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ROYAL BOTANIC GARDENS, KEW

BULLETIN OF
MISCELLANEOUS
INFORMATION

1931

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BULLETIN OF MISCELLANEOUS INFORMATION

No. 1 1931

ROYAL BOTANIC GARDENS, KEW

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

F. BOERGENSEN.

The present paper deals with some new or interesting *Rhodophyceae* selected from my collection of Marine Algae made in India during my stay there in the winter 1927-8. Most of the species mentioned originate from the very interesting algal locality at Dwarka, at the entrance to the Gulf of Cutch, where a rich algal vegetation covers the rocky shore and the bottom of the rock pools. A fine sublittoral algal vegetation is, I feel sure, also present. I tried on one occasion to dredge, but it was difficult because of the turbulent sea and even more so owing to the available boats being too large and heavy.

At Okha Port, about 20 miles north of Dwarka, a very rich sublittoral algal flora was found. One day, on visiting this place, I found algae cast ashore quite fresh and lying scattered in immense quantities upon the sloping sandy beach and evenly spread out, so that it was an easy task to collect.

For some time I had my headquarters in Bombay, and some algae from here, and from Carwar near the southern limit of the Presidency, are included.

In addition to the above, reference is made to a few algae from Karachi. I had, unfortunately, no opportunity to visit this locality which, as regards algae, seems to be very interesting. The Director of the Royal Botanic Gardens, Kew, has, however, given me the privilege of examining a large collection from this place, mostly gathered by Vice-Admiral W. J. S. Pullen about 1860 and by James A. Murray in the years 1880-1883. Mr. K. G. Naik, of D. J. Sind College, Karachi, has, moreover, most kindly presented me with a collection of various algae from this locality, preserved in spirit.

Apart from papers on Ceylon algae, it is many years since a paper of any significance was published on Indian seaweeds, and unfortunately most of the published MS. lists available in herbaria are based on scrappy or non-characteristic material collected on odd occasions, usually by persons who were not algologists. Many of the names listed are, in the light of modern knowledge, quite erroneous, and there is indeed at the moment very little definite information as to what algae (apart from cosmopolitan species) actually occur on the shores of the Presidency of Bombay and in the Arabian Sea. References to such published lists as exist will be found

in a paper by Prof. M. O. P. Iyenger entitled "Algal Work in India" (Proceedings of the Fifteenth Indian Science Congress, 1929, p. 207). It is hoped that this communication and others which may be published in the *Kew Bulletin* and elsewhere will assist in laying the foundation of a more correct knowledge of the marine flora of this interesting region.

It is early to make general observations based upon my collections, but there is one interesting fact which I wish even at this stage to point out, namely, that in the collections of algae from the north end of the Arabian Sea (viz., Dwarka, Okha Port, and Karachi) several species are found which are the same as (or if not, very closely related to) species from Australia. In the hot belt between these two localities these species appear to be wanting.

To the Director of the Royal Botanic Gardens, Kew, I am greatly indebted for having afforded me facilities for publication in the *Kew Bulletin*, and I have also to thank Mr. A. D. Cotton for his valuable help. The type specimens of new species described in this paper are preserved in the Botanical Museum, Copenhagen.

BANGIACEAE.

Erythrocladia subintegra Rosenvinge Mar. Alg. Denm., i. 73, figs. 13-14. Boergs. Mar. Alg. D.W.I. ii. 7, figs. 3-4.

Several discs of an alga which I think is referable to this species were found. The young plants are regularly formed and agree well with my figures (*l.c.*, 3 *a* and *b*). The older thalli are more irregular, having a very uneven margin. The largest discs seen were only about 8 μ broad. The peripheral, cylindrical, often forked cells are about 3 μ thick. The shorter, oblong or more irregular formed cells are a little broader in the middle. In some of the specimens sporangia were present.

INDIA : Carwar. On *Padina tetrastrumica* near low water mark.
Distr. Danish Waters, West Indies, Macassar.

HELMINTHOCLADIACEAE.

Acrochaetium crassipes Boergs. Mar. Alg. D.W.I. ii. 20, figs. 11-12. *Chantransia crassipes* Boergs. in Bot. Tidsskr. xxx. 1 (1909).

var. **typica** Boergs., *l.c.*

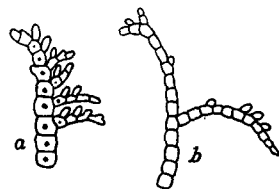


Fig. 1. *Acrochaetium crassipes* Boergs. ($\times 250$).

Of this epiphyte I found a few specimens growing upon *Heterosiphonia Muellieri* and *Polysiphonia ferulacea*. The specimens on the former (fig. 1*a*) reached a height of about 65 μ ; the basal cells had a

diameter of 10-11 μ , the branches tapering gradually upwards to 5-6 μ . The sporangia were 8-9 μ long and 5-6 μ broad. No hairs were present. Each cell had a large central pyrenoid, but the shape of the chromatophore could not be seen.

The specimens upon *P. ferulacea* (fig. 1*b*) were more slender. The thallus reached a height of 80 μ and the filaments had a diameter of 6-7 μ at their base and 5-6 μ at the summit.

The plant was originally described and known only from the West Indies, but an *Acrochaetium* referred to the nearly related *A. catenulatum* Howe has been found by Mme. Weber at Macassar (Algues du Siboga, p. 193).

INDIA : Dwarka, epiphytic on Florideae.

Liagora ceranoides Lamx. Hist. Polyp. corall. flex. 239 (1816). Howe, Algae, in Britton and Millspaugh, The Bahama Flora, 555 (1920). Boergs. Mar. Alg. Canary Isl. iii. Rhodophyceae, Part i. 58. *L. pulverulenta* Ag. Spec. Alg. i. 396. Boergs. Mar. Alg. D.W.I. ii. 80, figs. 87-92. *L. leprosa* J. Ag., Alg. Liebm. 8.

The Indian specimens appear to agree with those from the West Indies and Canary Islands and with my figures quoted above.

The cells of the assimilating filaments are narrow almost cylindrical below, shorter and broader upwards and nearly globular at the periphery. The rather vigorous carpogonial branch is developed on one of the uppermost cylindrical cells and is provided with a very long thin trichogyne. The cystocarps agree with my figure 90*d*. Long hairs like those found in the West Indian plant (fig. 92*c*) were common. Female plants only were found.

INDIA : Dwarka, in rock pools near low water mark.

Distr. West Indies, Canary Islands, Red Sea, Dutch East Indies, etc.

Galaxaura oblongata Lamx. Hist. corall. 262. Boergs. Mar. Alg. Canary Isl. iii. Rhodophyceae, Part i. 71 (full synonymy). *Corallina oblongata* Ellis et Solander, Nat. Hist. Zoophytes 114, tab. 22, fig. 1.

After having compared the Indian specimens with my Canary and West Indian material I have come to the conclusion that it is impossible to separate the former from those of the Atlantic Ocean. In the Indian specimens the segments are about 1-1.25 mm. (up to 2 mm.) broad, thus approaching the broad form found in the Canary Islands. The length of the segments is about 0.5-0.75 cm. rarely more, thus agreeing well with the Canary specimens. The anatomical structure of the thallus also agrees. The surface cells have a diameter of about 12-14 μ and the innermost and largest cells of the short assimilating dichotomous filaments below measure 30 μ in breadth. All the specimens seen were sexual.

It will be noted that the specimens with the thickest thallus reach the breadth which Kjellman records for *Galaxaura Schimperi* Dcne., a plant of which I have seen no authentic specimens. According to Kjellman's description [Kgl. Svenska Vet.-Akad. Handl.

xxxiii. 61 (1900)] and figures, I have, however, no hesitation in referring this species also to *Galaxaura oblongata*.

A bleached specimen in the Kew Herbarium, gathered by J. A. Murray at Karachi, and named *G. annulata*, is referable to the present species.

INDIA : Dwarka, in deep rock-pools, Karachi, J. A. Murray.

Distr. West Indies, Canary Islands, Mediterranean Sea, Red Sea, Indian Ocean, Japan.

Scinaia indica Boergs., sp. nov. ; a *Scinaia moniliformi* J. Ag., facie persimili, articulis subovalibus, axi centrali obscuro, utriculis angustioribus inter alia recedit.

Frons atropurpurea, cylindrica, identidem furcata et regulariter articulata, constricta, circiter 17 cm. alta et ultra, articulis magnitudinis variabilis, ovalibus paene subcylindricis, 4-5 mm. latis, 5-15 mm. longis, cystocarpis dispersis oculo nudo visibilibus. *Axis* centralis obscurus. *Utriculi* longi et angusti, 40-45 μ longi, 17-21 μ lati, cellulis epidermidis globosis pyriformibus, circiter 16 μ latis, coloratis. *Cystocarpia* globosa-pyriformia, circiter 250 μ lata.

INDIA : Dwarka, dredged at a depth of about 10 metres ; Okha Port, cast ashore. Boergesen 5479 (type).

Plant when fresh, red ; when dried, in the lowermost part black-red, paler red upwards, about 17 cm. high, repeatedly and regularly forked and very regularly deeply constricted (Plate I. fig. 1). Joints

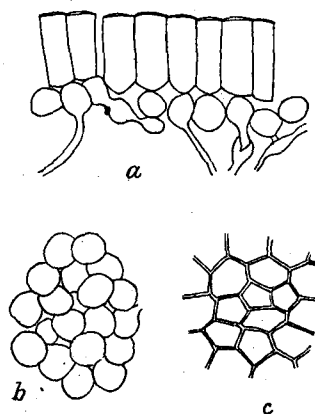
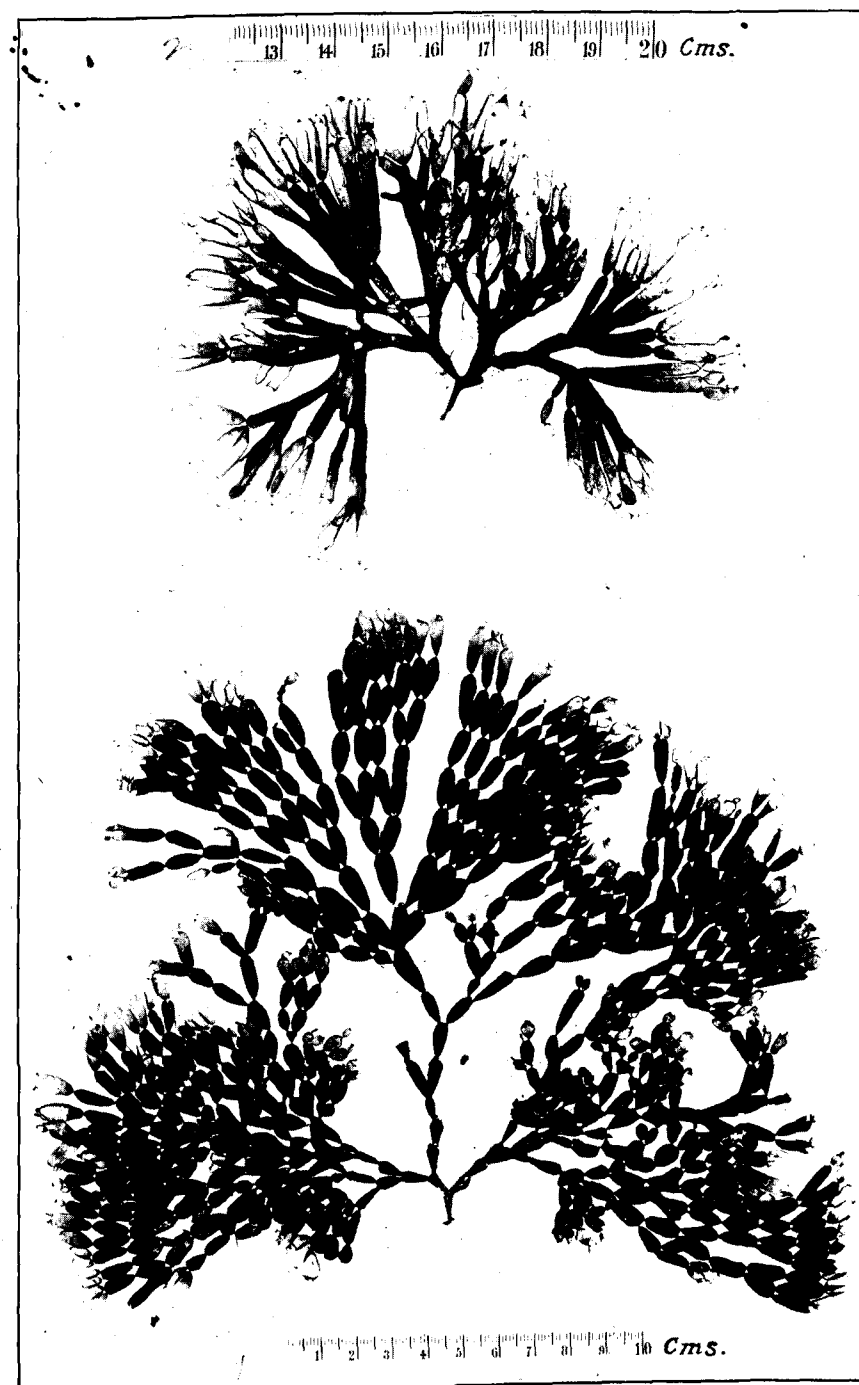


Fig. 2. *Scinaia indica* Boergs. a, transverse section of thallus ; b, coloured, subepidermal cells seen from above ; c, peripheral cells seen from above. ($\times 265$).

of variable size : in living specimens (or in spirit-material made turgescient with water) some subcylindrical with broader rounded apex and attenuated base up to about 15 mm. long and 4-5 mm. broad, others shorter oblong-oval or almost as long as broad, 5-6 mm. long and 4-5 mm. broad. In dried material the joints become broader (up to 6 mm.), broadly rounded above, less so below. The cystocarps are scattered over the surface of the joints. The

PLATE I



Lower, Fig. 1. *Scinaia indica* Boergs.
Upper, Fig. 2. *Scinaia Hatei* Boergs.

peripheral colourless cells (Fig. 2a) are about 40–45 μ long and 17–19 μ rarely up to 21 μ broad; seen from above their outline is polygonal (Fig. 2c). Between these a few narrow coloured cells are present. The assimilating cells below are nearly globular (Fig. 2a, b) or shortly pyriform, about 16 μ broad. They form a rather dense layer. To these cells the colourless filaments composed of long cylindrical cells are attached, traversing the mucilage-filled cavity in the middle of the joints. The axial strand is not visible in dried material or in material preserved in spirit except quite near the constrictions, where the filaments approximate closely and form a visible axis. The filaments are very variable in breadth, being from 2 μ to 12 μ thick. The cystocarps, which were found in January, are roundish pyriform about 250 μ broad.

This new species comes near to the Australian *S. moniliformis* J. Ag. but shows nevertheless essential differences. We have in the Botanical Museum of Copenhagen a specimen of the Australian plant collected by J. Bracebridge Wilson at Port Phillip Heads—the same collector and the same locality as those of J. Agardh's type. This species differs from *S. indica* in the presence of a very clearly visible axial strand running throughout the plant, and in the shape of the joints which are more angular and almost cuneate. The epidermal cells are moreover almost square in the Australian plant (compare Setchell, The *Scinaia* Assemblage, p. 105, pl. xii. fig. 32). Finally, the Indian plant seems to be larger, more ramified, and on the whole a stouter and more firmly built plant, and this, coupled with its distinct geographical distribution, warrants its being considered as a distinct and new species.

Scinaia Hatei* Boergs., sp. nov.; *Scinaiae articulatae* Setch. proxima, quae tamen thallo magis regulariter constricto, axi centrali conspicuo, utriculis latioribus et brevioribus a specie nostra distincta est.

Frons roseo-rubra, cylindrica, circiter 9 cm. alta, 2–5 mm. lata, identidem furcata et dichotomo-fastigiata, hic illic ad basim furcationis constricta. *Rami* inferne plus minus leviter attenuati. *Axis* centralis obscurus. *Utriculi* circiter 23 μ lati, 31 μ longi; cellulis epidermidis pyriformibus, circiter 13 μ latis 23 μ longis, coloratis. *Cystocarpia* oculo nudo visibilia, globoso-pyriformia, circiter 265 μ lata.

INDIA: Dwarka, in rock pools near low water mark, Boergesen 5391. Okha Port, cast ashore, Boergesen 5484 (type). Karachi, W. J. S. Pullen (Herb. Kew.).

The colour of the plant (Plate I. fig. 2) is deep rose. The tallest specimens collected reached a height of 9 cm. The cylindrical thallus is from 2 to 5 mm. thick and is repeatedly forked and generally but not always constricted at the joints (Fig. 3). The segments are

* Named in honour of Professor Vinayak N. Hate of Wilson College, Bombay, whose great interest in the algological investigation of India made it possible for me to go to India and collect during the winter 1927–28.

elongated, cylindrical, of variable size, as often no constrictions are present at their base; as a rule they taper a little below, and are broadly rounded or somewhat emarginate at their upper ends. The axial strand is not visible in dried specimens, but is clearly seen in spirit-material.

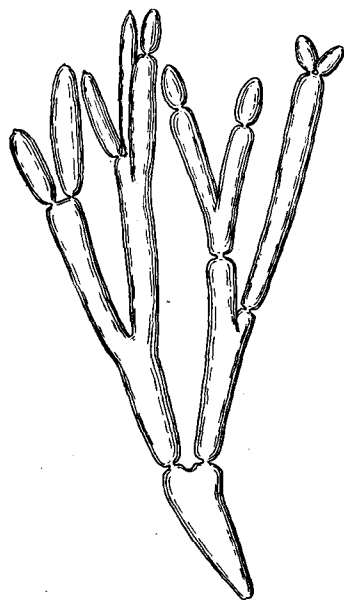


Fig. 3. *Scinaia Hatei* Boergs. Part of thallus ($\times 1\frac{1}{2}$).

The colourless epidermal cells (Fig. 4a) are flattened above, rather broad, about $23\ \mu$ broad and $31\ \mu$ long, seen from above 5-6-sided (Fig. 4b). Narrow coloured cells occur scattered among the colourless ones and some of these have antheridia.* The assimilating cells (Fig. 4c) are pyriform, about $13\ \mu$ broad and $23\ \mu$ long, as a rule forming only a single layer, rather loosely packed. The axial strand is about $230\ \mu$ thick and composed of thin filaments densely woven together. Most of the filaments are $3-4\ \mu$ broad; they consist of long cylindrical cells occasionally forked. The cavity in the middle of the joints is filled with mucilage, through which the filaments run in all directions and connect with the cells of the cortical layer. The cystocarps are roundish-pyriform, about $285\ \mu$ long and $265\ \mu$ broad.

S. Hatei was found in two forms, a slender one (gathered at Dwarka) the thallus of which only reached a breadth of about 1.5-3 mm., and one from Okha Port more robust and stout with a thallus measuring 3-5 mm. in breadth.

* Compare Svedelius, N., Zytologisch-entwicklungsgeschichtliche Studien über *Scinaia furcellata*. Ein Beitrag zur Frage der Reduktionsstellung der nicht tetrasporenbildenden Florideen. (Nova Acta Reg. Soc. Sci. Upsal. Ser. 4, iv.; Upsala, 1915).

In the collection of algae from the Kew Herbarium a fine specimen of this species is present, collected at Karachi in December, 1859, by W. J. S. Pullen.

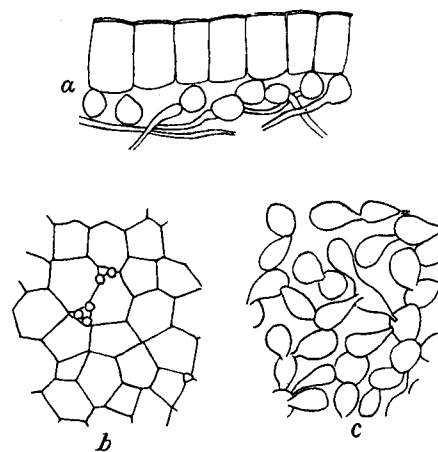


Fig. 4. *Scinaia Hatei* Boergs. a, transverse section of thallus; b, epidermal cells seen from above with antheridia; c, subepidermal assimilating filaments. ($\times 265$).

Scinaia Hatei is most nearly related to *S. articulata* Setchell (The *Scinaia* Assemblage, p. 109, plate xiii. figs. 39, 40). This species differs from our plant in the more regularly constricted thallus, the segments being usually a little narrowed near their upper ends, the axial strand being visible in dried specimens, and the utricles being broader and shorter.

Helminthocladia australis Harvey, Phycologia australica v. tab. 272. J. Agardh, Epicr. 506; Till Algeries System. xi. 39. De Toni, Syll. Alg. iv. 83. Okamura, Icones of Japanese Algae iv. tab. 156 (figura sinistra).

Two specimens of this plant were found, neither being attached to its substratum. One of these closely resembles Harvey's figure quoted above. The main stem when dried is about 3 mm. thick, and the branches about 2 mm., slightly attenuated at the base, and some of them branched as Harvey shows, but mostly simple. The other specimen has a thicker main stem, and is proliferous and very much branched, thus coming near to the plant figured by Okamura. The species is certainly very closely related to (if not identical with) *H. purpurea*, as pointed out by Harvey himself and later by Okamura.

The anatomical structure seems to agree with that of *H. purpurea* as described by L. Kolderup Rosenvinge (Mar. Alg. Denm. i. 47). According to Rosenvinge that species is monoecious, but the specimens of *H. australis* examined by me have shown only female organs.

INDIA: Okha Port, cast ashore.

Distr. Australia, Japan.

SPHAEROCOCCACEAE.

Chrysymenia Uvaria (L.) J. Ag. Alg. mar. Mediterr. et Adriat. 106; Epicr. 324; Florideenes Morphologi, tab. xvi. figs. 20-22. Harvey, Nereis Bor.-Am. ii. 191, tab. xx. B., figs. 1-3. Boergs. Mar. Alg. D.W.I. ii. 402, fig. 38. P. Kuckuck, Untersuchungen über *Chrysymenia* p. 214, tab. 13, figs. 14-15. *Fucus Uvarius* L. Syst. Nat. ii. 714 (1767). *Gastroclonium Uvaria* Kütz. Spec. Alg. 865; Tab. Phycol. xv. tab. 97.

forma **luxurians** Boergs., n.f. (Plate II. fig. 1).

The Indian plant far surpasses in size and luxuriance of the vesicles all other forms I have seen of this variable plant. While *Chrysymenia Uvaria* in the Mediterranean Sea is a small plant rarely exceeding, according to Kuckuck, 5-6 cm. in length, and the West Indian material reaches a length of about 20 cm., the Indian plant is often as much as 50 cm. long. It is very much branched and the branches are densely covered with the vesicles. Most of these are small, only 1-2 mm. broad, but they vary from 1 to 4 or 5 mm.

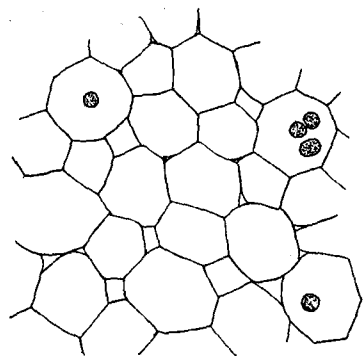


Fig. 5. *Chrysymenia Uvaria* (L.) J. Ag. Cells facing the cavity, some with gland-cells. ($\times 144$).

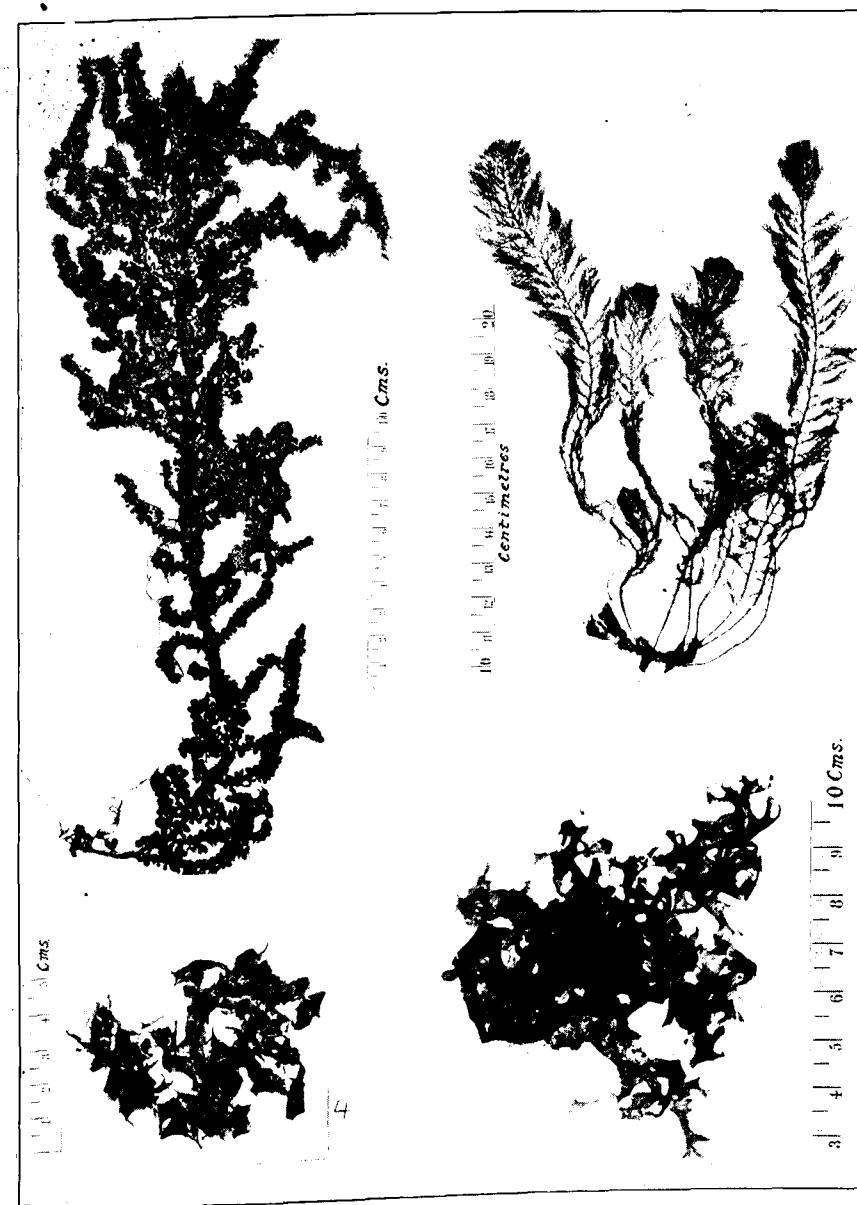
The anatomy agrees well with that of the West Indian specimens as described by me. Towards the cavity in the interior of the vesicles, some of the large cells bear here and there a globular gland-cell (Fig. 5). These are fairly regularly distributed. They are nearly always borne singly on each of the larger cells; very rarely two or three are found on the same cell. All the specimens gathered were sterile.

On account of its size I propose to call this stately plant f. *luxurians*.

INDIA: Dwarka, in the lowest part of the littoral zone or sublittoral. Karachi, J. A. Murray (Herb. Kew.).

Distr. Warmer part of Atlantic Ocean, Mediterranean Sea, Japan, Australia.

PLATE II



Upper Left, Fig. 1. *Chrysymenia Uvaria* J. Ag., f. *luxurians*.
Upper Right, Fig. 2. *Heterosiphonia Muellieri* De Toni.
Lower Right, Fig. 3. *Myriogramme okhaensis* Boergs.
Lower Left, Fig. 4. *Myriogramme bombayensis* Boergs.

Coelarthrum Muelleri (Sond.) Boergs., comb. nov. *Lomentaria* (*Gastroclonium*) *Muelleri* Sonder in Linnaea xxv. 693 (1852). *Chylocladia Muelleri* Harv. Phycol. austral. iii. tab. 138 (1860). *Lomentaria valida* Kütz. Tab. Phyc. xv. tab. 85 (1865). *Chylocladia* (?) *valida* (Kütz.) J. Ag. Till Algernes Systematik xi. 24 (1890). *Erythroclon Muelleri* (Sond.) J. Ag. Epicr. 302; Anal. Algal. Cont. iii. 91 (1896). De Toni Syll. Alg. iv. Sect. ii. 585. Okamura, Illustr. Mar. Alg. Japan, i. no. 4, tab. 16.

Before pointing out my reasons for referring this species to the genus *Coelarthrum*, I shall give a short description of the plant. I base this partly on some large specimens from Karachi from the Herbarium of the Royal Botanic Gardens, Kew, and partly on a fine specimen from the same locality which Mr. A. B. Kotwal, Karachi, has most kindly sent to me. As regards the anatomy I refer to a small piece of a plant which Mr. K. G. Naik, Sind College, Karachi, was good enough to give me.

The largest specimens seen reached a height of 25 cm. The thallus is jointed and fairly regularly di-trichotomously divided. The joints are hollow, whereas the short stem-like parts between the joints are solid. They are of variable size, oval cylindrical-cuneate, reaching a breadth of about 3-6 mm. and a length of from 0.5 cm. to 2.5 cm. The narrow part between the joints may reach a length of 2 mm., but as a rule it is quite short. Its breadth is about 0.5 mm.

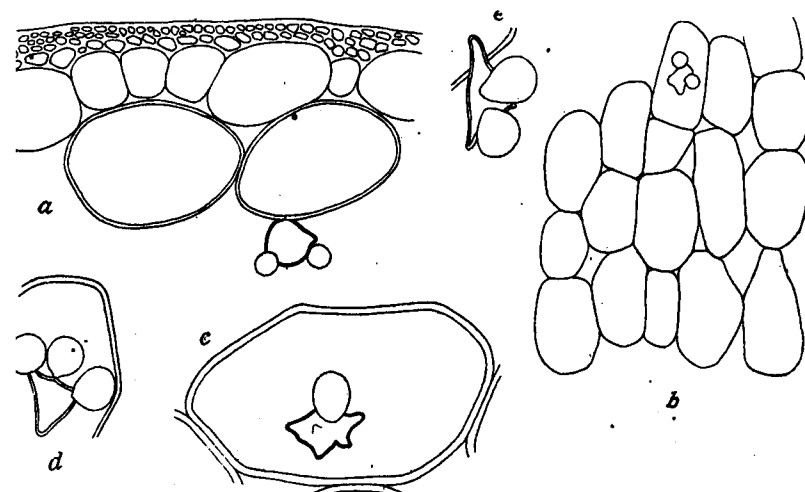


Fig. 6. *Coelarthrum Muelleri* (Sond.) Boergs. a, part of transverse section of thallus; b, the large cells seen from the cavity; c, d, e, large cells with stellate cells bearing gland cells. (a, c, d, e, $\times 144$; b, $\times 60$).

As to anatomical structure, a transverse section (Fig. 6a) of the hollow joints shows that the wall is composed on the inner side of large roundish cells. Seen from above these cells (Fig. 6b) are elong-polygonal, reaching a length of about 250 μ and a breadth

or about 200 μ . Above these some smaller roundish cells are found and these, at the periphery, are covered by a layer of cortical cells. The last mentioned are when seen from above roundish-polygonal and have a diameter of about 8 μ . Occasionally, towards the cavity in the interior of the joints, one of the large cells is provided with an irregularly stellate smaller cell upon which 1-3 globular or pyriform gland-cells are placed (Figs. 6a-e). As mentioned above, the narrow part of the thallus between the joints is solid. A longitudinal section (Fig. 7) shows that it is composed of parenchymatous tissue of longer narrow cells in the middle and small cells towards the periphery; it is formed very similarly to the solid stipe at the base of the vesicles of *Chrysomenia Uvaria* (compare Kuckuck, Beiträge zur Kenntnis der Meeresalgen 10-13, Fig. 5). The material in spirit was sterile, but one of the dried plants bore cystocarps which occur scattered over the surface of the thallus. Tetrasporic specimens I have not seen, but Okamura (*l.c.*) gives a figure of tetrasporangia and states that they occur densely scattered over the surface of the joints.

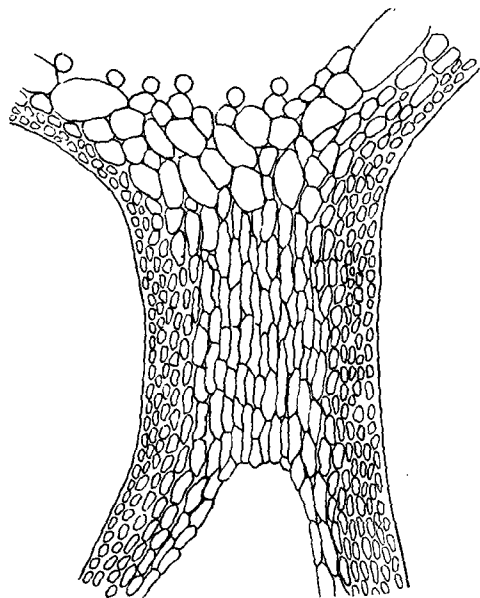


Fig. 7. *Coelarthrum Muelleri* (Sond.) Boergs. Longitudinal section of the narrow part of thallus between the joints. ($\times 69$).

It is obvious from this description that the thallus-structure of this plant is in agreement with that of *Coelarthrum Albertisii* (Picc.) Boergs. from the Atlantic Ocean except that, in the latter plant, the narrow portions between the joints are broader, and the joints (in the material I have examined) are separated by diaphragms composed of 1-2 layers of cells only, while in the Indian species the narrow part between the joints consists of a parenchymatic tissue.

In referring this plant to *Coelarthrum* I have had no authentic specimens of the Australian plant with which to compare it. But I think that it shows so much likeness to the published figures that no doubt is possible. Nevertheless, some differences between the two are present, namely the more marked monopodial ramification in the Australian plant (due to the fact that the ramification is most often trichotomous and the middle shoot becomes the most vigorous and continues the main axis) and the numerous proliferations which grow out from both sides of the thallus. The Japanese form, as figured and described by Okamura, shows marked main branches and numerous proliferal branches, and has more cylindrical and longer joints which reach a length of more than 5 cm. (compare also Okamura's specimens, *Algae Exsicc. Jap.*, no. 65).

With regard to the removal of this species from the genus *Erythrocolon* J. Ag. to the genus *Coelarthrum* Boergs., I should point out the following facts. The name *Erythrocolon* was first proposed by J. Agardh (in Grunow, *Algen der Fidschi-, Tonga- und Samoa-Inseln*, 1874, p. 33) as a name for a "sectio" of *Chylocladia* comprising *Chylocladia podagrica* Harv. and *C. Cliftoni* Harv., these species being characterized by the presence of big lacunae in the peripheral small-celled tissue (compare figure of *C. Cliftoni* in Harvey, *Phyc. Austral.* tab. 57, fig. 3, to which J. Agardh refers). Later J. Agardh (*Epicr.* 302) adds *C. Muelleri* Sond. to this subgenus. In *Analecta Algologica*, Cont. iii., he raises *Erythrocolon* to generic rank, the characteristic species being the two above-mentioned species of Harvey's, and points out at the same time that *C. Muelleri* has a different structure. I am now able to show that this structure with the characteristic starlike cells provided with glands is typical of *Coelarthrum* and the natural place of *C. Muelleri* must certainly be in this genus.

In my paper, "Some new or little known West Indian Florideae" (Part ii. 191-2), I have mentioned the genera related to *Coelarthrum* and the characters which distinguish them from it, which briefly stated are as follows. *Chrysomenia* differs in its ramification, its flattened non-constricted thallus, and the absence of stellate cells bearing gland cells. *Bindera* differs in the absence of diaphragms and by the tetrasporangia being placed in groups. *Champia*, *Lomentaria* and *Chylocladia* have characteristic longitudinal filaments running along the inner side of the joints, and it is upon these filaments that the gland cells are placed.

INDIA: Karachi, 1881, J. A. Murray (Herb. Kew.); A. B. Kotwal; L. Hare (Herb. Kew.); K. G. Naik.

Distr. Australia, Japan, India.

CERAMIAEAE.

Griffithsia tenuis C. Ag. Spec. Alg. ii. 131. J. Ag. Spec. Alg. ii. 84; *Epicr.* 70. Collins et Hervey, Alg. Bermuda 135, tab. vi. figs. 38-39. Boergs. Mar. Alg. D.W.I. ii. 462, fig. 423. *G. thyrsigera*

Askenasy, Forschungsreise "Gazelle," iv. Theil, Bot., 36, tab. ix. figs. 1 and 4. *Callithamnion tenue* Harvey, Nereis Bor.-Am., part iii. 130.

In a mixed collection of algae in spirit, tetrasporic specimens of this species were found. It is rather a robust form, the cells in the basal part of the filaments measuring up to $350\ \mu$ wide and those near the apex as much as $150\ \mu$ thick. As is stated by Askenasy (*l.c.*; compare also Boergs. *l.c.* fig. 423), the branches are not given off from the upper end of the cells but near their basal transverse walls. In the Indian plant adventitious filaments are often found issuing from the older cells and these filaments occur near their proximal end.

The ring of pedicellate tetrasporangia consists of from 8 to 16 (or even more) sporangia. The pear-shaped or clavate pedicel is about $140\ \mu$ long and about $70\ \mu$ broad above and half as broad at the base. A two-celled pedicel was once noted. A tetrasporic plant was gathered in January and the tetraspores measure $80\text{--}100\ \mu$ in diameter.

INDIA: Dwarka, on exposed rocks near low water mark, tetrasporic; Okha Port, cast ashore.

***Monospora indica* Boergs., sp. nov.**; a *Monospora pedicellata* imprimis differt filamentis tenuioribus, monosporis sparsis, pedicellis monosporarum longioribus.

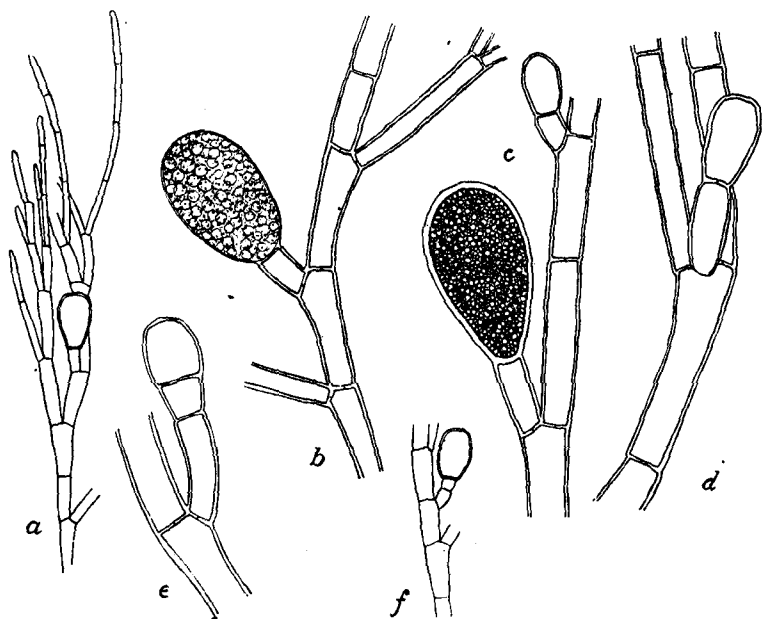


Fig. 8. *Monospora indica* Boergs. a, upper end of filaments with a monospore; b, c, d, parts of branches with monospores; e, a divided monospore; f, a monospore with two-celled pedicel. (a, f, $\times 60$; b, c, d, e, $\times 144$).

Frons erectiuscula, ramosa, dichotomo-decomposita. *Cellulae* cylindricae, in parte basali circiter 2 mm. longae et $50\text{--}80\ \mu$ latae, apicem versus gradatim breviores, in parte superiore $70\text{--}100\ \mu$ longae, et $12\ \mu$ latae. *Monosporangia* pedicellata, obovato-pyriformia, $70\text{--}80\ \mu$ lata et $100\text{--}150\ \mu$ longa.

INDIA: Bombay; Colaba, K. Gopal Iyenger (s.n.).

The plant, of which I have had material preserved in spirit, forms dense soft low tufts about 2 cm. high and as much across. Base not seen. The cells of the filaments are cylindrical near the base, very long (up to more than 2 mm.), while the breadth is only $50\text{--}80\ \mu$; higher up, the cells become suddenly shorter and near the upper ends are only 2-3 times as long as broad. Near the apex of the filaments the cells are again longer, their breadth here being about $12\ \mu$ and the length $70\text{--}100\ \mu$. The apices of the filaments are blunt.

The ramification is subdichotomous (Fig. 8a). Near the base, owing to the length of the cells, it is sparse, but as the cells become shorter it becomes more frequent and in the upper part is so rich that the system of branches presents a dense fastigate appearance.

Of reproductive organs monospores only were found (Fig. 8b, c). These occur in the upper part of the thallus, but at some distance from the apex, where the cells are proportionately short. In most cases they take the place of a branch (Fig. 8a, b, c), now and then as a third branch arising together with the two normally developed branches from the upper end of the cell (Fig. 8d).

The monospores are oval to pyriform in shape, about $70\text{--}80\ \mu$ broad and $100\text{--}150\ \mu$ long. They are apparently always pedicellate. The pedicels are mostly unicellular but are occasionally two-celled (Fig. 8f) or even three-celled. The length of the pedicel is variable, usually half or as long as the monospore but sometimes longer.

In rare cases the monospore is divided into two cells by a horizontal wall (Fig. 8e). This has also been noted in *M. pedicellata* several times by Schiller*, who terms the cells "bisporis" and points out that the pedicel in this species is more or less cup-shaped. In the Indian plant this is not the case: the wall dividing the spore from the pedicel may sometimes be a little curved, but usually it is horizontal.

In describing this plant as new I should point out that the descriptions of most of the species referred to this genus (see De Toni, Syll. Alg., vol. iv. pp. 1299-1303) are so poor and defective (e.g. without data as to size of different parts of the thalli) that without access to original material they are of little value. The present species may, therefore, if compared with original material of older species, prove not to be new, but I do not think it likely.

Monospora australis (Harv.) J. Ag. (Phyc. Austral. tab. 253) differs in the sessile monospores, whilst *M. ? lichenophora* (Harv.) De Toni and *M. ? Griffithsioides* (Sond.) De Toni figured by Harvey probably do not belong to this genus at all.

* Schiller, J., Über Bau, Entwicklung, Keimung und Bedeutung der Parasporien der Ceramiaeen (Oesterreich. bot. Zeitschr., 1913).

Halophlegma Duperreyi C. Montagne in Ann. sci. nat. sér. 2, xviii. 258, t. 18 (1842). Kütz. Spec. Alg. 672; Tab. Phyc. xii. tab. 62, figs. a-c. J. Ag. Spec. Alg. ii. 111; Epicr. 90. Weber van Bosse, Algues du Siboga, iii. 315.

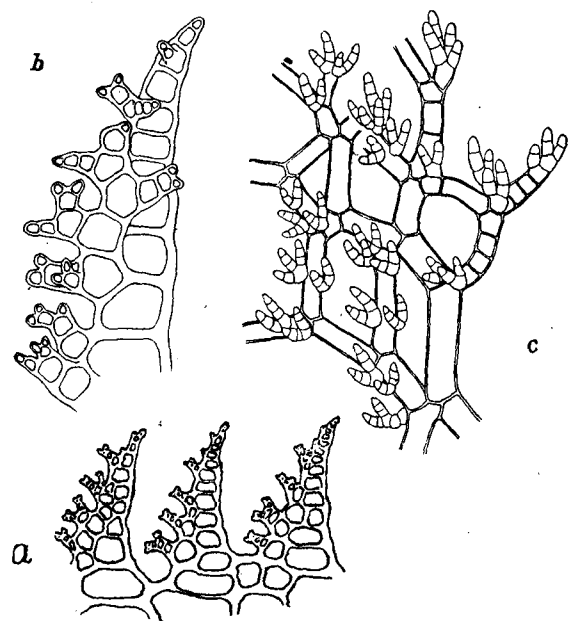


Fig. 9. *Halophlegma Duperreyi* Mont. a, margin of thallus ($\times 92$); b, free main axis of thallus ($\times 180$); c, piece of net dissected out ($\times 144$).

The figures prepared from a single drift specimen show the margin of the thallus (Fig. 9a), the free main axis more highly magnified (Fig. 9b), and a piece of net dissected out from the tissue (Fig. 9c). The peripheral short filaments forming the superficial layer are composed of from 2 to 3 cells about $12-13 \mu$ thick, and have broadly rounded apical cells (Fig. 9c).

Of the figures of *Halophlegma* by Kützing, those of *H. africanum* Kütz. (Tab. Phyc. vol. xii. tab. 63, figs. d, e, f) show perhaps most likeness to my plant. Madame Weber has examined a small piece of this plant found in Kützing's Herbarium, and she arrived at the conclusion that it seemed to be identical with *H. Duperreyi*.

INDIA: Okha Port, a sterile specimen cast ashore.

