwright, *The physick garden*; J. Duculot:—A. Barbey, *Une relique de la sapinière mediterranéenne le Mont Babor*; Messrs. Macmillan:—J. Hutchinson, *Families of flowering plants, vol. II, Monocotyledons*, and A. B. Stout, *Daylilies*; National Museum of Wales:—H. A. Hyde, and A. E. Wade, *Welsh flowering plants*; The Pharmaceutical Society:—*British Pharmaceutical Codex*, 1934 (2 copies); University of Michigan Press:—L. E. Wehmeyer, *The genus Diaporthe*.

The Editor of Nature has presented the following: Barbara Briggs, *Some other friendly trees*; H. F. Chow, *The familiar trees of Hopei*; W. G. Craib, *Florae siamensis enumeratio*, vol. ii, pt. 2; A. Guillaumin, *Les fleurs des jardins*; A. Howard, *A manual of the timbers of the world*, ed. 2.; J. W. Moll, *Phytography as a fine art*.

The following important works were in most cases presented by their authors: C. A. Backer, *Onkruidflora der Javasche suikerrietgronden*, Afl. 1 and 2, and Atlas, Afl. 1–5; (from Mrs. Muir); L. H. Bailey, *Gentes herbarum*, vol. iii, fasc. 4 and 5; H. C. Bastian, *The origin of life* (from Mr. F. Ballard); Mrs. H. M. L. Bolus, *Notes on Mesembrianthemum and allied genera*, pt. 2, pp. 417–472 (3 copies); I. H. Burkill, *Tours* (several volumes); Crevost, *Catalogue des produits de l'Indochine*, tome v, fasc. 1 (from Dr. A. F. G. Kerr); J. Burtt Davy, *A manual of the flowering plants and ferns of the Transvaal with Swaziland*, pt. II; O. Degener, *Flora hawaiiensis*, 76 ff.; R. E. Fries, *Revision der Arten einiger Anonaceen—Gattungen*, pt. III; *Hand-list of Irish plants* ed. 3, 1934 (from National Museum of Ireland); L. Hauman, *Catalogue des Pteridophytes et Phanérogams de la flore belge*; P. Herring (1) *Danske roser*, (2) *Studier i rosens kulturhistorie* and (3) *François Crepin*; B. P. G. Hochreutiner, *Plantae Hochreutineranae*, fasc. II and III; R. E. Holttum, and C. Christensen, *The ferns of Mount Kinabalu*; J. Hutchinson, *Families of flowering plants, vol. II, Monocotyledons*; H. H. Janssonius, *Mikrographie des Holzes, der auf Java vorkommenden Baumgarten*, Lfg. 11; J. de la Quintinye, *Instructions pour les jardins fruitiers et potagers, etc.* ed. 3, 1697 (from Mr. H. N. Ridley); A. Lemée, *Dictionnaire descriptif et synonymique des genres de plantes phanérogames*,

:ome V ; J. M. Macfarlane, *The evolution and distribution of flowering plants*, vol. i ; M. Magalon, *Contribution à l'étude des palmiers de l'Indochine* (from Dr. A. F. G. Kerr) ; R. C. Marshall, *Trees of Trinidad and Tobago* ; Isa H. Martin, *Field Club flora of the Lothians* (from the Edinburgh Natural History Society) ; H. Moldenke, *Monograph of the genus Aegiphila*, and *Flora of Watchung, N.J.*; S. Murbeck, *Monographie der Gattung Verbascum* ; T. Nakai, *Flora sylvatica Koreana*, pars. xx, 1933 (from Forest Experiment Station, Government General of Chosen) ; J. A. Nannfeldt, *Studien über die Morphologie und Systematik der nicht lichenisierten inoperculaten Discomyceten* ; R. Pampanini, *Aggiunti alla Flora del Caracorum* ; J. Prokhanov, *Conspectus systematicus Tithymalorum Asiae Mediae* (from I. S. Prokhanoff) ; A. Pulle, *Flora of Surinam*, 4 parts (from K. Ver. Koloniaal Instituut, Amsterdam) ; H. N. Ridley, A number of scarce papers on arrow poisons ; J. T. Roig y Mesa, *Diccionario botanico de nombres vulgares cubanos* (from Mr. C. Jinarajadasa) ; K. Sawada, *Descriptive catalogue of the Formosan fungi*, pts., II–IV and VI (from the Department of Agriculture, Govt. Research Institute, Taihoku, Formosa) ; E. Silva Tarouca and C. Schneider, *Unsere Freiland-Laubgehölze*, ed. 3, 1931 (from Mr. W. J. Bean) ; E. E. Stanford, *Economic plants* (from Mrs. Grieve) ; N. Stoyanoff, and B. Stefanoff, *Flora of Bulgaria*, new ed., 1933 (from University Library, Sofia) ; G. Taylor, *The genus Meconopsis* ; R. J. Thornton, *British flora*, 5 vols. (from Mr. W. H. Mason) ; H. Weimarck, *Monograph of the genus Cliffortia* ; R. O. Williams, *Flora of Trinidad and Tobago*, vol. i, pts. 1–6, vol. ii, pt. 1 (from Department of Agriculture, Trinidad and Tobago) ; C. A. Zenkert, *Flora of the Niagara frontier region.*