Distr. West Indies, E. Africa, Indian Ocean, etc.

Spyridia filamentosa (Wulf.) Harvey in Hooker, Brit. Flora ii. 336 (1833); Manual Brit. Alg. 101 (1841); Phyc. Brit. tab. 46. J. Ag. Spec. Alg. ii. 340; Epicr. 268. W.G. Farlow, Mar. Alg. New England 140, tab. x. fig. 1 and tab. xii. fig. 2 (1881). Boergs. Mar. Alg. D.W.I. ii. 233, figs. 222-226. De Toni, Syll. Alg., iv. 1427 (full

synonymy given). *Fucus filamentosus* Wulfen, Cryptog. aquatica in Roemer's Archiv. f. die Botanik iii. 63 (1803).

The Bombay specimens of this variable plant have short much-curved ramuli, which, especially in specimens from the open sea, were robust, reaching a length of only about 450μ (compare my figure, *l.c.*, fig. 223 b).

I also found the plant at Tuticorin (Madras); these specimens had longer ramuli which, in plants from more exposed localities, reached a length of about 650μ , and in those from more sheltered places a length of about $800-900 \mu$; these long ramuli were only about 35μ thick (compare my figure 223 a, b, c).

Tetrasporangia-bearing specimens were found in January at Bombay and at the end of February at Tuticorin.

INDIA: Bombay (in various localities); Tuticorin; Hare Island.

Distr. West. Indies, warmer parts of the Atlantic Ocean, Mediterranean Sea, Red Sea, Indian Ocean, etc.

Spyridia aculeata (Schimp.) Kütz. Phyc. gen. 377 (1843); Spec. Alg. 668 (1899); Tab. Phyc. xii. tab. 51, figs. a, b. J. Ag. Spec. Alg. ii. pars ii. 342; Epicr. 271. Harvey, Nereis Bor.-Am. part ii. 205 (1853). *Spyridia armata* Kütz. Tab. Phyc. xii. tab. 50, figs. c, d. *Spyridia Berkeleyana* Mont. in Exploration scientifique de l'Algérie, 141, tab. 15, fig. 6. *Ceramium aculeatum* Schimper in Unio itin., No. 966.

var. *inermis* Boergs. Mar. Alg. D.W.I. ii. 239, fig. 230.

The Indian specimens of this variety, which reach a length of 15 cm., agree well with the West Indian. The most characteristic feature lies in the absence of the hook-shaped spines found in the typical form. The ramuli run out into a long apical spine. They reach 1 mm. in length at their base and are about 60μ thick and taper gradually upwards. Their component cells are about as long as broad, or a little shorter at the base; higher up they are proportionately longer, up to about $1\frac{1}{2}$ times the breadth. The thallus is terete and corticated in the older parts. The branching is more or less markedly distichous, but not always quite regular, now and then a branch being placed between the otherwise distichously arranged ramuli. (Renewed examination of my West Indian plant showed a similar case.) No tendrils were found. The Indian plant growing in exposed situations showed a more robust thallus than the West Indian one. The feathery appearance of this species distinguishes it easily from *S. filamentosa*.

The occurrence of *S. aculeata* in the Indian Ocean is of interest as its hitherto most eastern locality was the Red Sea; elsewhere it is common in the West Indies and it is also found on the shores of Spain, Morocco and the Canary Islands. According to De Toni its occurrence in the Mediterranean Sea seems to be doubtful.

Tetrasporangia were found in January.

INDIA: Dwarka, lower part of littoral zone in a very exposed locality.

Distr. West Indies, southern Atlantic shores of Europe, Morocco, Canary Islands, Red Sea.

Polysiphonia ferulacea Suhr ms. in J. Agardh Spec. Alg. ii. pars iii. 980. Boergs. Mar. Alg. D.W.I. 277, figs. 277-280. *P. breviarticulata* Harv. Nereis Bor.-Am. ii. 36, tab. 16B.

The Indian material is very like Harvey's specimen of his Australian Algae, no. 185, preserved in the Botanical Museum at Copenhagen. This number is quoted by J. Agardh (*l.c.*) with a note of exclamation. But the Indian material is much larger and more robust, reaching a height of 16-17 cm. It has the dark brown-red colour of this species and when examined with a lens the pericentral cells are very easily seen. The filaments reach a breadth of 450 μ or even more. They have four pericentral cells and the trichoblasts with a $\frac{1}{4}$ divergence are well developed. The branches arise in the same position as the trichoblasts. No cortical layer is present.

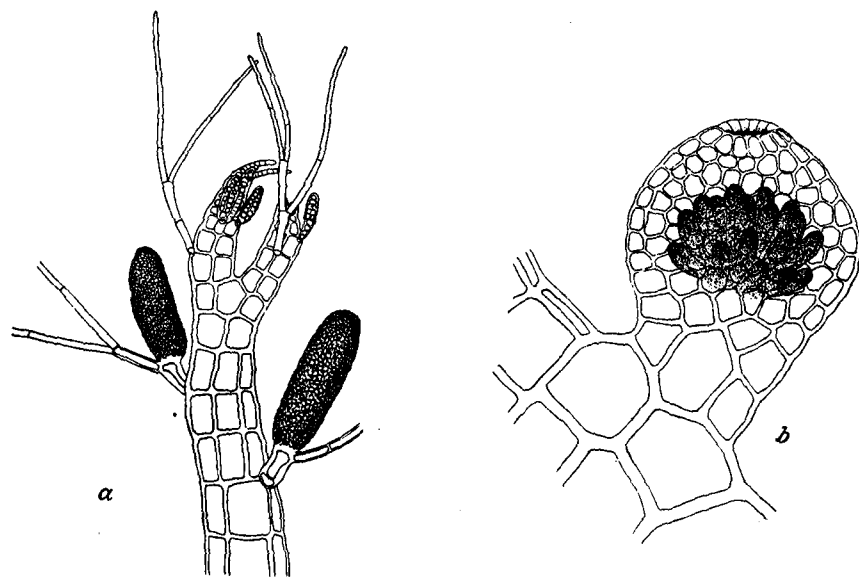


Fig. 10. *Polysiphonia ferulacea* J. Ag. a, apical end of filament with androphores; b, cystocarp (a, $\times 180$; b, $\times 140$).

All except a few small specimens were sterile. The tetrasporangia are formed in the end of the spirally arranged filaments, one in each segment. The antheridial stands (Fig. 10a) resemble my fig. 279 (*l.c.*) excepting that the sterile cells found at the apical end of the West Indian plant are lacking. The cystocarps (Fig. 10b) however, agree precisely. They are nearly spherical, up to about 400 μ long and 365 μ broad. Fertile plants were found in January.

Two specimens in the collection of algae from Karachi belonging to the Kew Herbarium are referable to this species. They were determined as "*Polysiphonia* near *P. utricularis* Zan." which, as stated by J. Agardh (Spec. Alg. ii. pars iii. 966), is referable to *P. ferulacea*.

INDIA: Dwarka, near low water on rocky exposed shores, dredged in 5 fathoms, also epiphytic upon *Codium*; Karachi, J. A. Murray (Herb. Kew.).

Roschera glomerulata (C. Ag.) Weber van Bosse Listes des Algues du Siboga, iii. Rhodophyceae 2, Ceramiales, 358. *Hutchinsia glomerulata* C. Ag. Spec. Alg. ii. 102. *Tolypocladia glomerulata* Schmitz. in Engler, Bot. Jahrb. xxi. 160 (1895); Falkenberg, Rhodomelaceen, p. 177.

This species has 4 pericentral cells and bears branches with $\frac{1}{4}$ phyllotaxis. Most of these branches have definite growth but occasionally a branch develops indefinitely which provides for increased ramification. The branches which remain short have a smooth basal part, but produce short thornlike branchlets above. From some of the segments in these thornlike branchlets trichoblasts arise. These are, as mentioned by Falkenberg, monosiphonous, unbranched filaments, the cells of which are at first short and coloured (Fig. 11a, b); but gradually the uppermost ones lengthen

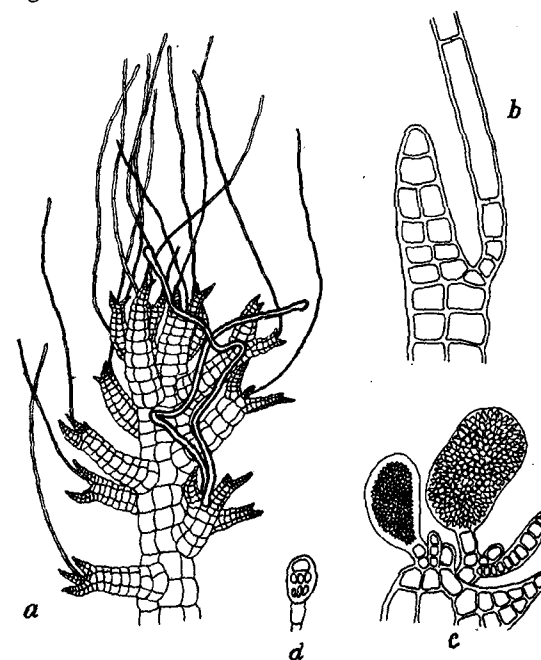


Fig. 11. *Roschera glomerulata* (Ag.) Weber van Bosse. a, apex of a filament with trichoblasts and two rhizoids; b, end of a thornlike branchlet with the basal part of a trichoblast; c, end of a branchlet with androphores; d, a young androphore. (a, about $\times 32$; b, c, d, $\times 265$).

out, become colourless and die away. The lower cells go through the same process.

In the trichoblasts destined to become androphores the two lowermost cells remain undivided (Fig. 11c). The upper one of these elongates, forming, together with the small one below, the stalk of the antheridial stand. The other cells above become polysiphonous (Fig. 11d) and, after several divisions, form together a somewhat oblique oblong body (Fig. 11c) about $115\ \mu$ long and $80\ \mu$ broad. Seen from above the antheridial stand is circular in outline. Antheridia were found at the end of February at Tuticorin.

INDIA: Dwarka, exposed coasts; Okha Port, cast ashore; Tuticorin, on a tuft of *Rosenvingea intricata* in shallow water.

Distr. Widespread in the Indian and Pacific Oceans.

Heterosiphonia Muelleri (Sond.) De Toni Syll. Alg. iv. 1238.

Dasya Muelleri Sond. in Harvey, Phyc. Austral. i. tab. xxxi (partim).

J. Ag. Spec. Alg. ii. pars iii. 1196; Till Algeries Systematik xi. 84.

Dasya plumigera Harv., Alg. Austral. exsicc. No. 208 (partim).

The plant (Plate II. fig. 2) has a rather thick, cartilaginous, creeping, rhizome-like, perennial base composed of a parenchymatic tissue in which as a rule the central and pericentral cells are visible. From the surface of the rhizome short spinelike branchlets protrude (Fig. 12c); these are composed of a single row of cells, which are larger below and become gradually smaller upwards. From this basal part the erect feathery stems arise. These are definitely annual and are found during the calm season of the year between the monsoons. The stems receive from each sympodium, of which the plant is built up, two segments, rarely more. The segments in the main stem are composed of 10 pericentral cells. In the younger thallus especially the segments are broader in the middle than at the ends, and the peripheral walls of the cells are very convex. No cortical layer is present. The free ends of each branch-system (Fig. 12a) are found alternating in two rows on both sides of the main stem. The pinnules of last order (Fig. 12b) are formed in the same way, only on a reduced scale. They bear at the ends 2 or 3 short spinelike branchlets, the most vigorous of which are provided with a short spine at the upper end. The number of pericentral cells is reduced in the upper part of the branchlets and the upper spinelike ends are monosiphonous (Fig. 12b). From about the middle of these branchlets (Fig. 12a, b) repeatedly forked trichoblasts are given off. When young the cells in these are barrelshaped, about as long as broad, but when older they are cylindrical, about $30\text{--}50\ \mu$ broad and $100\ \mu$ long. No fertile organs were present; only once in a trichoblast have I seen two polysiphonous segments (Fig. 12b).

I have compared some Australian specimens in the herbarium of the Botanical Museum, Copenhagen, with the Indian plant. One of these was gathered at Port Phillip by F. v. Mueller and referred to *Dasya Muelleri* by J. Agardh. Two other specimens belong to Harvey's Australian Algae, no. 208, which Harvey named *Dasya*

plumigera. This number J. Agardh (Spec. Alg. ii. pars 3) partly refers to *Dasya struthiopenna* (p. 1193) and partly to *Dasya Muelleri* (p. 1196). According to J. Agardh (cfr. Till Algeries Systematik xi, 84) the difference between these two species consists in the cystocarps, which are ovate and borne laterally in *D. Muelleri*, and

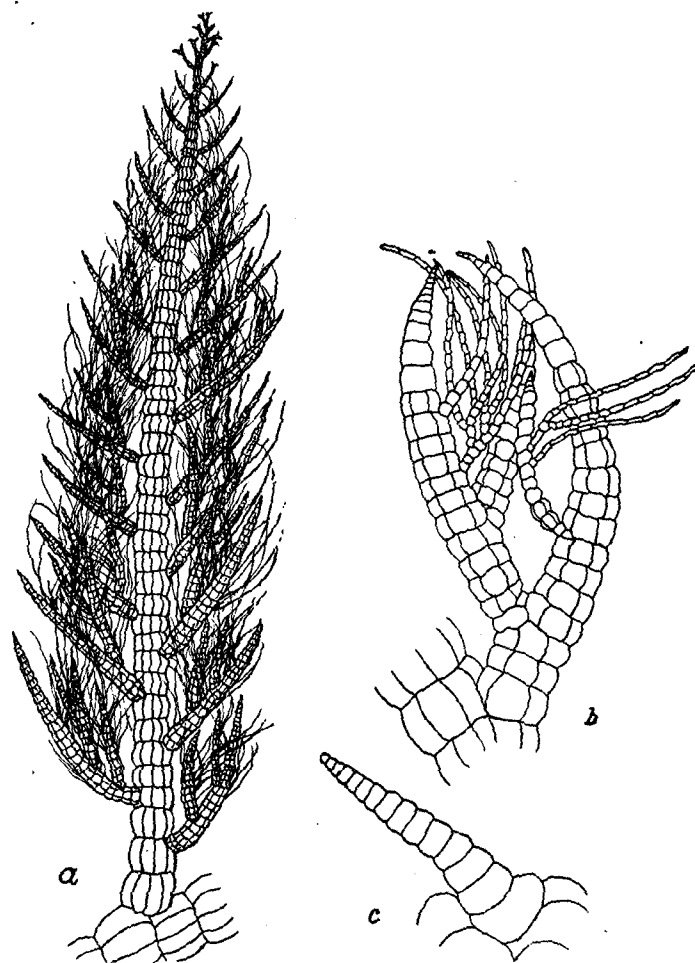


Fig. 12. *Heterosiphonia Muelleri* (Sond.) De Toni. a, free end of sympodium of first order; b, free end of sympodium of second order; c, spinelike branchlet upon the rhizome. (a, $\times 24$; b, c, $\times 80$).

are globular, about double the size and terminal in *D. struthiopenna*. The two species are, according to him, figured by Harvey on pl. 31 of *Phycologia Australica*. Fig. 1 of his plate gives a representation of *D. Muelleri*, whilst Fig. 2 is referable to *D. struthiopenna*. My material is unfortunately sterile but it agrees very well with Harvey's Fig. 1, and I have referred it to *H. Muelleri*.

Though the Indian specimens correspond fairly well with the Australian, they differ in some respects. Thus there are 10 pericentral cells in the main stem, whereas according to J. Agardh the Australian plant has only 5-7. Moreover, in the latter the erect stems seem to be corticated rather high up, while in the Indian specimens they are bare. It is possible that the Indian plant is distinct from the Australian, but as my material is sterile, I do not think it advisable to describe it as new.

INDIA : Dwarka, on low-lying rock pools on very exposed coast ; Okha Port, east ashore.

Distr. Australia.

DELESSERIACEAE.

Cottoniella fusiformis Boergs. Mar. Alg. Canary Isl., Rhodophyceae iii. 144, figs. 58-59.

On looking through the collection of algae from Karachi on loan from the Kew Herbarium I found some specimens of a finely divided, delicate and rose-coloured *Floridea* which I at first believed to be *Sarcomenia miniata*, a species I had already found at Dwarka. A microscopical examination, however, showed that I had to deal with a species of *Cottoniella*. As this genus was known only from the Atlantic its presence in the Indian Ocean was of much interest. The Indian plant has exactly the characteristic structure of this genus, viz., the curved apical summit of the polysiphonous filaments, from which issue the long, monosiphonous, unilaterally placed branchlets. So far as I can see from dried material, which is not easy to work with, the monosiphonous filaments are given off in pairs side by side. The branchlets seem generally to be placed upon the concave side of the branches, this being often, but not always, the ventral surface. The plant is much and irregularly branched, the main filaments are at least 250 μ broad, and are covered by a cortical layer.

This structure suggests that we most probably have to do with the Canary species, *Cottoniella fusiformis* Boergs., but even though the species is not determined with absolute certainty the occurrence of the genus in the Indian Ocean based on these old Kew specimens is worthy of record.

INDIA : Karachi, Dec. 1859, W. J. S. Pullen (Herb. Kew.).

Sarcomenia miniata (Ag.) J. Agardh Spec. Alg. ii. pars 3, 1260 ; Anal. algol., Cont. iii. 133. Weber van Bosse, Notes on *Sarcomenia miniata* Ag., in Journ. of Bot. xxxiv. 281, plate 359 (1896). *Hutchinsia miniata* Ag., Spec. Alg. ii. 94.

I have not seen any original material of this species, but the Indian plant seems to agree well with the original description and with Madame Weber's description and figures.

The structure of the thallus of *Sarcomenia miniata* is almost the same as that of *Cottoniella* except that the monosiphonous filaments characteristic of that genus are missing. When fully

developed it is composed of a central cell and four pericentral cells, the two first formed being the largest as seen in a transverse section (Fig. 13d). From the upper and lower corners of these cells two smaller cells are cut off forming the two peripheral cells at both sides of the thallus ; these cells have only half the length of the other 5 cells in each segment (Fig. 13c). The thicker filaments in the Indian plant have a diameter of about 160 μ and the length of the segments is about 200 μ . The upper ends of the filaments are only about 10 μ thick.

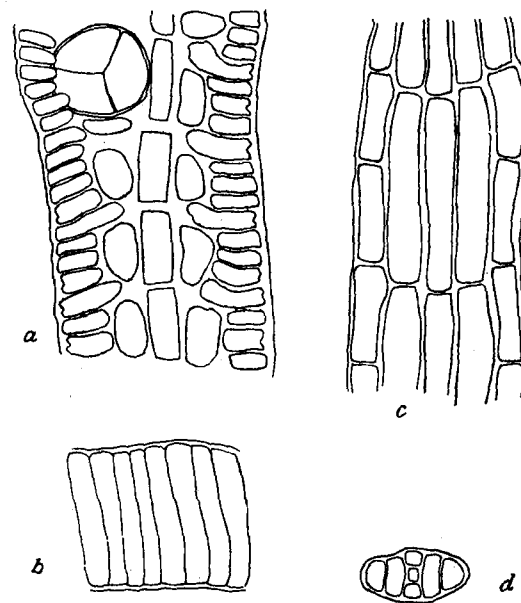


Fig. 13. *Sarcomenia miniata* J. Ag. a, part of a stichidium seen from above ; b, part of the same seen from the edge ; c, surface view of (sterile) thallus ; d, transverse section of thallus. (a and b, $\times 250$; c, $\times 180$; d, $\times 140$).

Tetrásporic plants only were found. The stichidia form ribbonlike bodies which continue to grow at their upper ends long after the sporangia in the lower part are mature and have escaped. The upper end of the stichidium often elongates like a vegetative branch and is even forked. The development of the stichidia is described and figured by Madame Weber. The two big pericentral cells are divided by a vertical wall into two cells. One of these does not divide further, the other is divided by a transverse wall into two cells, the uppermost of these becoming the mother cell of the tetrasporangia, and the lowermost the foot-cell (compare fig. 13a). At the same time the peripheral cells on both sides of the sporangia are divided by transverse walls into two cells. When the sporangia are mature and have escaped, the peripheral cells

lengthen and (together with the non-fertile cells first formed by the vertical division of the two pericentral cells) cover the hole through which the tetraspores have escaped (Fig. 13a). According to Madame Weber, cells are cut off from the ends of the large marginal cells, but I have not observed this. The healing of the sporangia is very useful to the plant, since the stichidia in this way are preserved and able to partake in assimilating activity. The ripe sporangia are about 120 μ broad and often more than 2 mm. long.

INDIA : Okha Port, cast ashore.

Distr. Cadiz, South Africa.

Myriogramme okhaënsis Boergs., sp. nov.; a speciebus relatis praecipue differt thallo *Acrosorio* (*Nitophyllo*) *uncinato* persimili.

Frons estipitata, enervosa, circiter 7 cm. alta, irregulariter multilobata et sinuata, superne monostromatica, dein bistromatica, lobis 2–5 mm. latis composita.

INDIA : coast of Okhamandal, Okha Port, cast ashore, *Boergesen* 5485 (type). Karachi, June 1883, *J. A. Murray* (Herb. Kew.).

The thallus (Plate II. fig. 3) reaches a height of about 7 cm. It is flat, sinuate, deeply and very irregularly divided into numerous lobes which, by means of the marginal rhizoids, become fastened not only to the rocky substratum but often to other parts of the thallus, the plant in this way forming irregular clumps and tufts. The breadth of the thallus varies from 2 to 5 mm. Its margin is irregularly sinuate and provided with numerous small teeth (Fig. 14a).

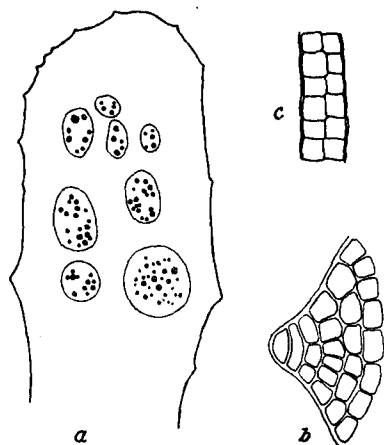


Fig. 14. *Myriogramme okhaënsis* Boergs. a, part of thallus with groups of tetrasporangia; b, marginal tooth; c, transverse section of the thallus. (a, $\times 2$; b, $\times 205$; c, $\times 60$).

Nerves and microscopic veins are absent. The thallus consists of two layers of cells (Fig. 14c), except near the edge, where it is composed of one layer only. In the small teeth along the margin a transversely divided apical cell is present (Fig. 14b). The surface

cells are polygonal and about 60–80 μ broad. In a few of the specimens small groups of tetrasporangia were present; these occur scattered in the thallus (Fig. 14a) and are about 60 μ broad.

M. okhaënsis comes near to the group of species, mentioned by Kylin in his very valuable treatise "Studien über die Delesseriaceen" [Lunds Universitets Årsskrift, N.F. Avd. 2, Bd. xx. Nr. 6, 60 (1924)], characterized by the presence of a transversely divided apical cell in the teeth; but the shape of the thallus is different. By the irregularly bent and toothed lobes its habit reminds one of *Acrosorium* (*Nitophyllum*) *uncinatum* (J. Ag.) Kylin, but the latter plant is easily distinguishable by the presence of microscopic veins. In the Kew Herbarium there is a large somewhat bleached specimen of *M. okhaënsis* collected by Murray and determined as *Nitophyllum punctatum* J. Ag.

Myriogramme bombayensis Boergs., sp. nov.; a speciebus nervosis thallo aliter formato distincta.

Frons brevistipitata, circiter 3 cm. alta, irregulariter sinuolobata, e margine prolifera, superne monostromatica dein bistromatica, nervosa, nervis robustis interdum furcatis instructa. (Plate II. fig. 4).

INDIA : Bombay; Malabar Hill, on rocks facing open sea, *Boergesen* 5132 (type).

The base consists of irregularly lobed discs formed by groups of rhizoids fusing together. From this base, very short nearly terete stems arise, often with remains of the leaf-like thallus attached, and continue as vigorous nerves throughout the leaf-like thallus. This is of a dark-red colour, leaf-like, wavy, irregularly lacinulate and proliferous along the margins, from which also numerous rhizoids often grow out. The thallus (Plate II. fig. 4), the lobes of which are often attached to each other by means of the rhizoids, is about 3 cm. high, forming dense tufts. The breadth of the thallus varies from 1 mm. to about 1 cm.

A transverse section shows that the thallus consists, in the younger parts, of a single layer of cells (Fig. 15b), but in the older parts of two layers. The nerves seen in transverse section are broadly oval or elliptic and consist of large cells in the middle and smaller ones externally (Fig. 15b). The nerves are occasionally forked.

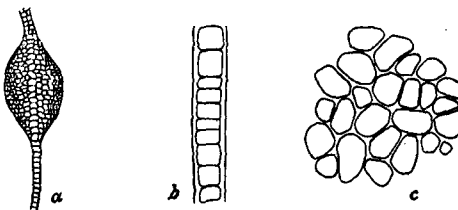


Fig. 15. *Myriogramme bombayensis* Boergs. a, transverse section of the thallus with nerve; b, the same without nerve; c, cells of thallus seen from above. (a, $\times 22$; b, $\times 205$; c, $\times 265$).

When seen from above the cells of the leafy thallus are small, roundish or of more irregular shape with thick walls (Fig. 15c); their diameter is about 16 μ .

This species belongs to a group of species of *Myriogramme* characterized by Kylin (*l.c.* p. 60) by the presence of vigorous nerves. As the nerves are often dichotomously divided it comes near also to the genus *Schizoseris*, but, to judge from the species referred by Kylin (*l.c.* p. 67) to this genus, these are all larger forms with the thallus divided into many leaf-like parts and all formerly referred to the genus *Delesseria*.

I am much indebted to Professor Kylin, who has most kindly confirmed my reference of this and the previous species to *Myriogramme*.

II.—THE BUTTRESSES OF RAIN-FOREST TREES.

W. D. FRANCIS.

The flattened extensions of the roots and stems of certain species of trees are now commonly referred to by English botanists as buttresses or plank-buttresses. The accompanying illustration (Plate III) shows examples of buttressed stems in a littoral forest.

Buttresses are a feature of many species of rain-forest trees as well as of several kinds of trees which inhabit mangrove and littoral forests. The phenomenon of buttress development is seen at its highest in tropical and subtropical rain forest. It appears to be comparatively rare in temperate forests. In explanation of the genesis of buttresses in rain-forest trees it has been fairly generally assumed that they have arisen as mechanical supports to the stem. H. N. Whitford* especially has stressed this view. He states "This means that the tree in youth while it is crowded in the forest produces a regular bole, but that when it reaches above the surrounding vegetation, in response to the increased heaviness of the top, the buttresses appear at the base, enabling the tree to withstand the extra strain."

One of the most recent and novel contributions to the mechanical theory has been put forward by Navez.† Briefly stated, Navez's conclusions are to the effect that tabular roots (a term evidently equivalent to buttresses) are located principally on the sides of the dominant winds and that these roots (or buttresses) act as resistant cables and not as buttresses.

In my own investigations on buttressed trees in Australian rain forests‡, the buttresses were found to be well developed when the trees were comparatively young, and long before they produced heavy crowns or became exposed to the force of winds. This observation appertains to several species of trees. It raises a very serious

* Philippine Journ. Science, i. 420 (1906).

† Proc. Nat. Acad. Sciences U.S.A., xvi. 343 (1930).

‡ Proc. Roy. Soc. Queensland, xxxvi. 21 (1925); Australian Rain-Forest Trees, 8 (1929).

PLATE III



Heviiera littoralis in littoral forest near high-tide mark. Yarrabah, near Cairns, North Queensland. Photo J. E. Young.

(To face page 24.

objection to the supposition that winds and heavy crowns exert a direct action in the incipient production of buttresses. Everyone who is familiar with the conditions in dense rain forests will recognise that the effects of winds on young trees much below the forest canopy is negligible.

It was also noticed that the axis or main stem of large buttressed trees was much smaller at the point of contact with the soil than above the buttresses. From this and from other observations it is concluded that the roots contribute chiefly to the construction of the buttresses in the earlier stages and that the stem performs a large part in their development in the later stages of the life of large buttressed trees. These deductions indicate that the buttresses of large trees are the combined extensions of the roots and stem. The observed attenuation of the main axis of large buttressed trees towards the base shows that the buttresses of these trees do not conform exactly to the buttresses which support the walls of buildings. Presumably the walls of buildings, which are supported by buttresses, are rarely thinner at the base than above.

Petch* has recently published a paper on the subject. The views expressed by him are similar to my own in so far as he credits the theory which attributes buttresses to the direct effects of strains and tensions induced by winds and heavy crowns. In explaining the origin of buttresses Petch associates them with a deficient tap root and suggests that their formation is due to the restriction of the nutritive current to narrow regions of the stem continuous with the lateral roots.

The origin of buttresses appears to be somewhat obscure. There are, however, certain considerations which indicate that the physical and chemical properties of the soil may be associated with their genesis. The prevalence of strongly buttressed trees among mangroves as well as in rain forests is suggestive. It leads one to suspect that the definite tendencies of roots to project into the air and become perpendicularly flattened in both of these classes of forest are repulsions from some conditions in the soils.

The buttressed Australian species of rain-forest trees have already been enumerated†. Among the prominently buttressed mangroves of the Malayan region the following are examples: *Bruguiera eriopetala*, *B. caryophylloides*, *B. parviflora*, *B. gymnorhiza*, *Xylocarpus moluccensis*, *X. granatum*, *Heritiera littoralis* and *Ceriops Candolleana*. Several of these species are figured by J. G. Watson‡, and in the excellent photographs the buttresses are well shown.

Although it may not be of any significance, it is of interest to remark that some of these buttressed mangroves are allied to rain-forest species which are also characterized by the possession of buttresses. *Heritiera littoralis* is related to *Tarrietia* (Sterculiaceae),

* Annals Royal Botanic Gardens, Peradeniya, xi. 277 (1930).

† Proc. Roy. Soc. Queensland xxxvi. 21 (1925); Australian Rain-Forest Trees, 8 (1929).

‡ Mangrove Forests of the Malay Peninsula, Malayan Forest Records No. 4 (1928).

and *Xylocarpus moluccensis* and *X. granatum* are allied to *Dysoxylum* and *Cedrela* (Meliaceae).

The conditions prevailing in dense rain forests of a tropical character produce soils which are peculiar in some respects. One very important feature of the soils in Australian rain forests is the superficial layer of decomposing vegetable material. This consists of the accumulation of detached leaves, twigs, branches and bark. It results from the normal shedding processes of living plants and from the disintegration of dead and dying ones. The composition and extent of this decaying plant material in rain forests is affected by the denseness of the vegetation and the exclusion of winds with their dispersing and drying effects. The humidity of the air prevents bush fires, thus ensuring that the decomposing material is not subjected to rapid combustion. The humid atmosphere also accelerates the processes of decay, which are not retarded by the drying and antiseptic effects of the winds and strong sunlight which are active in open forests.

One of the conditions which may be connected with buttresses is that of aeration. The penetration of air into the soil of rain forests is strongly impeded by the layer of decaying vegetable material. In addition some of the organic compounds derived from the decomposition absorb oxygen from water. In this way the oxygenation of the soil below is further retarded.

The amount of moisture in the soil is also a factor which may be associated more or less directly with buttressed trees in rain forests. Trees with the largest buttresses are most frequently seen on damp flats or on slopes which bear indications of moist or water-saturated soils.

The considerable amounts of decomposing vegetable material which I have always noticed in Australian rain forests have not been observed in all rain forests. T. F. Chipp* has remarked upon the general absence from the soil surface of vegetable debris in the Gold Coast forests of tropical Africa. He attributes this condition to the rapid action of ants and the microscopic flora and fauna in destroying the debris.

In another place† he demonstrates the utility of buttresses in identifying trees in the forest. He appropriately comments upon the scant attention which is given to this peculiar structural feature in descriptive botanical works.

III.—CONTRIBUTIONS TO THE FLORA OF BURMA: IX.‡ C. E. C. FISCHER.

***Tristellateia australasica* A. Rich.** [Malpighiaceae].

Known previously from Indo-China, Malay Peninsula, Formosa to Australia.

* Oxford Forestry Memoirs, No. 7, 41 (1927).

† *Kew Bulletin*, 1922, 265.

‡ Continued from *K.B.* 1929, p. 317.

Mergui, Maliwun, flowers Jan., R. N. Parker 3164. "Edge of tidal swamp."

***Microtropis filiformis* King** [Celastraceae].

Known from Siam and the Malay Peninsula.

Mergui, Victoria Point, flowers Jan., R. N. Parker 3154. "Shrub, flowers yellowish-green."

***Connarus oligophylla* Wall.** [Connaraceae].

Known from Penang.

Mergui, Victoria Point, 200 ft., Jan., Su Koe per C. E. Parkinson 7609. "Tree; flowers whitish-pink. Fruit green, glabrous. Stem brownish." Malayan name: *Kahyn Sadin*.

***Acacia Meeboldii* Craib** [Mimosaceae].

Also in Siam.

Tenasserim, Borvachang, fruit April, Meebold 15295; Katin kwan chaung, 200 ft., fruit Feb., C. E. Parkinson 1693. "A thorny climber."

***Polyosma integrifolia* Bl.** [Saxifragaceae].

From Assam and the Malay Peninsula.

Mergui, Myinmolekat, 6500 ft., fruit Jan., R. N. Parker 3177. "Small tree."

***Ophiorrhiza erubescens* Wall.** [Rubiaceae].

Tenasserim, Chappedong Hills, buds Feb., Wallich No. 6233 (type in Kew Herb.); Tavoy, Zimba Valley, "in dense evergreen forest," fruit Nov., R. N. Parker 2263.

This species has been represented hitherto by a single sheet in the Wallich Herbarium and was considered by Sir J. D. Hooker in the Flora of British India as a doubtful species (iii. 84). The sheet contains 2 plants with a very few buds. The following description has been compiled from the Wallich sheet and Mr. Parker's specimen.

A herb or undershrub about 30 cm. high. Stem simple or branched, crisped pubescent upwards. Leaves lanceolate, obtusely acuminate, narrowed into the petiole, 6–13 cm. long, 1.75–3 cm. wide, dark and glabrous above, below pale and crisped puberulous especially on the midrib and nerves, midrib and 8–11 pairs of primary nerves distinct above and slightly raised below; petioles 0.5–3.5 cm. long, crisped puberulous. Stipules ovate, caudate, up to 0.75 cm. long. Cymes terminal; peduncles (and pedicels) crisped rufous-pubescent, 1.7 cm. long (in fruit); pedicel 0.25–0.4 cm. long. Buds puberulous. Calyx-tube very short, lobes short. Corolla prismatic, 5-angled, lobes valvate, ligulate, acute, keeled, mealy-puberulous within, much longer than the tube; tube glabrous within, villous at the mouth. Anthers nearly sessile, linear, nearly as long as the corolla lobes. Disk fleshy, 2-lobed, brown-puberulous. Flowers not seen. Capsule reniform, hardly compressed, very narrowly winged at the outer angles, 1 cm. wide, 0.5 cm. long, reddish-brown, minutely sparsely puberulous. Seeds minute, angled.

The species comes very near *O. trichocarpa* Bl. but differs in the shape and pubescence of the leaves, shape of stipules and the nearly glabrous capsules.

Randia Klossi Ridl. [Rubiaceae].

Hitherto known only from Siam.

S. Tenasserim, Kyeinchaung, 100 ft., Feb., C. E. Parkinson 1660.
"A climber. Flowers white turning yellow."

Psychotria rhinocerotis Bl. [Rubiaceae].

In K.B. 1927, p. 209, this was wrongly described as *Gaertnera lasianthoides* Fischer, which name now goes into synonymy.

Lasianthus glaberrimus Ridl. 1918, non 1920 [Rubiaceae].

Known only from the Malay Peninsula.

Mergui, Sandawut, flowers March, R. N. Parker 2773. "Shrub 4 ft. high. Leaves very foetid when bruised." Vern. *Myauk-i*.

Vallaris anceps (Wall.) Fischer, comb. nov. [Apocynaceae].

This species was described in K.B. 1927, p. 92, under the name *Vallaris arborea* Fischer. It is, however, identical with *Trachelospermum anceps* Dunn & R. Williams in K.B. 1920, p. 343, which was founded in part on *Vallaris? anceps* ms. in Wall. Cat. 1622. The plant, however, is not a *Trachelospermum* but a *Vallaris* in virtue of the following characters.

Leaves punctate. *Corolla* tube not swollen over the anthers and not constricted at the mouth. *Anthers* with a large gland on the connective. *Seeds* with a long beak (Dunn and R. Williams did not see seeds).

The combination *Trachelospermum anceps* and the trivial name *arborea* must, therefore, be sunk in synonymy in favour of the combination *Vallaris anceps* (Wall.) Fischer.

Ficus lepicarpa Bl. [Moraceae].

Recorded from the Malay Peninsula.

Mergui, Palauk chaung, 1600 ft., Jan., R. N. Parker 3095.
"Large shrub on rocks in stream bed."

Asarum cordifolium Fischer [Aristolochiaceae].

Described from specimens from Assam.

Mali—Nam Tamai Divide, 3000-4000 ft., fruit April, Kingdon Ward 6661. "On shaded earth banks where the soil is moist."

Musa nagensium Prain [Musaceae].

From the Naga Hills of Assam.

Myitkyina District, Tagwin chaung, 400 ft., flowers and fruit Nov., C. E. Parkinson 1759. "In evergreen forest." Kachin name: *Lek Chep*.

Musa paradisiaca Linn., var. **pruinosa** King [Musaceae].

From Assam.

Myitkyina District, Tagwin chaung, 400 ft., flowers and fruit Nov., C. E. Parkinson 1760. "In evergreen forest." Fruit eaten by Kachins. Kachin name: *Nga Toe*.

Musa velutina Wendl. & Drude. [Musaceae].

From Assam.

Myitkyina District, Tagwin chaung, 400 ft., flowers Nov., C. E. Parkinson 1765, "Attains the height of a man. Found near water." Burmese name: *Hnget Pyaw A*.

Gahnia javanica Moritzi [Cyperaceae].

Reported from Yunnan, the Malay Peninsula and the Malay Islands.

Mergui, Myinmolekat, 6800 ft., flowers Jan., R. N. Parker 3123.
"Stems 3-4½ ft. high."

Carex finitima Boott [Cyperaceae].

From Eastern Himalayas and from China.

Myitkyina District, Hpimaw Pass, above 11,000 ft., June, Su Koe per C. E. Parkinson 10081.

Carex fragilis Boott [Cyperaceae].

From Sikkim.

Myitkyina District, below Chimali Pass, 10,100 ft., May, Su Koe per C. E. Parkinson 9915.

Carex setigera Don [Cyperaceae].

From the Himalayas from Kashmir to Nepal.

Myitkyina District, below Chimali Pass, 10,000 ft., May, Su Koe per C. E. Parkinson 9911.

IV.—NOTES ON NEW OR RARE HYPERICA. B. STEFANOFF.

During a recent study of the taxonomy and phytogeography of the Mediterranean Oriental *Hyperica* I have had the opportunity of examining many sheets from the Herbarium of the Royal Botanic Gardens, Kew. My best thanks are due to the Director for the loan of the material and to Dr. W. B. Turrill for assistance in preparing for press the manuscript of these notes on new or rare *Hyperica* preserved in the Kew Herbarium.

Hypericum inodorum Willd. (*H. ramosissimum* Led.). Three sheets from the Caucasus and Armenia indicate that this species consists of two easily distinguished varieties. The first, var. **glandulosum** Stefanoff, agrees with the original description of Boissier (Flor. Or. i. 789) and is probably the commoner of the two varieties here recognized. It is represented, in the material seen by me, by two sheets: Armenia (leg. Szovits); Caucasus (leg. Ledebour). It may be defined as follows: sepala aequalia, lanceolata, apice acuta, margine glandulis remotis breviter stipitatis obsita. The second variety is named var. **integrisepalum** Stefanoff and is represented by a single sheet of material collected in Lazistan (*Balansa*, Plantes d'Orient, 1866, no. 1377). It is characterized as follows: sepala inaequalia, spatulato-linearia, apice rotundata vel subacuta,

margine integra. Apart from the form of the sepals and the presence or absence of glands on their margins, these two varieties have the same characters. *H. inodorum* Willd., as cultivated in gardens, appears to be more frequently represented by the second variety, var. *integrisepalum*.

***Hypericum heterophyllum* Vent.** Jard. Cels. tab. 68; Boiss. Flor. Or. i. 793. A specimen collected in Asia Minor near Smyrna, comm. E. Whittall, no. 816, in Herb. Kew., is referred to this. *H. heterophyllum* Vent. is one of the rarest species of the Mediterranean-Oriental group of the genus. Boissier, after giving a diagnosis of the species, writes: "vidi in Herb. DC. specimen incompletum hujus plantae a recentioribus non lectae." Ventenat quotes only Persia (leg. Olivier & Brug.) and Whittall's specimen is only the second one known, but is much the more complete. The distance between Persia and Smyrna makes one suspect that one or the other locality may be incorrectly given. *H. heterophyllum* Vent. may be considered the type of the subsection *Triadenioidea* Jaub. et Spach, but differs radically in many of its morphological characters from all the species subsequently included by various authors in the same subsection. As Boissier remarks, in its general appearance the plant recalls *H. linearifolium* Vahl. It differs, however, taxonomically in many respects from all known species of *Hypericum* of the Mediterranean-Oriental group, and its isolation in a separate section appears to be reasonable.

***Hypericum ovalifolium* Stefanoff sp. nov.;** ab *H. fragile* Boiss. et Hausskn. et *H. pumilio* Bornm. foliis floribusque majoribus, seminibus cylindricis vix rugosis atribus differt.

Planta perennis, basi suffruticosa, ramis simplicibus abbreviatis 6-8 cm. altis adscendentibus glabris praedita. *Folia* subcarnosula, pallide viridia, plus minusve glauca, ovato-rotundata vel fere orbicularia, ad 1 cm. longa et 8 cm. lata, basi abrupte in petiolum attenuata, apice sparse pellucide punctata, margine plana vel vix revoluta et remote glanduloso-punctata. *Cyma* terminalis, distincte pedunculata, pauciflora. *Sepala* lanceolato-elliptica, dorso epunctata, margine glandulis nigris breviter stipitatis obsita. *Corolla* calyce 2-2.5-plo longior, petalis oblongis apice glandulis paucis breviter stipitatis obsita. *Stamina* basi in fasciculos tres coalita. *Ovarium* triloculare; styli tres. *Capsula* usque ad basin valvis cylindrica, leviter curvata, obsolete rugulosa et latere interiori subcarinata.

SYRIA BOREALIS: Amanus, in monte Duldul, 1500-2000 m., M. Haradjian 3897, in Herb. Kew.

The species described above is properly classified with the species of the subsection *Triadenioidea* Jaub. et Spach, as enlarged by Boissier and R. Keller. It is easily distinguished from *H. nummularium* L. and *H. nummularioides* Trautv., and is best compared with *H.*

fragile Boiss. et Hausskn. and *H. pumilio* Bornm. (a species wrongly classified by R. Keller in the subsection *Arthrophyllum* Jaub. et Spach). It differs in its larger leaves and their shape and its larger flowers. The shape and sculpturing of its seeds give characters which I have found of great importance in the genus. The seeds of *H. fragile* and *H. pumilio* are identical, very elongated, noticeably curved, of a pale colour and with an almost smooth surface. In *H. ovalifolium* the seeds are dark-coloured, only slightly rugose, and have a marked cylindric shape. They are only slightly curved and on the inner side are distinctly carinate with one small appendage at the base. A new grouping of the species of *Hypericum* is to be proposed in a subsequent work, but under the old system our species is to be placed in the subsection *Triadenioidea*.

***Hypericum olympicum* L.** The numerous specimens of this species from the Balkan Peninsula and Asia Minor, which I have had the opportunity of examining, indicate that this species, which is one of the most characteristic types of the genus in the Mediterranean region, is very polymorphic and consists of a number of varieties distinguishable by important and constant characters.

The typical variety has a very wide geographical distribution and appears to cover the whole range of the species (S. E. Balkan Peninsula, Asia Minor, Armenia, and Syria). With *H. polyphyllum* Boiss. et Bal. and *H. Hayekii* Siehe it forms a natural group (the subsection *Olympia*), formerly accepted as a separate genus. The last two species occupy comparatively small geographical areas and have constant morphological characters, while *H. olympicum* contrasts with them in having a strongly developed tendency for variation in the general size and aspect of the plant, the form and size of the leaves and sepals, and in other characters.

In the Balkan Peninsula in addition to the forma *minus* (*H. olympicum minus* Ch. et Bory) and the var. *coronense* Vel., we have *H. Dimonieii* Vel., which Bornmüller has recently [in Bot. Jahrb. lix. 432 (1925)] reduced to a variety of *H. olympicum* and which is probably merely a modification developed under habitat conditions in the subalpine zone of the mountains of Central Macedonia. In the mountains of the eastern parts of the Balkan Peninsula, especially in the southern Rodopes, Ali Botush, and Belasitza, as also in Greece and Asia Minor, *H. olympicum* is a common plant in the mountain zones, ascending to over 1000 m. and even to 2000 m.

One variety (or modification) common at high altitudes is named var. *viride* Stefanoff with the characters: planta valde caespitosa, caulibus abbreviatis usque ad 25 cm. Its leaves are shorter but much broader than in typical *H. olympicum* L. and are a brighter green, without the bluish-green colour caused by the fine bloom covering the leaves of the typical plant, and with many pellucid dots which are few or absent in the plants from the lowlands or lower mountain zones. The sepals, as in the commoner type variety, vary much in size and shape, and specimens of var. *viride* from

different localities can be more or less distinguished by sepal characters. The simple stems, usually with solitary flowers, form a constant character.

Another variety, morphologically very similar to var. *viride*, is named var. *latifolium* Stefanoff, with the diagnosis: a var. *viridi* caulibus longioribus, foliis latioribus et longioribus, glandulis pellucidis numerosioribus, marginibus glandulis nigris dense instructis, cymis floribus tribus vel multis praeditis differt. N. SYRIA: Amanus, *M. Haradjian* 393, in Herb. Kew.

A third variety is named var. *prostratum* Stefanoff, with the diagnosis: caulibus prostratis. N. SYRIA: Amanus, *M. Haradjian* 2501, in Herb. Kew. This variety is often cultivated in gardens under the wrong name of *H. polyphyllum* Boiss. et Bal.; it differs from other varieties of *H. olympicum* chiefly by its prostrate stems. The leaves have a bluish-green colour and, as in the var. *latifolium*, have many pellucid dots and a limited number of black points confined mainly to the top of the lamina. The cymes are composed of three or more flowers, and the sepals, as in the var. *latifolium*, have a number of black points which are absent in the typical variety and in var. *viride*.

The above varieties from the Balkan Peninsula and Syria resemble typical *H. olympicum* so closely that they ought not to be confused with the other two species of the section *Olympia*. In Syria, however, there are apparently plants whose classification is more difficult because of their closer resemblance to *H. polyphyllum* Boiss. et Bal., a species of the same region. One such is named *H. olympicum* L. var. *stenophyllum* Stefanoff, with the diagnosis: folia angustissima, acuta, glandulis pellucidis instructa vel non instructa, marginibus planis haud revolutis; sepala ovato-lanceolata, elongata, apice gradatim attenuata; calyx major ad corollae medium attingens (*A. Péronin*, Pl. de Cilicie no. 12, in Herb. Kew.). In *H. polyphyllum* Boiss. et Bal. the calyx is very reduced in size, being three or four times shorter than the corolla. In general the flowers of *H. polyphyllum* and of *H. Hayekii* Siehe are much smaller than those of any of the varieties of *H. olympicum*.

Hayek, in Ann. Hofmus. Wien xxviii. 159 (1914), reduces *H. Hayekii* Siehe (Flor. Or. no. 542, nomen solum) to a synonym of *H. polyphyllum* Boiss. et Bal., but incorrectly. The two plants are closely related but good characters distinguish them. Thus the stem and leaves in *H. Hayekii* are dark green and intensely glaucous, while in *H. polyphyllum* they are almost pale green. The calyces of both species are small relative to the corolla but the sepals have different shapes. In *H. Hayekii* they are broad and obovate, while in *H. polyphyllum* they are lanceolate-elliptic with many black points on their surface. In the latter also the petals have numerous black points on their margins—a character not observed in *H. Hayekii*.

Hypericum tomentellum Freyn et Sint. in Oesterr. Bot. Zeitschr. 366 (1891). I have had the opportunity of comparing

original material of this species with that of *H. pruinatum* Boiss. et Bal. and thus to establish the complete identity of the two species. Both were described from specimens collected in the same district of Armenia.

Hypericum cassium Boiss. After comparing Boissier's original plant with much authentic material of *H. Montbretii* Spach from the Balkan Peninsula and Asia Minor, I have reached the conclusion that the two species are really the same. The only important difference in the original diagnoses of the two supposed species is that *H. cassium* is said to have no pellucid dots in the leaves. Bornmüller (l.c. 433) has pointed out the inconstancy of this character, and the examination of a series of specimens of *H. Montbretii* has confirmed Bornmüller's contention that the number and arrangement of the dots on the leaves is a very fluctuating character. They may be entirely absent or occur only in the leaves immediately below the inflorescence. On the other hand a few pellucid dots occur in the upper leaves of the plant originally described by Boissier as *H. cassium*.

The strongly developed polymorphism of *H. Montbretii* Spach probably explains why many plants of it from different localities have been described as distinct species by various authors. To its known synonyms must be added *H. bulgaricum* Davidoff [Trav. de la Soc. Bulg. de Sci. Nat. viii. 59 (1915)] and *H. modestum* Strauski non Boissier [Sbornik na Bulg. Akad. na Nauk. xvi. 116 (1921)]. Though *H. Montbretii* is very polymorphic I am of the opinion, that its various forms have little taxonomic importance because of their irregular geographical distribution and their inconstancy.

V.—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: II.* H. N. RIDLEY.

OPILACEAE.

Lepionurus sylvestris Bl.

BORNEO. Sarawak: Kuching, Haviland 1777.

OLACACEAE.

Ximenia americana L.

BORNEO. British North Borneo: East Coast, Mabul island, Creagh.

Olax rosea Ridley, sp. nov.; *O. imbricatae* Roxb. affinis, paniculis in axillis singulis longioribus, floribus roseis cum fructibus multo majoribus, bracteis perparvis distincta.

Frutex glaber. *Folia* oblonga abrupte acuminata acuta, basi rotundata, 6–9 cm. longa, 4–4.5 cm. lata, nervis tenuibus conspicuis inter se anastomosantibus; petioli crassiusculi 5 mm. longi. *Paniculae* axillares singulae pubescentes 1 cm. longae, 8–10-florae.

* Continued from K.B. 1930, p. 373.

Flores rosei fragrantis brevissime pedicellati; bractae parvae ovatae pubescentes caducae. *Calyx* infundibuliformis pubescens 1 mm. longus. *Petala* 3 linearia acuta, duobus bifidis, minute scabrido-punctatis, 1 cm. longis. *Stamina* 3 aequilonga; staminodia papyracea linearia profunde bifida. *Pistillum* pubescens conicum, tertia parte immersa, cum stylo 4 mm. longum; stigma capitatum obscure trilobum. *Fructus* 2 cm. longus, glaber, in calyce cupuliformi magno 1.5 cm. longo 1 cm. lato ferme omnino inclusus.

BORNEO. Sarawak: near Kuching, *Haviland* 484, 3018 (type), 3118. "Petals pale rose-colour, sweet scented; ovary superior, three-celled, with one ovule in each cell."

This is allied to *O. imbricata* Roxb., but the panicles are solitary in the axils and longer, the flowers pink and much larger, as are the fruits, and the bracts are much smaller.

***Olox multiflora* Ridley**, sp. nov.; *O. imbricatae* Roxb. affinis, paniculis longioribus glabrioribus, floribus saepe unisexualibus petalis 3 distincta.

Frutex vel *arbor*. *Folia* oblonga obtusa basi rotundata vel brevissime cuneata, 12-14 cm. longa 5-6 cm. lata, coriacea, nervis elevatis 5-jugis. *Paniculae* in axillis singulae, puberulae multiflorae 2 cm. longae; bractae persistentes ovatae; pedicelli 2 mm. longi. *Calyx* patelliformis vix 1 mm. longus. *Petala* 3, linearia, 5 mm. longa, coriacea. *Stamina* 3; staminodia 3, linearia, longe bifida. *Stylus* glaber canaliculatus, stigmatibus subglobosis integro.

CELEBES. Penisola S.E. a Lepo-Lepo, presso Kandari, Luglio 1874, *Beccari*.

As *Beccari* notes on the specimens, the flowers are unisexual; in some branches there is a preponderance of male flowers, in others of females.

***Olox laxiflora* Ridley**, sp. nov.; *O. multiflorae* Ridl. affinis sed paniculis elongatis laxis, rachide tenui, floribus multo majoribus, foliis elliptico-lanceolatis majoribus differt.

Frutex vel *arbor* glabra. *Folia* elliptico-lanceolata acuminata basi cuneata, 10-17 cm. longa 4-7 cm. lata, coriacea, nervis 8-jugis conspicuis; petioli crassi 5 mm. longi. *Paniculae* axillares singulae laxae, 3 cm. longae, scabridae subglabrae. *Flores* dissiti; pedicelli graciles 5 mm. longi puberuli. *Calyx* patelliformis 1 mm. longus margine ciliatus. *Petala* 3 lineari-subspathulata 1 cm. longa glabra. *Stamina* 3; staminodia 3, petalis vix breviora, linearia, dimidio trifida. *Pistillum* conicum 1 mm. longum, stylo 1 cm. longo, stigmatibus capitato.

KEI ISLANDS. Bandan a Weri, *Beccari*.

This species is allied to *O. multiflora* Ridl., but the panicles are laxer, more glabrous, slender and spreading; the flowers are longer and the leaves larger.

***Anacolosa frutescens* Bl.**

BORNEO. Sarawak: Kuching, *Haviland* 2950.

***Gomphandra javanica* Valet.**

BORNEO. Sarawak: Entoyut River, *Hose* 455, 700; Baram, *Hose* 154.

***Ochanostachys amentacea* Mast.**, var. ***rufa* Stapf**, var. nov.; a typo differt foliis angustioribus lanceolatis, alabastris, ramulis, costa in pagina inferiore, rachide racemorum, ferrugineo-furfuraceis.

BORNEO. Sarawak: near Kuching, *Haviland* 1950; *Haviland & Hose* 3473; *Lobb*.

This form is distinct from *O. amentacea* Mast. [from which I cannot distinguish the Banca and Lingga plant, *O. bancana* (Becc.) Valetton], by the rather narrower long acuminate leaves, and by the red scurf which covers the buds, twigs, rachis of the racemes and midrib of the leaves.

***Iodes reticulata* King**, var. ***glabrescens* Ridley**, var. nov.; a typo differt caule hirsuto gracili foliis supra glabris subtus costa parce hirsuta aliter glabris, angustioribus lanceolatis caudatis, 5.5-10 cm. longis 1.5-4 cm. latis.

BORNEO. Sarawak: Kuching, *Haviland* 1651.

This variety is very closely allied to *I. reticulata* King, a native of the Malay peninsula not previously recorded for Borneo, but the whole plant is much more glabrous and the leaves almost completely so. The latter are also more coriaceous and narrower with a distinct long point.

ILICACEAE.

***Ilex orestes* Ridley**, sp. nov.; *L. Havilandii* Loesn. approximatus sed foliis quintuplo majoribus crassis glabris, floribus majoribus, calyce pubescente differt.—*I. Havilandii* var. *major* W. W. Smith in Notes Roy. Bot. Gard. Edinb. viii. 323 (1915).

Arbor parva. *Folia* oblongo-obovata apice retusa basi angustata, 3-5 cm. longa 1-2 cm. lata, rigide crasse coriacea glabra, supra dense punctata polita nervis costaeque depressis, subtus nervis 5-jugis valde inconspicuis; petioli crassi 2 mm. longi. *Racemi* axillares 1.5 cm. longi puberuli. *Flores* pauci albi; pedicelli 2 mm. longi puberuli; bractae minutae ovatae acutae puberulae. *Sepala* 4, ovata rotundata pubescentia. *Petala* 4, lineari-oblonga obtusa. *Stamina* petalis longiora, antheris ellipticis. *Ovarium* parvum globosum.

BORNEO. Sarawak: Santubong, March 1914, *Native collector* D 167; Bongo Mountains, *Haviland & Hose* 3717. "Small tree; flowers white."

This plant, referred by W. W. Smith to a variety of the small-leaved *Ilex Havilandii* Loesn. of Kinabalu, appears to me very distinct. The leaves are much larger, about five times as big, glabrous and stiffly coriaceous. The flowers are larger, with a pubescent calyx, and the plant is a tree, not a shrub.

CELASTRACEAE.

Euonymus castaneifolius Ridley, sp. nov.; *E. Wrayi* King affinis, floribus multo minoribus, foliis majoribus serratis lanceolatis acuminatis distincta.

Frutex? glaber. *Folia* opposita lanceolata acuminata acuta, basi cuneata, margine in parte superiore serrata, 9.5-16 cm. longa 2-6 cm. lata, rigide coriacea, nervis conspicuis 11-jugis superne depressis, costa elevata; petioli crassi rugosi 1 cm. longi. *Cymae* axillares graciles pauciflorae, pedunculo 2.8 cm. longo, ramis 2 dichotomis, pedicellis gracillimis 1 cm. longis. *Flores* parvi. *Sepala* rotundata. *Petala* 4, rotundata minute crenulata 2 mm. longa. *Stamina* in disco immersa, antheris conicis. *Stylus* crassus, stigmate magno capitato.

BORNEO. Sarawak: near Kuching, *Haviland* 827.

Euonymus Moultoni Ridley, sp. nov.; *E. Wrayi* King affinis, foliis tenuibus lanceolatis cuspidatis serrulatis, cymis laxis floribus minoribus distincta.

Frutex vel *arbor* parva, glabra. *Ramuli* graciles angulati. *Folia* opposita elliptica cuspidata vel lanceolata basi angustata, margine remote denticulata, 8-9 cm. longa 2.5-4 cm. lata, tenuiter coriacea; nervis 4-5-jugis superne depressis subtus elevatis; petioli 5 mm.-1 cm. longi. *Cymae* axillares graciles, pedunculo 4 cm. longo, ramis dichotomis 2 cm. longis ramulis 1 cm. longis, pedicellis 5 mm. longis gracillimis, bracteis minutis ovatis acutis. *Flores* parvi. *Sepala* ovata-rotundata. *Petala* obovata minute denticulata 1 mm. longa. *Stamina* brevissima. *Discus* crassus. *Ovarium* immersum.

BORNEO. Sarawak: Upper Baram, Gunong Tenabok, 4000 ft., *J. C. Moulton* 7675 (type); Penkulu Ampat, *Haviland*.

Very distinct in its bullate leaves, the nerves on the upper side as well as the reticulations being deeply sunk in the polished surface. The edges in very young leaves are serrate, in adults they are undulate with short obscure teeth, somewhat distant. The cymes are lax, spreading, and the flowers very small. *Haviland's* single specimen has much broader, more ovate leaves and shorter cymes only 3 cm. long, but it appears to be the same species.

Microtropis rigida Ridley, sp. nov.; *M. ellipticae* King affinis sed foliis rigide et crasse coriaceis obtusis, petiolis brevissimis, petalis rotundatis, antheris in tubo sessilibus distat.

Arbor? *Folia* opposita elliptica apice obtusa basi truncata, 9.5-12 cm. longa 5-6 cm. lata, rigide coriacea, nervis 5-jugis tenuibus inconspicuis intra marginem arcuantibus; petioli crassi 2 mm. longi. *Flores* in axillis congesti; pedunculi 2 mm. longi, in fructu 5 mm. longi, crassi, bracteis navicularibus acutis coriaceis 2 mm. longis. *Sepala* 5, ovata rotundata minute fimbriata 1.5 mm. longa. *Petala* 5, rotundata coriacea. *Stamina* 5, filamentis connatis tubum efformantibus petalis adnatum, antheris parvis oblongis. *Ovarium*

conicum, stylo crassiusculo. *Fructus* (immaturus) cylindricus, oblongus.

BORNEO. Sarawak: *Beccari* 1702.

This species is most closely allied to *M. elliptica* King, but the leaves are much thicker and more rigid, blunt at both ends, the base truncate slightly retuse, the petioles very short; the corolla lobes are rounded, and the anthers are sessile on the tube.

Lophopetalum sessilifolium Ridley, sp. nov.; *L. pachyphyllae* King affinis sed foliis magnis lanceolatis sessilibus distincta.

Arbor parva. *Rami* quadrangulati. *Folia* opposita subsessilia lanceolata acuminata, basi rotundata minute cordata, margine integra, 10-30 cm. longa 5-11 cm. lata, coriacea, nervis conspicuis 12-jugis. *Paniculae* elongatae laxae patentes, 30 cm. longae, ramis remotis angulatis, pedicellis gracilibus, 5 mm. longis, griseis. *Calyx* explanatus 5-lobus, lobis ovatis rotundatis albo-cereis. *Petala* flava ovato-rotundata, 2 mm. longa ferme 2 mm. lata. *Discus* corollam implens, planus, angulatus. *Staminum* filamenta immersa, antheris minutis loculis apice divaricatis. *Capsula* oblonga obtusa basin versus paullo attenuata, 6 cm. longa, valvis pustulatis 2 cm. latis. *Semina* oblonga, 5.5 cm. longa 1.7 cm. lata.

BORNEO. Sarawak: near Kuching, *Haviland* 1744 and 1958. "Small tree; flowers yellow; ovules three or more in each cell." Matang, Ridley (in fruit).

This species is very distinct in its very large lanceolate sessile leaves, which dry a grey colour, the conspicuous nerves and the midrib, elevated on both sides, being red. The flowers are large and somewhat similar to those of *L. pachyphylla* King.

Lophopetalum subsessile Ridley, sp. nov.; *L. sessilifolium* Ridl. affinis, foliis multo minoribus distincte petiolatis, petiolis brevibus, floribus minoribus petalis ovatis acutis distincta.

Arbor. *Folia* opposita elliptica vel elliptico-ovata obtuse acuminata basi brevissime attenuata, 5-11 cm. longa 2-5 cm. lata, coriacea, nervis inconspicuis 16-jugis, costa superne elevata; petioli crassi 4 mm. longi. *Paniculae* subterminales laxae 10 cm. longae multiflorae; pedicelli 4 mm. longi; bractae parvae ovatae acutae. *Calyx* 5-lobus, lobis brevibus rotundatis. *Petala* ovata acuta 2 mm. longa, marginibus undulatis. *Discus* 5-angulatus. *Staminum* filamenta immersa, antheris ellipticis 4-lobatis.

BORNEO. Sarawak: Kuching, *Haviland* 2235.

This resembles *L. sessilifolium* Ridl. in its opposite short-petioled leaves. The leaves, however, are much smaller and elliptic. The flowers also are much smaller and the petals ovate acute.

Lophopetalum Havilandii Ridley, sp. nov.; nulli speciei arcte affinis, foliis magnis oblongis, paniculis laxis, floribus minoribus, antheris minutis distincta.

Arbor parva glabra. *Folia* alterna elliptica obtuse acuminata, basi breviter angustata, 15-16 cm. longa, 6-7 cm. lata, tenuiter coriacea,

nervis 9-jugis gracilibus superne elevatis subtus depressis; petioli crassiusculi 5-9 mm. longi. *Paniculae* laxae multiflorae axillares et pseudo-terminales, 11-15 cm. longae, ramis dissitis 4 cm. longis vel brevioribus, ramulis 5 mm. longis; pedicelli 1 mm. longi; bractee ovatae minutae. *Calyx* patelliformis, lobis 5 rotundatis. *Petala* 5, obovato-rotundata unguiculata, 1 mm. longa, marginibus sinuatis. *Stamina* 5, in disco profunde immersa, antheris minutis subglobosis. *Discus* 5-angulatus angulis petalis alternantibus. *Ovarium* immersum, ovulis paucis.

BORNEO. Sarawak: Lundu, *Haviland* 882.

This plant resembles an *Euonymus* in the small number of ovules and in the small flat flowers with minute anthers. I have placed it under the genus *Lophopetalum*, however, as the large panicles, subterminal as well as axillary, more closely resemble those of the latter genus than those of the former. In the genus *Euonymus* I have seen no plants at all with the characteristic panicle of *Lophopetalum*. The real difference between the two genera lies in the fruit, the seeds of *Lophopetalum* (mostly large trees) being winged for wind-dispersal, those of the shrubby *Euonymi* being arillate and adapted for bird-dispersal. In this species, as in many other cases, fruit has not yet been collected.

Lophopetalum Beccarianum Pierre Fl. For. Cochinch. iv. (1894) sub t. 307 (*nomen ferre nudum*).

Arbor. *Folia* lanceolata basi angustata, 12-15 cm. longa, 4.5-5 cm. lata, coriacea, nervis elevatis 7-jugis; petioli crassi 5 mm. longi. *Paniculae* 3-4 in axillis terminalibus, multiflorae laxae 12-15 cm. longae glabrae, ramis inferioribus 5 cm. longis, ramulis 5 mm. longis; bractee ovatae acutae 0.5 mm. longae; pedicelli 3 mm. longi. *Sepala* ovato-rotundata, parva. *Petala* obovata 2 mm. longa integra nec carinata. *Discus* planus lobatus lobis rotundatis. *Stamina* breviter immersa. "*Ovula* 14."

BORNEO. Sarawak: *Beccari* 2475; *Miri*, *Hose* 674.

I make no apology for describing this species, of which Pierre gives only a few notes of no critical value. By error he quotes the number as 2495, which is that of a species of *Loranthus*.

Hose's plants differ slightly in the broader more rounded leaves, 14 to 15 cm. long, 7 to 8 cm. wide. His excellent specimens show a number of papillae on the outside of the sepals.

Lophopetalum rigidum Ridley, sp. nov.; *L. Beccariano* Pierre affinis, foliis multo crassioribus et rigidioribus, petiolis brevioribus, nervis inconspicuis, paniculis brevioribus, petalis denticulatis distincta.

Arbor glabra. *Folia* elliptica acuminata acuta, basi obtusa, 8-12.5 cm. longa, 4-7 cm. lata, rigide coriacea, nervis 6-jugis tenuibus cum costa superne elevatis subtus valde inconspicuis; petioli crassi 4 mm. longi. *Paniculae* subterminales (siccitate rubrae) 5-9 cm. longae, ramis paucis, inferioribus 2.5 cm. longis;

bractee ovatae acuminatae acutae. *Flores* brevissime pedicellati. *Sepala* ovata rotundata 1 mm. longa. *Petala* oblongo-ovata minute denticulata. *Stamina* 5, in disco majusculo integro immersa. *Ovarium* conicum immersum, ovulis paucis, stylo brevi gracili.

BORNEO. Sarawak: near Kuching, *Haviland* 2236.

Stapf, in a note on the specimen in the Kew Herbarium, suggests that it is an *Euonymus* on account of its few ovules, but the plant has completely the habit of *Lophopetalum*.

Lophopetalum multinervium Ridley, sp. nov.; *L. Beccariano* Pierre affinis, sed floribus paucioribus, foliis ovatis multinerviis differt.

Arbor. *Folia* alterna ovata vel elliptica obtusa basi inaequilateraliter subrotundata, 11-14 cm. longa 5.5-9 cm. lata, subcoriacea, nervis parallelis 11-jugis subtus cum costa elevatis; petioli 2-2.5 cm. longi. *Paniculae* axillares pauciramosae pauciflorae 9 cm. longae, ramis remotis 6 cm. longis; pedicelli 1 mm. longi. *Flores* parvi. *Calycis* lobi 5, ovati acuti. *Petala* 5, ovata, 2 mm. longa. *Stamina* 5, in disco inserta.

BORNEO. Sarawak: *Beccari* 3659.

The only specimen I have seen of this is in poor condition, but the species is distinct in its broad, ovate, rounded leaves with numerous elevated nerves.

VI.—FURTHER NOTES ON LACHNOPYLIS.

C. A. SMITH.

During the preparation of the previous paper* on *Nuxia* and *Lachnopylis*, which was concerned primarily with the South African species of the latter genus, it was found that three groups of specimens from Tropical Africa and Madagascar could not be assigned satisfactorily to any of the known species of *Lachnopylis*. Descriptions of these are now given below.

L. scytophylla was erroneously included by Baker under his *Nuxia pachyphylla* [i.e. *L. pachyphylla* (Baker) C. A. Sm.], from which it differs in such important characters of the inflorescence, that it is now referred to a different series, namely, *Glomerulatae*.

L. compacta (sp. nov.) is said to be an important constituent of forests in the Imatong Mountains of Southern Sudan, and it therefore seems desirable that it should be named and described. A description of a closely related species, *L. flocculosa* (sp. nov.), is given for purposes of comparison.

The two latter species belong to the series *Laxiflorae*, which comprises by far the greatest number of species in the genus.

L. scytophylla C. A. Sm., sp. nov.; *L. pachyphyllae* (Baker) C. A. Sm. similis, sed inflorescentia laxa, caulibus folisque glabris, floribus exterioribus haud deflexis facile distinguitur.

*K.B. 1930, pp. 10-32.

Frutex vel *arbor* parva (teste Baker), inflorescentia excepta undique glaber. *Folia* ternatim verticillata, elliptica vel oblongo-elliptica, usque 7 cm. longa et 2.8 cm. lata, basi in petiolum distinctum usque 1.5 cm. longum angustata, firme coriacea, marginibus subrevolutis, utrinque subtiliter reticulata, nervis lateralibus inconspicue elavatis. *Inflorescentia* usque 11 cm. longa et 7 cm. diametro, laxe ramosa, ramis 2-3-furcatis angulatis, partibus novellis pilis brevibus subfuscis pubescentibus. *Flores* in pseudocapitula plus minusve compacta paucifloraeque aggregati. *Calyx* campanulato-subcylindricus, circiter 5 mm. longus et 2.5 mm. diametro, triente inferiore extra puberulo, ceterum plerumque glaber. *Corolla* non visa. *Capsula* dense sericeo-pilosa, in calyce persistente plus minusve inclusa.—*Nuxia pachyphylla* Baker in Journ. Linn. Soc., Bot. xxii. 506 (1887), pro minima parte, excl. descr.

CENTRAL MADAGASCAR (sine loc. exact.), *Baron* 1326! (type in Herb. Kew.), 4056! (Herb. Kew.).

L. flocculosa C. A. Sm., sp. nov.; affinis *L. sambesinae* (Gilg) C. A. Sm., a qua inflorescentia laxissima et praesertim flocculoso indumento foliorum differt.

Arbor parva vel *frutex* altus. *Ramuli* superne conspicue angulati foliorum cicatricibus valde prominentibus notati; versus apices foliosi, tomentosi. *Folia* ternatim verticellata, late elliptica, usque 10 cm. longa et 5 cm. lata, utrinque manifeste angulata, praesertim basin versus, apice acuta, integra, coriacea, eglandulosa, supra glabra, vel interdum pilis parvis paucis hinc inde dispersis; petioli usque 1.5 cm. longi, dense pubescentes. *Inflorescentia* laxissima, tamen rotundata, multiflora, speciosa, usque 15 cm. diametro, rhachi ter vel quater furcata laxe pubescente. *Flores* fere semper sessiles, raro pedicellis usque 1.5 mm. longis, pubescentibus. *Calyx* campanulatus, usque 5 mm. longus et 2 mm. latus, pilis millobus simplicibus dense pubescens, saepius bilabiatus, labiis integris vel bidentatis, dentibus ovatis obtusis. *Corollae lob*i oblongi, apice cucullati, infra apicem tuberculo calloso onusti, extra sparse setulosi. *Capsula* saepius calyci aequilonga.

TROPICAL AFRICA. Southern Angola: Huilla, Maunyino, Sept. 1900, *Herb. Huilla* 262! (type in Herb. Kew.; also in Herb. Mus. Bot. Berol.).

L. compacta C. A. Sm., sp. nov.; affinis *L. flocculosae* C. A. Sm., a qua inflorescentia percompacta foliis multo angustioribus differt.

Arbor usque 13 m. (vel ultra) alta. *Ramuli* angulati, versus apices foliosi et dense tomentosi. *Folia* ternatim verticellata, elliptica vel oblonga-elliptica, usque 10 cm. longa et 2.5 cm. lata, apice acuta vel subacuta, inferne in petiolum 1 cm. longum dense pubescentem cuneatim angustata, integra, marginibus subrevolutis, supra viridia, glabra, subtus pallidiora et stellatim pubescentia, conspicue nervata. *Inflorescentia* dense multiflora, compacta, speciosa, usque 7 cm. lata et 4 cm. longa, ubique pilis ramosis

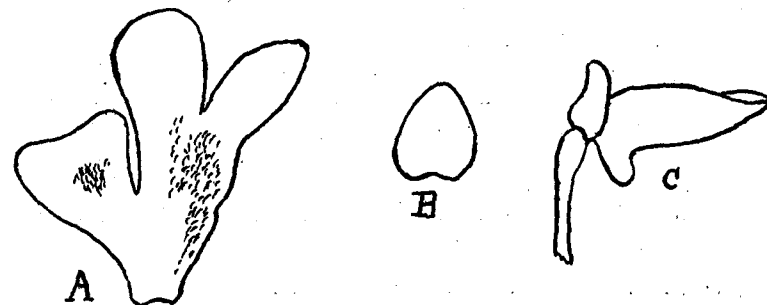
densissime pubescens; rami (rhacheos) bis vel ter furcati. *Flores* subsessiles, vel raro pedicellis usque 1.5 mm. longis. *Calyx* campanulatus, sub fructu subcylindricus, usque 5 mm. longus et 2.5 mm. latus, bilabiatus, labiis integris vel bidentatis vel emarginatis, dentibus ovatis subacutis. *Corollae lob*i oblongi, apice cucullati, infra apicem tuberculo calloso onusti, extra sparsi setulosi. *Capsula* e calyce subexserta.—*Nuxia sambesina* M. B. Moss in Kew Bull. 1929, 190; non Gilg.

TROPICAL AFRICA. Southern Anglo-Egyptian Sudan: above Kippia, in ravines on the Imatong Mts., 32° 50' N., 3° 80' N., 2500-3350 m., Feb. 1929, *Chipp* 95! (type in Herb. Kew.).

VII.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXV.

1241. **Impatiens nilgirica** C. E. C. Fischer [Geraniaceae-Balsamineae]: *I. Akkae* Bedd. similis sed robustior, folia semper glabra, bractae multo latiores, flores majores rubri, lobis alarum basales latiores, pedicelli fructiferi reflexi.

Herba erecta, acaulis, alis corollae exceptis glabra; bulbus parvus, globosus. *Folia* 1-2, radicalia, carnosa, suborbicularia vel reniformia, basi profunde cordata, lobis rotundatis, saepe imbricatis, 2.5-4 cm. lata, nervis primariis 7-9, flabellatis, supra obscuris, subtus distinctis, marginibus remote apiculato-crenatis; petioli 3-9 cm. longi, purpurascens. *Scapi* 1-2, usque 20 cm. longi, purpurascens, 4-10-flori; bractae late ovatae vel suborbiculares, usque 6 mm. longae, concavae; pedicelli purpurascens, 1 cm. longi, fructiferi longiores, reflexi, apice paullo incrassati. *Flores* purpureo-rubri. *Sepala* ovato-falcata, obtusa, basi paullo cordata, 4 mm. longa. *Vexillum* 1 cm. longum, naviculiforme, subacutum, calcar brevi recto obtuso munitum. *Alae* 3-lobatae, fere 2 cm. longae, infra lobos duos superiores et in medio lobi basalis pilosae; lobus basalis late obovatus, obliquus, retusus, 5-6 mm. longus; lobus medius angustior, obovato-oblongus, apice rotundatus, 8 mm. longus; lobus distalis etiam angustior, saepe brevior, oblongus, obtusus. *Labellum* late oblatum, cucullatum, 1 cm. longum,



Impatiens nilgirica C. E. C. Fischer. A, wing; B, bract; C, vexillum; all $\times 2$.

basi subsaccatum, marginibus integris. *Capsula* ellipsoidea, subacuta, 1.2 cm. longa, rigide deorsum porrecta. *Semina* minuta, ovato-oblonga, compressa, glabra.

INDIA. Madras Presidency, on the Kundahs in the Nilgiri Hills, among grass, 2800 m., Sept., *E. Barnes* B 36 (type), B 37; summit of Mukurti Peak, on rocks, *E. Barnes* B 8.

Very like *Impatiens Akka* Bedd. and at first, from the description, taken to be that form of *I. crenata* Bedd.; but, on comparison with Beddome's sheet in the British Museum, the differences noted became apparent.

1242. *Millettia nepalensis* R. N. Parker [Leguminosae-Galegeae]; affinis *M. caudata* Baker, sed foliolis non caudatis, floribus multo majoribus inter alia differt.

Frutex scandens, cortice pallido lenticellato, ramis primo breviter ferrugineo-velutinis mox glabris. *Folia* 2-3-jugata, 15-20 cm. longa; stipulae 3 mm. longae, caducae; foliola lateralia superiora 8-11 cm. longa, 3-4.5 cm. lata, oblonga, primo ferrugineo-tomentosa mox glabra, apice leviter acuminata, basi rotundata, subcoriacea, nervis 8-12-jugis; petioluli 3-7 mm. longi; stipellae nullae. *Racemi* axillares 8-12 cm. longi, rhachii pedicellis calycibusque dense ferrugineo-velutinis. *Flores* fasciculati, pedicellis 5-7 mm. longis. *Calyx* 6-7 mm. longus et latus, campanulatus, dentibus brevibus. *Petala* praeter apices glabra; vexilli lamina 15 mm. longa, rotunda, basi subito in unguem 5-plo brevior angustata, subcordata, obscure callosa; alae angustae, oblongae, leviter falcatae, basi semisagittatae; carinae petala latiora, fortiter falcata. *Stamina* monadelphae, vexillare basi solutum. *Ovarium* sericeum, 6-8-ovulatum.

WEST NEPAL. Chusiakana, flowers March, *Bis Ram* 48.

1243. *Sonerila collina* R. N. Parker [Melastomataceae-Sonerileae]; *S. succosae* Ridl. affinis sed habitu, foliis glabris et cymis 1-2-floris differt.

Frutex circiter 50 cm. altus, ramulis glabris. *Folia* in quoque jugo subaequalia, 3-6 cm. longa, 1.5-2.5 cm. lata, elliptica vel elliptico-lanceolata, acuminata, glabra, minute serrata; nervis 3-5 e basi foliorum ortis, ceteris obscuris; petiolus usque 2 cm. longus. *Cymae* terminales, pedunculo 2-2.5 cm. longo suffultae, 1-2-florae; pedicelli 5 mm. longi. *Calyx* circiter 8 mm. longus, tubulosus, glaber, dentibus parvis triangularibus. *Petala* 10 mm. longa, 6 mm. lata, alba, ovata, abrupte acuminata. *Stamina* 3, antheris rostrato-acuminatis, 10 mm. longis. *Capsula* 8-10 mm. longa, obconica, laevis.

BURMA. Mergui district: Myinmolekat, at 1800 m. in forest undergrowth, flowers January, *Parker* 3109.

1244. *Spathichlamys* R. N. Parker, gen. nov. [Rubiaceae-Rondelietiae]; facie generis *Greeniae*, in tribu insignis propter corollam fissam spathiformem.

Calycis tubus globosus; limbi lobi 5-6, oblongi, obtusi, persistentes. *Corolla* in alabastro apice paulum inflata; lobi minuti, imbricati, 2 exteriores sub anthesin antice profunde fissi, revoluti, intus pilosi. *Stamina* fauci corollae inserta, filamentis brevibus; antherae dorso affixae, versatiles, lineares, apice basique 2-lobulatae. *Discus* tumidus, annularis. *Ovarium* 2-loculare; stylus filiformis, apice incrassatus, 2-fidus; ovula numerosa, placentis hemisphaericis septo peltatim affixis inserta. *Capsula* parva, crustacea, globosa, septicida 2-valva, valvis apice 2-fidis. *Semina* angulata et compressa.—*Frutex*; folia opposita, petiolata; stipulae interpetiolares. Flores in cymas terminales dichotome ramosas subscorpioidales dispositi, secundi, breviter pedicellati, bracteis minutis, ebracteolati.

S. oblonga R. N. Parker, sp. unica.

Frutex magnus. *Folia* 10-20 cm. longa, 2.5-5 cm. lata, oblonga vel oblanceolata-oblonga, glabra, integra, acuminata, basi angustata, papyracea, nervis lateralibus 16-18-jugis; petioli 1-2 cm. longi; stipulae 8 mm. longae, oblongae, obtusae, extra strigosae. *Cymae* pedicelli calycisque strigosi; pedicelli ad 3 mm. longi. *Calycis* tubus 1.5 mm. longus, limbi lobi tubo subaequales. *Corolla* 18 mm. longa, extra minute strigosa; lobi vix 1.5 mm. longi, obtusi. *Antherae* 4 mm. longae. *Stylus* 18 mm. longus, glaber. *Capsula* 3 mm. diametro.

BURMA. Mergui district: in evergreen forest at 1200 m. on Myinmolekat, flowers cream-coloured, January, *Parker* 3100.

1245. *Stapelia Youngii* N. E. Br. [Asclepiadaceae]; affinis *S. giganteae* N. E. Br., sed caulibus et floribus minoribus facile distinguitur.

Caules erecti, subconferti, 7.5-12.5 cm. longi, 1.5-2 cm. crassi, 4-angulati, velutino-puberuli, angulis compressis breviter denticulatis. *Folia* 1-2 mm. longa, erecta. *Pedicelli* 0.6-2 cm. longi, 3-4 mm. crassi, puberuli. *Corolla* 12.5-15 cm. diametro; pars disciformis leviter depressa absque tubo; lobi 4.5-6.5 cm. longi, 2.5-3 cm. lati, ovato-lanceolati, acuminati; corolla extra puberula, intus transverse rugosa, loborum parte apicali glabra, ceterum laxe purpureo-pilosa, marginibus pilis simplicibus longe ciliatis, flavida vel viridi-lutea lineis transversis purpureis notata. *Corona* atrata; lobi exteriores 6 mm. longi, lineari-oblongi, concavi, apice recurvi, truncati, apiculati; lobi interiores bipartiti, parte interiore 8 mm. longa subulata erecta recta, parte exteriori 6 mm. longa lanceolata obtusa.

S. RHODESIA. Collected by Mr. R. G. N. Young near Salisbury, *Herb. Moss* 17301.

This fine species is nearly allied to *S. gigantea* N. E. Br. but differs by having smaller stems and flowers, with shorter points to the lobes of the corolla.

1246. *Hornstedtia sulfurea* R. N. Parker [Zingiberaceae-Zingibereae]; affinis *H. megalocheilo* Ridl. sed antheris villosis, thecis connectivo late discretis, labello sulfureo, deinde pallescente, medio erubescence differt.

Caulis foliosus validus usque 2.5 m. altus, 4 cm. crassus, basi incrassatus, folia circiter 30 gerens. *Folia* 60–90 cm. longa, 7–15 cm. lata, breviter acuminata basi inaequilateraliter; petioli 2–3 cm. longi; ligula rotundata, petiolo subaequalis. *Spica* cum pedunculo et floribus 10–12 cm. longa, pedunculo 3–5 cm. longo. *Bracteae* exteriores usque 4 cm. longae 2.5 cm. latae, marginibus fulvociliatis; bracteolae 5 cm. longae, tubulosae, unilateraliter fissae, hirsutae. *Calyx* 5 cm. longus, unilateraliter fissus, apice subinteger vel 2–3-fidus, sursum puberulus. *Corollae* tubus 3 cm. longus, lobis oblongis 17 mm. longis. *Labellum* 5 cm. longum, basi rhomboideum dein contractum et iterum dilatatum apice rotundatum, primo sulfureum deinde pallescens et medio erubescens. *Filamentum* 7 mm. longum et latum; thecae minute villosae discretae; connectivum 7–8 mm. latum; appendicula o. *Ovarium* villosum; nectarii glandulae 2, lamellosae, 6 mm. longae.

BURMA. Mergui district: Yanngwa hills at 360 m. elevation, flowers March, Parker 2738.

1247. *Cryptocoryne albida* R. N. Parker [Aroideae-Arineae]; affinis *C. Wightii* Schott, sed folia et spatha minora. A *C. Crudasiana* Prain spathae lamina non transverse rugosa inter alia differt.

Caudiculus 5 mm. crassus; radices ferrugineae. *Foliorum* petiolus sensim in laminam transiens, 5–6 cm. longus, usque 3–4 cm. vaginatus; lamina 5–8 cm. longa, 7–15 mm. lata, anguste oblonga, acuta, margine crispato-undulata. *Pedunculus* brevis vagina inclusus. *Spathae* tubus inflorescentiam includens 15 mm. longus 5 mm. latus, superior 4 cm. longus 2–3 mm. diametro; lamina breviter caudato-acuminata, cauda inclusa 2 cm. longa 8 mm. lata. *Inflorescentia* feminea 5-flora, a mascula 2 mm. longa interstitio 7 mm. longo sejuncta; appendix 0.5 mm. longa, late conica.

BURMA. Mergui district. Yanngwa klong, Parker 2735.—Common along shady streams in beds of gravel. Spathes dirty white, inconspicuous amongst the pale leaf-sheaths.

1248. *Fimbristylis aggregata* C. E. C. Fischer [Cyperaceae-Scirpeae]; *F. pauperculae* Boeck. affinis, sed robustior, culmis 5-angulatis, foliis planis scabridis, umbellis decompositis, spiculis multo numerosioribus, nucibus trabeculatis differt.

Herba rigida. *Radix* non visa. *Culmi* solitarii (an semper?) basi incrassati, 5-angulati, angulis minute scabridis, usque ad 60 cm. longi; vaginae coriaceae, laxae, acuminatae, glabrae, usque ad 15 cm. longae. *Folia* nulla vel compluria, plana, anguste ligularia, ad apicem obtusum sensim attenuata, culmos aequantia, usque ad 7 mm. lata, extra glabra, intus marginibusque scabrida, costa nervisque numerosis extra prominentibus. *Umbella* decomposita,

spiculis numerosis. *Bracteae* et *bracteolae* lanceolato-caudatae, interdum anguste ensiformes, extra puberulae, intus scabridae, marginibus setuloso-scabridis. *Radii* costati, costis scabridis, primarii circiter octo, 1.5–5 cm. longi; secundarii pauciores, usque ad 2.5 cm. longi; tertiarii 3–4, usque ad 1 cm. longi. *Spiculae* sessiles, 3–8 in quaque umbella aggregatae, ellipsoideae, 5 mm. longae; gluma ima vacua, glumae 6–10 mediae flores hermaphroditos gerentes, superiores tabescentes. *Glumae* rubro-brunneae, marginibus pallidioribus: gluma ima ovata, acuta, floriferis minor, vix carinata, extra parce puberula; glumae floriferae explanatae latissime ovatae, obtusae, valde carinatae, breviter cuspidatae, basi obliqua, 3.5 mm. longae. *Rhachilla* partibus glumarum basalibus persistentibus alata. *Stamina* 3, exserta; filamenta plana, 1-nervia; antherae lineares. *Stylus* glaber, nuce paullo longior, 3-fidus, lobis linearibus duas tertias styli aequantibus, breviter villosus. *Nux* trigona, obovoideo-ellipsoidea, 5 mm. longa, pallide brunnea, apice depresso-pyramidata vel subtruncato-apiculata; cellulae extimae breviter transverse oblongae, per 7–11 series in quaque facie superpositae; gynophorum breve.

INDIA. Anamallai Hills of the Madras Presidency, R. H. Beddome.

1249. *Fimbristylis contorta* C. E. C. Fischer [Cyperaceae-Scirpeae], *R. complanatae* Link affinis, sed radiis laevibus, spiculis cylindricis contortis longioribus, glumis majoribus marginibus hyalinis, stylis lobisque longioribus, nucibus majoribus cellulis extimis transverse oblongis differt.

Herba erecta; rhizoma robustum, induratum. *Culmi* 1–2, rigidi, teretes, striati vel paullo costati, laeves, 20–50 cm. longi. *Folia* compluria, plana, linearia, abrupte acuta, 7–52 cm. longa, usque 4 mm. lata, glabra, marginibus apicem versus scabridis. *Umbella* decomposita; bracteae 4–5, 8–35 mm. longae, foliis paullo latiores, marginibus scabridis. *Radii* teretes vel interdum subcomplanati, saepe graciles, laeves; primarii 6–8, usque ad 8.5 cm. longi; secundarii 3–4, usque ad 2.8 cm. longi; tertiarii pauci, breviores. *Spiculae* plerumque in radiis ultimis terminales, interdum in furcis sessiles, cylindricae, contortae, 5–12.5 mm. longae, 2 mm. latae. *Glumae* explanatae late ovatae, 2.5 mm. longae, subacutae, carinatae, basi utroque latere excavatae, pallide rubro-brunneae, marginibus hyalinis. *Rhachilla* partibus basalibus glumarum persistentibus alata. *Stamina* 3, exserta; antherae lineares. *Stylus* 1.6 mm. longus, glaber vel parum hirsutus, 3-fidus, lobis linearibus breviter villosis duas tertias styli aequantibus. *Nux* anguste obovata, trigona, 1.1 mm. longa, minute verrucosa, apice depresso-pyramidata, basi in gynophorum brevissimum attenuata, pallide brunnea; cellulae extimae breviter transverse oblongae.