The following are the periodicals, additional to those recorded in recent Reviews, which have been presented by the editors, societies or institutions issuing them, unless otherwise stated : *Anais do Instituto Superior de Agronomia*, vol. vi, fasc. 1 ; *Annales de la Société Linnéenne de Lyon*, tome lxxvii ; *Annals of the Agricultural Experiment Station, Government-General of Chosen*, vol. vii, no. 3 ; *Arbeiten der Mittelasiatischen wissenschaftlichen Versuchsstation*, etc., L. I; *Bericht über das Geobotanische Forschungsinstitut Rübel*, 1933 ; *Boletim do Ministerio da Agricultura, Rio de Janeiro*, Ano xxi, no. 2, and Ano xxii ; *Boletin de Pro-Cultura Regional S.C.L.* nos. 28, 29, and 33–37 ; *Boletin de la Sociedad de Historia Natural*, tome xxxiv, nos. 2–7 ; *Bothalia*, vol. ii, pt. 2 ; *British Fern Gazette*, vol. vi, nos. 7–10 (From Mr. C. H. Wright) ; *Bulletin Forestier Polonais nos.* 1–2 ; *Bulletin of the Government Botanical Garden, Nikita, Yalta*, nos. 11–15 ; *Bulletin of the Hemlock Arboretum*, nos. 7–8 ; *Bulletin of the Indian Lac Research Institute*, nos. 16–21 ; *Bulletin of the School of Forestry, Yale University*. no. 38 ; *Bulletin de la Société Francaise de Microscopie*, vol. i, no. 1 ; *Bulletin of the Tea Research Institute of Ceylon*, no. 11 ; *Carnegie Institution of Washington, Publication No.* 450 ; *Contributions of the Council for Scientific and Industrial Research, Commonwealth of Australia*, nos. 2–15, 22–29, and 31–33 ; *Contributions from the Institute of*

Botany, National Academy of Peiping, vol. ii, nos. 5–7 ; *Contributions from the Museum of Palaeontology, University of Michigan*, vol. iv, nos. 6–12 ; *Contribution from the Phytopathological Laboratory, Taihoku Imperial University*, nos. 1–12 ; *Contributions from the United States National Herbarium*, vol. xxvi, pt. 7 ; *Journal of the Imperial Fisheries Institute, Tokyo*, vol. xxv, no. 2, and vol. xxix, no. 2 ; *Journal of the Society of Tropical Agriculture*, vol. v, no. 4 and vol. vi, nos. 1 and 2 ; *Malayan Orchid Review*, vol. ii, no. 1 ; *Mededeelingen van het Botanisch Museum en Herbarium van de Rijks Universiteit te Utrecht*, nos. 10–14 ; *Mededeelingen van het Phytopathologisch Laboratorium " Willie Commelin Scholten "* xiii ; *Mémoires de la Société d'Histoire Naturelle de l'Afrique du Nord*, nos. 2–5 ; *Memoir, Botanical Survey of South Africa*, no. 7 ; *Memoranda do Jardim Colonial de Lisboa* lxxii–lxxviii ; *Memorias de la Sociedad Española de Historia Natural*, tome xiv, Mem. 5a ; *Orchidologia Zeylanica*, vol. i, nos. 1–3 ; *Oxford Forestry Memoirs*, no. 17 ; *Proceedings of the Dorset Natural History and Antiquarian Field Club*, vol. xxvi. and xxxv–xxxvii (from Mr. H. J. Goddard) ; *Proceedings of the Isle of Wight Natural History and Archaeological Society*, vol. ii, pt. iv ; *Publicaties van de Zuiderzeecommissie*, nos. 1–25 (from Dr. J. M. Sirks) ; *Publicationes Instituti Botanici Universitatis Jagellonicae Cracoviensis*, nos. 1–8 ; *Publications de l'Institut de Botanique Systematique, Université de Varsovie*, nos. 31–38 ; *Queensland Naturalist*, vol. ix, nos. 1–3 ; *Report of the British Association for the Advancement of Science* 1933 (from Miss E. M. Wakefield) ; *Revista Española de Biologia.*, tom. ii and iii (nos. 1 and 2) ; *Revue Agrologique et Botanique du Kivu*, nos. 5–7 ; *Science Reports of the Tokyo Bunrika Daigaku, Sect. B.* nos. 15–27 ; *South Australian Naturalist*, vol. xv, nos. 1–4 : *Studies from the Tokugawa Institute*, vol. iii, no. 1 : *Transactions of the Hertfordshire Natural History Society and Field Club*, vol. xix, pt. iv ; *Year Book of the Massachusetts Horticultural Society*, 1934.

As in former years many publications have been received from the Imperial Economic Committee, the Imperial Agricultural Bureaux, and from many agricultural, botanical, and forestry departments and institutions, at home, in the overseas Empire, and in foreign countries.

A large number of botanical papers reprinted from periodicals have also been received from their authors.

The Ordnance Survey Office, Southampton has continued to send maps of its new fifth (relief) edition, as they are issued. Further maps have also been presented by the War Office.

Mr. J. D. Snowden's work on the classification of the cultivated races of Grain Sorghums was completed during the year, and a paper describing the new types has been prepared for publication in the Kew Bulletin. A more comprehensive account, dealing with all the collections received at Kew during recent years supplemented by specimens from various European herbaria, is ready for the press.

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