S. INDIA. Courtallum, Heyne in *Herb. Wall.* 3510A (type, in Kew Herb.); Sept. *Madras Herbarium* 12189; Oct. K. C. Jacob 16248; Oct. K. Venkoba Rao 3846, 3847; Travancore, without precise locality, T. F. Bourdillon 145.

1250. *Fimbristylis Narayanii* C. E. C. Fischer [Cyperaceae-Scirpeae]; *F. distichae* Boeck. affinis, umbella saepissime simplici, spiculis paucioribus majoribus, glumis majoribus, nucibus majoribus obpyramidatis differt.

Herba erecta; radix fibrosa. *Culmi* caespitosi, graciles, obtuse quadrangulares, 10-20 cm. longi, glabri vel sparse minute hispiduli; vaginae 3, usque 4 cm. longae, fauce oblique acutae vel truncatae cum limbo brevi, lineari, foliaceo. *Folia* plana, angustissime ensiformia, 4.5-10 cm. longa, 1-2.5 mm. lata, abrupte acuta, glabra; margines sparse minute hispiduli; nervi prominentes. *Umbella* nunc simplex spiculis 2-5, 1 sessili, ceteris pedunculatis, nunc rarius composita radio uno iterum ramoso spiculas 2 alteram sessilem alteram pedunculatam gerente. *Radix* usque 3 cm. longi, capillares. *Bractae* cujusque radii singulae, lanceolatae, cuspidatae, usque 6 mm. longae. *Spiculae* lanceolatae, 5-9 mm. longae (in fructu multo longiores), 2-3 mm. latae. *Glumae* plerumque omnes distichae, interdum superiores plus minus spiraliter dispositae, explanatae late triangulares, subacutae, basi truncatae, 2-3.5 mm. longae, 1.75-2.5 mm. latae, carinatae, glabrae vel carinae minute scabridae, pallide brunneae, margine stramineo, nervis indistinctis; 3 imae vacuae, 6-20 mediae flores hermaphroditos gerentes, paucae superiores tabescentes. *Rhachilla* satis lata, excavata, foveolis utroque latere ala ovata 1 mm. longa munitis. *Stamina* 3, stylum subaequantia; filamenta plana, basi dilatata sensim attenuata. *Stylus* 3-fidus, lobis quartam partem styli aequantibus, vel minoribus. *Nux* obpyramidata, trigona, matura pallidissime brunnea, albo-verrucosa.

INDIA. Travancore: without precise locality, *V. Narayanaswami* 1357 (type, in Kew Herb.), 1194; Naduvathmuzzi, in evergreen forests, Aug., *M. Rama Rao* 1515; without precise locality, Aug.-Sept., *C. C. Calder & M. S. Ramaswami* 212A, 502; Kaldhurutty rock, Sept., *C. C. Calder & M. S. Ramaswami* 806; Courtallam, Oct., *K. Venkoba Rao* 3835; Peermade, Oct., *K. Venkoba Rao* 3896.

VIII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA. IV. & V.* N. Y. SANDWITH.

IV. THE BAROMALLIS OF BRITISH GUIANA.

Few Arawak vernacular names for trees are more familiar to forest officers and botanists in British Guiana than Baromalli. The name is applied to one of the commonest and largest trees of the rain-forest. It rises to a height of 120-150 feet, with a diameter normally considerably exceeding 18 inches, and the smooth straight trunk is immediately recognised and distinguished from all other trees by the conspicuous external rings which occur at regular intervals. The heartwood is reddish in colour. The tree is abundant

*Continued from *K.B.* 1930, p. 480.

in the greenheart, mora, morabukea and mixed forest types. It is a member of the small Bombacaceous genus *Catostemma*, which was founded on a species collected in Berbice by Robert Schomburgk in 1837 and described by Bentham as *C. fragrans* Benth. Since that date, a second species with large flowers has been found in the colony on a tributary of the Mazaruni River, and was described as *C. Altsoni* in Kew Bull. 1928, no. 9, p. 366. Still more recently, two additional species, *C. micranthum* and *C. praecox*, have been described by Ducke from the Upper Amazons and Rio Negro, and the author has added a key to the known species of the genus (Archivos do Jard. Bot. do Rio de Janeiro, vol. v. p. 165, 1930). This key includes two species, *C. Spruceanum* and *C. grandiflorum*, formerly placed in the genus *Scleronema* Benth., which has been united with *Catostemma* by Hemsley and Oliver (Hook. Ic. Pl. 1986), and by Bakhuizen van den Brink in his recent revision of the Bombacaceae (Bull. Jard. Bot. Buitenzorg, 1924, sér. 3, vi. 217-8), although the two were treated as distinct genera by K. Schumann in Engl. and Prantl, Pflanzenfam. Nachtr. ii. 42-43 (1908). *Scleronema* has a 5-lobed instead of a 2-3-lobed calyx, and much shorter style-branches than *Catostemma*. Of the species enumerated by Ducke all are represented at Kew except *C. (Scleronema) grandiflorum* (Huber) Ducke, which was collected on the Rio Caquetá in Colombia.

Two kinds of Baromalli, both plentiful in different habitats, are distinguished by the Arawak Indians of British Guiana, though not under different vernacular names, and have for long been known to forest officers of the colony, but their existence and the possibility of their proving specifically distinct has not been indicated in recent sketches* of these forests, in one of which—by an unfortunate error—Baromalli is identified in the check list of common names with the Bignoniaceous genus *Tabebuia*. Herbarium botanists at home remained ignorant of this until last year, partly owing to the absence of complete material and partly to lack of information, with the result that the two kinds, although both imperfectly represented, have been hopelessly confused and have both been described and figured as *C. fragrans* Benth. They bear a fairly strong superficial resemblance to each other, and the excellent characters distinguishing them either were not noticed or are to be found on parts of the tree which were not represented.

The botanists of the Oxford Expedition to British Guiana, 1929, guided by Mr. T. A. W. Davis, Assistant Conservator of Forests, who was familiar with the two kinds of Baromalli and their distinct habitats, and by Arawaks who accompanied the expedition, were able to collect and study both near their camp on the Moraballi Creek, Essequibo River, so that it is now possible to define them as species and to decide which of them is the original *C. fragrans*.

*"The Forests of British Guiana," by Miles Haman and B. R. Wood, in Tropical Woods, no. 15, pp. 1-13 (1928).

"Some observations on the forests of the North West District," by T. A. W. Davis, in the Agricultural Journal of British Guiana, vol. ii, no. 3, pp. 157-166 (Sept. 1929).

Both species were out of flower, but fortunately this character is sufficiently represented on older material at Kew.

The Common Baromalli is the huge tree of several types of forest which was referred to at the beginning of this paper. The second kind is known as "Sand Baromalli" or "Baromalli of Wallaba," because of its peculiar habitat in the Wallaba (*Eperua*) forest on a white sandy soil, generally on the summit of low ridges. It is one of the common trees of this kind of forest and like many others is never found away from it except for a short distance over the boundary of the adjoining forest type; the Common Baromalli, on the other hand, never occurs in Wallaba forest, so that the two kinds are not seen together, although they may occur at different levels on the same slope and can be felled and collected on the same day. The Baromalli of Wallaba, owing to its habitat, is naturally a smaller tree than its ally. Mr. P. W. Richards who, with Mr. T. A. W. Davis, made a detailed ecological study of the area which was worked by the expedition, writes as follows:—"The Sand Baromalli is the subdominant species in Wallaba forest and is very abundant. It only strays into the top of the Greenheart forest and gives way to the other species (Common Baromalli) almost as soon as the white sand is left. This is shown very beautifully on the transect which E. B. Martyn and I carried out from Wallaba to Greenheart. The two species do not really overlap in distribution at all. The Common Baromalli has a very wide range of soil, as it occurs in Greenheart, Mixed, Morabukea and Mora. It is possible that the Sand Baromalli occurred in the sandy Mora forest, as did so many of the Wallaba species, but I have not noted the fact."

The most remarkable, as well as the most useful, character distinguishing the two Baromallis is to be found in the leaves of the seedlings, which can always be found in plenty and collected without any difficulty. They were quite unrepresented in the Kew Herbarium, and provide a striking example of the importance of identifying and collecting seedlings in the field. Even if there were no other differences of habitat or mature foliage which could be detected between the two trees, this character is so constant and so obvious that it would immediately separate them as distinct species. As usual, these leaves are extraordinarily different in shape and texture from those of the mature tree, the lamina being thinner, proportionately very long and narrow, and obovate-oblong or oblanceolate in outline, while the apex is conspicuously acuminate or cuspidate instead of rounded or retuse with a minute apiculus. The seedling leaves of the Common Baromalli are compound, with from two to five (usually three) leaflets; the petiole is very long; the lamina of the leaflets is acuminate at the apex, and the acumen is relatively short and broad, more or less triangular in outline. Those of the Sand Baromalli are simple, with a much shorter petiole; the lamina is thinner in texture (this is more noticeable in the field than in the herbarium), and remarkably cuspidate at the apex, with a very long, sharp and extremely narrow "drip-tip," the sides of which are often practically parallel and sometimes involute from near the base. The

lamina tends to be more obovate-oblong or obovate-elliptic than that of the Common Baromalli, which is usually oblanceolate, and the midrib is symmetrical, whereas in the Common Baromalli it is conspicuously excentric in the lateral leaflets. The secondary and tertiary venation is equally reticulate in both species, but the pattern is totally different. That of the leaflets of the Common Baromalli is extraordinarily complex and irregular, almost defying description; the secondary nerves which leave the midrib are nearly horizontal at first, but those which leave the conspicuous arcuate primaries do so at an angle of 90 degrees or more with the primaries, and their direction is consequently obliquely upwards towards the midrib and downwards away from it, but they soon become for the most part indistinguishable in an intricate network of tertiaries. The venation of the leaves of the Sand Baromalli, on the other hand, is neat and regular; all the secondary nerves, both those which leave the midrib and those which leave the arcuate primaries, are more or less horizontal in direction and parallel; they are sinuous in outline, but they anastomose without a break with the nerve which comes to meet them from the lower or upper primary, and their course is always visible. The same is true of the tertiary nerves, which are more or less regular and parallel.

The mature leaves of the two species are very similar superficially both in appearance and outline. A careful examination, however, shows that they retain some of the important differences which were noticed in the leaves of the seedlings. Those of the Sand Baromalli are still obovate-oblong or obovate-elliptic, and both margins are nearly always neatly rounded on to the petiole; whereas the leaves of the Common Baromalli are elliptic or frequently definitely obovate, the base being wedge-shaped, with the margins gradually narrowed into the petiole. The differences in the pattern of the venation are not only retained but are accentuated owing to a difference in texture. The mature leaves of the Sand Baromalli are more coriaceous than those of the Common Baromalli, so that all the nerves are far more impressed on both surfaces, with the exception of the midrib and primary nerves on the lower surface, which are far more prominent. The regularity of the pattern made by the secondary nerves of the Sand Baromalli is more noticeable than before, particularly on the lower surface, on which the tertiary nerves are so much impressed that they are often quite invisible. The mature leaves of the Common Baromalli, on the other hand, are equally reticulate on both surfaces, and the minor venation is just as strong and irregular in pattern as it was in the seedling leaves; the midrib and primary nerves are more prominent on the upper and less prominent on the lower surface than in the Sand Baromalli. Finally, the presence of stellate hairs on the lower surface of the leaves, particularly of the smaller ones, which was just noticeable in the leaves of the seedlings of the Sand Baromalli, becomes more definite in those of the mature tree and is also noticeable on the young

branchlets and petioles; these hairs have not yet been seen on similar parts of the Common Baromalli.

An examination of the herbarium material of *Catostemma* at Kew immediately showed that the leaves of the type specimens of *C. fragrans* Benth. agreed in all respects with those of the Sand Baromalli. This type was collected by Robert Schomburgk (no. 280) in the savannah country of Berbice, a locality which confirms the identification with the sand-loving species. The notes in Robert Schomburgk's mss. are as follows:—"Tree on banks of river, 50 ft. high. Trunk brownish. Branches spreading. Leaves dark green, lucid. Calyx light green. Corolla white. Stamens and anthers yellow. Odoriferous [presumably referring to the flower]." The locality "Berbice, Schomburgk, 1837," is written in Hooker's handwriting on a duplicate sheet of the type; as with so many of Robert Schomburgk's plants, no locality is specified in his manuscript notes preserved at Kew, but no. 280 occurs in a list of savannah species which were doubtless collected in Berbice.

The identity of the Sand Baromalli with *C. fragrans* is thus satisfactorily established. Now it is a curious fact that, with the exception of two sheets, all the specimens of Baromalli hitherto preserved at Kew are referable to this species, and have evidently been collected either in savannah country or in Wallaba forest. This means that, by a remarkable coincidence, no one has apparently hitherto collected material from the common species of the usual types of forest by the rivers and creeks in the north of the colony. The reason may be, perhaps, that the vernacular name was familiar, and had been assigned to *Catostemma fragrans*; or that the tree was too large and too common to be worth felling for botanical material; or that it has rarely been noticed in flower or fruit. The Oxford Expedition found only a few withered flowers on the branch from which their collection was made, and it is possible that the tree flowers in the rainy season between May and July, when collectors avoid the forest.

Fortunately, however, there are two sheets at Kew, bearing leaves, flowers and fruit, which agree exactly with the Oxford Expedition material of the Common Baromalli. They were forwarded to Kew in April, 1891, from the Old Botanic Garden, St. Vincent, where a tree of the Common Baromalli had evidently been cultivated for very many years. These specimens were figured as *C. fragrans* in the *Icones Plantarum* (no. 1986) by Prof. Daniel Oliver, but only the fruit was described, as flowering *C. fragrans* had already been figured and described in the same work (no. 1793) by Mr. J. G. Baker from material collected by Jenman (no. 4336) on the Lower Demerara River. The Jenman specimen is undoubtedly *C. fragrans*, as it agrees with Schomburgk's type and is evidently from a Sand Baromalli. Oliver, therefore, failed to notice the differences in the leaves, and it has come about that the mature leaves and flowers of both Baromallis have been figured in the *Icones Plantarum* under the name *C. fragrans*.

A study of the inflorescences of both species thus fixed in the Herbarium reveals several distinguishing characters which will have to be tested by the collection of better flowering material of the Common Baromalli. The pedicels of the Sand Baromalli are normally longer than those of the common species, and the bracteoles, which are usually three in number, are very small and situated at some distance below the flower or even at the middle of the pedicel. The bracteoles of the Common Baromalli are large and conspicuous (see Oliver's figure) and the point of attachment is close up to the calyx, so that the two overlap. The calyx, petals, stamens and ovary of the two species seem to be very similar. The style, however, is glabrous in the Sand Baromalli except for scattered stellate hairs at the base where it joins the ovary; whereas the style of the Common Baromalli is stellate-tomentose throughout the lower third of its length. The style-branches of the Common Baromalli are shorter than those of the other species. Both these characters, which were discovered on dissection, are confirmed by the figures of the two species given by Baker and Oliver.

Finally, the fruit of the Common Baromalli, on present evidence, is larger than that of the Sand Baromalli, and the pericarp is smoother and less striate on the outer surface, and very much thicker on the inner side. The seed of the Common Baromalli is said by the Arawaks to be red, that of the Sand Baromalli to be yellow. No further evidence of the colour of the former exists at Kew, but Hohenkerk notes that the seed of the Sand Baromalli is bright orange.

It may be mentioned at this point that a careful description of the anatomy of a tree identified as "*Catostemma fragrans* Benth." is given by David A. Krebs in his paper on "the Persaud Collection of British Guiana Woods" in *Tropical Woods*, no. 13, pp. 13-14 (1928). The herbarium material (*Persaud* 134) of this tree is not represented at Kew, so that it is impossible to say to which of the two species it should be assigned, but it is hoped that the possessors will now be able to settle the question of its determination.

To summarise the above discussion, there are two Baromallis occurring plentifully in different habitats in the forests of British Guiana, which are abundantly distinct both in the field, where they have already been distinguished, and in the herbarium, where they have hitherto been confused. The original species described by Bentham as *C. fragrans* has been conclusively identified with the Sand Baromalli. The Common Baromalli is thus left without a name; it has no affinity whatever with any of the Amazonian species of *Catostemma*, and only its fruit has been described hitherto, so that it is necessary to define it further as follows:—

***Catostemma commune* Sandwith sp. nov.**; a *C. fragrante* Benth. foliis plantarum incipientium 2-5-foliolatis nec simplicibus, foliolis acuminatis nec anguste longe cuspidatis, foliis maturis basi cuneatis utrinque aequaliter irregulariter reticulatis subtus haud stellatim

pilosis, pedicellis brevioribus, bracteolis conspicuis multo majoribus, stylo triente inferiore tomentoso, fructu majore pericarpio crassiore differt.—*C. fragrans* Oliv. in Hook. Ic. Pl. 1986 (1891), quoad tabulam totam atque descriptionem fructus arboris cuiusdam in insula Sancti Vicenti cultae, excl. exemplis ceteris citatis; non Benth. in Hook. London Journ. Bot. ii. 365 (1843) nec Baker in Hook. Ic. Pl. 1793 (1888).

Arbor excelsa, ad 45 m. alta, trunco laevi annulis externis insignibus regulariter praedito, materie rubescente. *Folia plantarum incipientium* 2–5-foliolata, vulgo trifoliolata; foliola oblanceolata, apice oblique acuminata, acumine triangulari-lanceolato vulgo 1–1.8 cm. longo supra medium 3–6 mm. lato apice obtuso sed costa excurrente terminato, basi attenuata cuneata latere inferiore foliorum exteriorum rotundato excepto, petiolulis brevissimis crassis corrugatis nigrescentibus, 9–32 cm. longa, 3–8 cm. lata, siccitate supra olivacea subtus olivaceo-brunnescentia, utrinque glabra, nitida, chartacea, costa nisi in foliolo mediano conspicue excentrica, utrinque fere aequaliter intricatissime reticulata, nervis primariis in utroque costae latere vulgo 8–12 laete arcuantibus, reticulatione nervorum secundariorum venularumque tertiariarum valde intricata atque irregulari quoqueversus versante; petiolus longissimus, nitidus, glaber, sulcatus, brunneus, 11–28 cm. longus, 1–3 mm. crassus. *Ramuli arboris maturae* crassi, 4–10 mm. diametro, glabri, inferne cicatricibus foliorum pedicellorumque delapsorum asperi, foliis versus apicem satis confertis vel in ramulis minimis lateralibus fasciculatis. *Folia matura* elliptica vel obovata, apice rotundata vel late satis profunde retusa, costa excurrente saepius reflexa, basi in petiolum attenuata cuneata, 4–19 cm. longa, 2–9 cm. lata, siccitate supra olivacea nervis brunnescentibus subtus olivaceo-brunnescentia, utrinque glabra, nitida, rigide chartacea vel subcoriacea, utrinque fere aequaliter sed praesertim subtus conspicue reticulata rete venularum prominentium intricato ac irregulari, costa nervisque primariis utroque latere 8–12 utrinque subaequaliter exstantibus; petiolus glaber, 1–9 cm. longus, sub lamina atque basi incrassatus. *Flores* complures, ut videtur saepe 2–5, in axillis fasciculati; bractaeae basi pedicellorum semicirculares, concavae, extra plus minusve furfuraceo-tomentosae, vix ad 1 mm. longae atque 2 mm. latae; pedicelli pilis stellato-lepidiformibus dense furfuraceo-tomentosi, breves, 0.5–2 cm. longi, ad 1.5 mm. lati; bracteolae binae, supra medium pedicellum vel sub flore positae, conspicuae, mox caducae, ovatae, obtusae, utrinque pilis stellatis confertis dense tomentosae, 5–6 mm. longae, ad 4.5 mm. latae. *Calyx* extra dense stellato-tomentosus, intus marginibus loborum exceptis glaber, in lobos 2 fissus; tubus campanulatus, demum versus basim circumscissus, circiter 4 mm. longus, 3–4 mm. latus; lobi ovati, ad 7 mm. longi, 6 mm. lati. *Petala* glabra, oblongo-spathulata, obtusa, circiter 1.2 cm. longa, 4–5 mm. lata. *Stamina* circiter 8 mm. longa, glabra. *Ovarium* ovoideum, dense tomentosum, 2.5 mm. longum, ad 2 mm. diametro; stylus ad 1.3 cm. longus, triente inferiore

tomentosus, ceterum glaber, stigmatibus 0.75–1.5 mm. longis. *Fructus* jam a cl. Olivero optime descriptus atque tabulatus, oblongo-ellipsoideus, 8–10 cm. longus, 3.5 cm. diametro, siccitate dense minute ferrugineo-tomentellus; semen oblongo-subcylindricum, ad 7.5 cm. longum, ad 3.5 cm. diametro, testibus incolis rubrum.

BRITISH GUIANA. Moraballi Creek, Essequibo River, August 25th, 1929, *Sandwith* 116 (type); *ibid.* (seedling leaves), October 9th, 1929, *Sandwith* 435.—Old Botanic Garden, St. Vincent, comm. H. Powell, April 1891; these specimens, taken from a cultivated tree, were figured by D. Oliver, *vide supra*.

Vernacular name (Arawak), Baromalli or Common Baromalli.

The type material was collected from a tree over 130 feet high, which was used as an observation-post by the ornithologists of the Expedition.

It seems advisable to add a similar detailed description of the Sand Baromalli, and to conclude with some remarks on the third Guiana species.

Catostemma fragrans Benth. in Hook. London Journ. Bot. ii. 365 (1843); Baker in Hook. Ic. Pl. 1793 (1888).

Arbor mediocris vel haud valde excelsa, 15–30 m. alta, in terra arenosa, saepius in eperuetis frequentissime crescens, nunquam juxta *C. commune* reperta. *Folia plantarum incipientium* simplicia, obovato-oblonga vel obovato-elliptica, apice nunc rotundata fere truncata nunc attenuata, semper insigne longe anguste cuspidata, cuspidate lineari-subulata 1–5 cm. longa supra medium 0.75–2.5 mm. lata apice truncato vel obtuso marginibus nonnunquam paullo involutis, basi in petiolum plerumque rotundata, 12–38 cm. longa, 3–10.5 cm. lata, siccitate supra olivacea, subtus brunnescentia, utrinque glabra vel juniora subtus pilis stellatis rarissimis secus nervos conspersa, nitida, saepe magis tenuiter chartacea quam ea *C. communis*, costa centrali, utrinque praesertim supra subtilissime pulcherrime reticulata, nervis primariis in utroque costae latere vulgo 8–12 laete arcuantibus, reticulatione regulari, nervis secundariis omnibus plus minusve horizontalibus parallelisque sinuatis, venulis tertiariis plus minusve verticalibus atque parallelis; petiolus satis brevis, glaber vel parcissime stellato-pilosus, sulcatus, brunneus, 2.5–8.5 cm. longus, ad 2 mm. crassus, apice sub lamina incrassatus nigrescens. *Ramuli arboris maturae* sulcati, 3–8 mm. diametro, juniores plus minusve copiose stellato-pilosi, adulti glabrescentes. *Folia matura* obovato-oblonga vel obovato-elliptica, apice ut in *C. communi*, basi in petiolum rotundata, 2.8–22 cm. longa, 1.2–10.5 cm. lata, siccitate plus minusve olivacea subtus brunnescentia, utrinque fere glabra sed subtus secus nervos—saepius etiam in facie foliorum minorum—pilis stellatis parce vel satis copiose conspersa, nitida, subcoriacea vel coriacea eis *C. communis* crassiora, costa nervisque primariis in utroque latere vulgo 8–12 supra impressis subtus valde exstantibus, reticulatione utrinque praesertim subtus obscura impressa, regulari, nervis secundariis praesertim subtus

conspicue subhorizontalibus parallelisque, tertiariis subtus saepe vix vel haud distinguendis; petiolus stellato-pilosus, 0.5–5 cm. longus. Flores albi, fragrantés, complures in axillis fasciculati; bracteae eis *C. communis* subsimiles; pedicelli stellato-tomentosi, 1.5–4 cm. longi; bracteolae 2–3 in medio pedicello vel supra positae, nonnunquam distantes, parvae, ovatae, obtusae, utrinque tomentosae, 1–2.5 mm. longae, ad 2 mm. latae. Calyx ut in *C. communis*; tubus 3–4 mm. longus, 4–5 mm. latus; lobi ovati, ad 9 mm. longi, 6–7 mm. lati. Petala glabra, oblongo-spathulata, obtusa, ad 1.3 cm. longa, latitudine variabili ut videtur 3–7 mm. Stamina ut in *C. communis*. Ovarium dense tomentosum, ovoideum, ad 4.5 mm. longum, ad 3.5 mm. diametro; stylus ut videtur ad 1.1 cm. longus, basi ipsa excepta glaber, stigmatibus ad 3 mm. longis. Fructus monospermus, oblongo-ellipsoideus, 4–7 cm. longus, ad 3.5 cm. diametro, siccitate dense minute ferrugineo-tomentellus, pericarpio quam in *C. communis* extra magis striato intus multo minus crasso; semen oblongo-subcylindricum, purpurascens, laeve sed passim granulatum, 4 cm. longum, 2.3 cm. diametro, testibus incolis atque cl. Hohenkerk flavum vel laete aurantiacum.

BRITISH GUIANA. Berbice, 1837, Robert Schomburgk 280 (type); Lower Demerara River, Jan. 1888, Jenman 4336 (type of Ic. Plant. 1793); sandy soil, Mora-mora-bisi Creek, Mapenna River, Corentyne River, April 1918, Hohenkerk in Forestry Department record no. 704; hill-top, Kamwatta Creek, Koirimap River, Pomeroun River, July 1918, Hohenkerk in ditto, no. 704A; Kuruduni River, Demerara River, July 1920, Hohenkerk in ditto, no. 704B; in Wallaba forest on sandy ridge, Moraballi Creek, Essequibo River, Oct. 1929, Sandwith 485 (leaves of mature tree and of seedlings).

Vernacular name (Arawak), Sand Baromalli or Baromalli of Wallaba.

Catostemma Altsoni Sandwith in Kew Bull. 1928, no. 9, p. 366.

This species was described at some length, and no further material has been seen. Its affinity with the Sand Baromalli (*C. fragrans*) is clearly indicated by the low height of the tree, by the long pedicels, the small bracteoles and the glabrous style. The flowers of *C. Altsoni* are much larger in all their parts, while the leaves are more elliptical and considerably more coriaceous, so that the reticulation of the lower surface, which is irregular and more like that of *C. commune*, is even more impressed. Again, no stellate hairs have been seen on the petioles or leaves of *C. Altsoni*. The Arawak vernacular name was noted by Altson as "Cou-yami."

V. SAPROPHYTES COLLECTED BY THE OXFORD UNIVERSITY EXPEDITION TO BRITISH GUIANA, 1929.

The saprophytes enumerated below were collected by the botanists of the Oxford Expedition within a two-mile radius of the camp on the Moraballi Creek, Essequibo River, which was occupied from early August to the middle of November. A prolonged rainy season was

favourable to the appearance of these curious and delicately beautiful little plants, which were found in plenty throughout the month of August, and seemed to become much scarcer with the arrival of the dry season. The number of species discovered in this small area is significant, as it includes three which are described here for the first time, three more which were recently described by Dr. H. A. Gleason, and another which appears to be a first record for the colony. Most of these were found on more than one occasion, and several were comparatively frequent, though occurring in small quantity.

The species are members of the *Gentianaceae* and *Burmanniaceae*, with the exception of a single Orchid, and a species of *Balanophoraceae* which is included here because of the similarity of its habit. The large majority, as would be expected, preferred the darkest type of forest with the richest, deepest leaf-mould on its floor. The morabukea forest-type, on the slopes of ridges, was therefore the most profitable locality in which to search, and here numerous species would always be found, often growing in company near the bases of trunks or between the buttresses, and frequently accompanied by the remarkable fern *Schizaea fluminensis* Miers. The yellow-flowered *Leiphaimos aphylla* was an exception, as it showed a definite preference for the more open, sandy wallaba forest on the tops of ridges where the light penetrates. Another species, *L. tenella*, was nearly always found at the foot of greenheart. A definite habitat can also be assigned to *Campylosiphon purpurascens*, which was never found away from the mud of actual swamps, either of palm or mora.

A lesson has been learnt from the failure to identify several of the smaller species of the genus *Gymnosiphon*, owing to the incompleteness of the material. Some of the species were quite frequent, and were in perfect flowering condition in the field. They almost certainly represent species which have not hitherto been recorded from the colony, or which have not been described. Yet it is impossible now to do anything with the dried material, as the perianth segments and half the tube have either fallen off or are unfit for dissection. Future collectors in British Guiana should therefore preserve these species in spirit before the otherwise almost inevitable circumscission of the perianth has taken place; or, alternatively, they should take careful notes in the field of the measurements of the flower and of the important specific characters of the stamens and style-branches. It need hardly be added that, owing to the similarity between the white-flowered species, a separate number must always be given to every gathering, even if only a single specimen is found.

GENTIANACEAE.

Voyria rhodochroa Sandwith sp. nov.; *V. roseae* Aubl. affinis, corollae lobis obtusis oblongo-spathulatis differt.

Caules fastigiato-ramosi; rami rubri, corymbosi, 1–7 cm. longi, 1–3 mm. lati, carnosi, sulcati, satis dense foliati. Folia squamosa,

opposita, basi connata, triangulari-lanceolata vel ovata, obtusa vel subacuta, 2-5 mm. longa, 2-3 mm. lata, minutissime tomentella, inferne internodiis ad 1 cm. longis sejuncta, sursum sub floribus imbricatim conferta. *Flores* apice ramulorum summorum brevium in fasciculum corymbosum saepe multiflorum congregati, supra squamas summas brevissime pedunculati. *Calyx* ruber, brevis, cylindrico-campanulatus, sub lente plerumque minutissime papilloso-tomentellus; tubus 3-6 mm. longus, 3-4 mm. latus; dentes breves, triangulares, obtusi, inaequales, 1-2.5 mm. longi, basi ad 2 mm. lati. *Corolla* pulcherrima, hypocraterimorpha, minutissime papilloso-tomentella; tubus albo-carneus, 3.2-4.2 cm. longus, ut in *V. rosea* basi circa ovarium ac apice circa genitalia ad 4 mm. latitudinem ampliatus, apice fere campanulatus ac intus dense pilosulus, sub lobis levissime contractus, ceterum cylindricus angustissimus 1-1.5 mm. latus; lobi pulcherrimi, laete rosei, oblongo-spathulati, obtusi, patuli, 5-10 mm. longi, 2-3.5 mm. lati. *Stamina* prope basim partis tubi superioris campanulato-ampliatæ inserta; filamenta brevissima; antherae 1.5 mm. longae. *Ovarium* glabrum, anguste ellipsoideum, circiter 8 mm. longum atque 2.5 mm. diametro, sensim in stylum glabrum 2.5 cm. longum attenuatum; stigma antheras paullo superans, sinuato-peltatum, fere ad 2.5 mm. latum.

BRITISH GUIANA. Essequibo River; Moraballi Creek, in mixed and morabukea forest, August 21st, 1929, *Sandwith* 82. Found on only two occasions. Stems and branches tufted as in *Clavaria* spp. Stems and calyx red. Corolla tube flesh-white; lobes a beautiful wild-rose pink.

Voyriella parviflora *Miq.* Stirp. Surinam. Sel. 147 (1850).

In morabukea-greenheart forest near the Moraballi-Wineperu Divide, August 28th, *Sandwith* 134. Fl. white. Calyx segments very conspicuous and chaffy, white.

Distr. Surinam, *Miquel*. Rio Uaupes, Brazil, *Spruce* 2834 in part.

Apparently the first record from British Guiana. The specimens agree very well with *Miquel's* syntypes at Kew.

Examination of the scanty material of this genus in the Kew Herbarium reveals the presence of a second, very distinct species, with much larger; more chaffy, upper scale-leaves, much larger floral parts, and longer style. This was collected by *Spruce* on the Rio Uaupes at the same time as *V. parviflora*, and the two species were distributed under the same number, 2834; but *Spruce* noted that "these specimens were gathered widely apart and may belong to more than one species." Good material of this new species has recently been collected by Mr. A. A. Abraham in British Guiana, and it may be described here as follows:—

Voyriella oxycarpa *Sandwith* sp. nov.; a *V. parviflora* *Miq.* foliis heteromorphis, superioribus ut bracteis anguste lanceolatis longe acute attenuatis vel aristatis, omnibus partibus floralibus atque fructescentibus multo longioribus differt.

Caulis simplex vel infra medium in ramos binos aequales bifurcatus, 3-8 cm. altus, dense foliatus. *Folia* squamosa heteromorpha; inferiora plus minusve ut in *V. parviflora* parva, ovata vel ovato-lanceolata, obtusa, 1-2 mm. longa atque lata; superiora sensim longiora angustiora ac acutiora, summa anguste lanceolata, longe anguste acutissime attenuata vel aristata, 5-8 mm. longa, basi ad 1.5 mm. lata; internodia 2-10 mm. longa. *Inflorescentia* apice caulis ut in *V. parviflora* dense simpliciter vel composite cymosa; raro etiam flores singuli vel gemini versus basim caulis lateraliter surgunt; bracteae foliis summis simillimae. *Flores* pedicellis 1-2 mm. longis. *Sepala* ad basim libera atque basi imbricata, lanceolato-subulata, acutissime angustissime longe attenuata, 7-9 mm. longa, basi vulgo 1 mm. lata. *Corolla* 7.5 mm. longa, tubo cylindrico fere 2 mm. lato; lobi triangulares, brevissimi, ad 1 mm. longi atque lati. *Stamina* circiter 3 mm. supra tubi basim inserta; filamenta ad 1.2 mm. longa; antherae oblongae, 1 mm. longae, apiculo connectivi ad 0.5 mm. producto. *Ovarium* ovoideo-ellipsoideum, 2 mm. longum, vix 1 mm. diametro; stylus 3 mm. longus. *Fructus* maturescens satis anguste ovoideo-ellipsoideus, 4-5 mm. longus, vix 1.5 mm. diametro, sensim in stylum 2-3.5 mm. longum attenuatus; stigma tum conspicue bilobum.

BRITISH GUIANA. Berbice County; Yawakuri, alt. 70-80 ft., growing on dead leaves, June 2nd, 1919, *Abraham* 163 (type).

BRAZIL. In shady forests by the Rio Uaupes, January, 1853, *Spruce* 2834 in part.

The sepals of *V. parviflora* are 3-5 mm. long, the ripening capsule 2-2.5 mm. long, and the style only 1 mm. long or often less.

Leiphaimos aphylla (*Jacq.*) *Gilg* in Engl. et Prantl, Pflanzenfam. iv. 2. 104 (1895). *Gentiana aphylla* *Jacq.* Enum. Pl. Carib. 17 (1760); Ic. Sel. Stirp. Amer. t. 60, f. 3 (1797).

On leaf-mould and rotten stumps in mora and wallaba forest, August-November, *Sandwith* 266.

Distr. Widely distributed over the West Indies and Tropical South America.

This golden-yellow species is the commonest of the group, and was distinguished in this locality by a marked preference for the wallaba forest where there was plenty of light, a factor notoriously shunned by most saprophytes.

L. corymbosa (*Splitg.*) *Gilg* in Engl. et Prantl, Pflanzenfam. iv. 2. 104 (1895). *Voyria corymbosa* *Splitg.* in Tijdschr. Nat. Geschied. vii. 136, pl. ii. f. 4 (1840). *Voyria nivea* *Miq.* in Linnaea xix. 140 (1847). *Leianthostemon niveus* *Miq.* Stirp. Surinam. Sel. 148 (1850). *Leiphaimos nivea* *Gilg* l.c.

Plentiful in dark forest, August 16th, *Sandwith* 26. Stem and flowers pure white. Inflorescence sometimes reduced to a single terminal flower; usually three to four times dichotomously cymose. *Distr.* Surinam and British Guiana.

The syntype of *L. corymbosa* was borrowed from Leyden, and was found to be indistinguishable from that of *L. nivea* at Kew. The supposed difference in the colour of the flowers (lilac or white) is probably negligible.

L. (§ *Disadena* Gilg) **tenella** (Hook.) Miq. Stirp. Surinam. Sel. 149 (1850). *Vohiria tenella* Hook. in Hook. Bot. Misc. i. 47, t. 25 B (sphalm. *tenera*) (1829). *Voyra tenella* Guild., Griseb. Gen. et Sp. Gent. 207 (1839). *Voyria tenella* Guild., Progel in Mart. Fl. Bras. vi. pars i. 223 (1865). *V. nuda* Splitg. in Tijdschr. Nat. Gesch. vii. 134, pl. i. fig. 2 (1840). *Leiphaimos? nuda* Miq. l.c. *Voyria brachyloba* Griseb. Cat. Cub. 181 (1866). *Leiphaimos brachyloba* Urb. in Arkiv. Bot. xxi A. no. 5, 58 (1927).

In greenheart and mixed forest, August 28th, Sandwith 135. Stem white. Fl. bluish-mauve.

Distr. West Indies, Guiana, Brazil.

L. tenella was unfortunately misrepresented from the start by Hooker, who described the corolla lobes as rose-coloured, and failed to discover the presence of the stipitate gland on each side of the ovary. This naturally misled Grisebach and Progel, the latter placing the species in the wrong section of his key in the Flora Brasiliensis. The type specimens in the Kew Herbarium are accompanied by a coloured drawing and notes by Guilding, who discovered the plant in St. Vincent. The corolla lobes are coloured bluish-mauve and the stems yellowish-white, and Guilding himself writes that the "petals" are "pale purple." The glands on the ovary are clearly visible on the type specimens, and there can be no doubt from a comparison with Splitgerber's description and figure that the species is conspecific with the Surinam *L. nuda* (Splitg.) Miq., and that Splitgerber overlooked the calyx which is often deciduous or difficult to make out in these plants. The type material of *L. brachyloba* in Herb. Kew. is very poor, but it is a very good match with *L. tenella*.

BALANOPHORACEAE.

Helosis cayennensis (Sw.) Spreng. Syst. iii. 765 (1826). *Cynomorium cayennense* Sw. Fl. Ind. Occ. i. 13 (1797). *Helosis guianensis* L. C. Rich. in Mém. Mus. Par. viii. 416, t. 20 (1822); Eichl. in Mart. Fl. Bras. iv. pars ii. 23, tt. iv-vi (1869).

Among rotten logs in mora and palm swamp, and in adjoining mixed forest, Nov. 16th and 18th, Sandwith 620. Parasite with far-spreading, much-branched, horizontal, bone-white rootlets with orange tips, the main branches up to 5 mm. in diameter. Tube of volva 7-8 mm. long and 1 cm. wide, split at the apex into four broadly triangular lobes about 5 mm. long and 6 mm. broad. Stems 3-18 cm. high and 9 mm. in diameter, pale mauve to dull brownish-mauve, scurfy all over, warty at the top. Scales of the anthophore pinkish-mauve, turning pale ochre with age, 4-5 mm. in diameter, tipped with a short dark setaceous apiculus. Styles whitish-hyaline. Male flowers appearing quincuncially at intervals of

4-5 mm. on the older brownish-mauve anthophore, their base surrounded by whitish-hyaline paleae which are tipped with reddish spots; perianth tube white, up to 4 mm. long; lobes white below, reddish-purple towards the apex, 2-3 mm. long. Common filament white, 5-7 mm. long.

Distr. Trinidad and Northern South America; possibly also in Guatemala and Cuba.

BURMANNIACEAE.

Dictyostega Schomburgkii Miers in Trans. Linn. Soc. xviii. 542 (1841), var. **parviflora** Benth. in Hook. Kew Journ. Bot. vii. 13 (1855).

In mora-greenheart forest, once found, October 31st, Sandwith 540. Fl. white, very small.

Distr. British Guiana. French Guiana, Sagot 1164 in part. Rio Uaupes, Brazil, Spruce 2623 (type).

Urban (Symb. Antill. iii. 442) refers Sagot's specimen to *D. orobanchoides* Miers, but he does not appear to have examined *D. Schomburgkii* and its variety. Typical *D. Schomburgkii* occurs in British Guiana and in Trinidad (Fendler 597).

Miersiella aristata Sandwith sp. nov.; *M. umbellatae* (Miers) Urb. atque *M. costatae* (Miers) affinis, colore albo, squamis caulinis bracteisque insigne longe aristatis differt.

Radix et dense imbricato-squamosa et longe fibrillosa generis typica. *Caules* 1-2 albi, distincte sulcati, 5-11 cm. longi. *Folia* squamosa, numerosa, a se 4-7 mm. distantia, siccitate brunnea, 4-7 mm. longa, 0.5-1.5 mm. lata, margine saepius lacerata vel fimbriata, sensim conspicue longe aristata, arista e caule exstante vel saepe reflexa. *Inflorescentia* umbelliformis, alba, 3-9-flora; pedicelli erecti, subteretes vix sulcati, 3-6 mm. longi; bractee foliis simillimae, confertae, dimidio superiore reflexo. *Perianthium* tubo ovoideo-cylindrico cum ovario ad 2.5 mm. longo, 2 mm. lato; lobi 6, majores late triangulari-ovati, fere ad 1 mm. longi, 0.75 mm. lati, minores ad 0.5 mm. longi, multo angustiores. *Stamina* ut in speciebus affinis. *Ovarium* ad 1.5 mm. altum, uniloculare, apice gibbis glandulosis tribus sessilibus ut videtur supra apices placentarum dispositis praeditum; stylus cum stigmatibus ad 1.5 mm. longus.

BRITISH GUIANA. Essequibo River; Moraballi Creek, in morabukea forest, August 27th, 1929, Sandwith 131.

It was noticed on several occasions, and was evidently frequent.

The following new combination should be made here: **Miersiella costata** (Miers) Sandwith, comb. nov. *Dictyostega costata* Miers in Trans. Linn. Soc. xviii. 542 (1841). This is very closely allied to *M. umbellata*, and perhaps insufficiently distinct from it, a fact which was evidently overlooked by Urban, since he saw no specimens and the plant was not figured by Miers. Glaziov 18560, cited by Urban in Symb. Antill. iii. 439 as *M. umbellata*, agrees better with the type specimens (in the British Museum) of *M. costata* than with those of *M. umbellata*.

Cymbocarpa saccata *Sandwith* sp. nov.; a *C. refracta* Miers perianthii tubo basi supra ovarium in annulum insignem saccis 5-compositum producto differt.

Planta sordide albo-lutea, 7-17 cm. alta; caules gracillimi, simplices, aut ramo singulo circiter e medio exoriente praediti; internodia plurima, sensim versus apicem longiora, 0.2-2.2 cm. longa. *Folia* atque *bracteae* ut in *C. refracta*. *Inflorescentia* semel cymose divisa, cum flore in angulo divisionis, 2-5-flora; rami ad 2.5 cm. longi; pedicelli brevissimi. *Flores* post anthesin subhorizontaliter positi; perianthii tubus post anthesin circumscissus ad 2.5 mm. longus, basi supra ovarium in annulum saccorum quinque globosorum vertice ovarii latiore insigni ampliat. *Ovarium* forma generis typica, maturitate 2-3 mm. longum, 1-2 mm. latum; ovulis, funiculis, placentis, glandulisque internis omnino ut in *C. refracta*.

BRITISH GUIANA. Essequibo River; Moraballi Creek, in morabukea forest, August 27th, 1929, *Sandwith* 132. Fl. creamy-white.

The circumscission of the perianth tube has taken place in every flower except a single young one which has not been dissected. In this the whole perianth above the ovary is nearly 3 mm. long, and the curious ring of sacs which forms at the base of the tube is already noticeable though not conspicuous. This character is a remarkable and constant feature of the mature flower, and immediately distinguishes the species from *C. refracta*, of which there are numerous specimens in Herb. Kew. from Cuba and Brazil.

Gymnosiphon breviflorum Gleason in Bull. Torrey Bot. Club lvi. 22 (1929).

In greenheart forest, November 4th, *Sandwith* 706.

Distr. British Guiana.

G. guianense Gleason l.c.

At foot of a mora, August 14th, *Sandwith* 11. Plant wholly white.

Distr. British Guiana, frequent.

G. Altsoni Gleason l.c. 23.

In deep shade in morabukea forest, August 27th, *Sandwith* 130, a perfect match with the type. Stem mauve. Flowers solitary or in pairs, white, tinged with mauve at tip. The three perianth segments have a central ridge of a creamy biscuit colour.

Distr. British Guiana, hitherto known only from the Kurupung River, Mazaruni River.

Campylosiphon purpurascens Benth. in Hook. Ic. Pl. lxxv. t. 1384 (1882).

Swampy edge of small creek in mora forest, October 6th, coll. T. A. W. Davis, *Sandwith* 383; in a palm swamp, November 4th, *Sandwith* 553. Stems and buds white; scales brown. Outer floral whorl white, inner mauve in 383, white in 553.

Distr. British Guiana; Brazil (Rio Negro and Rio Uaupes); Venezuela (Rio Negro).

ORCHIDACEAE.

Nulischlaegelia calcarata Benth. in Journ. Linn. Soc. xviii. 342 (1881); Cogniaux in Mart. Fl. Bras. iii. pars iv. 243, t. lvii. f. ii (1893).

On leaf-mould on the edge of mora swamp forest, October 15th, *Sandwith* 455; similarly in dry mixed forest, October 22nd, *Sandwith* 501. Stem dull whitish-mauve. Ovary and flowers (with conspicuous spur) bone-white. Only a single specimen was found on each occasion.

Distr. Trinidad; British and French Guiana; Rio Uaupes, Brazil. Previously collected in British Guiana on the Aruka River, September 897, in *Thurn* 225.

X.—IDENTIFICATIONS OF SOME TYPES IN THE HERBARIA OF THUNBERG AND LAMARCK.

[E. BROWN.]

By the courtesy of Dr. N. E. Svedelius I have been able to examine the types of the South African species of *Buddleja* and *Capraria* preserved in Thunberg's herbarium, and by that of Prof. H.ecomte the type of a species of *Eriocaulon* in Lamarck's herbarium, and give below the result of my comparison of them with specimens at Kew.

Buddleja incompta Linn. f. This name is omitted from the "Flora Capensis," but the type specimen is identical with *Gomphostigma incanum* Oliver, which becomes **G. incomptum** (Linn. f.) N. E. Brown in Kew Bull. 1929, 143.

Buddleja virgata Linn. f. = *Gomphostigma scoparioides* Turcz. = **G. virgatum** (Linn. f.) Kuntze.

Capraria lanceolata Linn. f. = *Freylinia oppositifolia* Spin. = **F. lanceolata** (Linn. f.) G. Don.

Capraria longiflora Thunb. This name is omitted from Dyer, "Flora Capensis," but the type matches that of **Freylinia longiflora** Benth., which in my opinion is distinct from *F. undulata* Benth. and not a mere variety of that species as given in the "Flora Capensis." *F. longiflora* was published as a new species, not as a new combination for *Capraria longiflora*.

Capraria rigida Thunb. = *Ehretia hottentotica* Burch. = **E. rigida** (Thunb.) Druce.

Capraria undulata Linn. f. = **Freylinia undulata** (Linn. f.) Benth. The type comprises both glabrous and pubescent forms that are exactly equivalent to *F. undulata* Benth. and *F. undulata* var. *pubescens* Benth. respectively.

Eriocaulon minimum Lam. Encycl. iii. 275. This is a native of Ceylon, but the name is entirely omitted from Trimen and Hooker, "Handbook to the Flora of Ceylon." Upon comparison with the Kew material I find it to be identical with *E. Trimeni* Hook. f., which must now rank as a synonym of **E. minimum** Lam.

X.—MISCELLANEOUS NOTES.

In the recent New Year Honours List the Director was appointed a Knight Commander of the Most Distinguished Order of St. Michael and St. George.

The Director has been elected an Honorary Life Member of The Botanical Society of South Africa.

Psyllium Seeds.—It is evident that the use of Psyllium Seeds (*Plantago Psyllium* L., the "Fleawort" or "Fleeseed") for medicinal purposes is becoming more widespread. The seeds have always been a fairly common commodity in certain Continental countries, such as France and Spain, where they are held in high repute as a laxative and are one of the well-known domestic medicines, but outside Europe and the near East they have been comparatively little known and used. At the present time, however, there is a brisk demand for the seeds in the United States and signs are not wanting that increased interest is being taken in the seeds as a therapeutic agent in this country. It was recently reported that the demand in the United States was in excess of supply and that imports from South Europe had increased to a surprising degree.

It is to the peculiar property of secreting a large quantity of mucilage on being placed in water that the seeds owe their medicinal value. The presence of the mucilage renders the seeds demulcent and emollient and they are used in cases of catarrh, dysentery, and other inflammatory disorders. Other seeds secreting mucilage in a similar manner and employed in internal medicine are Flax, Sesamum and Ispaghul Seed (*Plantago ovata* Forsk.). Apart from medicinal uses Psyllium Seeds are employed to some extent in Europe in the preparation of dressings for textiles, particularly for silk fabrics, muslin and lace. The dressings are prepared by boiling the seeds for some time with the requisite quantity of water. The mucilage from the seeds has also been used for toilet purposes as a *bandoline*.

The production of the mucilage, which is perfectly clear and of a jelly-like consistency when formed in the presence of a limited quantity of water, is due to the action of water or aqueous fluids on the superficial cells of the seeds. It is located principally in the surface layers of the seed coat, the seeds containing up to 15 per cent. of mucilage. In contact with water the surface-cells first swell considerably, and finally burst, forming a mucilaginous mass. When administered internally the seeds reach the intestines in a condition exactly suitable for emulsification and are claimed to fulfil a dual role. The liberation of the mucilage of the seeds and emulsification of their oils produces a mode of action distinctly laxative, while the mechanical action of the seeds themselves is to facilitate the division of the food-mass and to excite secretion of the gastric juice without in any way impoverishing its digestive power.

Plantago Psyllium is native to the Mediterranean region and extends eastwards into Persia. It appears to favour dry sandy soils, and is often of a semi-trailing habit. The small globose inflorescences, each of which produces about a dozen of the brown boat-shaped seeds, are borne in the axils of the leaves. The whole plant is somewhat sticky owing to its entire surface being covered with minute glandular hairs. In common with other members of the genus this species grows freely and can be cultivated with a minimum of trouble provided suitable localities are chosen. It grows so readily in its native habitat that it is frequently to be seen as a weed growing up through the ballast of railway tracks. In cultivation a dry sandy soil is generally chosen. After it has been well worked, in some cases harrowed and rolled, small furrows are made at distances of about 60 centimetres. Along these furrows the seed is sprinkled and lightly covered. During the growth of the crop it is usually sufficient for weeding and cultivating operations to be performed once or twice only. The period of harvesting varies according to locality but is generally in August. The whole plant is harvested and after drying the liberation of the seeds is assisted by threshing.

During last summer the plant was under cultivation in the Herbaceous Ground at Kew and fruited profusely, the seeds being of good quality and colour. Genuine Psyllium Seeds are brown in colour, though an inferior pale-coloured form is occasionally to be met with in commerce. The pale-coloured seeds are cheaper than the brown but are deficient in mucilage and are regarded as of little value for medicinal use. The sudden appearance of the plant as a member of the alien weed flora of South Australia some years ago caused a certain amount of alarm* at the time, for it was feared the plant would spread and prove troublesome as a weed. F. N. H.

The Dispersal of Plants throughout the World.†—Mr. H. N. Ridley's monumental volume occupies, with the copious and excellent index and biography, 744 closely printed pages. There are also twenty-two useful plates, one being in colour, showing various methods of dispersal of seeds and fruits, in the delineation of which the author has been ably assisted by Miss M. B. Moss. The volume is divided into twelve chapters, some of which are further subdivided into parts, each being devoted to some particular adaptation or type of dispersal. The following list of chapter headings, with their subdivisions, gives an adequate idea of the scope and comprehensiveness of the work, which will prove of immense value to all botanists and students of plant distribution :—

Dispersal by Wind—Without special modification ; By special adaptations.

By Water—Rain-wash ; Ice, Stream, River and Flood ; Sea.

* Journ. Agric. South Australia, 1916, pp. 360-362.

† By H. N. Ridley. L. Reeve & Co., Ltd., Lloyd's Bank Buildings, Ashford, Kent, 1930. pp. xx+744, pl. 22. Price 63s.

By Animals. By Birds—Attraction by Colour ; Transformation of Berry to Capsule and Vice Versa ; The Aril ; Compound Fruits ; Dissemination of Dry Seeds and Grain by Granivorous Birds ; The Distribution Due to Birds ; List of Frugivorous Birds ; Birds' Nests.

By Reptiles, Batrachians, Fish, Insects, Etc.

Dispersal by Simple Adhesion.

By adhesion through special modification and by adhesion due to viscid exudation.

Dispersal by human agency. Mechanical Dispersal. Island Floras. Dispersal of Orders and Genera.

It is scarcely possible to review in any detail a book which covers such a vast field, and which is of all the more value since its much-travelled author has been able to include so many details of his own observation. Nor is it perhaps fair to offer any remarks of a somewhat critical nature in connection with a book in which such a mass of valuable information is collected together. A word, however, may be said with regard to the American origin of the Coconut, since Mr. Ridley upholds Cook's theory of its American origin, which is now generally considered untenable by the majority of botanists. Then again it is unfortunate that no reference is made to Dr. E. D. Merrill's interesting account of the introduction of Central American plants to the Philippine Islands by means of the annual Acapulco galleon, to which is due the presence of a large number of American plants around Luzon at the present day, and of the reverse process by the same means.

Mr. Ridley makes some interesting remarks on dry dehiscent fruits becoming baccate (pp. 422, 423), and cites the New Zealand Gaultherias among his examples. In some of these cases, however, he has not referred to the possibility of hybridisation, for it is now recognised that *G. fagifolia* is a hybrid between *G. oppositifolia* and *G. antipoda*, while a multiplicity of hybrids exists between all the New Zealand species showing every gradation from dry to fleshy "fruits."

These, however, are only minor points, and one can say with all sincerity that we owe a deep debt of gratitude to Mr. Ridley for having brought together such a mass of information in a volume which will serve as an invaluable work of reference for all time, and which will be a stimulus to all those who are concerned with trying to solve enigmas presented by the present distribution of plants throughout the world.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1931 ROYAL BOTANIC GARDENS, KEW

XI.—A NEW HARVEYA FROM THE TRANSVAAL HIGHVELD. C. A. SMITH.

This new *Harveya* represents the fourth species so far recorded for the Transvaal, and was collected by Mr. R. A. H. Flugge de Smidt on the Golf Course of the Geduld Proprietary Mines at Dersley (Heidelberg division) in September, 1928. On revisiting the spot in December 1929, the collector also took several fine photographs of this interesting root-parasite, and generously sent a set of photographs to Kew, two of these being reproduced herewith. Thus Plate IV shows a single flowering stem in full bloom, the flowers being at first a "rich yellow, a little lighter than primrose, bleaching to a snow white in a day or two." In the dried state, as is common in the group of scrophulariaceous root-parasites to which it belongs, the whole plant dries an inky black, frequently becoming very brittle.

Both plates further show the plant in its native habitat amongst its hosts, which are of interest as belonging to very different families from those recorded for the other species of the genus, so far as the hosts of these are known. Thus *Harveya Randii* Hiern (a Transvaal species) was found by Dr. Rand to form brilliant patches of scarlet around specimens of its host, *Vahlia capensis* Thunb. (Saxifragaceae); *H. hyobanchoides* Schltr. was discovered in 1875 by the late Prof. P. MacOwan in the Albany division on the roots of several species of *Aspalathus* (Polygalaceae), particularly on *A. laricifolia* Berg; *H. capensis* Hook., the type of the generic name, was collected as far back as 1838 on the Cape Peninsula by Dr. W. H. Harvey as a parasite on the "roots of *Blaeria muscosa** and other small Ericaceae." Of the other species there appear to be no records of their host plants. This new *Harveya*, however, appears to confine itself to the Compositae (with a tentative record for an undetermined leguminous plant), having been recorded by Mr. Flugge de Smidt on *Conyza podocephala* DC., *Haplocarpha scaposa* Harv., *Berkheya Radula* (Harv.) O. Hoffm. and *Senecio asperulus* DC. (the last not shown in the illustrations).

Full data are not available at the moment, but it appears that "roots" from the same stem of the parasite attach themselves indiscriminately to the roots of the hosts mentioned, a condition not so far met with in the writer's experience of South African root-parasites. Thus *Striga bilabiata* (Thb.) O. Ktze. (= *S. Thunbergii* Bth.), *S.*

**Scyphogyne inconspicua* Brongn. of Fl. Cap. iv. i. 407 (1906) = *S. (Blaeria) muscosa* Dryand Steud. Nom. ed. 2. i. 568 (1840), not "in syn." as given in the Ind. Kew.

lutea Lour., *S. elegans* Benth. (the "witch weed" group), and *S. gesnerioides* (Willd.) Vatke [= *S. orobanchoides* (R. Br. ex Endl.) Bth.] have frequently been carefully dug up in the natural habitat round Pretoria, but so far their "roots" have invariably been found associated with those of one particular host only—various species of *Sporobolus*, *Eragrostis*, *Indigofera* etc.—although these grow freely intermixed—the same species of parasite being found on different hosts in the same area.

Very little, however, is known about the host plants of the South African root- (as well as stem-) parasites, except perhaps in the case of the so-called "economic" species*—the "witch-weeds" above noted—and a most interesting field yet awaits exploration.

Harveya anisodonta sp. nov. [Scrophulariaceae-Gerardieae]; *H. Randii* Hiern et *H. crispulae* Conr. affinis, sed ab illo florum colore, ab utraque squamis et calyce glabris, filamentis brevioribus in medio corollae tubo insertis, indumento diverso vestitis differt; etiam *H. speciosae* Bernh. valde affinis, sed ovario glabro facile distinguitur.

Herba erecta, usque 25 cm. alta, in radicibus *Berkheyae Radulae* (Harv.) O. Hoffm., *Conyzae podocephalae* DC. et aliarum parasitica, radicibus verrucosis tuberculatis, tumentiis sede ortus e hospite instructis. *Folia* squamiformia, laxe imbricata in ima parte plantae, plus minus oblata, apice rotundata, basi vix angustata et late amplexicaulia, erecto-adscendentia, cauli adpressa, usque 5 mm. longa et 7 mm. lata, glaberrima. *Squamae* oppositae vel suboppositae, ovatae, usque 2.5 cm. longae et 1 cm. latae, in apicem acutam angustatae, basi late amplexicaules, erecto-adscendentes, vel cauli adpressae, extra plus minus manifeste nervatae, utrinque glaberrimae. *Spica* terminalis, brevis, 4–8-flora. *Flores* magni et speciosi, versus maturitatem albi. *Bractae* oblongo-ovatae, calyce breviores, in apicem acutam usque subacutam angustatae, basi late amplexicaules, usque 2.3 cm. longae et 8 mm latae, glaberrimae. *Bracteolae* binae, lineares usque anguste oblongo-lineares, subacutae, usque 2 cm. longae, glabrae. *Calyx* tubuloso-cylindricus, usque 3 cm. longus (dentibus inclusis) et 8 mm. latus, valde inaequaliter dentatus, inter dentes duo inferiores profunde fissus, subbilabiatus, intus extraque glaber; dentes duo inferiores tribus superioribus longiores; dentes superiores plus minus connati ad denticulos tres parvos subacutos deltoideos redacti. *Corolla* usque 6 cm. longa, e calyce longe exserta, in limbum quinquelobum patentem ampliata; tubus parte inferiore anguste cylindricus, plus minus inflatus, pilis articulatis glanduliferis patentibus dense vestitus; limbus usque 3 cm. diametro; lobi late orbiculares, patentes, usque 7 mm. diametro, margine tenuiter crispulo-undulati, extra dense pubescentes, intus et fauce crispulo-pilosi; duo superiores breviores et angustiores. *Filamenta* subaequilonga, usque 4 mm. longa, inclusa, ad basin corollae

[Kew Bulletin, 1931.

PLATE IV



Photo: R. Flugge de Smidt.

Harveya anisodonta C. A. Sm., showing a single specimen in natural habitat with host plants, *Conyza podocephala* DC. and *Haplocarpha scaposa* Harv., amongst grasses, *Themeda* and *Eragrostis* spp.

*See "The Problem of the 'Witchweed'" by H. H. W. Pearson.—Union Department of Agriculture Bulletin No. 40, 1913.

PLATE V



Photo: R. Flugge de Smidt.
Harveya anisodon C. A. Sm., showing five young shoots in the natural habitat with three host plants, *Coryza podoccephala* DC., *Haplocarpha scoposa* Harv., and *Berkheya Radula* (Harv.) O. Hoffm., the last (with the widest leaves) not yet in flower.

tubi partis inflatae inserta, parte inferiore dense pilosa. *Antherae* 2-thecae, glabrae; theca fertillis semilunaris, usque 4 mm. longa, apicem liberum versus subacuminata; theca sterilis brevior, a fertili in modum calcaris brevis curvati pallide mucronati divergens. *Ovarium* ovoideum, basi constrictum, disco parvo affixum, in stylum sensim attenuatum, glaberrimum; stylus filiformis, corollae tubo brevior, usque 2.5 cm. longus; stigma oblique clavatum, circiter 2 mm. diametro, subcompressum, antheris imminens, glabrum. *Capsula* non visa.

TRANSVAAL. Heidelberg Div.: at Dersley, on the Golf Course of the Geduld Proprietary Mines, Sept., *Flugge de Smidt*! s.n. (type in Nat. Herb. Pretoria).

XII.—ON THE DISTRIBUTION OF PSEUDOLARIX FORTUNEI, THE GOLDEN LARCH. W. R. PRICE.

As it does not appear to be generally realized that the distribution area of this interesting tree is no longer confined to its three original, classical localities of over 60 years ago, and as one of these localities is most persistently and misleadingly misquoted as being in the province of Kiangsu, instead of Kiangsi, a statement seems to be called for, giving as far as possible an accurate and up-to-date account of the area within which the tree is now known to be found in China.

The following is a list of localities in order of discovery:—

1. Fortune—1853. Near the monastery of Tsan-tsin, about a day's journey S.W. of Ningpo, at lat. $29^{\circ} 30'$ in the province of Chekiang at an altitude of 1000 to 1500 ft. Trees were 120–130 ft. high by 5 ft. girth up to some 50 ft. from the ground.

2. Fortune—1854. Twenty miles W. of the above locality, near Quanting monastery in Chekiang, a plantation on a mountain slope at 4000 ft. The largest tree was 130 ft. by 8 ft. The trees appeared to have been planted. (Probably rediscovered in 1874 by the Rev. Moule.)

3. Abbé David—1868. On the Lushan Mountains S. of Kiukiang in Kiangsi (not Kiangsu, as usually stated). Maries recorded the same locality later, and was struck by the huge size of the trees, though Wilson more recently recorded only small trees.

4. Handel-Mazzetti—1914 to 1918—in the course of his travels in Central China during this period discovered the Golden Larch in Hunan province, no less than 500 km. S.W. of its nearest known Kiukiang locality. He states that the trees grow in considerable quantity in the Warm Temperate Zone in mixed forest, above Ngandjapu near the town of Hsinhwa on the Hsikwang-shan, on sandstone at 700 m., and are 20 m. high.

5. R. C. Ching, of the Metropolitan Museum, Nanking, in 1924, while botanising in Anhwei, found the tree growing quite wild to the height of 80 ft. in mixed forest over much of the district between the Yangtze and the Chekiang border, especially N.W. of Hweichow.

In 1925 he also found it in the S.W. corner of Kiangsu, west of the Tai-hu lake.

He also states that the tree is fairly common in the south and west of Chekiang, especially in the Chuchow-Kinhwa district.

He considers that these districts, in which he has himself seen the tree, are the headquarters of the species at the present time.

6. F. P. Metcalf writes in September, 1929, "Recently it has also been found in S.W. Chekiang rather near the border of Fukien."

The writer, while travelling in Fukien province in the summer of 1912, observed a group of tall larch near the small village of Chih-a-na about 60 miles N.W. of Amoy up the West River, on the path to Lung-yen (Leng-nga). The trees grew beside a stream in a wooded valley, and were about 80 ft. high. There being no low branches and no means of felling a tree at the time, unfortunately no specimen was obtainable. A photograph was, however, taken, and was, through the kindness of Professor F. P. Metcalf, Professor of Botany at the Fukien Christian University at Foochow, shown last year to Dr. Rehder in America, who pronounced it to be probably *Pseudolarix Fortunei*, the first record for Fukien.

Mr. Ching, however, informs the writer that from the photograph he would suspect the tree to be *Glyptostrobus heterophyllus*, on account of its low situation by a stream. This record must therefore be considered a doubtful one.

Thus we have at present for this tree's distribution area, omitting the Fukien locality, a narrow wedge-shaped area based upon the coast of Chekiang, extending westwards for some 700 miles with its apex in the middle of Hunan, and including parts of the provinces of Anhwei, Kiangsu, Kiangsi, and Hunan, and the whole of Chekiang.

As this tree seems to grow exclusively in upland and hilly districts, it is more than probable that it will eventually be found to occur over a wider area in the mountainous parts of the southern Chinese provinces.

I am indebted to Mr. R. C. Ching for much information.

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XIII.—NEW ASIATIC GENTIANAS: II.* C. V. B. MARQUAND.

The complete revision of the Chinese Gentians mentioned in the former paper of this series has been held back for three years pending

*Continued from K.B. 1928, p. 62.

the publication of an account, by Dr. Harry Smith of Upsala, of the Gentianaceae collected in China by himself and other botanists. This postponement was considered advisable in order that the various novelties contained in these collections might be included in the revision, and also in order to avoid any possible duplication in the description of new species. As the account in question has not yet appeared, it is now proposed to issue the revision of Chinese Gentians without further delay. In the meantime a considerable amount of further Asiatic material of *Gentiana* has passed through the writer's hands, including the twenty-nine new species and ten new varieties described below. Where not otherwise stated, the type specimens are in the Kew Herbarium.

During the course of the present investigation it was found that the treatment of *Crawfurdia* Wall. as a genus independent from *Gentiana* could no longer be maintained. *Crawfurdia* was based by Wallich (Tent. Fl. Nap. 63, tt. 47, 48: 1826) on two new Nepalese species, *C. fasciculata* and *C. speciosa*, which differed by their climbing habit from all the Gentians then known. All subsequent authors have retained the genus *Crawfurdia*, distinguishing it from *Gentiana* solely on the ground of its twining stems and drooping flowers. But *Gentiana filicaulis* Hemsl. (Sect. *Stenogyne*) is a species which exhibits distinct signs of a climbing habit, though its flowers are terminal and more nearly erect than they are in many other species of *Gentiana* of which the stems are erect. On the other hand, *Gentiana crawfurdoides*, a new species described below, has a wide range of habit from distinctly twining stems to erect stems which though spirally twisted are not more so than is frequently the case in *Gentiana sensu stricto*.

In any case, *Crawfurdia* as a whole is a rather unnatural group and cannot be maintained as at present delimited, even as a subdivision of *Gentiana*. Its two sections, *Dipterospermum* and *Tripterospermum*, are, however, natural and well marked by the seed characters, so that they are here transferred as Sections to *Gentiana*. The third Section of *Crawfurdia*, namely, *Pterygocalyx*, which was originally described as a genus by Maximowicz, is excluded from *Gentiana* on account of its floral characters, which agree with those of *Gentianella*.

In consequence of the reduction of the genus *Crawfurdia*, new specific epithets are unfortunately required for seven species, as the epithets concerned had already been used for other species of *Gentiana*.

Sect. *Dipterospermum*.

1. *Gentiana Heleni* Marquand, nom. nov., is proposed for *Crawfurdia Trailiana* Forrest in Notes Roy. Bot. Gard. Edin. xvii. 76 (1907), intending to perpetuate the name of Professor James William Helenus Trail, M.D., F.R.S., in whose honour the original name was given to this magnificent plant. The specific epithet *Trailiana* is occupied by *Gentiana Trailiana* Forrest, a Chinese species of *Gentianella*.

2. *Gentiana fratri* Marquand, nom. nov., replaces *Crawfurdia Delavayi* Franch. in Bull. Soc. Bot. France, xlv. 306, in order to retain the connection with the French missionary Delavay who discovered so many new species of plants in Western China. The original specific epithet is already occupied in *Gentiana* by *G. Delavayi* Franch., the only Chinese representative of Sect. *Isomeria*.

3. *Gentiana khamensis* Marquand, nom. nov., is substituted for *Crawfurdia thibetica* Franch. in Bull. Soc. Bot. France, xlv. 307. The original specific epithet is used in *Gentiana tibetica* King ex Hook. fil., a species belonging to Sect. *Aptera*.

4. *Gentiana fascicularis* Marquand, nom. nov., is proposed for *Crawfurdia fasciculata* Wall. Tent. Fl. Nap. 63, t. 47. The specific epithet has been employed for a Formosan species, *Gentiana fasciculata* Hayata in Journ. Coll. Sci. Tokyo, xxv. Art. 19, 165.

5. *Gentiana Kingdonii* Marquand, nom. nov., replaces *Crawfurdia Wardii* Marquand in Journ. Linn. Soc., Bot. xlviii. 203, which was named after the collector, Capt. F. Kingdon Ward, the specific epithet being already occupied by *Gentiana Wardii* W. W. Sm. in Notes Roy. Bot. Gard. Edin. viii. 122, a species of Sect. *Frigida* from China and South-Eastern Tibet.

6. *Gentiana confusa* Marquand, nom. nov., is proposed for *Crawfurdia affinis* C. B. Clarke in Hook. fil. Fl. Brit. Ind. iv. 107, which was founded on Wall. Cat. 4370 *pro parte*. The specific epithet has been used for *Gentiana affinis* Griseb. Gen. et Sp. Gent. 289, a north-west American species.

Sect. *Tripterospermum*.

7. *Gentiana Golowninia* Marquand, nom. nov., is substituted for *Crawfurdia japonica* Sieb. et Zucc. in Abh. Akad. Muench. iv. part 3, 160 (*Golowninia japonica* Maxim. in Bull. Acad. Pétersb. iv. 252, cum tab.). The specific epithet is already occupied by *Gentiana japonica* Schult. Svst. vi. 174, as well as by the later homonym *G. japonica* Maxim. in Bull. Acad. Pétersb. xx. 433.

In addition, the following transfers from *Crawfurdia* to *Gentiana* are made without change of specific epithet.

Sect. *Dipterospermum*.

8. *Gentiana speciosa* (Wall.) Marquand, comb. nov.

9. *Gentiana angustata* (C. B. Clarke) Marquand, comb. nov.

10. *Gentiana Bulleyana* (Forrest) Marquand, comb. nov.

11. *Gentiana campanulacea* (Wall. et Griff.) Marquand, comb. nov.

Sect. *Tripterospermum*.

12. *Gentiana luteo-viridis* (C. B. Clarke) Marquand, comb. nov.

The genus *Gentiana* is here restricted to subgenus *Eugentiana* Kusnez., as delimited in Kusnezow's "Subgenus *Eugentiana* Kusnez. generis *Gentiana* Tournef." (Act. Hort. Petrop. xv. : 1896-1904). *Gentianella* differs in the calyx-tube being homogeneous instead of being provided with an adnate inner membrane, and in the corolla, which lacks the plicae between the lobes. The following Sections of *Gentiana*, all recognised by Kusnezow, are represented in China in addition to *Dipterospermum* and *Tripterospermum*, which are now transferred from *Crawfurdia*:—*Pneumonanthe* (Kusnez. l.c. 179), *Otophora* (l.c. 246), *Stenogyne* (l.c. 248), *Frigida* (l.c. 254), *Aptera* (l.c. 291), *Isomeria* (l.c. 339), *Chondrophylla* (l.c. 344).

The writer desires to thank Dr. E. D. Merrill, Director-in-Chief of the New York Botanical Garden, for the opportunity of examining all the Asiatic material in that Herbarium and in the Herbarium of the University of California. To Dr. Maxon and Dr. Ellsworth P. Killip he desires to express his appreciation of the privilege of seeing the whole of the Chinese specimens of *Gentiana* in the United States National Herbarium, Washington, including the extensive collections made by Mr. Rock. He is also indebted to Professor Lecomte and to Professor Issatchenko for the same favour with regard to type-specimens in the Herbaria of the Muséum d'Histoire Naturelle Paris and the Principal Botanic Garden, Leningrad, respectively.

Descriptions of new Species and Varieties.

Gentiana eurycolpa Marquand sp. nov. (Sect. *Stenogyne*); ex affinitate *G. gentilis* Franch., sed calycis lobis lanceolatis basi attenuatis, tota planta multo majore inter alia differt.

Annual. Stems glabrous, upwards of 20 cm. long, creeping, rather slender, tetragonous, narrowly 4-winged, with numerous spreading branches 5-6 cm. long, each terminated by a solitary sessile flower and one pair of leaves. Basal leaves none. Cauline leaves sessile, broadly ovate or cordate-ovate, up to 1.5 cm. long and broad, margin minutely denticulate. Calyx-tube 10-12 mm. long, 4-5 mm. in diameter at the mouth, slightly expanded in the middle, with 5 narrow wings bordered with short purple multicellular hairs; lobes 5, lanceolate-spathulate, acute, 5-6 mm. long, 2-2.5 mm. wide, narrowed at the base into a rotundate sinus. Corolla subcylindrical, 3.5-4.5 cm. long, pale purple; tube scarcely 1 cm. in diameter at the mouth; lobes 5, ovate, acute or subacuminate, not caudate, about 1 cm. long, 4-5 mm. wide; plicae shortly lacinate at the apex, less than half the length of the lobes. Stamens two-thirds to three-quarters the length of the corolla, inserted 1 cm. above the base of the tube; filaments arcuate, free above; anthers 2 mm. long. Ovary stipitate. Ovules triquetrous (mature seeds not seen).

CHINA. Yunnan: Grassy hills, La-kou, 2400-3000 m., October, E. E. Maire 7404 (Herb. Univ. Calif. 388169, type); Kin-tchongchan, 2600 m., flowers blue, E. E. Maire 2910 (Herb. Univ. Calif. 388159); without locality, Henry 10023.

This species is undoubtedly closely allied to *G. gentilis*, and less so to *G. pterocalyx* Franch.

***Gentiana discoidea* Marquand** sp. nov. (Sect. *Dipterospermum*); *G. fascicularem* Marquand simulans, sed foliis subsessilibus, calycis tubo vix carinato lobis brevissimis differt.

Perennial. Stems climbing, much twisted, internodes long. Leaves in pairs, ovate-lanceolate, acute, 5-6 cm. long, 2-2.5 cm. wide, very shortly petiolate, margin obscurely crenulate or subentire, glaucescent beneath, nerves 3-5. Bracts lanceolate, leaflike, the uppermost 1-2 cm. long, the lower larger. Flowers axillary, solitary or 2 together. Calyx entire; tube 12-14 mm. long; lobes erect, linear, 2-3 mm. long. Corolla subcylindrical, more or less curved, 4 cm. long, pale purple; lobes ovate, acuminate, 7-8 mm. long, 6 mm. wide; plicae rotundate, entire, 3.5 mm. wide, 1.5 mm. long. Stamens 3 cm. long; filaments incurved at the apex with a narrow wing on both sides; anthers 1.5 mm. long. Ovary stipitate, oblong, 2 cm. in length. Style 6-7 mm. long. Stigma recurved. Mature capsule semi-exserted from the corolla tube. Seeds almost completely surrounded by a discoid wing, 3 mm. in diameter, double on the narrow side.

CHINA. W. Hupeh: without precise locality, Oct. 1900, E. H. Wilson (Veitch Exped.) 1742 (type); Patung district, A. Henry 1038, 2848, 4877.

***Gentiana crawfurdioides* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. Wardii* W. W. Sm., sed ovario stipitato stylo brevi inter alia differt.

Perennial. Roots filiform, not arising from an enlarged caudex. Stems erect or semi-scandent, slightly twining, rather lax, up to 4.5 cm. high, glabrous, dark purplish, subterete or slightly tetragonous and obscurely winged, slightly exceeding 1 mm. in diameter near the base. Leaves in pairs, rather distant, ovate, acuminate, very shortly petiolate, 2.5-3.5 cm. long, 1.5-2.5 cm. wide; nerves 3, rather prominent, connivent, meeting at the apex of the acumen. Flowers solitary or rarely 2 together, terminal, on pedicels up to 5 cm. in length. Calyx dark purple; tube dimidiate-spathaceous, 2 cm. long; lobes narrow lanceolate, acute, 3-4 mm. long, more or less recurved. Corolla infundibular, 4-5 cm. long, deep purple maroon in colour; lobes ovate, scarcely more than 2 mm. longer than the erose sub-truncate plicae. Stamens considerably shorter than the corolla tube; filaments with a double wing, the upper 7-8 mm. free. Ovary stipitate, ovoid, 1.5 cm. long. Style short. Stigma recurved. Stipe equalling the ovary in length. Ovules discoid (mature seeds not seen).

S. E. TIBET. Tsarong: in heavy pastures on the Ka-gwi-pu, Mekong-Salwin Divide, lat. 28° 30' N., 3600-3900 m., Sept. 1917, G. Forrest 14789 (type in Herb. Edin.); Doker-la, Mekong-Salwin Divide, lat. 28° 20' N., 3600-3900 m., Aug. 1918, G. Forrest 16880.

This species shows a clear connection with the Sect. *Stenogyne* of *Gentiana*, the stems being spirally twisted to a slight extent only.

var. ***macrophylla* Marquand** var. nov.; a typo differt foliis ad 9 cm. longis, 4 cm. latis.

S. E. TIBET. Tsarong: on scrub and grass in open, dry situations, Shweli-Salwin divide, lat. 25° 40' N., 2100 m., Sept. 1919, G. Forrest 18522.

N. E. UPPER BURMA. Scandent plant of 60-120 cm., flowers deep purplish blue, on grass and dwarf cane on the western flank of the N' Maikha-Salwin Divide, lat. 26° 45' N., long. 98° 48' E., 3400-3600 m., Oct. 1925, G. Forrest 27442.

***Gentiana bomareoides* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. speciosae* (Wall.) Marquand, sed antheris parvis, calycis lobis magnis spathulatis, foliis quinquenervatis insigniter differt.

Twining plant, 1.5-2.5 m. high. Stems subtetragonous, strongly twisted, 2 mm. in diameter. Internodes about 12 cm. long. Leaves in pairs, ovate-acuminate, 5-6 cm. long, 2.5 cm. wide, round at the base, membranaceous, 5-nerved; petiole 6 mm. long. Flowers borne 5-6 together on short branches. Bracts lanceolate, 1-1.5 cm. long. Calyx-tube 8-9 mm. long, 4-5 mm. in diameter; lobes 5, spathulate, 6-10 mm. long, 3-4 mm. wide, attenuate to 1-1.5 mm. at the base, apex acute, sinus rounded. Corolla subinfundibuliform, purple-rose; tube 3-4 mm. in diameter below, expanded above; lobes triangular, acute, 3 mm. long, 3-4 mm. wide; plicae rounded, 2.5-3.0 mm. wide. Stamens scarcely 3 mm. long; filaments free throughout the upper part, with a broad hyaline wing on each side, attenuate to the apex; anthers 2.5 mm. long. Ovary stipitate, elliptic-fusiform, about 1.5 cm. long. Style 3-4 mm. long. Immature seed with a discoid wing (mature capsule not seen).

N. E. UPPER BURMA. On scrub and grass on the west flank of the N' Maikha-Salwin Divide, lat. 26° 45' N., long. 98° 48' E., 2100-2400 m., Oct. 1925, G. Forrest 27558.

***Gentiana sinkuensis* Marquand** sp. nov. (Sect. *Dipterospermum*); affinis *G. Delavayi* Franch. (e descr.), sed floribus fasciculatis, calycibus dimidiato-fissis inter alia differt.

Twining plant. Stems subtetragonous, twisted, dark purplish. Internodes 6-7 cm. long. Leaves in pairs, ovate-lanceolate, acuminate, 4 cm. long, 1.5 cm. wide, three-nerved, margin minutely sinuose, very shortly petiolate. Flowers terminal and axillary. Pedicels 1-3 cm. long, slender. Calyx dimidiate-spathaceous; tube 1-1.5 cm. long, purplish, divided to the middle; lobes three, linear, 3-4 mm. in length, strongly recurved. Corolla subinfundibuliform, slightly gibbous above the calyx, 3 cm. in length, washy purple; lobes auriculate, acute, 2.5-3.0 mm. long, 3.0-3.5 mm. wide; plicae rounded or subtruncate, slightly shorter than the lobes. Stamens 2.5 cm. long, upper 1 cm. free; filaments with a subulate

wing on each side; anthers oblong, 1.5 mm. long. Ovary stipitate, elliptic-ovate, attenuate at apex and base. *Stipe* 1-1.5 cm. long. *Style* 6-7 mm. long. *Stigma* recurved. *Immature seed* with narrow wings (mature seeds not seen).

UPPER BURMA. Valley of the Seinghku near the Tibetan frontier, lat. 28° N., long. 97° 25' E., in alpine meadow which clothes the steep flanks of the gullies, Sept. 27, 1926, *F. Kingdon Ward* 7495.

***Gentiana iochroa* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. crawfordioides* Marquand, sed floribus sessilibus, calycibus integris vel dimidiato-fissis inter alia differt.

Perennial. Stem erect, 30-60 cm. high, showing more or less distinct spiral twisting on its own axis, scarcely tetragonous, purple. *Leaves* broadly ovate or suborbicular, up to 3 cm. long, 2.5 cm. wide, apex more or less acuminate, usually 5-nerved, sessile. *Flowers* sessile or subsessile, terminal and axillary. *Calyx-tube* 1 cm. long, entire or subdimidiate-spathaceous; lobes 5, erect, 3 mm. long, linear or linear-lanceolate, acute. *Corolla* subinfundibular, slightly expanded above the calyx, 3.0-3.5 cm. long, purplish-rose, marked a deeper shade; lobes deltoid; plicae subtruncate, erose, slightly shorter than the lobes. *Stamens* 2.5 cm. long, upper half free from the corolla-tube; anthers small, cordate-ovate, less than 2 mm. long; filaments winged on both sides. *Ovary* ellipsoid, shortly stipitate. *Style* long. *Ovules* discoid (mature seeds not seen).

S. E. TIBET. Tsarong: open pastures on the margins of forests on the Salwin-Kiu-chiang Divide, lat. 28° 40' N., long. 98° 15' E., Aug., 1919, *G. Forrest* 18794 (type in Herb. Edin.).

***Gentiana curviflora* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. iochroae* Marquand, sed floribus curvatis inter alia distinctissima.

Perennial. Stems subtetragonous, ascending, reddish purple, glabrous, 20-30 cm. in length, arising from an underground caudex. *Hypophylls* numerous, rosulate-ovate, 2-3 mm. in length at the base of the stems. *Cauline leaves* resembling the hypophylls in the basal one or two pairs, then rapidly increasing in size to 2.5 cm. long, 2 cm. wide, cordate-ovate, acute or acuminate, subsessile, subcoriaceous, margin scabrid. *Flowers* solitary, terminal. *Calyx* dimidiate-spathaceous; tube reddish-purple, up to 1.5 cm. long; lobes spatulate, 3-6 mm. long. *Corolla* distinctly curved, infundibuliform, 4 cm. long; lobes 5, ovate, acute, 8 mm. long, 7 mm. wide; plicae truncate. *Stamens* 5, free above; filaments with two broad scarious wings; anthers oblong, 6 mm. long. *Ovary* stipitate, ellipsoid, 1.5 cm. long, 5 mm. wide. *Stipe* stout, longer than the ovary. *Ovules* discoid (mature seeds not seen).

CHINA. S. Szechuan: Muli, on shady limestone cliffs, 2700-3000 m., Aug. 31, 1921, *F. Kingdon Ward* 4880 (type in Herb. Edin.).

This species is very remarkable in the form of the corolla, the tube being distinctly curved. The leaves much resemble species

belonging to Sect. *Stenogyne* in the characteristic shape and texture and scabrid margin.

***Gentiana semialata* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. curviflorae* Marquand, sed filamentis uno latere alatis, corolla vix curvata inter alia insigniter differt.

Perennial. Stems erect, 20-25 cm. high (roots not seen), arising from a caudex which bears the saccate bases of the previous year's growth. *Leaves* in pairs, graduated in size from the base upwards, cordate-ovate, acuminate, 1-3 cm. long, 7-18 mm. wide, very shortly petiolate, subcoriaceous, margin scabrid. *Flowers* sessile. *Calyx* entire, narrowly carinate; tube 1 cm. long; lobes spatulate-ovate, acute, 6-7 mm. long. *Corolla* infundibular, 5 cm. long, violet; lobes 5, deltoid, 7 mm. long, 6 mm. wide; plicae subtruncate, scarcely erose. *Stamens* considerably shorter than the corolla tube; filaments with the uppermost 10-12 mm. free, lower half of the free portion unilaterally winged, upper half filiform; anthers 6-7 mm. long. *Ovary* stipitate, 12 mm. long, attenuate above into the short style. *Stipe* about equalling the ovary in length. *Ovules* discoid (mature seeds not seen).

CHINA. W. Szechuan: on limestone cliffs, Litang-Yalung Divide, 10 miles east of Litang River, 3600 m., Oct. 20, 1921, *F. Kingdon Ward* 4984 (type in Herb. Edin.).

***Gentiana membranacea* Marquand** sp. nov. (Sect. *Dipterospermum*); inter species hujus sectionis foliis membranaceis lanceolatis acuminatis distinctissima.

Scandent shrub, up to 3 m. Stem more or less terete, much twisted, with long internodes. *Leaves* in pairs, lanceolate, acuminate, rounded at the base, entire, membranaceous; nerves 3-5; petiole up to 2 cm. in length. *Flowers* axillary, 2-3 together, on slender pedicels, 1.5-3.0 cm. long. *Calyx* dimidiate-spathaceous, truncate between the lobes; tube 8-12 mm. long; lobes setaceous or linear-acuminate, 8-9 mm. long. *Corolla* narrowly infundibuliform; lobes deltoid, acute; plicae truncate. *Stamens* 2.5 cm. long; filaments slender, subulate, winged on both sides on the portion (1.3 cm. in length) which is free from the corolla tube; anthers ovoid, 1 mm. long. *Ovary* shortly stipitate, 1-1.5 cm. long, attenuate above. *Style* 1 cm. long (mature seeds not seen).

N. E. UPPER BURMA. On scrub and cane on the margins of hickets, 3000-3400 m., lat. 26° 23' N., long. 98° 48' E., Sept. 1924, *F. Forrest* 25060.

***Gentiana Pricei* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. campanulaceae* (Wall.) Marquand et *G. Bulleyanae* (Forrest) Marquand, sed a priore foliorum nervis 5-7, a posteriore petiolis brevioribus calycis lobis deltoideis recurvatis differt.

Climbing herb. Stem subterete, twisted, about 2 mm. in diameter, green tinged with purple, bearing numerous axillary flowering

branches. *Internodes* up to 15 cm. in length. *Leaves* in pairs, lanceolate to ovate-lanceolate, acuminate, 7-10 cm. long, 2.5-3 cm. wide, round at the base; margin narrowly recurved and minutely sinuose, nerves 5-7, scaberrulous, petiole 3-4 mm. long. *Flowering branches* 10-20 cm. long, bearing 3-6 flowers in one or two whorls. *Bracts* lanceolate, 6-7 mm. long. *Pedicels* up to 4 cm. long. *Flowers* subpendulous. *Calyx-tube* entire, up to 1.5 cm. long; lobes 5, linear-lanceolate, acute, strongly recurved, 4-6 mm. long. *Corolla* subinfundibuliform, slightly expanded at the base of the throat, 3-4 cm. long; lobes deltoid, acute, 5 mm. long and broad; plicae subtruncate with an erose margin. *Stamens* slightly shorter than the corolla tube; filaments broadly winged in the lower part, tapering to a subulate apex; anthers triangular, 2.5-3.0 mm. long. *Ovary* stipitate, ellipsoid, 6-8 mm. long, attenuate above and below. *Stipe* 1.5 cm. long. *Style* 4-5 mm. long. *Immature seeds* 0.5-0.7 mm. in diameter, surrounded by a discoid wing (mature fruit not seen).

CHINA. Fukien: open mountainous country between Lung-yen and Eng Hok, 900 m., Sept. 22, 1912, W. R. Price 1169.

***Gentiana sessiliflora* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. semialatae* Marquand, sed antheris multo brevioribus, calycis lobis triangularibus insigniter differt.

Climbing herb. *Stem* 80 cm. high, brownish purple, subterete, scarcely winged, spirally twisted, 2-3 mm. in diameter. *Internodes* 3-4 cm. in length near the base, 8-11 cm. long above. *Leaves* in pairs, sessile, those on the lower part of the stem ovate, acute, 1-2 cm. long, 6-8 mm. wide, rounded at the base, upper leaves lanceolate, up to 4 cm. long. *Bracts* lanceolate, sessile, 2-2.5 cm. long. *Flowers* in pairs. *Calyx-tube* entire, 1-1.5 cm. long; lobes triangular acute, about 5 mm. long, sinus very narrow. *Corolla* infundibuliform-campanulate, 5 cm. long; lobes 5, deltoid; plicae rotundate, erose, 4 mm. wide. *Stamens* 4 cm. long; filaments winged on one side only; anthers sagittate, 3.5 mm. long. *Ovary* stipitate. *Stipe* 2 cm. long. *Immature seed* with a discoid wing (mature capsules not seen).

WESTERN CHINA. Probably W. Szechuan: without precise locality, Sept. 1904, E. H. Wilson (Veitch Exped.) 4150.

Only a single specimen of this rather strikingly distinct species is known. It is most unfortunate that as the ovules are so young there is some doubt as to the affinity of the plant.

***Gentiana Nienkui* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. fascicularis* Marquand, sed corollae plicis triangularibus, staminibus multo longioribus differt.

Scandent plant, reaching a height of 2.5 m. *Stem* subterete, twisted, about 1.5 mm. in diameter, dark purple. *Internodes* up to 9 cm. long. *Leaves* ovate-lanceolate, acuminate, cordate at the base, 5-8 cm. long, 2-3 cm. wide; petiole up to 1 cm. in length. *Bracts* minute, linear-lanceolate. *Flowers* axillary, 1-3 together.

Calyx 5-lobed; tube 1 cm. long, 0.5 cm. in diameter at the mouth; lobes linear, equalling the tube. *Corolla* narrowly infundibular, 5 cm. long, greenish and purple striped, unspotted; lobes ovate, apiculate, 7 mm. long, 6 mm. wide; plicae triangular, 5 mm. wide, 3 mm. long, margin minutely erose. *Stamens* nearly as long as the corolla tube; filaments with a narrow wing on each side, upper 2 cm. free, apex recurved; anthers cordate-ovate, scarcely 2 mm. long, slightly exceeding the stigma. *Ovary* subsessile, oblong, attenuate at the apex, 3 mm. wide. *Style* about 1.5 cm. long, rather stout. *Immature seeds* triquetrous with three narrow wings (mature fruit not seen).

CHINA. Hongkong: in a wood, Jan. 4, 1930, N. K. Chun 4011.

This species appears to be extremely rare, since only a single specimen was collected. Professor W. Y. Chun informs me that immediately it was brought in in the fresh state he sent the collector (his nephew) to look for more specimens in the same wood, but two whole days were spent in the search without success. The name commemorates the collector, Mr. Nienku-Chun. One half of the specimen has been presented to Kew by Professor W. Y. Chun.

***Gentiana dimidiata* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. fascicularis* Marquand et *G. membranaceae* Marquand, a priore tubo calycis dimidiato-fissis, a posteriore antheris multo majoribus et ovario stipitato differt.

Perennial. *Stems* scandent, 2-3 m. high, subterete, spirally twisted. *Internodes* long. *Leaves* in pairs, lanceolate, up to 10 cm. long, 3 cm. wide, apex acuminate, curved, rounded at the base; nerves 3-5; petiole 8-10 mm. long, 1.5 mm. in diameter. *Flowers* both axillary and terminal, more or less pendulous, borne on slender, terete pedicels up to 3.5 cm. in length. *Calyx* dimidiate-spathaceous; tube membranaceous, 12-14 mm. long, 4-5 mm. in diameter, divided to below the middle, nerves distinct, not keeled. *Corolla* purple-lilac, darker on the exterior; tube infundibular, 3.5 cm. long, 1.5 cm. wide at the mouth; lobes 5, deltoid, acute or acuminate, 3-4 mm. long, 3 mm. wide; plicae subtruncate or rounded, slightly erose, much shorter than the lobes. *Stamens* 5; lower half of filaments united to the corolla-tube, upper half with a broad scarious wing on one side and very narrow wing on the other side; anthers oblong, 3 mm. long. *Ovary* stipitate, elliptic-oblong, 10-12 mm. long, 2.5 mm. wide, attenuate at apex and base. *Style* 3-4 mm. long. *Stigmatic lobes* recurved. *Ovules* discoid (mature seed not seen).

CHINA. Yunnan: on cane scrub in side valleys on the Shweli-Salwin Divide, lat. 20° 45' N., long. 98° 58' E., 3000 m., Sept. 1924, G. Forrest 25225.

***Gentiana cordata* Marquand** sp. nov. (Sect. *Dipterospermum*); affinis *G. fasciculari* Marquand, sed foliis cordatis, floribus terminalibus fere solitariis differt.

Scandent herb. Stems subterete, purplish, internodes up to 18 cm. long. Leaves in pairs, cordate-ovate, acute or acuminate, 8-12 cm. long, 4-5.5 cm. wide, margin entire; nerves 3-5; petiole 1.5-2 cm. long, 1-2 mm. wide. Flowers axillary, solitary or 2-3 together, pedicellate. Bracts minute, linear-lanceolate. Calyx narrowly keeled; tube 10-12 mm. long, 5-6 mm. wide at the mouth; lobes filiform, acute, 1.5 cm. long, sinus rather narrow. Corolla narrowly infundibular, 3-4 cm. long; lobes ovate, subacute, 5-6 mm. long, 3-4 mm. wide; plicae rounded, erose, scarcely half the length of the lobes. Stamens 3.5 cm. long; filaments subulate, narrowly winged on both sides above the point of attachment to the corolla-tube; anthers oblong-ovoid, 2-2.5 mm. long, 1 mm. wide. Ovary subsessile, attenuate at the apex. Style very long. Ovules ovoid (mature seeds not seen).

CHINA. W. Szechuan: Mount Omei, July 1904, *E. H. Wilson* (Veitch Exped.) 5105A (type) and 5105; without precise locality, 1500-2100 m., Oct. 1903, "flowers bluish," *E. H. Wilson* (Veitch Exped.) 4151; Mount Omei, 1350 m. and 1200 m. respectively, *Faber* 171, 293; without precise locality, *A. Henry* 8881; near Ta-chien-lu, 2700-4000 m., *Pratt* 431.

CHINA. Yunnan: Yeng Chen Lin mountain, forests 2100 m., "flowers pink purple," *A. Henry* 11186.

***Gentiana caudata* Marquand** sp. nov. (Sect. *Dipterospermum*); ex affinitate *G. fascicularis* Marquand, sed corollae lobis caudatis, foliis bracteisque dissimilaribus insigniter differt.

Perennial. Stems slender, subtetragonous, spirally twisted and loosely twining, up to 50 cm. high, arising from a small nodose rhizome. Radical leaves none. Lower cauline leaves cordate-ovate, acute or subacute, up to 3 cm. long, 2.5 cm. wide, margin entire; midrib and one pair of lateral nerves conspicuous on the underside; petiole 3-4 mm. long. Upper cauline leaves and bracts much narrower, lanceolate, not exceeding 9 mm. in width; petioles about 4 mm. in length. Flowers solitary, terminal and axillary. Calyx tubular, scarcely keeled; tube 10-12 mm. long; lobes 5, linear, erect or slightly recurved at the apex, 3.5-5 mm. long; sinus truncate, 1.5-2 mm. wide. Corolla narrowly infundibuliform, 3.5-4.5 cm. long, pink; lobes 5, ovate-lanceolate, acute, caudate, 5-7 mm. long, 3.5-4 mm. wide, with tails about 1 mm. long; plicae rounded, erose, 3 mm. wide, less than half the length of the lobes. Stamens 5; filaments slightly longer than the corolla-tube, recurved at the apex, the upper 1.3-1.5 cm. free from the corolla-tube, subulate, very narrowly winged on both sides; anthers ovoid, scarcely 2 mm. long. Ovary stipitate, narrow, elliptic-oblong, attenuate at the apex. Style 8-12 mm. long. Style 1 cm. or more in length. Stigmatic lobes recurved at the apex. Ovules winged (mature seed not seen).

CHINA. Szechuan: North Wushan, without precise date, *A. Henry* 7091 (type).

HUPEH. Nanto and mountains to northward, *A. Henry* 4463.

This is a very distinct species which has been confused with *Gentiana fascicularis*. It is remarkable for the heterophylly, the tailed corolla lobes and very long stamens, the anthers being semi-exserted.

***Gentiana Golowninia* Marquand**, supra p. 70 (Sect. *Tripterospermum*) var. ***oblonga* Marquand** var. nov.; a typo differt capsula oblonga 15-20 mm. longa 5-7 mm. lata, foliis lanceolatis acuminatis longe petiolatis usque ad 15 cm. longis 4.5 cm. latis.

CHINA. Hupeh: S. Wushan, on grassy mountains, flowers blue, *E. H. Wilson* (Veitch Exped.) 1687; Chienshih, without precise date, *A. Henry* 7416.

***Gentiana dendrologi* Marquand** sp. nov. (Sect. *Aptera*); affinis *G. tibeticae* King, sed bracteis multo minoribus, necnon inflorescentiis recedit; a *G. Feltisowii* Regel et Winkl. calycibus quinqueidentatis differt.

Perennial, up to 30 cm. in height. Basal leaves scarcely petiolate, lanceolate or linear, 12-25 cm. long, 2-3 cm. wide, attenuate into the more or less sheathing base, shortly acuminate to a sub-obtuse apex, with a rather broad midrib and 4-6 lateral nerves. Bracts sessile, narrow lanceolate, 4-7 cm. long, 1-1.5 mm. wide. Cauline leaves 4-5 pairs, up to 9 cm. long, 1-1.5 cm. wide, apex subacute. Flowers sessile or subsessile in the upper whorls, long-pedunculate in the axils of the uppermost leaf-like bracts. Calyx dimidiate-spathaceous, submembranaceous; tube 1.5 cm. long; lobes 5, filiform, scarcely 2 mm. long. Corolla 3-3.5 cm. long, white; tube cylindrical, about 1 cm. in diameter; lobes ovate, subobtusate; plicae truncate, 4 mm. long, 5 mm. wide. Stamens free, 2 cm. long; filaments slender; anthers 2.5 mm. long. Ovary shortly stipitate, 2 cm. long. Immature seeds ovoid, not winged (mature seeds not seen).

WESTERN CHINA. Grasslands, without precise locality, 3000 m., August 1903, *E. H. Wilson* (Veitch Exped.) 4130 (type), excluding large basal leaves; alpine meadows, 3000-3400 m., July 1903, *E. H. Wilson* (Veitch Exped.) 4125.

This species is named in honour of the late Mr. E. H. Wilson, the distinguished botanical traveller whose tragic death occurred recently. It is distinguished from the Siberian species *Gentiana Feltisowii* Regel et Winkl. by the calyx having five short filiform lobes instead of the three characteristic of that species. From *G. macrophylla* Pall., which it much resembles, it may be recognised immediately by the larger flowers with stamens which are twice as long as in that species, as well as by the narrower bracts. *G. tibetica* King and *G. robusta* King differ in the densely crowded flowers and aggregated upper leaves.

It should be noted that the large basal rosette leaves which were collected with *E. H. Wilson* 4130 and are mounted on the type sheet, do not belong to this species but appear to be *G. crassicaulis* Duthie.

Gentiana wutaiensis Marquand sp. nov. (Sect. *Aptera*); ex affinitate *G. siphonanthae* Maxim., sed floribus paucioribus, capsula stipitata, corollae plicis brevioribus, inter alia differt.

Perennial (roots not seen). *Stems* decumbent, subterete, purplish, up to 18 cm. long, moderately stout (basal leaves not seen). *Cauline leaves* usually in three pairs with very long internodes, lanceolate or linear-lanceolate, acute, 5-7 cm. long, 6-7 mm. wide, united at the base to form a deep sheath. *Flowers* sessile, several together, closely congested, terminal and axillary on the penultimate node. *Bracts* like the leaves. *Calyx* dimidiate-spathaceous, membranous, purplish; tube 8-9 mm. long; lobes 5, linear, about 1.5 mm. long. *Corolla* tubular-campanulate, 2-2.5 cm. long, blue above, paler below; lobes 5, ovate, rounded at the apex, 4 mm. long, 3 mm. wide; plicae triangular, acute, scarcely one-third the length of the lobes. *Stamens* 5, 1.5-1.7 cm. long; filaments filiform, free from the corolla-tube above the middle; anthers subsagittate, 3 mm. long. *Ovary* shortly stipitate, elliptic-oblong, attenuate at the apex. *Style* 2.5 mm. long. *Ovules* elliptic-oblong, smooth (mature seed not seen).

CHINA. Shansi: Wu-tai-shan, 1876, *Hancock* (Kew No.) 62; open mountain slope within alpine region on the same mountain, 1800-3000 m., July 18, 1919, perennial herb, calyx purplish, petals blue and lighter at the lower part, *T. Tang* 1110.

Gentiana wasenensis Marquand sp. nov. (Sect. *Frigida*); ex affinitate *G. Purdomii* Marquand, sed calycis lobis minutis subulatis, floribus sessilibus differt.

Perennial. *Caudex* small, giving rise to numerous fleshy roots, 2 or 3 short barren stems and a solitary flowering stem. *Leaves of the barren stems* narrow, linear-lanceolate, up to 7 cm. long, 7 mm. wide, apex subobtusate, base attenuate into the sheathing petiole. *Flowering stems* up to 20 cm. high, tetragonous, glabrous, green suffused with purple, bearing 2 or 3 pairs of cauline leaves. *Cauline leaves* lanceolate, 4.5-6 cm. long, 1.5 cm. wide, apex subobtusate, attenuate into the petiole at the base; nerves 3. *Flowers* 6-8 together in a congested terminal pseudo-umbellate inflorescence, and usually one borne in the axil of the penultimate pair of leaves. *Calyx-tube* entire, 8-9 mm. long, about 4 mm. in diameter at the mouth; lobes minute, erect, subulate (scarcely 1 mm. in length). *Corolla* infundibular, 3 cm. long, 1.5 cm. in diameter at the mouth, blue; lobes unilaterally ovate, obtuse, twisted to the left; plicae truncate, erose. *Stamens* free; filaments narrow subulate, 2 cm. long; anthers 2.5 mm. long. *Ovary* stipitate, 1.5 cm. long. *Stipe* 1.5 cm. long. *Stigma* subsessile. *Ovules* not winged (mature seeds not seen).

CHINA. W. Szechuan: Wên-chuan-hsien, wa-sen country, alpine meadows, 3000-3600 m., July, 1908, *E. H. Wilson* (Arn. Arb. Exped.) 2457.

Gentiana subocculta Marquand sp. nov. (Sect. *Frigida*); ex affinitate *G. heptaphyllae* Balf. fil. et Forrest, sed foliis calycem obtegentibus 2 mm. latis, ramis erectis vel ascendentibus vix decumbentibus differt.

Perennial. *Stems* erect, or more rarely somewhat decumbent, 12-18 cm. high, with internodes 5-7 mm. long, arising from a caespitose base, terete, rather stout, bearing a single terminal flower, and short vegetative stems up to 2.5 cm. high, bearing ovate, acute, membranous hypophylls up to 8 mm. long, 5 mm. wide. *Leaves* on the flowering stems 7 in a whorl, those of the lower whorls ovate or obovate, 4.5 mm. long, 2 mm. wide, those of the upper whorls congested around the calyx, linear, acute, 12-16 mm. long, 2 mm. wide. *Flowers* subsessile. *Calyx-tube* 7-8 mm. long; lobes 7, spatulate, acute, 8 mm. long, 2 mm. wide. *Corolla* subinfundibular, slightly gibbous above the calyx, 4-4.5 cm. long, clear sky blue, lined on the exterior dark blue and green; lobes 7, deltoid, caudate, 5-7 mm. long, 5-6 mm. wide; plicae rounded or subtruncate, much shorter than the lobes. *Stamens* 7, filaments 2.5 cm. long, lower half united to the corolla-tube; anthers oblong, 2 mm. long, 0.5-0.7 mm. wide. *Ovary* stipitate, elliptic-oblong. *Style* very short. *Ovules* ovoid, exalate (mature seed not seen).

CHINA. N. W. Yunnan: on open moist stony meadows, Mekong-Salwin Divide north of Pien-tien Go, lat. 27° 30' N., long. 99° 30' E., 3900-4200 m., Oct. 1924, *G. Forrest* 25954 (type); Kari pass, near summit, between Pung-tzu-la and Shi-zo, Yangtze-Mekong Divide, in dry grassland, 4500 m., Sept. 1904, *G. Forrest* 405; in meadow on Mount La thou-Ch'ou K'ha, south-east of Chung-Tien, 3700 m., flowers steel blue, *Rock* 17266.

S. E. TIBET. Tsarong, moist open stony pasture on the Salwin-Kiu-chiang Divide, lat. 28° 40' N., long. 98° 15' E., *G. Forrest* 19103; moist meadows on the Salwin-Kiu-chiang Divide, lat. 28° 24' N., long. 98° 24' E., 3600-3900 m., Oct., 1921, *G. Forrest* 20746.

Much confusion has arisen owing to the fact that two distinct species were included in the original description of *G. heptaphylla* Balf. fil. et Forrest, represented by Forrest's numbers 45 and 405 respectively. As neither was specially cited as the type of the species and the description covers both, it becomes necessary to select one. Since no. 45 was the sheet illustrated on the plate accompanying the diagnosis, I have chosen this as the type, referring no. 405 to a new species to which I have given the name *G. subocculta* on account of the habit of the leaves.

Gentiana hexaphylla Maxim. var. *caudata* Marquand var. nov.; a typo differt corollae lobis caudatis.

CHINA. Kansu: flowers blue, on steppe, upper Kar Ching K'ou, near Old Taochow, 3800-4300 m., Aug. 28-31, 1923, *R. C. Ching* 870.

Gentiana Arethusae Burkill var. *delicatula* Marquand var. nov.; a typo differt foliis floribusque minoribus, corollae lobis latioribus, plicis subdeltoideis vix truncatis.

S. E. TIBET. Tsarong, plant of 7.5–12.5 cm., flowers light blue, lined darker, on open, moist stony pasture on Doker-La, Mekong-Salwin Divide, lat. 28° 20' N., 4200 m., Sept. 1917, G. Forrest 14854.

Gentiana Arethusae Burkill var. **rotundata-lobata** Marquand var. nov.; a typo differt corollae lobis rotundatis plicis deltoideis, cum var. *delicatula* foliis floribusque minoribus quadrat.

CHINA. N. W. Yunnan: plant of 5–12.5 cm., flowers pale clear blue, greenish and darker-lined on the exterior, open moorland on the Mekong-Salwin Divide, lat. 27° 30' N., long. 98° 56' E., 4200 m., Sept. 1921, G. Forrest 20766.

Gentiana emergens Marquand sp. nov. (Sect. *Frigida*); affinis *G. phyllocalyci* C. B. Clarke, sed corollae plicis triangularibus acutis, calycis dimidia parte tantum foliis oblecta.

Perennial. Stems very short, more or less caespitose, with the bases covered with the closely imbricate old dead leaves. *Leaves* of both the flowering stems and barren stems closely imbricate, obovate-spathulate, 8–9 mm. long, 6–7 mm. wide; midrib rather conspicuous from the under surface in the dried specimens. *Flowers* solitary, terminal, shortly pedicellate or subsessile, with the calyx partly enclosed by the uppermost leaves. *Calyx* tubular-campanulate; tube 6 mm. long, 5–6 mm. in diameter at the mouth; lobes 5, spathulate-oblong, 6–8 mm. long, 2–3 mm. wide, apex subacute; sinus rounded or truncate. *Corolla* spindle-shaped, 3–3.5 cm. long, scarcely 1 cm. in diameter in the upper part of the tube; plicae triangular, acute, scarcely more than half the length of the lobes and usually somewhat unilateral. *Stamens* 5, much shorter than the corolla-tube; filaments subulate, 1.6–1.8 cm. long, free nearly to the middle; anthers oblong, 3 mm. long. *Ovary* subsessile, elliptic-oblong. *Style* very short. *Stigmatic lobes* recurved. *Ovules* ovoid, areolate (mature seeds not seen).

CHINA. S. W. Szechuan: on rocks and boulders, Mount Mituga, west of Muli Gomba, 3050–4875 m., June 1928, J. F. Rock 16591.

This new species (growing with barren stems of *Androsace villosa*?) differs from *G. phyllocalyx* Clarke in the calyx-lobes not being covered by the uppermost leaves, the triangular plicae of the corolla, as well as the smaller leaves. From *G. Wardii* W. W. Sm. it may be distinguished by the much larger flowers and leaves, as well as by the plicae.

Gentiana trichotoma Kusnez. var. **brevicaulis** Marquand var. nov.; a typo differt habitu multo brevior, tota planta vix ad 10 cm. alta.

CHINA. N. W. Yunnan: on the Peima-shan, Mekong-Yangtze divide, between Atuntze and Pangtzer, 4200–4500 m., June-July 1923, flowers Prussian blue, J. F. Rock 10033.

This variety does not seem to diverge in floral characters from typical *G. trichotoma*, but differs so strikingly in its dwarf habit from the extensive series of specimens of that species seen by the author that it seems worth while to give it a varietal name—*G. trichotoma* is typically a slender plant, 30–60 cm. in height.

Gentiana Chingii Marquand sp. nov. (Sect. *Frigida*); ex affinitate *G. Przewalskii* Maxim., sed foliis angustioribus, corolla caerulea multo minore differt.

Perennial. Barren stems short, decumbent, bearing several pairs of linear subobtusate leaves, 4–6 cm. long, 2.5–3 mm. wide. *Flowering stems* decumbent, 12–15 cm. high, slender, subterete, purple, glabrous. *Internodes* up to 6 cm. long. *Leaves* connate in pairs, linear-lanceolate, subobtusate, 2–2.5 cm. long, 2–2.5 mm. wide, leaf sheaths 3 mm. deep. *Flowers* 2–3 together, on glabrous pedicels up to 1.5 cm. long. *Calyx* tubular-campanulate; tube entire, 8 mm. long, 4 mm. wide at the mouth; lobes 5, linear, 4–6 mm. long, 1 mm. wide, apex subobtusate, sinus rather broad, truncate. *Corolla* subinfundibuliform, up to 3.5 cm. long, blue; lobes 5, ovate, acute, 3–4 mm. long, 2.5 mm. wide; plicae rounded or subtruncate, more or less erose, scarcely half the length of the lobes. *Stamens* 5, 2.5 cm. long; filaments slender, subulate, united with the corolla-tube to above their middle; anthers oblong, reddish, 2–2.5 mm. long. *Ovary* stipitate, elliptic-oblong, 8–10 mm. long, attenuate at apex and base. *Stipe* 10–12 mm. long. *Style* about 3 mm. long. *Ovules* discoid, exalate (mature seed not seen).

CHINA. Kansu: in dense tussocks, very common, Ye Cheon K'ou, near Old Taichow on the border of Tibet, 3300–3800 m., Aug. 21, 1923, R. C. Ching 817.

Gentiana gilvostriata Marquand sp. nov. (Sect. *Frigida*); affinis *G. stragulatata* Balf. fil. et Forrest ex Marquand, sed floribus minoribus, corolla infundibuliformi.

Perennial, subprostrate, caespitose, with rather slender rhizomes bearing numerous long, slender, little-branched roots. *Barren stems* numerous, subprostrate, terminated by a rosette of leaves. *Flowering stems* short, decumbent. *Leaves of the barren stems* oblanceolate, subobtusate, 5–7 mm. long, 2–2.5 mm. wide, apex subobtusate, attenuate at the base into the petiole; petioles short, connate in pairs into a narrow submembranous sheath. *Leaves of the flowering stems* rather densely aggregated about the base of the calyx, obovate-spathulate to oblanceolate, increasing in size from the base of the stem, up to 10 mm. long, 2–3 mm. wide, apex acute; petioles short. *Flowers* subsessile, solitary, terminal. *Calyx* tinged with dark purple; tube 10–12 mm. long, 6 mm. in diameter at the mouth; lobes suborbicular, 2.5–3.5 mm. long, 2–3.5 mm. wide, narrowed below to 1–1.5 mm.; sinus broad, rounded. *Corolla* infundibular, 3–3.5 cm. long, sea-blue; tube with clear-cut cream-coloured stripes down the inside, flanked below with five

purplish-blue dots; lobes 5, broadly ovate, 6–7 mm. long, 5–6 mm. wide; plicae ovate, obtuse, 2–3 mm. wide, less than half the length of the lobes. *Stamens* 2.3–2.5 cm. long; filaments slender, subulate, lower half united to the corolla-tube; anthers slightly curved, 2.5 mm. long, 0.5 mm. wide. *Ovary* stipitate, elliptic-oblong, attenuate at the apex into the long style. *Ovules* ovoid, exalate (mature seeds not seen).

UPPER BURMA. In open places, on rocks or gravelly patches between clumps of *Rhododendron*, on precipitous slopes facing south, in the valley of the Seinghku near the Tibetan Frontier, lat. 28° 10' N., long. 97° 20' E., 3600–3900 m., Oct. 13, 1926, *F. Kingdon Ward* 7585.

***Gentiana Handeliana* H. Sm. var. *brevisepala* Marquand** var. nov.; a typo differt corolla caerulea, calycis dentibus brevissimis triangularibus recurvatis.

UPPER BURMA. On alpine turf slopes in the valley of the Seinghku, near the Tibetan Frontier, lat. 28° 10' N., long. 97° 20' E., 3600 m., flowers dark blue, Oct. 5, 1926, *F. Kingdon Ward* 7541.

***Gentiana Veitchiorum* Hemsl. var. *caelestis* Marquand** var. nov.; a typo differt corollae plicis longioribus acutis, floribus pallidioribus, foliis rosulatis nullis.

CHINA. Yunnan: flowers blue, among limestone rocks on the eastern slopes of the Lichiang Snow Range, 5100 m., May-Oct. 1922, *Rock* 7785; flowers blue with yellow stripes, in alpine meadows on the eastern slopes of Lichiang Snow Range in the Yangtze watershed, 4500 m., Sept. 1923, *Rock* 10858.

***Gentiana sino-ornata* Balf. fil. var. *punctata* Marquand** var. nov.; a typo differt habitu graciliore, corollae tubo punctato.

N. E. UPPER BURMA. Tufted plant of 2.5–3.5 cm., flowers with bright blue interior, exterior lined deeper blue and greyish green, in open moist stony alpine meadows on the western flank of the Chimi-li N'Maikha-Salwin divide, lat. 26° 23' N., long. 98° 48' E., 3400–3600 m., Nov. 1924, *G. Forrest* 25423; plant of 7.5–12.5 cm., flowers bright clear blue lined dark purple on exterior, on moist alpine pasture and by streams on western flank of the N'Maikha-Salwin divide, lat. 26° 25' N., long. 98° 48' E., 4200–4500 m., Oct. 1925, *G. Forrest* 27450; plant of 2.5–5 cm., semiprocumbent, flowers in bud, deep blue, in moist stony meadows on the western flank of the N'Maikha-Salwin divide, lat. 26° 45' N., long. 98° 48' E., 4200 m., Oct. 1925, *G. Forrest* 27749; corolla sea-blue at the mouth, fading through paler blue to almost white at the base, where it is striped and dotted with blue, on open patches of gritty loam (granite) between clumps of dwarf *Rhododendron* on sunny slopes in the Valley of the Seinghku near the Tibetan frontier, lat. 28° 10' N., long. 97° 20' E., 3600 m., Oct. 13, 1926, *F. Kingdon Ward* 7586.

CHINA. N. W. Yunnan: tufted plant of 2.5–3.5 cm., flowers with bright blue interior, exterior lined deeper blue and greenish grey,

in open moist alpine meadows on the Chien-Chuan-Mekong divide, lat. 26° 40' N., long. 98° 40' E., 3900–4200 m., Oct. 1922, *G. Forrest* 22602; flowers blue and yellow, in alpine meadow, Mt. Fu-chuan, west of Wei-Hsi, Mekong-Salwin divide, 4460 m., Sept.-Oct. 1929, *Rock* 18346.

***Gentiana choanantha* Marquand** sp. nov. (Sect. *Chondrophylla*); ex affinitate *G. Maximowiczii* Kusnez., sed foliis caulinis linearibus, et *G. aristatae* Maxim., a qua corollae lobis acutis cuspidatis plicis acutis differt.

Annual? Stems numerous, patent or ascending from a basal rosette, up to 5 cm. long. *Basal leaves* broadly ovate, 7–8 mm. long, 4–5 mm. wide, mucronate, with a cartilaginous margin. *Cauline leaves* lax, linear, acute, erect, 4–6 mm. long, united in pairs at the base. *Flowers* solitary, terminal. *Pedicels* up to 1.5 cm. long. *Calyx* 6 mm. long; lobes triangular, acute, 2 mm. long. *Corolla* infundibular, 8–10 mm. long, rose-purple; tube marked inside with dark lines, curving downward at the height of the anthers; lobes acute, triangular, 2 mm. long; plicae about three-quarters the length of the lobes, subacute with suberose margin. *Stamens* 5–6 mm. long; filaments filiform; anthers less than 1 mm. in diameter. *Ovary* stipitate, obovoid-oblong, 3–4 mm. long. *Style* short. *Stigmatic lobes* recurved. *Capsule* semiexserted, with a narrow wing at the apex. *Seed* 1 mm. long, trigonous, with a reticulate surface.

CHINA. W. Szechuan: near Ta-chien-lu, without precise locality, 2700–4000 m., *A. E. Pratt* 512 (type); without precise locality 3300–3600 m., July 1903, *E. H. Wilson* (Veitch Exped.) 4140A; Miuya country, south of Ta-chien-lu, Yulong-hsi, on grassy slopes, 4120 m., flowers purplish blue, July 1929, *J. F. Rock* 17485.

E. TIBET. Kiala: Tongola, 1893, *J. A. Soulié* 877.

***Gentiana pedicellata* Griseb. var. *Chingii* Marquand** var. nov.; a typo differt corollae tubo multo angustiore, foliis rosulatis ovatis vix. 1.5 cm. longis, plicis subdeltoideis obtusis.

CHINA. Anhwei: under shade, 630 m., flowers whitish, July 12, 1925, *R. C. Ching* 4157.

***Gentiana macraucena* Marquand** sp. nov. (Sect. *Chondrophylla*); ex affinitate *G. chungtienensis* Marquand, sed capsula longissime exserta inter alia insigniter differt.

Annual. Stems erect, up to 5 cm. high, glabrous, dark brown. *Rosette leaves* ovate, 8–10 mm. long, 7 mm. wide, very shortly mucronate with a narrow cartilaginous margin. *Cauline leaves* lanceolate, acute or acuminate, up to 6 mm. long, 2 mm. wide, connate at the base into a membranous sheath, with a scarious margin. *Calyx-tube* narrow, up to 8 mm. long, 3 mm. wide at the mouth; lobes triangular, acute, up to 3 mm. long, with a narrow scarious margin. *Corolla* tubular, up to 1.5 cm. long; lobes 5, ovate, about 2 mm. long, 1–1.5 mm. wide; plicae triangular. *Stamens*

up to 8 mm. long; filaments filiform, uppermost 3 mm. free. *Ovary* stipitate. *Stigma* subsessile. *Capsule* ovoid, the two halves recurving when mature. *Stipe* growing out to a length of 4-5 cm. in the fruiting stage, about 1.5 mm. in diameter, semitranslucent. *Seed* trigonous, scarcely 1 mm. long, rugose.

S. E. TIBET. Tsarong: in fruit on open moist pasture and boulders on Ka-gwr-pw, Mekong-Salwin divide, lat. 28° 25' N., 3600-3900 m., July 1917, *G. Forrest* 14196.

***Gentiana moniliformis* Marquand** sp. nov. (Sect. *Chondrophylla*); ex affinitate *G. pedicellatae* Wall., sed calycis lobis corollam subaequantibus, stipite multo crassiore differt.

Annual. *Stems* ascending, up to 6 cm. long, glabrous, slightly branched. *Rosette leaves* obovate-spathulate, up to 1.7 cm. long, 4-5 mm. wide, acuminate, 6-nerved. *Cauline leaves* lanceolate, recurved, attenuate into the petiole, 6-7 mm. long, 3 mm. wide, connate in pairs. *Flowers* borne terminally on the branches, shortly pedicellate. *Calyx-tube* 5-6 mm. long, 2.5-3.0 mm. in diameter; lobes 5, spathulate-ovate, slightly recurved, 2-3 mm. long, apex acute. *Corolla* only slightly exceeding the calyx, pale greenish blue; lobes 5, deltoid, acuminate; plicae subtruncate. *Stamens* short. *Ovary* stipitate. *Stigma* subsessile. *Capsule* 4 mm. long, ovoid, much exserted from the corolla on a stout stipe 2-2.5 mm. in diameter. *Seed* oblong, scarcely 0.5 mm. in length, reticulate with minute moniliform ridges.

CHINA. Yunnan: marshy pasture on hills east of Tengyueh, lat. 25° N., 2100 m., May 1912, *G. Forrest* 7655.

This interesting species has very minute seeds which are decorated by moniliform ridges forming a reticulum with elongated meshes, precisely as is found in the type specimens of *Gentiana decemfida* Ham., from which species it may be distinguished immediately by the calyx almost equalling the corolla in length.

***Gentiana Parryae* Marquand** sp. nov. (Sect. *Chondrophylla*); ex affinitate *G. Bodinieri* Léveillé, sed corolla multo brevior vix usque ad 1.5 cm. longa, foliis rosulatis nullis inter alia insigniter differt.

Annual. *Stem* erect, up to 15 cm. long, terete, scaberulous, dark brown, about 1 mm. in diameter, the lowest 10 cm. naked. *Internodes* 1-2 cm. long. *Leaves* in pairs, elliptic, acute at the apex and attenuate at the base, 4 cm. long, 7 mm. wide, with an extremely narrow cartilaginous margin. *Bracts* minute, acuminate. *Flowers* on short branches. *Calyx-tube* 3 mm. long; lobes 5, triangular, 5 mm. long, scarcely 1 mm. wide. *Corolla* obconic to subinfundibular, 1-1.5 cm. long; tube 3-3.5 mm. wide at the mouth; lobes 5, ovate, 2.5 mm. long, 2 mm. wide; plicae triangular, acute, slightly more than half the length of the lobes. *Stamens* 5, slightly shorter than the corolla tube; anthers narrow, oblong, 3 mm. long; filaments subulate, united to the corolla-tube through

half their length. *Ovary* shortly stipitate. *Style* 2-3 mm. long. *Stigmatic lobes* recurved. Immature *capsule* obovoid, carinate. Immature *seed* minute, elongate, smooth (mature seed not seen).

INDIA. Assam: Lushai Hills; Tailiphai, growing in shade, 1500 m., May 1927, *Mrs. Parry* 168.

***Gentiana subuniflora* Marquand** sp. nov. (Sect. *Chondrophylla*); ex affinitate *G. chungtienensis* Marquand, sed corollae lobis obtusis ecaudatis differt.

Annual. *Stems* unbranched, very short, erect or decumbent. *Leaves* crowded, ovate, acuminate, 2.5-3.5 mm. long, 2-3 mm. wide, margin narrow, cartilaginous, apex acute slightly recurved. *Flower* solitary, terminal, sessile, the lower part of the calyx immersed in the imbricating uppermost leaves. *Calyx* tubular; tube 6-8 mm. long, 3 mm. wide at the mouth; lobes 5, lanceolate-ovate, acute, 2-3 mm. long. *Corolla* infundibular, bright blue; lobes 5, ovate, obtuse, 3.5-4.5 mm. long, 4 mm. wide; plicae minute, triangular, scarcely half the length of the lobes. *Stamens* 5; filaments slender, filiform, 12-14 mm. long, united throughout half their length, and incurved at the extreme apex; anthers cymbiform, scarcely 1 mm. long. *Ovary* stipitate, elliptic-oblong, attenuate into the stipe and abruptly attenuate into the style at the apex. *Style* 2 mm. long, slender. Immature *seeds* fusiform, 0.5 mm. in length, not winged. Mature *capsule* not known.

W. CHINA. Flowers bright blue, heaths without precise locality, 4300-4500 m., June 11, 1904, *E. H. Wilson* (Veitch Exped.) 4132.

***Gentiana radiata* Marquand** sp. nov. (Sect. *Chondrophylla*); ex affinitate *G. Piasezkii* Maxim., sed foliis caulinis acuminatis margine cartilagineis, foliis rosulatis ovatis acutis, staminibus brevioribus differt.

Annual. *Stems* 2-7, radiating from the base, unbranched, glabrous, up to 6 cm. long, 1 mm. in diameter. *Radical leaves* few, sessile, ovate, acute, 6-8 mm. long, 4-5 mm. wide, with a distinct scaberulous, cartilaginous margin. *Cauline leaves* in pairs, scarcely patent, lanceolate, acute, 6-7 mm. long, 2-2.5 mm. wide, with a wide thin scarious margin. *Flowers* solitary, terminal, on pedicels 8-12 mm. long. *Calyx* tubular-campanulate; tube 6-8 mm. long, 4-5 mm. in diameter at the mouth; lobes 5, triangular, acute, cuspidate, 6-7 mm. long, 1.5 mm. wide at the base, with a narrow scarious margin; sinus acute, with the inner membrane visible within. *Corolla* infundibular, 2-2.5 cm. long, blue; tube 5 mm. in diameter at the mouth; lobes 5, ovate, mucronate, 5-6 mm. long, 5 mm. wide; plicae rounded, suberose, 4-5 mm. wide, shorter than the lobes. *Stamens* 5, 1.5 cm. long; filaments slender, united with the corolla-tube to above the middle; anthers ovoid, 1.5 mm. long. *Ovary* shortly stipitate, elliptic-oblong. Mature *seeds* not seen.

CHINA. Szechuan: Muli district, Mount Siga, north-east of Kulu, in meadows, 4150 m., June 1929, *J. F. Rock* 17886.

***Gentiana anisostemon* Marquand** sp. nov. (Sect. *Chondrophylla*); affinis *G. nanobellae* Marquand, sed foliis caulinis ovatis acutis, calycis lobis multo longioribus attenuatis inter alia differt.

Annual. Stems terete, glabrous, much branched, up to 6 cm. high, purple-tinged. *Rosette leaves* broadly ovate, mucronate, 8–10 mm. long, 6–8 mm. wide, with a narrow cartilaginous margin, dark purple. *Cauline leaves* in pairs, lanceolate, ovate-lanceolate or oblong-lanceolate, mucronate, 7–9 mm. long, 2.5–3.5 mm. wide, clasping the stem but not imbricate; margin scarious, wide in the upper leaves, narrower in the lower. *Flowers* solitary, shortly pedicellate, terminal on each of the branches. *Calyx* tubular, tinged with purple; tube 5 mm. long, 3 mm. wide at the mouth; lobes triangular, acute, 3–4 mm. long, 1.5 mm. wide at the base, margin scarious, widening from apex to base, sinus acute. *Corolla* subinfundibular, about 1.5 cm. long, rich blue; tube 5–6 mm. in diameter at the throat; lobes 5, ovate, 4–4.5 mm. long, 2.5–3 mm. wide; plicae broadly ovate or subtruncate, 2–2.5 mm. wide, shorter than the lobes, margin irregularly serrate. *Stamens* 5, of unequal length; filaments slender, 7–10 mm. long, united with the corolla-tube to about the middle; anthers ovoid, 1.5–2 mm. long. *Ovary* stipitate, elliptic-oblong, attenuate at the apex and base. *Style* 2 mm. long. *Stigmatic lobes* recurved. *Ovules* minute, oblong, smooth (mature seed not seen).

CHINA. Yunnan: in alpine meadow on the eastern slopes of the Lichiang Snow range, 3600 m., May 2, 1923, J. F. Rock 8339.

XIV.—DIOSCOREA: SECTION STENOCOREA.

D. PRAIN AND I. H. BURKILL.

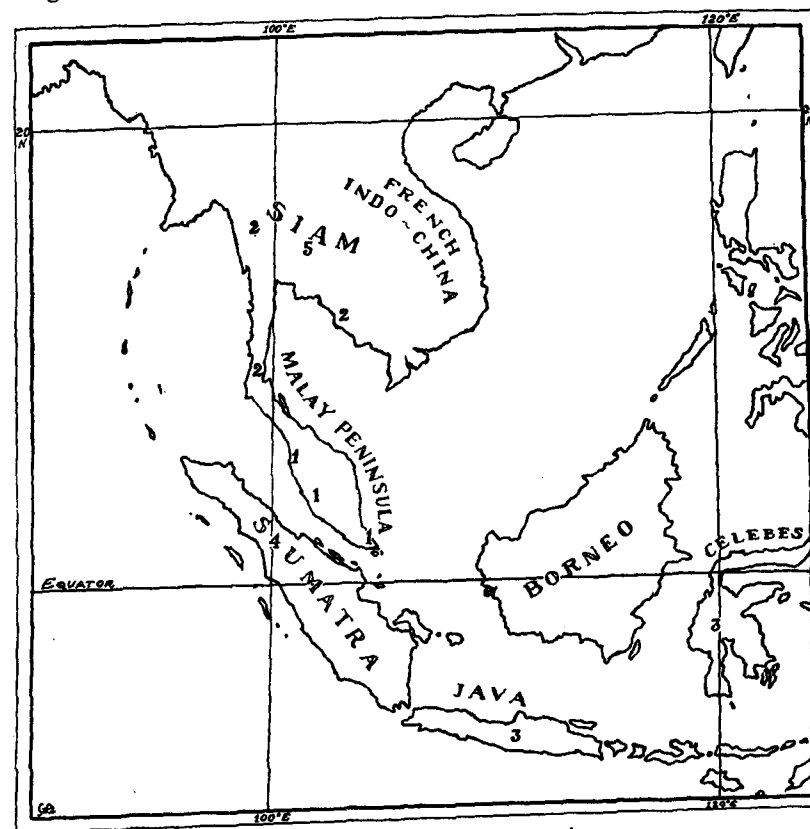
We are indebted to the kindness of Dr. A. F. G. Kerr, Director of the Botanical Section of the Ministry of Commerce and Communications, Siam, and of Dr. E. D. Merrill, Director-in-Chief of the New York Botanical Garden, for the opportunity of studying material representing two species of the genus *Dioscorea*, section *Stenocorea*. This enables us to state that the section now includes five species.

The male flowers of all are known; the female flowers of *D. stenomeriflora*, *D. daunaea* and *D. sumatrana*. Mature fruits of *D. sumatrana* and *D. paradoxa* are known and half-ripe fruits of *D. daunaea*. The underground parts of *D. paradoxa* alone are known, but some imperfect material of *D. daunaea* is available.

The additional material now at our disposal involves the necessity of describing a new species and enables us to provide an amplified account of the section.

In the Section *Stenocorea* the underground parts consist of a woody knot which gives rise to storage tubers laterally, to feeding roots above the tubers, and to a bud, destined to become the woody knot of next year, which appears by the side of the functioning stem. The storage tubers descend direct into the earth. The stem twines to the left and is unarmed. The male flowers, which open

wide, are pedicelled and are produced singly along the axis of the spike-like raceme: they have a disc upon the edge of which six fertile stamens are carried. The female flowers are pedicelled, and rather large. The ovules are produced towards the middle of the placenta. The capsules are large, deflexed, the pedicel of the flower becoming a rigid curved stalk: the wings dehisce along the whole of the suture, and allow the seeds to glide out. The seeds are winged all round.



Distribution of *Dioscorea* species.

1, *stenomeriflora*. 2, *daunaea*. 3, *keduensis*. 4, *sumatrana*. 5, *paradoxa*.

Among the *Dioscoreas* of Asia which twine to the left, *Stenocorea* alone has capsules from which the seeds escape in this fashion: in this respect and in the shape of the capsules it agrees with the section *Enantiophyllum*. It is also like *Enantiophyllum* in the way in which its storage tubers are formed, but in every other respect it differs from that section. In the direction of the twining of the stem it agrees with all the sections except *Enantiophyllum*. The male flowers are in structure as in the sections *Stenophora*, *Shannicorea*, *Combilium* and *Paramecocarpa*: and abundantly distinct from those

in the sections *Opsophyton*, *Lasiophyton* and *Enantiophyllum*. They are produced singly as in the section *Combilium* and the three sections just named. The seeds are winged all round as in *Combilium* and *Enantiophyllum*; but the capsule of *Combilium* is reflexed in the only specimen known.

The following artificial key to the five species of *Stenocorea* may be useful.

Leaves twice as long as broad :

♂ flowers not reflexed : leaves rather firm.....*stenomeriflora*.

♂ flowers reflexed : leaves thin :

♂ flowers on pedicels only 1.5 mm. long.....*daunaea*.

♂ flowers on pedicels 4-5 mm. long.....*keduensis*.

Leaves about as broad as long :

♂ flowers greenish-yellow, shaped as in the last two :

♀ inflorescence long : fruits very large.....*sumatrana*.

♂ flowers more sparse, with shorter perianth-lobes, reddish : ♀ inflorescence apparently with one flower only : fruits smaller.....*paradoxa*.

1. **D. stenomeriflora** *Prain et Burkill* in Journ. As. Soc. Bengal, N.S. 10, 1914, p. 40 : Ridley, Flora Mal. Penins. 4, 1924, p. 319.

MALAY PENINSULA. Perak and southwards to Singapore.

2. **D. daunaea** *Prain et Burkill* in Journ. As. Soc. Bengal, N.S. 4, 1908, p. 450 ; and in Kew Bull., 1927, p. 230.

SIAM, in the moister parts and just into TENASSERIM.

3. **D. keduensis** *Prain et Burkill* in Kew Bull., 1925, p. 59.

EASTERN JAVA and SOUTHERN CELEBES.

4. **D. sumatrana** *Prain et Burkill*, sp. nov.

NORTH-EASTERN SUMATRA.

5. **D. paradoxa** *Prain et Burkill* in Kew Bull., 1927, p. 246.

EAST-CENTRAL SIAM.

The following is a description of *D. sumatrana*.

D. sumatrana *Prain et Burkill*, sp. nov. ; ex affinitate *D. daunaeae* differt foliis hastato-cordatis brevioribus, inflorescentiis foemineis rigidis, capsulis majoribus.

Partes inferiores ignoti. *Caulis* inermis, laevis, glaber, sinistrorsum volubilis. *Folia* alterna, hastato-cordata, breviter acuminata, ad 9 cm. longa, ad 9 cm. lata medio parte, 7-nervia : areola intranervia interior clausa late oblanceolata : areola a nervorum paribus alteris amplexa subrotunda : pagina superior glabra, nervis omnibus distinctis : pagina inferior glabra, nervis primariis exstantibus, reti distincto : petiolus ad 9 cm. longus, glaber. *Racemi masculi* vel axillares vel in inflorescentiam longam terminalem dispositi, si axillares vel solitarii vel 2-nati vel 3-nati, ad 12 cm. longi, 20-50-flori, dependentes : flores pedicellati, respicientes : pedicelli 1 mm. longi, bracteolati : bracteae anguste lanceolatae : bracteolae

similes, minores. *Perianthii masculi* laciniae in tubo infundibuliformi connatae, subsimiles, longe-ovatae, subacutae, 1-nerviae. *Stamina* 6, incurvata. *Flores foeminei* pedicellati, in racemis rigidis solitariis ex axillis foliorum versus stirpem porrectis, 10 cm. longis : axis 1.5 mm. diametro, alatus : pedicelli decurvati, 4-5 mm. longi. *Sepala* lanceolata, dorso subcristata, 2 mm. longa. *Petala* similia. *Staminodia* 6, perparva. *Capsulae* magnae, obcordatae : pedicellus antea floris capsula jam matura incrassatus, curvatus, apicem versus ampliatus, 2.5-3 cm. longus : alae ad placentas 4 cm. longae, oblique ex pedicello ad marginem 6 cm., etiam 3.5 cm. latae. *Semina* circumcirca alata.

SUMATRA. Asahan, ad Bandar Poeloeh, in silvis, Yates 2055 ! (type ♂) ; Simeloengoen, inter Djoema Tombak et Taratak, Bartlett 8200 ! (type ♀).

XV.—THE BOTANICAL NAME OF "TARA."

T. A. SPRAGUE.

"Tara" is one of three American species of *Caesalpinia* the pods of which are used in tanning, the other two being "Divi-divi," *C. coriaria* (Jacq.) Willd., and "Algarobilla," *C. brevifolia* (Clos) Baill.* It is a shrub or small tree rather widely distributed in tropical America, and has been re-described several times under different names, the ones most commonly employed in recent literature being *Caesalpinia tinctoria* (H.B.K.) Taub. and *Caesalpinia pectinata* Cav. Under International Rules, however, the correct name for the species is *Caesalpinia spinosa* (Mol.) Kuntze.

The earliest mention of "Tara" seems to be in Feuillée's journal† of his observations on the coast of South America and in the West Indies, during the years 1707-1712. Feuillée gave what was, for the time at which he wrote, a fairly good botanical description and figure of "Tara," in which, however, the filaments were described as five in number instead of ten, and the leaflets were taken for leaves.

According to Feuillée, "Tara" is a shrub reaching a height of more than 12 ft., found in the valley of Lima. He mentions that the lower sepal is much longer than the four others and that it has a denticulate margin, a character which is shown also in his figure. The pods were used by the dyers for obtaining a black dye, and Feuillée relates that he used to make a beautiful black ink by boiling them with a small quantity of alum.

The name *Poinciana spinosa* was adopted by Molina in the first edition of his "Saggio sulla storia naturale del Chile," 158 (1782), accompanied by a reference in a footnote to "Poinciana spinosa, vulgo Tara Feuil." In the second edition (1810) of his "Saggio," however, Molina changed the name of the species to *Tara tinctoria* Mol., *Tara* being a proposed new genus of Pentandria Monogynia. In the meantime, the same species had been described under the name

* Chevalier in Rev. Bot. Appl. ix. 300 (1929).

† Feuillée, Journ. Obs. ii. 752, t. 39 (1714).

Caesalpinia pectinata by Cavanilles* in 1802 from a shrub 5-7 ft. high grown in the Royal Garden at Madrid, which flowered for the first time in July of that year. According to Cavanilles, *C. pectinata* was a native of Nueva España (New Spain), a geographical expression which then included, in a wide sense, parts of Central America and the West Indies, in addition to Mexico, to which it was applied in a more restricted sense. The work in which *C. pectinata* was described by Cavanilles must, in its original edition, have had a very limited circulation—it was apparently unknown to De Candolle, who published a new description of *C. pectinata* in 1813† without citing that of Cavanilles. The specific epithet *pectinata* referred to the pectinate margin of the lower sepal.

An excellent illustration of "Tara" under the name *Caesalpinia Tara* appeared in Ruiz et Pav. Fl. Peruv. iv. t. 374, issued in 1802.

In 1810 Molina, as mentioned above, proposed the name *Tara tinctoria* for "Tara," which he regarded as the type of a new genus of Pentandria Monogynia. He mentioned that it occurred at Valparaíso as well as in Peru, but does not appear to have re-examined the species, his description being based on that of Feuillée and including the same erroneous statements as to number of stamens and the arrangement of the leaves.

In 1824 Kunth‡ based a new genus *Coulteria* H.B.K. on material gathered by Humboldt and Bonpland at Cartago in Colombia. This included two species, *C. horrida* H.B.K. and *C. tinctoria* H.B.K., which are now considered to be spiny and unarmed states respectively of the same species. Kunth cited *Caesalpinia pectinata* Cav. and *Caesalpinia tinctoria* Domb. mss. as synonyms of *Coulteria tinctoria*, but his main description of that species was drawn up from Humboldt's material and notes, so that the type of the name *Coulteria tinctoria* is the Cartago specimen. He added a short description of Dombey's Peruvian specimens, confined chiefly to the legume and seeds, which were unrepresented in Humboldt's material. According to Humboldt, *C. tinctoria* was known in Colombia under the vernacular names "Dividivi" and "Bresil."

The last name given to the species was *Caesalpinia spinosa* (Mol.) Kuntze, § a new combination based on *Poinciana spinosa* Mol.

Examination of the material in the Herbaria at Kew and the British Museum confirms the view now generally adopted that *Caesalpinia spinosa* of Peru, *C. horrida* and *C. tinctoria* of Colombia, and *C. pectinata* from "Nova Hispania" represent forms of the same species. The "Tara" of Peru is consistently described as a shrub by Weberbauer,|| but according to O. F. Cook** it grows into a tree

20-30 ft. in height in the valley of Urubamba, Peru. At Huanuco, Peru, the species is also a tree of 20-30 ft., according to Pearce (Herb. Kew.), and at Ambato and Riobamba in Ecuador, it attains the same height, according to Spruce (Herb. Kew.). In the dry climatic of Cartago, Colombia, where it is known as "Divi-divi" or "Bresil," it is described by Humboldt as a shrub 12-24 ft. high ("Frutex 2-4-orgyalis.").

The species has been recorded from Chile, Peru, Bolivia, Ecuador, Colombia, Venezuela and Cuba, but in Chile it does not appear to be native. C. Gay* mentioned it as being cultivated in gardens, particularly in the north of Chile, and suggested that it had been introduced from the province of San Juan, Argentina. Reiche† states that it is either indigenous or introduced from Argentina. There appears to be no actual record, however, of the occurrence of "Tara" in the Argentine Republic, and it is not included by Hieronymus‡ in his account of the useful plants of that country. No information is available as to whether the species is actually a native of Cuba or is merely cultivated or naturalized there. In Peru, Bolivia, Ecuador, Colombia and Venezuela, it appears to be indigenous, although it is also cultivated in those countries.

The question of the correct name, under International Rules, of the species concerned is not quite so simple as it might seem. Molina (vide supra) employed the binary name *Poinciana spinosa* in the first edition of his "Saggio," with a reference to *Poinciana spinosa* vulgo Tara Feuillée, which had been published with a description (Feuill. Journ. Obs. ii. 752: 1714). But the fact that *Poinciana spinosa* appears in Roman characters in Molina's book, whereas the botanical names of all the other plants mentioned by him are in italics, might give rise to a suspicion that Molina merely used the name proposed by Feuillée without regarding it as a proper botanical name. On the other hand, if Molina in 1782 did not regard the plant as a species of *Poinciana*, and accept the name *Poinciana spinosa* for it, there was no need for him to mention it in the text of his book. He might simply have stated that the pods of the "Tara" were used for making ink. Presumably the printing of the name in Roman characters was due to a typographical error. Actually, the name was published in 1782 by Molina with a reference to a previously published description, and unless and until it can be shown that Molina did not accept it at that date, the specific epithet will stand. The fact that twenty-eight years later he changed the name to *Tara tinctoria* Mol. is immaterial in this connection. At that date (1810), and indeed for many decades later, it was not considered necessary to retain the original specific epithet when transferring a species from one genus to another. Hence *Poinciana spinosa* Mol. (1782) may be regarded as having been effectively published.

* Cav. Descr. Pl. 467 (1802).

† DC. Cat. Pl. Hort. Bot. Monspel. 13, 84 (1813).

‡ H.B.K. Nov. Gen. vi. 329.

§ Kuntze, Rev. Gen. iii. pars 2, 54 (1898).

|| Engl. & Drude, Veg. der Erde, xii. 93, 143 etc. (1911).

** U.S. Dept. Agric. Bur. Pl. Industry, Invent. Seeds & Plants Imported, no. 45, 12 (1918).

* Fl. Chil. ii. 222 (1846).

† Flora de Chile, ii. 49 (1897).

‡ Pl. Diaphor. Fl. Argent. (1882).

The next question which arises is that of the genus to which it should be assigned. The writer accepts the genus *Caesalpinia* as defined by Benth* and adopted by Taubert,† and fails to see that any useful purpose is served by restoring Benth's Sections of *Caesalpinia* to generic rank. Under *Caesalpinia* the correct name for "Tara" is *Caesalpinia spinosa* (Mol.) Kuntze; if, however, *Caesalpinia* Sect. *Coulteria* (H.B.K.) Benth. is treated as an independent genus, it must bear the generic name *Tara* Mol. (1810), not *Coulteria* H.B.K. (1824), and the species becomes *Tara spinosa* (Mol.) Britton et Rose.‡

An account of the synonymy, principal illustrations, vernacular names, uses and geographical distribution of *Caesalpinia spinosa* follows. Except where otherwise indicated, the specimens cited are in the Kew Herbarium.

***Caesalpinia spinosa* (Mol.) Kuntze**, Rev. Gen. iii. pars 2, 54 (1898). *Poinciana spinosa* Mol. Saggio, ed. 1, 158 (1782). *Caesalpinia pectinata* Cav. Descr. Pl. 467 (1802); DC. Cat. Pl. Hort. Monsp. 13, 84 (1813); Turp. in Dict. Sc. Nat., Planch. Bot. Dicot. t. 257 (1816-29); Spreng. Syst. iv. Cur. Post. 169 (1827); Britton in Bull. Torr. Bot. Club, xvi. 325 (1889); Urb. Symb. Antill. ii. 285 (1900); O. F. Cook in U.S. Dept. Agric., Bur. Pl. Industry, Invent. Seeds & Plants Imported, No. 45, 12, 16, t. 1 (1918); Standley in Contrib. U.S. Nat. Herb. xxiii. 424 (1922), in obs.; Chevalier in Rev. Bot. Appl. ix. 301 (1929). *Caesalpinia Tara* Ruiz et Pav. Fl. Peruv. iv. t. 374 (1802); Haenke, Introd. Hist. Nat. Prov. Cochabamba, 92 (1900). *Tara tinctoria* Mol. Saggio, ed. 2, 153 (1810); Schult. Syst. v. 407 (1819). *Caesalpinia mucronata* Willd. Enum. Hort. Berol. i. 444 (1809), fide Urb. Symb. Antill. ii. 285 (1900). *Coulteria tinctoria* H.B.K. Nov. Gen. vi. 331, t. 569 (1824); DC. in DC. Prodr. ii. 481 (1825); G. Don, Gen. Syst. ii. 429 (1832); Hook. et Arn. Bot. Beech. Voy. 55 (1832); et in Hook. Bot. Misc. iii. 207 (1833); Spach, Hist. Nat. Veg. Phan. i. 100 (1834); et Atlas, t. 2 (1846); Walp. in Flora, xxi. pars 1, 36, t. 1 (1838); Gay, Fl. Chil. ii. 222 (1846); Ralph, Ic. Carpol. 17, t. 22, fig. 3 (1849); Griseb. Cat. Pl. Cub. 78 (1866); Cortés, Flora de Colombia, 209, 224 (1897); Pittier, Plantas Usuales de Venezuela, 216 (1926). *Coulteria horrida* H. B. K. Nov. Gen. vi. 330, t. 568 (1824); DC. l.c.; G. Don, l.c.; Walp. l.c. t. 1, fig. 3; Spach, l.c. i. 100; Ralph, l.c. 16, fig. 4; M. Micheli in Journ. de Bot. vi. 192 (1892). *Coulteria chilensis* DC. in DC. Prodr. ii. 481 (1825). *Caesalpinia tinctoria* Domb. ex DC. l.c. (pro. syn. *Coulteria tinctoriae*); Royal Gardens, Kew, Guide Mus. Econ. Bot., no. 1, 54 (1883); Lubbock, Seedlings, i. 456, fig. 297 (1892).

* Benth. & Hook. f., Gen. Pl. i. 565 (1865).

† Engl. & Prantl, Nat. Pflanzenf. iii. Abt. 3, 173 (1892).

‡ Britton & Rose in N. Am. Fl. xxiii. 318-341 (1930).

Poinciana Tara Ruiz et Pav. ex DC. Prodr. ii. 481 (1825), pro syn.; Peña, Flora Cruceña, 237 (1901).

Caesalpinia tinctoria (H.B.K.) Taubert in Engl. & Prantl, Nat. Pflanzenf. iii. Abt. 3, 175 (1892); Reiche, Fl. Chile, ii. 49 (1898); Weberbauer in Engl. & Drude, Veg. der Erde, xii. 158, f. 16 (1911); Pittier in Bol. Ci. Tecn. Mus. Com. Venez. i. 58 (1926); Knuth in Fedde, Repert., Beih. xliii. 381 (1927).

Tara spinosa (Mol.) Britton & Rose in N. Am. Fl. xxiii. 320 (1930). *Poinciana spinosa*, vulgo *Tara* Feuillée, Journ. Obs. 2, 752, t. 39 (1714).

ILLUSTRATIONS. Feuillée, Journ. Obs. ii. t. 39 (1714), as *Poinciana spinosa*; Ruiz et Pav. Fl. Peruv. iv. t. 374 (1802), as *Caesalpinia Tara*; H.B.K. Nov. Gen. t. 568 (1824), as *Coulteria horrida*; H.B.K. l.c., t. 569, as *Coulteria tinctoria*; U.S. Dept. Agric., Bur. Pl. Industry Invent. Seeds & Plants Imported, No. 45, t. 1 (1918), as *Caesalpinia pectinata*.

VERNACULAR NAMES. "Tara" (Chile, Peru, Bolivia), "Guaranga" (Ecuador), "Guarango" (Colombia: Antioquia), "Dividivi" (Colombia: Cauca, Cundinamarca, Santander), "Dividivi de los Andes" (Venezuela).

USES. The pods are used in tanning. (Chevalier in Rev. Bot. Appl. ix. 301, 380: 1929.) According to O. F. Cook, "Tara" pods are a regular article of trade in the market at Lima, and are said to be used for dyeing, tanning leather, and making ink. He also states that "Tara" is often planted for hedges in Peru, especially in the district round the town of Urubamba, a well-grown hedge of it keeping out cattle, pigs or goats, as well as human intruders (U.S. Dept. Agric., Bur. Pl. Industry, Invent. Seeds & Plants Imported, No. 45, 12: 1918).

CHILE. Cultivated in gardens at Valparaíso, *Bridges* 96 (vide Hook. & Arn. Bot. Beech. Voy. 55); near Valparaíso, *Macrae*. Prov. Tarapaca: Pica, 1100 m., *Werdermann* 752. Tacna, *Rusby* 2358. "Cobija, Iquique and Arica," *Cuming* 936.

PERU. Lima, in dry sandy places, *Nation*. Valley of Lima and Pachacamac, *A.M.* 442. Huanuco, *Pearce* 58. Without locality *Herb. Pavon* (Mus. Brit.). Urubamba valley, between Ollantaytambo and Torontoy, 2400-3000 m., very abundant in a wild state, also planted, especially around the town of Urubamba (ex O. F. Cook, l.c.).

BOLIVIA. Near Sorata, 2650 m., *Mandon* 749. Songo, *Bang* 824. Coroico, in a garden, *Pearce* (Mus. Brit.). Santa Rosa, 3000 m., cultivated (ex Kuntze, l.c.).

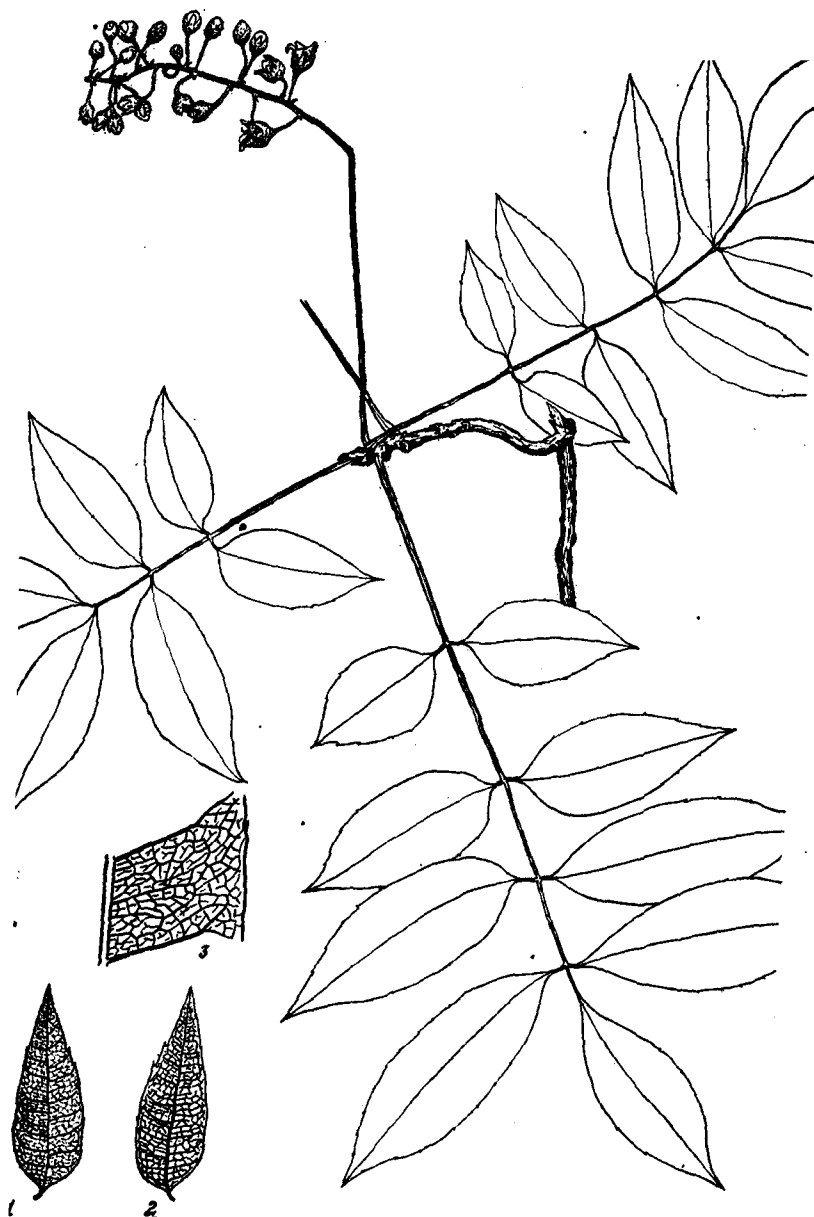
ECUADOR. Baños, *Spruce*. Ambato, Riobamba etc., *Spruce* 5315. Loja, *Seemann* 749. In dry sandy valley of the Rio Chota, Imbabura, 1500-2200 m., *Lehmann* 4788. By the banks of the Rio Chota, *André* 3561. Valleys of the Andes, 1800-2400 m., *Jameson* 821.

COLOMBIA. Cauca : Cartago, 900 m. (ex H.B.K. l.c.). Antioquia, 1300 m., *Jervise*. Cundinamarca : garden in Bogota, *Mrs. Tracey*, 303 ; Cáqueza, 2000 m. *Triana* 465 (4370) (Mus. Brit.) ; Chipaque, 1500-2000 m., *Lehmann* 8764. Without locality, *Dawe* 378. VENEZUELA. Merida : in subalpine places, *Moritz* 1455. Los Andes : Páramo del Molino, 2200 m., *Jahn* 924 (ex Knuth, l.c.) CUBA. Without locality, *Wright* 2363.

XVI.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXVI.

1251. ***Bersama rosea* Hoyle** [Melianthaceae]; *B. abyssinicae* Fresen. affinis sed ramulis novellis glabris roseo-brunneis, rhachide angustiore, foliolis utrinque fortius reticulatis et subtus lucentibus, inflorescentia laxa rosea, pedicellis longioribus gracilibusque, distincta.

Frutex parvus ; ramulis novellis fortiter striatis, roseo-brunneis, glabris ; cortice canescente, fortiter striato. *Foliis* prope apices ramulorum confertiusculis, imparipinnatis, raro abortu paripinnatis ; stipulis interpetiolaribus, 5 mm. longis latisque vel majoribus, late ovatis, rigide coriaceis, ciliatis, petioli basim amplexantibus et intra eundem connatis ; petiolo 4-9 cm. longo, gracili, basi tumido, sursum terete, supra canaliculato, glabro ; rhachide 3.5-18.5 cm. longo, terete, non alato, gracili, supra canaliculato et praeter floccos longorum pilorum inter petiolulorum juga glabro ; foliolis 3-6 jugis superioribus oppositis, 1 vel 2 jugis infimis sub-oppositis, jugis plerumque 2-3 cm. separatis ; petiolulis usque ad 4 mm. longis, gracilibus, supra fortiter canaliculatis, glabris, infimis saepe reflexis, petiolulo folioli ultimi 9-12 mm. longo, gracillimo ; foliolis 3.3-8.5 cm. longis, 1.7-4.2 cm. latis, ovatis usque ad elliptico-vel oblongo-lanceolatis, superis angustioribus ; foliolis basi cuneatis, leviter decurrentibus, apice acute acuminatis cum gracili mucrone (usque ad 3 mm. longo) ; margine integerrimo vel repando, vel paulum distanter crenato-serrato ; foliolis utrinque glabris praeter paucos pilos longos subtus in costa, supra fusco-viridibus, subtus lucentibus et tenuiter reticulatis, costa supra paulum impressa subtus prominente ; nervis lateralibus 8-13. *Inflorescentiis* laxis, racemosis, longipedunculatis, singulis in axillis foliorum summorum vel superiorum ; pedunculo usque ad 10 cm. longo, gracili, fortiter striato, infra glabro, rhachide et pedunculi apice crispis pilis roseo-brunneis hirsuto ; pedicellis in genere longiusculis, 6-10 mm. longis, gracilibus, roseo-brunneo-tomentosis, solitariis in axillis bractearum ; bracteis brunneo-tomentosis, usque ad 3 mm. longis ; alabastris oblongo-ovoideis ; floribus cernuis, 1 cm. longis, 1.5 cm. latis. *Calyce* extus dense tomentoso, intus glabro, sepalis extus in medio longitudinaliter brunneo-, prope marginem roseo- (Tyrio-) tomentosis ; sepalis 4-5 mm. longis, 2.5-3.5 mm. latis, basi breviter connatis, ovatis usque ad ovatis-lanceolatis, obtusis, grande sepalo breviter vel paulum profunde in apice incisa. *Petalis* ligulato-spatulatis, 1 cm. longis,



Bersama rosea Hoyle, from type.

1, Upper surface of leaflet, $\frac{1}{2}$ nat. size. 2 Lower surface of leaflet, $\frac{1}{2}$ nat.
3, Portion of lower surface of leaflet, $\times 2$.

superne 3 mm. latis, densissime cum roseis (Tyriis) pilis villosotomentosis. *Staminibus* 5; filamentis 4 mm. longis, basi glabris et breviter connatis, in parte libera lanceolatis tomentosis, intra crassum discum concavum et paulum lobatum insertis; thecis amplis, 3 mm. longis, flavis, sparse villosis, oblongis. *Ovario* villoso, 4-5-loculare; stylo crasso, glabro, staminibus vix longiore, stigmate 5-lobato, sub-globoso. *Fructibus* non visis.

TANGANYIKA TERRITORY. Mufindi, an undershrub in temperate rain-forest near the Forest House, 6,000 ft., flowering 12th Nov. 1929, *L. G. T. Wigg* 14! (type, in Herb. Kew.); *Haarer* 1602!

1252. *Coelidium cymbifolium* C. A. Sm. [Leguminosae-Genisteae]; affine *C. bullato* Benth., a quo caulium indumento conspicue adpresso argenteo, foliis majoribus longe acuminatis subtus glabris differt.

Radix crassissima, lignosa, basi usque 1.5 cm. crassa, deorsum sensim attenuata. *Caules* numerosi, erecto-adscendentes, usque 18 cm. longi, simplices vel ramosi, inferne nudi, superne foliati, indumento arcte adpresso argenteo-sericeo (pilis infra bases foliorum patulis), inferne glabrati. *Folia* anguste cymbiformia, marginibus inflexis, ambitu (explanata) ovata, usque 1.5 cm. longa et 4 mm. lata, coricaea, in apicem longe acuminata, basi dilatata, plus minusve amplexicaulia, longe ciliata, supra densissime adpresse sericeo-villosa, subtus ecarinata, glabra. *Inflorescentia* strobiliformis, circiter 3 cm. longa et 2 cm. diametro. *Flores* sessiles, bini in axillis bractearum foliacearum vel, si mavis, foliorum superiorum; bractee propriae florum valde reductae, subulatae, villosae. *Calycis* tubus campanulatus, usque 4 mm. longus, extra dense sericeo-villosus, intus nitidus, glaber; dentes subaequales, subulati, usque 5 mm. longi, longe ciliati, utrinque dense sericeo-villosi. *Petala* libera, longe unguiculata, glabra; vexillum oblongo-ellipticum, usque 6 mm. longum et 4 mm. latum, longitudinaliter plicatum; alae oblongae, usque 5.5 mm. longae et 1.5 mm. latae, obtusae; carinae petala plus minusve oblique falcata, usque 4.5 mm. longa et 1.5 mm. lata. *Filamenta* dimidio inferiore connata; tubus staminalis postice fissus, sed basi annulo ovarium circumambiente instructus. *Ovarium* dense sericeo-villosum, 1-ovulatum; stylus crassiusculus, leviter incurvus, triente superiore excepta longe sericeo-pilosus. *Legumen* ignotum.

SOUTH AFRICA. Riversdale Div.: on the north side of the Langebergen, Sept.-Oct. 1929, *Muir* 4510 (type in Nat. Herb. Pretoria).

The name *Coelidium parvifolium* Druce (in Rep. B. E. C. Brit. Isles, 1916, 616: 1917) must be rejected under International Rules in favour of *C. Thunbergii* Harv. As a new combination, *Coelidium parvifolium* Druce is invalid, since it was based on an invalid name, *Crotalaria parvifolia* Thunb. (1800) non Roth (1797). As a new name for the species concerned, it is long antedated by *Coelidium Thunbergii* Harv.

1253. *Dissotis (Heterotis) mirabilis* Bullock [Melastomaceae-Osbeckieae]; *D. cryptanthae* Baker affinis sed floribus majoribus paucioribus, foliis multo majoribus differt.

Frutex 0.5-2 m. altus; caules subtetragoni vel subteretes, junioribus dense ferrugineo-pubescentibus. *Folia* opposita, integra, lanceolata vel anguste oblonga, 2.5-6 cm. longa, 1-1.5 cm. lata, e basi truncata usque ad apicem subacutum 5-7-nervia; pagina superiore rigide scabrido-pubescente, nervis impressis, pagina inferiore molliter ferrugineo-pubescente, nervis valde prominentibus scabrido-pubescentibus; petioli 2-4 mm. longi, ferrugineo-pubescentes. *Flores* magni, terminales solitarii vel in cymas paucifloras dispositi; bracteolae 5-8, calyci adpressae, involucrium foliaceum efformantes, ovatae usque ovato-lanceolatae, 2-3.5 cm. longae, circiter 1.5 cm. latae, margines versus membranaceae, nervis e basi compluribus vix prominulis. *Calyx* extra dense adpresso-sericeo-villosus, intus glaber; tubus cupularis, circiter 1.3 cm. longus, 1 cm. diametro; lobi 3-seriati, seriebus exterioribus subimbricatis, lobis circiter 10 semiorbicularibus vel semiellipticis 2-4 mm. longis persistentibus, serie intima 5-loba, segmentis lanceolatis subacutis 1.5-1.8 cm. longis 4 mm. latis caducis, sinibus latis. *Corolla* lilacino-purpurea, mox caduca; petala 5, inaequalia, contorta, obovata, petalo maximo plus quam 4 cm. longo et 2.7 cm. lato, limbo late rotundato in unguem brevem decurrente. *Stamina* 10, per paria disposita; filamenta circiter 1.3 cm. longa, recta; thecae 1-1.2 cm. longae vel ultra; connectivum unius cujusque paris staminum infra thecas usque 2.5 cm. productum, valde incurvum, appendicibus 2 caudiformibus 5 mm. longis; connectivum alterius staminis basi tantum 2-3 mm. productum, infra ipsas thecas abrupte incurvatum, caudis similibus. *Ovarium* 5-loculare, ellipsoideum, 1 cm. longum, parte inferiore tubo calycino adnatum, parte superiore libera, dense longo-pilosa; stylus glaber, usque 3 cm. longus, curvatus, stigmate truncato. *Capsula* in tubo calycino leviter accrescente inclusa, 1.2 cm. longa.

UGANDA. Katera, in the swamp-lands in Minziro Forest, May, *Brasnett* 22 (type); Bombo Road, Feb., *Lankester* s.n.; Kampala, 3900 ft., Nov., *Mailland* 549; without precise locality, *Mailland* 42AB; Buddu etc., Mar., *Scott Elliot* 3174, 7240, 7480; without precise locality, *Wilson* 137; Entebbe, about 10 miles from the lake, *Fyffe* 206.

A very handsome shrub 2-6 ft. high, with short-lived, sweet-scented, purple-mauve flowers. The plant grows in very striking groups in swampy country, always near surface water.

1254. *Begonia hypolipara* Sandwith [Begoniaceae]; species e Sect. *Magnusia* (Klotzsch) Irmsch., Subsect. *Rachia* (Klotzsch) Irmsch., a *B. incana* Lindl. atque *B. polygonata* Liebm. foliis haud peltatis, a *B. lanuginosa* DC. petiolis foliis scapisque haud lanuginosis differt.

Herba acaulescens, rhizomate crasso setifero 1.5 cm. diametro. *Stipulae* scariosae, brunneo-striatae, triangulari-lanceolatae, ad 2 cm. longae. *Folia* reniformia, rotundata, margine subsinuata vix angulata, apice obtuso nonnunquam apparente, basi profunde cordata lobis rotundatis magis conspicue dentatis, 7-13 cm. longa, 9-15.5 cm. lata, subcarnosa, utrinque satis dense molliter sed inconspicue adpresse pilosa, subtus pernitentia et conspicue palmatinervia nervis 7-9, haud peltata; petiolus pilosus, 8-19 cm. longus, 3-8 mm. diametro. *Scapi* ad 25 cm. longi, 2.5 mm. diametro, satis inconspicue pilosi. *Inflorescentia mascula* ter ramosa, 6 cm. lata, floribus pedicellisque albis, pedunculi primarii virides, pilosi, 1-1.5 cm. longi; pedicellus floris intermedius albus, pilosus, 3 cm. longus; pedicelli sparse pilosi, ad 1.5 cm. longi; bracteae delapsae; bracteolae sparse pilosae atque ciliatae, obovatae vel obovato-oblongae, 4-7 mm. longae, 2-3 mm. latae; sepala 2, glabra, fere orbicularia vel late obovata, 1-1.2 cm. longa, ad 1.2 cm. lata; petala nulla, vel raro petalum unum parvum, obovato-lineare, 8 mm. longum, 2.5 mm. latum; stamina libera, 2-3 mm. longa, antheris filamenta aequantibus vel eis paulo brevioribus. *Inflorescentia feminea* 9 cm. lata, bis ramosa, cymulis trifloris; pedunculi virides, pilosi, ad 1.5 cm. longi; pedicelli albo-virides, pilosi, 0.7-1.7 cm. longi; bracteae delapsae; bracteolae ovario arcte adpressae, orbiculares, conspicue regulariter fimbriatae atque ciliatae, ceterum glabrae vel sparse pilosae, albo-virides, florem minutum sessilem saepe obtegentes, 6-9 mm. longae, 0.6-1.2 cm. latae; sepala 2, alba, glabra, fere orbicularia, 1.2-1.3 cm. longa, circiter 1.4 cm. lata; petalum semper 1, album, anguste obovatum, obovato-oblongum vel fere spathulatum, 0.9-1.2 cm. longum, 4-6 mm. latum; styli 3, flavo-virides, laciniis spiraliter papillois; ovarium albo-viride, inaequaliter 3-alatum, glabrum, 9-10 mm. longum atque diametro, ala maxima 7-10 mm. lata, secunda 2-3 mm. lata, tertia inconspicua; placentae 2-partitae, lamellis utrinque ovuliferis.

HONDURAS. San Pedro, comm. G. Catt, fl. in Hort. Kew., March 1930 (type in Herb. Kew.).

1255. *Eriocephalus aromaticus* C. A. Sm. [Compositae-Anthemideae]; *E. punctulato* DC. et *E. tenuifolia* DC. affinis, ab illa ramulis foliosis semper oppositis valde abbreviatis axillis arachnoideo-lanuginosis, ab hac foliis multo brevioribus configuratione aliena distincta.

Frutex parvus, rigide erectus, ramosissimus, dumosus, usque 60 cm. (vel ultra) altus. *Rami* robusti, nudi, cortice rugoso striato fusco, tandem valde (plerumque dicto vel trichotome) ramosi, hinc inde parce tenuiter hirsuto-lanuginosi vel arachnoidei; ramuli ultimi erecti, graciles, nudi, paria 6-10 ramorum foliosorum valde abbreviatorum ferentes, internodiis usque 2.5 cm. longis, rubro-brunnei, laeves, levissime striati vel tenuiter granuloso-puberuli, sub quoque pari ramorum lateralium plerumque lanuginoso-hirsuti. *Folia* opposita, decussata, imbricata, oblonga usque oblongo-

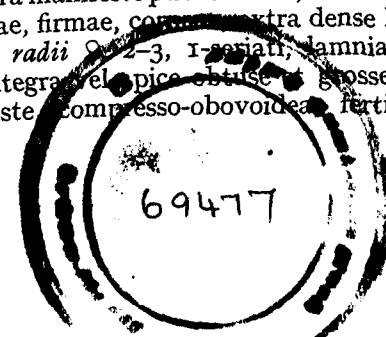
linearia, e basi lata amplectente orta, apice obtusa mucronulata, pagina superiore plano-convexa basin versus leviter depressa, pagina inferiore (exteriore) manifeste convexa, usque 8 mm. longa et 1 mm. diametro, margine integro albo, jam viventia dense punctata et aromatica, praeter axillas lanuginosas glabra; folia basin pedunculorum involucrentia densissime conferta, pagina inferiore rotundato-convexa, pagina superiore profunde sulcata. *Pedunculi* 3-5 ad apicem ramulorum subumbellatim dispositi, graciles, foliis usque duplo longiores, tenuiter puberuli, basin versus et infra capitula albo-lanuginoso-hirsuti. *Capitula* circiter 18-flora. *Involucrum* 3-4-seriatum; bracteae extimae 2, oppositae, ovato-suborbiculares, intus valde concavae, dorso rotundato-convexae, carina glanduloso-punctatae, ceterum glabrae, margine latissimo integro scarioso; exteriores 2-3, praecedentibus similes, sed latiores, minus conspicue carinatae; interiores 2-3, suborbiculares, apice rotundatae, incrassatae, firmae, dorso pilis longis undulatis dense lanuginosae, intus glabrae; intimae 6-7, suboblongae, praecedentibus tenuiores et multo minores, dorso vel omnino lanuginosae vel tantum apice villosae. *Flosculi radii* ♀, 2-3, 1-seriati, longe exserti, lamina alba cuneiformi profunde grosse 3-dentata pagina inferiore glanduloso-punctulata; achaenia fertilia, compresso-obovoidea, pilis lanuginosis oblecta. *Flosculi disci* ♂, circiter 15, in lana laxa involuti; corolla superne purpurea et glanduloso-punctulata; achaenia sterilia.

SOUTH AFRICA. Laingsburg Div.: slopes of the Witteberg, 975 m., Oct., Compton 2681 (type, Herb. Kew.; Bolus). Sutherland Div.: in a kloof at Stompiesfontein, in the Zwartuggens, 1100 m., Sept., Mrs. Levyns 1879A!

1256. *Eriocephalus tenuipes* C. A. Sm. [Compositae-Anthemideae]; affinis *E. punctulato* DC., a quo indumento tenuiter argenteo foliorum facile distinguitur.

Frutex parvus, erectus, dumosus, usque 60 cm. altus. *Rami* alterni, cortice nigrescente tenui ei *Elytropappi rhinocerotis* simili tecti, ramosissimi, nudi, tantum foliosi secus ramulos ultimos tenuiter puberulos. *Folia* more sectionis *Phaenogynis* disposita, linearia vel oblongo-linearia, basin versus subangustata, apice rotundata, usque 2 cm. longa et 1 mm. lata, succulenta, integra, pagina superiore plana inferiore valde convexa, plus minus minute punctulata, pilis brevibus sericeis vestita, tandem glabrescentia. *Pedunculi* 2-6 ad apices ramulorum ultimarum subumbellatim aggregati, graciles, folia multo excedentes, tenuiter sericeo-pubescentes. *Involucrum* 2-seriatum; bracteae exteriores 4-5, elliptico-oblongae usque ovatae, obtusae, basibus latis, discretae, medio saturate virides, late scarioso-marginatae, extra manifeste pubescentes; bracteae interiores plus minus basi concreatae, firmae, corolla extra dense lanuginosae, intus glabrae. *Flosculi radii* ♀, 2-3, 1-seriati, lamina alba longe exserta suborbiculari integra vel apice obtuse et grosse 3-dentata; achaenia fertilia, anguste compresso-obovoidea, fertilia, sordide

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alba, tenuiter et laxe lanato-pilosa. *Flosculi disci* ♂, circiter 10, in lana laxa involuti; corolla superne purpurea; achaenia sterilia.

SOUTH AFRICA. Uniondale Div.: in Lang Kloof, near Haarlem, 760 m., May, *Fourcade* 1334 (type, Herb. Kew.; *Fourcade*).

1257. **Cyphocarpus innocuus** *Sandwith* [Campanulaceae-Cyphieae]; *C. rigescens* Miers affinis, foliorum dentibus inconspicuis paucioribus haud pungentibus, foliis radicalibus lineari-spathulatis, lamina a petiolo vix distincta, praesertim laciniis calycinis integerrimis, antheris minoribus elliptico-oblongis differt.

Herba annua, tota scabrido-pilosula, radice simplici ad 1.5 mm. diametro; caules e foliis radicalibus surgentes 1-3, erecti, 5-10 cm. alti. *Folia* radicalia lineari-spathulata, 0.3-2.5 cm. longa, dentibus inclusis ad 4 mm. lata, lamina a petiolo vix distinguenda, apice obtuso, utroque margine dentibus 2-3 triangularibus vel triangulari-subulatis 0.25-1 mm. longis haud pungentibus; folia caulina circum florem quemque terna (quorum 2 sunt bracteae) radicalibus similia, magis linearia, ad 2.5 cm. longa, ad 2.5 mm. lata, apice acuto subpungente, dentibus parvis similibus. *Calyx* tubo subcampanulato vel obconico 1-2 mm. longo, apice ad 2.5 mm. lato; lacinae inaequales, lineares, integerrimae, apice acuto subpungente, 0.5-1 cm. longae, ad 1 mm. latae sed saepe dimidio angustiores. *Corolla* extra striato-angulata striis minute scabrido-pilosulis; tubus 5 mm. longus, basi 1 mm. latus, sursum ad 2 mm. latitudinem ampliatus; labium superius facie spathulatum, 5 mm. longum, inferne plicatum atque tubuliforme, tum lamina elliptica 3.5 mm. longa 1.5 mm. lata praeditum; labium inferius lobis 4 obovato-oblongis delicate composite pinnatim venosis 4-5 mm. longis 2 mm. latis, sub sinibus ut in *C. rigescens* gibboso-plicatum. *Stamina* filamentis medio ut in *C. rigescens* barbatis 0.75 mm. longis; antherae elliptico-oblongae, ad 1 mm. tantum longae. *Ovarium* 1-1.5 cm. longum, basi 2-3 mm. latum, sursum sensim angustatum; stylus cum stigmate 6.5 mm. longus. *Capsula* matura non visa.

CHILE. Coquimbo; Andacolla Valley, 3000 ft., October 1927, *Clarence Elliott & W. Balfour Gourlay* 98 (type in Herb. Kew.).

No intermediates have been seen between this plant and *C. rigescens*, and specimens of the latter which exactly correspond in age and size show the distinguishing characters as conspicuously as those which are taller and stouter. The anthers of *C. rigescens* are narrowly linear and 1.5 mm. long.

1258. **Anguloa sagittata** *Summerhayes* [Orchidaceae-Kerospaereae-Lycasteae]; affinis *A. Goldschmidtianae* Schlechter, a qua floribus minus apertis, labelli lobis lateralibus apice subtruncatis, callo antice levissime retuso, columnae pede latiore, pollinii glandula dorso sagittata differt.

Epiphytica. *Pseudobulbi* anguste ovoidei, compressi, primo biconvexi, demum obtuse 6-angulati, sordide virides, usque 13 cm. longi et 7 cm. lati, apice 3-4-phylli, juventute basi vaginis circiter

5 herbaceis obtusis amplexantibus suprema foliacea. *Folia* oblanceolata, acuta vel breviter acuminata, usque 50 cm. longa et 14 cm. lata, glabra. *Scapus* erectus, robustus, teres, glaber, circiter 15 cm. altus, uniflorus, vaginis 5-6 amplexantibus ovatis subacutis usque 6 cm. longis; bractea basi vaginans, elliptica, valde concava, apice cucullata, acuminata, circiter 6 cm. longa. *Flos* magnus, erectus, ei *A. Ruckeri* Lindl. similis. *Sepalum* intermedium erectum vel incurvum, anguste ellipticum, acutum, apiculatum, 7.5 cm. longum, 4 cm. latum, concavum; sepala lateralia falcato-ovata, acuta, infra medium margine anteriore conspicue ampliata, concava, 6 cm. longa, 4 cm. lata; omnia sepala flavo-viridia, intus densissime rubromaculata, superne rubra. *Petala* oblique ovata, obtusa, acutissime apiculata, 5.5 cm. longa, 3 cm. lata, colore sepalis similia sed maculis minus densis. *Labellum* (explanatum) ambitu fere orbiculare, trilobum, 2.8 cm. longum, 4 cm. latum; lobi laterales erecti, quadrati, e basi labelli 2.5 cm. longi, margine anteriore 7 mm. longi, basi 1.5 cm. lati, apice paulo revoluti leviter undulati velutino-papilloso; lobus intermedius simplex, ovatus, utroque latere erectus, apice revolutus, apiculatus, 1 cm. longus et latus, apice velutino-papillosus, callo obcuneato truncato apice levissime retuso glabro 6 mm. longo 5 mm. lato; labellum sordide album, rubromaculatum vel intus basin versus rubro-striatum. *Columna* erecta vel subreclinata, crassa, 2.5 cm. longa, apice 1.2 cm. lata, supra basin antice incrassata, rubromaculata, pede paulo angustiore curvato. *Anthera* cucullata, antice producta leviter retusa, pallide aurantiaca. *Pollinia* pyriformia, 2.5 mm. longa, intus leviter complanata, flava, in stipitem infra apicem inserta, stipite lineari apice dilatato acuto basi vix attenuato 4 mm. longo, glandula antice rotundato dorso acute sagittata.

Flowered at the Royal Botanic Gardens, Kew, in July, 1930. Plant received from Mr. T. Hay in 1928, and said to have come from Colombia.

Lip with red bars inside towards the base; spots very dense on sides and thinning out towards apices of the lateral lobes; front lobe with white apex and heavy red spots below; callus with red spots towards the base; outside, the lip has scattered red spots towards the base.

1259. **Scirpus Jacobi** *C. E. C. Fischer* [Cyperaceae-Scirpoideae]; a *S. articulato* Linn., cui peraffinis, statura minore habitu gracili vaginia arte adpressis, glumis suborbicularis rotundatis latioribus quam longioribus, nucula obtuse trigona angulis carina verticali praeditis faciebus convexis transverse valde 8-10-undulato-costatis.

Herba glabra, radicibus fibrosis. *Caules* caespitosi spongiosi teretes acuti intus transverse septati, 7-30 cm. alti, circiter 1.5 mm. diametro. *Folia* 0; vaginae 2, caulem arte amplexantes, inferior circiter 5 mm. longa, superior usque 4 cm. longa, ore obliquo acuto. *Bracteae* 0. *Spiculae* sessiles, ovoideae vel ovoideo-oblongae, 5-15 in capitulo globoso laterali ex ore vel paullo supra os vaginae superioris

orto dispositae. *Glumae* membranaceae suborbiculares leviter concavae haud vel obscurissime carinatae, pallide brunneae, 2.5-3 mm. longae et paullo latiores, apice rotundatae interdum minute apiculatae. *Setae hypogynae* o. *Stamina* 3. *Stylus* nuculo brevior; stigmata 3 stylo aequilonga. *Nucula* obovoidea obtuse trigona, angulis carina verticali praeditis, apiculata, matura nigra, 1-1.25 mm. longa, faciebus plus minus convexis costis validis transversis undulatis 8-10 instructis.

INDIA: without precise locality, Heyne in Wall. Cat. 3458, under the name *Scirpus fistulosus* (type in Wall. Herb. at Kew); Madras Presidency, "Montes Policattensis," Feb., Heyne from Herb. Rottler, in Herb. Kew; Nellore District at Gudur, Feb., K. C. Jacob 18517, in Herb. Madras and Herb. Kew; Coimbatore District at Virumandampalayam, 700 ft., Aug., C. E. C. Fischer 2134, in Herb. Calc.

Mr. K. C. Jacob of the Madras Agricultural College found this plant growing together with *S. articulatus* Linn. in Feb. 1929 in water along the margins of permanent tanks. Recognising it as distinct by its more slender habit and the other characters noted above, he sent it to Kew for comparison. During the preparation of the Flora of the Madras Presidency the other specimens listed above, which had been confused with *S. articulatus* Linn., came to light. In the above description Mr. Jacob's notes have been drawn upon though it is based upon all the specimens cited.

Probably both Heyne's specimens are of the same collection. The hills referred to are those near the Pulicat Lake which falls partly in the Nellore District and partly in the Chingleput District and are not very far from Gudur where Mr. Jacob made his find. Gudur is but little above sea-level; the elevation of Heyne's locality is not known, but it is not likely that the species occurs much higher than the 700 ft. of the Virumandampalayam plant, which was found growing together with *Scirpus supinus* Linn. and is mounted with a plant of that species on one sheet.

1260. *Ascopholis* C. E. C. Fischer, gen. nov. [Cyperaceae].

Inter genera *Mariscum* et *Ascolepidem* medium; ab illo squama utriculari evoluta, ab hoc caulis basi turgida, spiculis 1-floris, ab utroque gluma secunda spathiformi differt.

Spiculae anguste lanceolatae, uniflorae, floribus omnibus hermaproditis. *Glumae* 2, oppositae, subhyalinae, inferiori vacua, altera florifera, spathacea. *Rhachilla* supra glumas 2 vacuas disarticulans, tuberculo gibboso relicto. *Squamella* hypogyna utriculiformis, glumam excedens, subtus integra, supra longitudinaliter aperta florem includens. *Seta* o vel unica, brevis. *Stamina* 3; antherae lineares, paullo exsertae. *Stylus* cum ovario continuus, basi haud incrassatus, ramis stigmatosis 2 vel 3 filiformibus. *Nux* squamella inclusa, sessilis, anguste oblonga, plano-convexa vel obtuse subtrigona.—*Herbae*; caules solitarii, basi turgidi, squamis carnosissimis involuti. *Folia* angusta ad basi caulis conferta. *Spiculae* in spicas

breves oblongas densissimae confertae, terminales, intra bracteas lineares foliaceas valde inaequales sessiles.

Ascopholis Gamblei C. E. C. Fischer—species unica.

Herba erecta, glabra; radicibus fibrosis. *Caulis* solitarius, striatus, basi turgidus, vaginis inferne carnosissimis albis superne scariosis ferrugineo-punctatis 4-10 cm. longis involutus. *Folia* compluria, supra caulis basin turgidam conferta, filiformia vel anguste linearia, caulem aequantia vel superantia; vaginae membranaceae, ore truncatae. *Spicae* oblongae, circiter 1 cm. longae, 3 usque complures in capitulo denso subgloboso sessiles. *Bracteae* 4, lineares e basi lata, acuminatae, inaequales, minimae circiter 1 cm. longae, maximae circiter 7 cm. longae. *Spiculae* lineares, 1-florae, in rhachillam satis robustam spiraliter insertae, jam delapsae tuberculo parvo interdum marginato relicto. *Glumae* 2, oppositae, hyalinae, punctis ferrugineis plus minus maculatae, venosae gluma inferior abaxialis, oblonga vel lanceolata, acuta, concava, carinata, 2.7-3 mm. longa, vacua; adaxialis spathiformis, 2.5-2.7 mm. longa, rotundata, parte inferiore 0.05-0.08 mm. longa tubulari. *Squama* solitaria, utricularis, 3.5-3.8 mm. longa, facie adaxiali circiter ad medium supra aperta, apice obtusa, venosa, pallide brunnea, punctis ferrugineis saepe maculata, florem includens. *Seta* o vel unica, abaxialis, capillaris, alba, levis, ovario multo brevior. *Stamina* 3, adaxialia; antherae lineares, 1.2-1.5 mm. longae, paullo exsertae. *Stylus* cum ovario continuus, 0.75-1 mm. longus; stigmata 2 vel 3, 1-1.5 mm. longa, glabra. *Nux* anguste oblonga, plano-convexa vel obtuse subtrigona, circiter 2.5 mm. longa, fusco-brunnea; cellulae extimae minutae, obtuse hexagonae.

INDIA. Madras Presidency at Ootacamund in the Nilgiri Hills, 7000 ft., June 1884, J. S. Gamble 14279.

XVII.—MISCELLANEOUS NOTES.

MR. GEORGE WILLIAM ROBINSON has been appointed, by the Minister of Agriculture and Fisheries, an Assistant Curator, Royal Botanic Gardens, Kew, in succession to Mr. A. Edwards, who has resigned his position on being appointed Superintendent of Parks, Fleetwood. Mr. Robinson had considerable horticultural experience before the War, and after he was released from military service in 1919 was for two years with the Imperial War Graves Commission in France. He came to Kew as a Student Gardener in 1922 and was promoted Sub-foreman in 1923. On completion of his course at Kew in 1924, he went to Chile and took charge of the gardens of Don Agustin Edwards, Chilean Minister in London, where he was engaged for five years laying out a new estate. In 1929 he was appointed Head Gardener to the London Electric Railways.

CHARLES EDWARD MOSS.—We learn, with great regret, that Professor C. E. Moss died in November last, at Johannesburg, at the age of 58. In him botanical science loses one of the pioneers in the study of plant ecology in the British Empire. Quite early in his career he made his mark as a student of vegetation in the field. Whilst a student at Leeds, Moss had collaborated with the late Dr. W. G. Smith in a study of the vegetation of the West Riding of Yorkshire. Later, when a science master at Taunton, he published an account of the plant-life of a part of Somerset. For these, and other contributions published by the Royal Geographical Society, he was awarded the Society's Back Bequest for 1907 in respect of his "important researches on Geographical Distribution of Vegetation in England." He received his degree of Doctor of Science from the University of Manchester, and from that centre made an intensive study of the Peak District, the results of which were published in book-form under the title "Vegetation of the Peak District." Other important ecological papers including "Xerophily and the Deciduous Habit," "The Fundamental Units of Vegetation," and "The Woodlands of England"—the last with W. M. Rankin and A. G. Tansley—were all published in the *New Phytologist* 1907 to 1910.

In 1906 he went to Cambridge to take charge of the University Herbarium and of the courses in systematic botany. His chief studies there were devoted to the taxonomy of British Plants, and he edited, and largely wrote, the two volumes (II. and III.) of the *Cambridge British Flora* (1914, 1920) which accompanied the only two published volumes of plates by the late E. W. Huxley.

When, in 1917, he was appointed Professor of Botany at Johannesburg, he brought with him a wealth of experience not only in the lecture room, but also in herbarium work. His new field of activity was in an extremely rich and practically untouched floral area. Here he soon began to build up a herbarium for his Department, and with this ideal he travelled extensively during the long vacations, covering nearly all parts of the Union of South Africa. His two principal expeditions were an early one in company with his friend the Rev. F. A. Rogers through the Zoutpansberg area, and his last long excursion (1929-30) into S.W. Africa with Mrs. Moss, especially undertaken to collect specimens of *Welwitschia*. So successful was Moss in building up his herbarium that at his death he had accumulated some 20,000 numbers, which places it among the largest of the University herbaria in the Union. It contains a large amount of types of species described in recent years by himself and other botanists—especially among the petaloid Monocotyledons—and a good deal of material critically named by specialists.

Like Dr. Harry Bolus, Moss paid several visits to England, bringing with him large numbers of specimens for critical examination and comparison with type material at Kew and the British Museum, as well as in Continental Herbaria.

Accustomed while in England to the use of an extensive botanical library, Moss found his taxonomic work at Johannesburg severely hampered by the dearth of accessible botanical literature, and with characteristic energy he gradually built up a useful working library at the Botanical Department of the University of Witwatersrand. His success as a teacher of botany was in no small way due to his ability to inspire in his students an enthusiasm for, and active interest in, the subject for its own sake.

Nothoscordum tubiflorum.—*Allium tubiflorum* Rendle in Journ. Bot. vol. xlv. p. 44 (1906), t. 476 C, has the perianth-segments united into a cup-shaped tube at the base, as is indicated by the specific epithet, and belongs accordingly to the genus *Nothoscordum* Kunth. The new combination **Nothoscordum tubiflorum** (Rendle) Stearn is therefore proposed. It is closely related to *Nothoscordum nerineflorum* (Herb.) Benth. et Hook f. (Bot. Reg. xxxiii. t. 5) from which it differs in its smaller habit and blunt reflexed perianth-segments. W. T. S.

Essential Oils.—Two essential oils of interest have recently been acquired for the Museum Collection—"Mawah" oil from Kenya, and "Pe-Mou" oil from French Indo-China.

Mawah oil is obtained from *Pelargonium graveolens* Ait., a "geranium" native of South Africa, and introduced to Kenya, where approximately 500 acres, centred at Njoro, are under cultivation (Ann. Rep. Dept. Agric., Kenya, 1928). Kew is indebted to the Director of Agriculture, Kenya, and Mr. W. J. Dawson, at Njoro, for information and specimens of the plant; also to Messrs. Lever Bros. Ltd. (Associated Co. Icilma Trading Co., Ltd.), Port Sunlight, for a sample of the oil. As far back as 1914 the characters of "Oil of Geranium" distilled in "British East Africa" were described in the *Perfumery and Essential Oil Record* (Vol. V. 1914, p. 423). It was regarded as having been distilled from *Pelargonium Radula* var. *quercifolium*?; apparently on the evidence of some leaves which accompanied the sample. A note in the "Chemist and Druggist," July 16, 1927 (p. 98), stated that "an essential oil described as Mawah oil is now being produced in commercial quantities in Kenya from a 'cultivated grass'." An analysis was given, and in general the analysts described "the odour, physical and chemical characters of the plant as somewhat akin to those of a geranium oil." An analysis in the "Oil and Colour Trades Journal" of June, 1928, bears out this view:—"E. J. Parry and G. Ferguson have recently examined some essential oils produced in Kenya Colony, states a contemporary. An oil distilled from plants which are locally known as geraniums—and as "Mawah"—was found to have an odour between that of normal geranium oil and palmarosa oil. Its characters were:—Specific Gravity 0.894 at 15.5°C; Optical Rotation 16.7°; Refractive Index 1.4690 at 20°C; Total Alcohols (as Geraniol)

71 per cent. ; Citronellol 20 per cent. ; Esters (as Geranyl Tiglate) 12.5 per cent.

"A sample of true geranium oil was examined. This was distilled from plants imported three years before from Grasse. Its characters were—Specific Gravity 0.892 at 15.5°C; Optical Rotation 9° 40; Refractive Index 1.4649 at 20°C; Esters (as Geranyl Tiglate) 30.7 per cent."

The *Pelargonium* specimens from Kenya received for identification at Kew permit it to be safely assumed that these notes refer to one and the same plant (*P. graveolens*). The name "Mawah" was adopted for purposes of trade, from the Swahili word "Maua," the plural form of "Ua" (a flower).

The "Palmarosa" oil referred to above is obtained from a true grass, *Cymbopogon Martini* Stapf, a native of India, the Hindustani name being "Rusa" or "Rosha"; but in the course of trade the oil has also become known as "East Indian Geranium" and "Turkish Geranium."

"Pe Mou."—This oil is obtained by distillation from the root-wood and stumps (or root-stocks) of *Fokienia Hodginsii* Henry & Thomas (*Cupressus Hodginsii* Dunn), a conifer found in the mountainous parts of Annam and Tongking, in Indo-China, and in Fokien. The tree grows to a height of from 45 to 50 feet, with a girth of 3 feet. Specimens of the wood and oil have been acquired through the kind offices of Mr. F. G. Gorton, His Majesty's Consul-General at Saigon, and the Inspector-General of Agriculture and Forests of French Indo-China. In a letter from the Inspector to the Consul-General, dated Hanoi, 26th July, 1930, it was stated that the production of "Oil of Pe-Mou" was first undertaken at Tongking in 1926 for use in a soap manufactory at Haiphong, and that from 1926 to 1928 it had been exploited in the region of Chapa, whence from 300 to 400 tons of root-wood and stumps had been sent to Messrs. Chiris at Grasse, under whose authority the sample of oil was presented.

M. Gardies has found the principal constituents of essence of "Pe-Mou" to be—Specific Gravity at 20°C., 0.913; Optical Rotation +13°; Refractive Index 1.4937 at 20°C; Acidity per cent. 0; Ester Index 23.14; Ester Index after acetylation 188.34; Free Alcohol 41 per cent.; Solubility 1 volume in 3.5 volumes of 70 per cent. alcohol (See *l'Agronomie Coloniale*, Paris, vi. p. 74, No. 54, March 1922). The odour resembles that of "Cedar Wood oil" distilled from the wood of the "Pencil Cedar" (*Juniperus virginiana* Linn.), which is used here for perfuming soaps. Comparatively little appears to be known of Pe Mou oil in this country and the probability is that all the exports of the material for distillation from Indo-China go to France.

A note on the rarity of the tree under cultivation at home appeared in the *Kew Bulletin*, 1911, p. 328, when a plant from Fokien was presented to Kew by Mr. H. Clinton Baker, Bayfordbury,

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Herts. The tree was discovered in the province of Fokien by Captain Hodgins in 1908.

J. H. H.

Linseed in Iraq.*—In recent years the Department of Agriculture in Iraq has carried out trials with both Linseed and Flax and has shown that both can be profitably raised under the conditions prevailing in Iraq. Flax, however, is regarded as a difficult crop to introduce among the native cultivators owing to the care and attention required in harvesting, retting, and scutching the fibre, and, since 1925, attention has been transferred almost entirely to Linseed. Varieties of Linseed from the more important Linseed-producing countries of the world such as India, the Argentine, and Morocco, have been cultivated at the Rustam Experiment Farm. The Indian varieties gave high yields at first but subsequently proved to be very liable to attack by rust with consequent reduction in yield and quality of the seed. Damage from rust attack, often exceeding 50 per cent. of the normal crop, was found to be more severe than was the case in India. In contrast with the Indian varieties the Moroccan and South American varieties proved to be entirely immune to the disease. The Moroccan varieties showed themselves to be superior in yield to the South American, and cultivators are advised to grow only the Moroccan and South American.

The average oil content of Moroccan Linseed grown at the Experiment Farm over a period of years was found to be in the neighbourhood of 38 per cent. This compares favourably with that of seed from the usual trade sources (Bombay 42 per cent.; Calcutta 39 per cent.; South America 35-38 per cent.; Russia 33 per cent.). Yields at the Experiment Farm varied from 600 to 1200 lbs. per acre during the period 1924-29, with an average yield of about 820 lbs. per acre. The soil of the experiment plots was regarded as poor compared with that in many parts of Iraq, which should be able to produce higher yields. On the other hand, in the provinces the crop would probably not receive such careful supervision nor be so well cultivated and cleanly harvested as was the case at the Experiment Farm. It is considered that for Iraq an average yield of 800 lbs. to the acre should be possible.

F. N. H.

Botanical Magazine.—Part ii of vol. cliv (1928) has now been published and contains the following plates:—*Cymbidiella Humblotii* Rolfe (t. 9216), a Madagascar Orchid of the genus complementary to *Cymbidium* of Asia, figured from a plant grown at Kew; *Rhododendron didymum* Balf. f. & Forrest (t. 9217), distinguished from *R. haemaleum* only by the presence of glandular leaves, a native of north-western Yunnan; *Primula Angleniana* Balf. f. & Forrest (t. 9218), one of the finest of the Nivales-primulas, with fragrant, creamy-yellow, orange-throated flowers, from the mountains of Yunnan; *Caryopteris mongolica* Bunge (t. 9219), from Kansu,

*The Cultivation and Marketing of Linseed, by E. Guest. Iraq Dept. of Agric. Bull. No. 21. Govt. Press, Baghdad, 1930.

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Chili, figured from a plant grown at Kew; *Iris Winogradowii* Fomin (t. 9220), resembling a yellow-flowered form of *I. reticulata*, known only from a very limited area in western central Georgia; *Rhododendron Amesiae* Rehder & Wilson (t. 9221), with a rich magenta-purple corolla, from western Szechuan; *Epigaea asiatica* Max. (t. 9222), from Japan; *Aster Farreri* W. W. Smith and J. F. Jeffrey (t. 9223), a perfectly hardy plant from north-eastern Tibet; *Tremacron Forrestii* Craib (t. 9224) from north-west Yunnan and south-west Szechuan, the plant figured representing the type of the genus separated from *Didissandra*; *Kniphofia insignis* Rendle (t. 9225), a common constituent of the grass-steppe of the Arussi highlands, Abyssinia, with pure milk-white flowers turning pinkish-grey on fading, figured from a plant raised at Kew; *Papaver macrostomum* Boiss. & Huet (t. 9226), with flowers of a deep red-purple and a marked sheen, native of Anatolia, Armenia, and western Persia.

British and Foreign Trees and Shrubs in Cornwall.*

This book is the outcome of several years' work by Mr. Edgar Thurston, during which he visited various estates and gardens in Cornwall where note was made of the many interesting native and exotic trees and shrubs that flourish so well in the county. He was assisted in his work by several friends, and many owners of gardens co-operated by giving him all the assistance possible. From time to time notices have appeared in various periodicals recounting the trees in isolated gardens and in groups of gardens, but no attempt has previously been made to enumerate in such a thorough manner the trees and shrubs which are hardy in Cornwall. On paying his first visit to Cornish gardens, the northern gardener is amazed to find many plants growing luxuriantly out of doors that he has never previously met with except in glasshouses; groves of tree ferns, rhododendrons of tree-like proportions, Australian acacias, eucalyptus trees 50 or 60 feet high, large specimen palms and cordylines are a revelation to him.

In the first 23 pages of his introductory matter, Mr. Thurston deals at some length with the peculiarly favourable position of Cornwall for the cultivation of semi-hardy trees and shrubs, and gives considerable details of climatic conditions, contrasting the temperatures with various towns in Southern Europe. He then gives historical references to the ancient woods and famous trees of Cornwall, and recounts the replies sent by the incumbents of the Diocese of Exeter to the Bishop when, in 1727, 1746 and 1806, he asked for a return of the number and value of all trees growing in the churchyards or on glebe land. Several pages are then devoted to the evidence of woods afforded by place-names in the middle ages. Chapter iii deals with the hedges of Cornish parks, and amongst

*By Edgar Thurston. Published on behalf of the Royal Institution of Cornwall by the Cambridge University Press, Fetter Lane, London, 1930. pp. xi. + 287, plates 42. Price 12s. 6d. net.

other items it is learned that respecting "Liskeard and Restormel Parks, Reeve's account, Edward III, 1348-9, some hedges were remade at a cost of 1½d. a perch and the old wood." Chapter iv recounts Cornish names of native trees and shrubs. Chapter v is descriptive of various Cornish parks and gardens, whilst the rest of the book is devoted to an alphabetical list of the genera and species of trees and shrubs found in the County, with, in most instances, the dimensions of specially noticeable specimens and an indication of where they are growing.

Of the illustrations special mention may be made of Plate xxxviii, p. 251, which depicts what is perhaps the finest plant of *Dacrydium Franklinii* in the British Isles. This is a particularly graceful plant growing at Penjerrick. Plate xxiv, p. 157, is also of considerable interest. Not only does it show fruits of *Musa Basjoo* growing out of doors, but it gives an excellent photograph of that fine old Cornish gardener, Mr. Jenkins, who for many years has served the Fox family so faithfully at Rosehill, Falmouth, a garden famed even amongst Cornish gardens for its wonderful collection of New Zealand, Australian and Himalayan trees and shrubs.

Mr. Thurston is to be congratulated upon the production of an exceedingly useful work of reference, and he has been well supported by the publishers.

W. D.

Plants of the Gold Coast.*—The author, who is Master of Agriculture and Biology in Achimota College, has compiled a list of some 1200 flowering plants of the Gold Coast and Ashanti. This number naturally falls far short of those actually known, apart from the fact that those of the Northern Territories are not included. The arrangement is alphabetic, from *Abutilon* to *Zornia*, each species having a short description with vernacular names and generally with economic or popular uses. This portion occupies over two-thirds of the book, and is the part most likely to be consulted by persons already possessed of some botanical knowledge and a desire to identify any plant. It is illustrated by 36 excellently reproduced photographs showing types of vegetation or individual species, and 34 line drawings. The latter vary in merit but are sufficiently accurate to be of assistance.

The chief feature of the book is the lists of vernacular names, and the collection and verification of these could only be achieved by enthusiasm added to accurate linguistic knowledge. Some 3,000 names are given, printed in the still unfamiliar script of the International Institute of African Languages, and are collected in an index of the four chief language groups of the Gold Coast with their dialects. The work claims to be an effort to satisfy both African and European inquirers. Within these difficult limits it succeeds, but the uncertainty left after looking up the word *bohwe* (to take one example) and finding that it refers to 4 unrelated plants suggests its

*Plants of the Gold Coast, F. R. Irvine. Oxford University Press, 1930. pp. lxxix + 521. Price 5s.

limitations. The names given for *Afromosia* all belong properly to *Distemonanthus*. A long list of economic plants arranged under 23 headings gives a bird's-eye view of native uses.

In a book on Gold Coast plants it is regrettable that *Cola acuminata* should be described as the "True or Commercial Cola Nut," and that *C. vera* should be given incorrectly as its synonym. The most valued nut of commerce is the indigenous Ashanti species *C. nitida* A. Chev. (syn. *C. vera* K. Schum.), which receives bare mention. The work suffers from immaturity. Errors, mostly of no great importance, some possibly attributable to the printer, are rather numerous. Had the author been able to await publication of Vol. 2 of the Flora of West Tropical Africa many of these would have been avoided, and his list of species so far known from the Gold Coast could have been made more complete.

J. M. D.

The Cactus Book.*—Although primarily intended for the American amateur, this little book by Dr. Houghton contains much useful information for Cactus lovers in this country. The contents are divided into sixteen chapters. In those dealing with seed raising, propagation by cuttings and grafting, watering and soil, the advice is practical and instructive, and should be of great assistance to all who contemplate making a collection.

The least valuable portions of the book, to the English amateur, are the chapters on Rock-Gardening and Acquiring and Trading. In the conspectus of species at the end of the volume many generic names appear with which we are not acquainted. This difference in the usage of names between America and Europe is apt to cause much confusion and annoyance. For instance *Phyllocactus* is not recognised and all the species and hybrids are placed under *Epiphyllum*, whereas the well-known *Epiphyllum truncatum* is now *Zygocactus truncatus*.

T. W. T.

Wild Flowers of Kashmir.†—Mr. Coventry has published a third series of beautifully reproduced autochrome pictures of 50 Kashmir plants with an autochrome frontispiece depicting a fairy-like scene in the Liddar Valley with *Cremanthodium* and *Corydalis* flowering in the bed of a glacial stream. The present series is of as high a standard as the previous two, and contains additional textual matter, which constitutes an improvement.

Nearly all the plants figured grow at elevations of over 8,000 ft., and should be hardy and suitable for English gardens, where their beauty will make them welcome. The book itself is an adornment to any library shelf.

C. E. C. F.

*By Dr. Arthur D. Houghton. The Macmillan Co., New York, 1930, pp. xii+147, ill. 18. Price 10s.

†Wild Flowers of Kashmir. Series iii, by B. O. Coventry. Raithby, Lawrence & Co., London, 1930, pp. xxix+100, 51 coloured plates. Price 16s.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1931 ROYAL BOTANIC GARDENS, KEW

XVIII.—INTRODUCTION OF CINCHONA TO INDIA.

The tercentenary (1630-1930) of the introduction of Peruvian or *Cinchona* bark into Europe, which was recently celebrated in London and Missouri, makes it of interest to recall the work of the Royal Botanic Gardens, Kew, in the introduction of *Cinchona* plants to cultivation in British India and various British Colonies.

The chief circumstances leading to the demand for cultivating *Cinchona* were the destruction of the native South American forests owing to the methods of collection, and the consequent growing scarcity of the bark. The explorer Ulloa (1735) reported to the Spanish Government that "the habit of cutting down the trees in the forests of Loxa and afterwards barking them without taking the precaution of replanting would undoubtedly cause their complete extirpation" (Markham, *Cinchona*, p. 19). Humboldt, at the time he travelled on the Andes (1799), found that "to procure the small supply of 11,000 Spanish pounds no less than 800 or 900 *Cinchona* trees were cut down every year" and that "the older and thicker stems are becoming more and more scarce" (Views of Nature, p. 391). About the beginning of the 19th century, McCulloch (Dict. of Commerce, London, 1834, p. 120) records that "Peruvian" or "Jesuits" bark was known in commerce under three principal kinds, the first stated to be "the 'pale bark' (Loxa bark) of the shops, the original *Cinchona* of Peru, now very scarce." The second and third barks of this date were "Red bark" from the Andes of Ecuador and "Yellow bark" of the shops, which was grown in Quito and Santa Fe.

The destructive methods of collection and the growing scarcity of "Loxa bark" are still further indicated by Cross in his report to the Under Secretary of State for India dated Sierra de Cajanuma, Loxa, November 9th, 1861, in which he says: "The plants from which the bark of commerce is now taken are in general not more than 8 to 10 feet in height, . . . some of the more industrious cascarilleros frequently pull up the roots and bark them also and bark is taken from the smallest twigs."

Other instances of reckless extravagance in the collection of the bark might be quoted; but enough has been said to show that signs were not wanting of the rapid destruction of the forests for at least a century before any thought of cultivation or conservation occurred to those responsible for maintaining supplies of the precious bark. It became clear that under these conditions and with the wild plants

limited to a definite area the supply would soon be exhausted. It is to the Secretary of State for India, with the assistance of the Director of the Royal Botanic Gardens, Kew, that credit is due for the eventual appreciation of the situation, in the year 1858, when steps were taken to provide for the future. The Government of the Netherlands, in 1852, had begun the cultivation of the plant in Java.

Dr. Forbes Royle, in 1835, had already recommended the introduction of the *Cinchona* plant into India, pointing out the Nilgiris as a suitable place for experiment (Himalayan Botany, i. p. 240). He made a report to the Directors of the Honourable East India Company, dated East India House, March, 1857, in which he refers to having drawn up in 1852 detailed instructions to enable Her Majesty's Consuls, in the South American countries where the plants grew, to assist in the project, but the results were unsuccessful. He also records a small experiment with living *Cinchona* plants:— "Knowing that Dr. Weddell, who has explored the Southern *Cinchona* regions, discovered the 'Calisaya,' or that species which yields the best 'yellow bark' and that he had brought home seeds of this valuable species which had germinated and produced young plants, both in France and in this country, I applied to and obtained from the Botanic Gardens of Kew and Edinburgh, as well as from the Horticultural Society [at Chiswick], six plants of the true *Cinchona Calisaya*."

Robert Fortune, who at that time was proceeding overland on his Mission to China to obtain tea seeds and plants, "was requested to take charge of these plants, which he himself packed into a small Ward's case. These were conveyed by him along with the passengers of the mail of January, 1854, across the desert, and five of the plants safely reached the Calcutta Botanic Gardens, then under the superintendence of Dr. Falconer." They did not thrive well at Calcutta and were sent to Darjeeling, where three of the original plants arrived alive, but the final report of Dr. A. Campbell, called for by the Medical Board of the East India Company (letter from the Medical Board to the President in Council dated Fort William, 9th June, 1855), was that "all the *Cinchonas* were killed by the cold of last winter." Finally in his memorandum Dr. Royle advised the employment of a special agent or the sending of a collector to the *Cinchona* regions. He died, however, before it was possible to act on his advice, and nothing seems to have been done until the matter was taken up by the Secretary of State for India in 1858 on the transfer of the authority in India from the East India Company. Dr. Royle's successor was to be directed to carry out the recommendations alluded to without further delay; but in the meantime Mr. Clements Markham, a clerk in the Department of India Correspondence, offered his services for the purpose, understanding, as he said in his application, that "it is the intention of the Secretary of State to take measures for the introduction of the *Cinchona* Plant into India" and referring to the fact that he was already "well

acquainted with several of the forests in Peru and on the frontiers of Bolivia containing the *Cinchona* Tree."

Markham was entrusted with the commission and lost no time in making arrangements for his important explorations. His knowledge of the country and the requirements led him to organise a triple expedition to begin operations early in 1860. Dr. Spruce and Mr. Robert Cross were to work the regions of Loxa bark (*Cinchona officinalis* Linn.; syn. *C. condaminea*) and "Red Bark" (*C. succirubra* Pavon) in Ecuador; Mr. Pritchett was to explore the forests of Huanuco and Huamalies in Northern Peru; whilst he himself, with Mr. John Weir as assistant, undertook the exploration of the Calisaya region (*C. Calisaya* Wedd.) in Bolivia and Southern Peru, mainly centred in the forests of Carabaya.

It was at this stage that the assistance of Kew became valuable. The Reports of the Director, Sir Wm. Hooker, from 1860 onward contain an interesting record. In his Report for 1861 he states:—

"The means adopted for introducing *Cinchonas* (trees yielding quinine) into the East Indies and our Tropical Colonies, rank first in point of interest and importance of the works of the past year. In my report for 1860 I mentioned the erection, at the desire of the Secretary of State for India in Council, of a forcing house especially for the cultivation of the *Cinchonas*, with the view of establishing plantations of them in India; the operations of the several parties organised to proceed into the Andes and procure young plants and seeds have been described in detailed reports laid before the Secretary of State for India by Clements R. Markham, Esq.

"Upon the Royal Gardens devolved the duties of receiving and transmitting the seeds and plants to India, of raising a large crop of seedlings, of nursing the young stock, lest those sent on should perish or the seeds lose their vitality, and of recommending competent gardeners to take charge of the living plants from the native forests to the hill country of India, and to have the care of the new plantations there."

Further, with the sanction of the Indian and Colonial Governments, it was arranged that our West Indian Colonies and Ceylon should be supplied with a portion of the seeds. The results obtained were the following:—

"In the Nilgiri Hills, I am informed by Sir W. Denison (Governor of Madras) that there are at this time flourishing 3,477 plants of the Red bark (*Cinchona succirubra*), one of the best kinds, many of which are from 3 to 3 ft. 9 in. in height, and 2,370 of other kinds equally healthy. Many of these are ready to be planted out in sites already selected by Mr. Markham.

"In the Royal Gardens we have 2,170 healthy young plants which will be ready for transmission to India at the proper season.

"In Ceylon under the management of Mr. Thwaites, Director of the Royal Gardens at Peradeniya, the experiment has been equally successful in proportion to the quantity of seeds received. A plantation of different kinds is flourishing at Newra-Ellia.

"In Jamaica the *C. succirubra* is succeeding admirably. A quantity of healthy seedlings has been transported to a locality 4000 feet above the sea and are now ready for planting out. Mr. Wilson, the Superintendent of the Botanic Gardens there, has made a requisition to Government for 50 acres of land to form a plantation therewith and for an assistant to take charge of the plantations.

"Seeds were sent to Trinidad at the same time as to Ceylon and Jamaica, but unfortunately not one has germinated."

In 1862 (Kew Report, p. 2) the Director referred to the two last reports in which he described "the assistance afforded by us in introducing *Cinchona* plants into our Foreign Possessions, namely, to India, where Mr. Markham's exertions have achieved remarkable success, and to Ceylon and the West Indian Colonies by the Royal Gardens." He gave the following concise statement of the results—"on the Nilgiris, under charge of Mr. McIvor, 117,706 plants, in the Sikkim Himalaya under Dr. Anderson 2000 plants, and in Ceylon under Mr. Thwaites about 3000 plants."

In the Kew Report for 1867 (p. 5) it is stated that "*Cinchona* has hitherto failed in Trinidad and Dominica" and that "Jamaica had 30,000 plants under cultivation."

Annual reports of the progress are continued until 1874, when the Director (Sir Joseph Hooker) was in a position to state that "the introduction of this febrifuge into India, Ceylon and Jamaica being now accomplished this subject no longer demands a notice in my report."

The official association of the India Office and Kew in respect of the introduction was regarded as completed three years after the date of Markham's first appointment as organiser and leader of the expedition to South America. This was conveyed in the following communication from the Secretary of State for India to Sir William Hooker:—

"The Secretary of State for India in Council having received an application through Earl Russell from the French Government, for a supply of *Cinchona* plants for transmission to Algeria, I am to request that you will reserve 200 or 300 plants for transmission to that destination. You will be informed in a few days with whom you should communicate for the liquidation of any expenses which may arise under this head.

"I am also directed to inform you that it has been resolved by the Secretary of State in Council, in consequence of the success which has attended the cultivation of the *Cinchona* plant in the Government Gardens at Ootacamund, to discontinue the auxiliary establishment under your charge in the Royal Gardens at Kew, and that the time has arrived when your account with this office may be closed. It will therefore rest with you to determine respecting the disposal of the plants under your charge after having allotted those required for the French Government."

"I am to take this opportunity of expressing the thanks of the Secretary of State for India in Council for the ready and able assistance which has been afforded by yourself and your subordinates on every occasion when it was required to promote the success of this important experiment, which has now been initiated in several quarters of Her Majesty's Dominions."

The compliance with the request of the French Government may be regarded as singularly appropriate at the conclusion of this notable experiment, when it is remembered that the first plants of *Calisaya* sent out to India were raised from seed supplied by the French botanist and explorer of the Calisaya region, Dr. Weddell, of whom in 1857 it was stated (Dr. Royle in his memo. dated March, 1857, above mentioned) that the plants of this species, which were at one time very numerous in hot-houses in Europe, were all obtained from seeds brought home by him.

In St. Helena a substantial number of plants of "Red bark" (*C. succirubra*) and "Loxa bark" (*C. officinalis*) were established by a gardener sent out from Kew. These plants at first gave every promise of success but were evidently neglected. In 1874 (Kew Report 1874, p. 5) Sir Joseph Hooker reported that "the subject of *Cinchona* cultivation in the Colony has been again brought under the notice of the Government owing to the fact of a large proportion of trees introduced there ten years before from Kew having been found after years of neglect to be in a flourishing condition. The suitability of the island for *Cinchona* cultivation has now been indisputably proved and the question of continuing it must depend on other considerations."

It is interesting to note that Sir Joseph's opinion on this subject was recently quoted in a letter to the "Times" of December 22nd, 1930—"In about 1901 I was speaking at Sunningdale with Sir Joseph Hooker, my godfather, and, knowing a little of the commercial results of some of his activities, I asked him which of them he thought had been the most important in its results. He replied with emphasis, 'Quite certainly, the getting of cinchona into India, the result is that anyone can get at any post office a dose of pure quinine for a little less than a half-penny.'"

The collections at Kew contain samples of packets of quinine and "*Cinchona* febrifuge" together with an extensive series of the Quinine barks of commerce, and illustrations of the cultivation in the East and production in South America; they are especially representative of British India and of experiments in various colonies, including Ceylon, Jamaica, St. Helena, Tanganyika and the Cameroons.

Filaments pink ; anthers purple.

Immature seeds pink. *Stigmata* very slightly tinged pink.

Ripe capsules intermediate between broadly ovoid-ellipsoid and obloid types, 8 mm. long, 8 mm. diam. ; teeth 2 mm. long, erect ; mouth 2 mm. diam.

Carpophore 2.5 mm. long, 2 mm. diam.

Mature seeds weak armadillo.

B.6. *Habit* erect, stems up to 6 dm. high, with little anthocyanin, glabrous ; plant female.

Leaves (average) 5.7 cm. long, 1.6 cm. broad, margins minutely crenulated, colour dark green.

Inflorescence with up to 80 flowers, more or less drooping, bracts as in B.1 but glabrous.

Calyx narrow, with little anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, with barely a boss, segments very narrow ; petals 1.9 cm. long, 7 mm. broad ; corolla diam. 1.8 cm.

Immature seeds pink. *Stigmata* pink.

Ripe capsules broadly ovoid-ellipsoid, 9 mm. long, 7.5 mm. diam. ; teeth 1.5 mm. long, erect ; mouth 2.5 mm. diam.

Carpophore 2 mm. long, 2 mm. diam.

Mature seeds tubercled.

B.7. *Habit* erect, up to 5 dm. high, glabrous ; plant with hermaphrodite and female flowers.

Leaves (average) 5.9 cm. long, 2.1 cm. broad, margins crenulated, glabrous, green.

Inflorescence with up to 17 flowers, more or less drooping ; bracts as in B.1, ciliated.

Calyx shape as in B.1.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 1.7 cm. long, 7 mm. broad, with barely a boss ; corolla diam. 1.7 cm.

Filaments and anthers not scored.

Immature seeds pink. *Stigmata* pink.

Ripe capsules intermediate between broadly ovoid-ellipsoid and obloid types, 8 mm. long, 8 mm. diam. ; teeth 1.5 mm. long, erect, mouth 2 mm. diam.

Carpophore 2 mm. long, 2 mm. diam.

Mature seeds tubercled.

B.8. *Habit* stems erect, up to 7.5 dm. long, with little anthocyanin, glabrous ; plant with female and hermaphrodite flowers.

Leaves (average) 5.5 cm. long, 1.5 cm. broad, dark green, margins long ciliate or crenulated and then with few cilia, glabrous.

Inflorescence with up to 30 flowers, more or less drooping, bracts crenulate to ciliate.

Calyx shape as in B.1, with a trace of anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 1.9 cm. long, 9 mm. broad, with a small scale ; corolla diam. 2 cm.

Filaments pink ; anthers purple.

Immature seeds white. *Stigmata* pink.

Ripe capsules. Intermediate between broadly ovoid-ellipsoid and obloid types, 8 mm. long, 8 mm. diam. ; teeth 1.5 mm. long, erect ; mouth 2.5 mm. diam.

Carpophore 2 mm. long, 2 mm. diam.

Mature seeds weak armadillo.

B.9. *Habit* stems erect, up to 7.2 dm. long, with a trace of anthocyanin, glabrous.

Leaves (average) 6.2 cm. long, 1.6 cm. broad, margins crenulated, dark green, glabrous.

Inflorescence with up to 50 flowers ; bracts as in B.1, ciliated.

Calyx shape as in B.1, with a medium amount of anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 1.9 cm. long, 8 mm. broad, with a boss ; corolla diam. 2.2 cm.

Filaments pink ; anthers purple.

Immature seeds white. *Stigmata* tipped pink.

Ripe capsules broadly ovoid-ellipsoid, 8.5 mm. long, 7 mm. diam. ; teeth 2 mm. long, erect ; mouth 2 mm. diam.

Carpophore 2 mm. long, 2 mm. diam.

Mature seeds weak armadillo, verging very near to armadillo.

B.10. *Habit* stems erect, 9.5 dm. long, with a trace of anthocyanin and medium pubescence ; plant hermaphrodite.

Leaves (average) 5.7 cm. long, 1.9 cm. broad, pubescent on both surfaces but with a few more hairs below, long ciliate.

Inflorescence with up to 50 flowers, more or less drooping ; bracts as in B.1, ciliate.

Calyx shape as in B.1, with a trace of anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 1.9 cm. long, 9 mm. broad, with a boss ; corolla diam. 2 cm.

Filaments with the merest trace of pink ; anthers green.

Immature seeds pink. *Stigmata* white.

Ripe capsules intermediate between broadly ovoid-ellipsoid and obloid types, 7.5 mm. long, 7.5 mm. diam. ; teeth 1.5 mm. long, erect ; mouth 2.5 mm. diam.

Carpophores 2.5 mm. long, 2 mm. diam.

Mature seeds tubercled.

B.11. *Habit* stems erect, up to 6.8 dm. long, with a little anthocyanin, densely pubescent ; plant hermaphrodite and female.

Leaves (average) 5 cm. long, 1.8 cm. broad, pubescent on both surfaces.

PLATE VI

Inflorescence with up to 70 flowers, more or less drooping, bracts as in B.1 with many long cilia.

Calyx shape as in B.1, with a trace of anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 2.3 cm. long, 1 cm. broad, with a well-developed boss; corolla diam. 2.6 cm.

Filaments pink; anthers purple.

Immature seeds white. *Stigmata* white.

Ripe capsules slightly obloid, 7 mm. long, 7.5 mm. diam.; teeth 2 mm. long, erect; mouth 2 mm. diam.

Carpophores 2 mm. long, 2 mm. diam.

Mature seeds tubercled.

B.12. *Habit* stems erect, up to 5.2 dm. long, with a little anthocyanin, glabrous; plant hermaphrodite.

Leaves (average) 5.1 cm. long, 1.4 cm. broad, glabrous on both surfaces, margins minutely crenulate with a few cilia.

Inflorescence with up to 46 flowers, more or less drooping; bracts as in B.1, not ciliated.

Calyx shape as in B.1, with a little anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 2.1 cm. long, 1.1 cm. broad, with a boss; corolla diam. 2.2 cm.

Filaments pink; anthers purple.

Immature seeds white. *Stigmata* pink.

Ripe capsules and *mature seeds* not collected.

B.14. *Habit* stems erect, up to 6.8 dm. long, with a little anthocyanin; glabrous; plant hermaphrodite.

Leaves (average) 6.8 cm. long, 2.1 cm. broad, margins crenulated and ciliate.

Inflorescence with up to 50 flowers; bracts as in B.1, with few cilia.

Calyx shape as in B.1, with a trace of anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 1.9 cm. long, 8 mm. broad, with barely a boss, and a tinge of suffused colour at the base of the lamina on both surfaces; corolla diam. 1.9 cm.

Filaments faintly tinged pink; anthers purple.

Immature seeds white. *Stigmata* pink.

Ripe capsules not collected.

Mature seeds tubercled.

B.16. *Habit* stems erect, up to 3.8 dm. long, with little anthocyanin at the nodes only, glabrous; plant female.

Leaves oblanceolate to oblong-obovate, (average) 3.8 cm. long, 1.0 cm. broad, glabrous, margins strongly ciliate, vivid green.

Inflorescence with up to 19 flowers; bracts as in B.1, ciliated.

Calyx shape as in B.1, with a trace of anthocyanin.

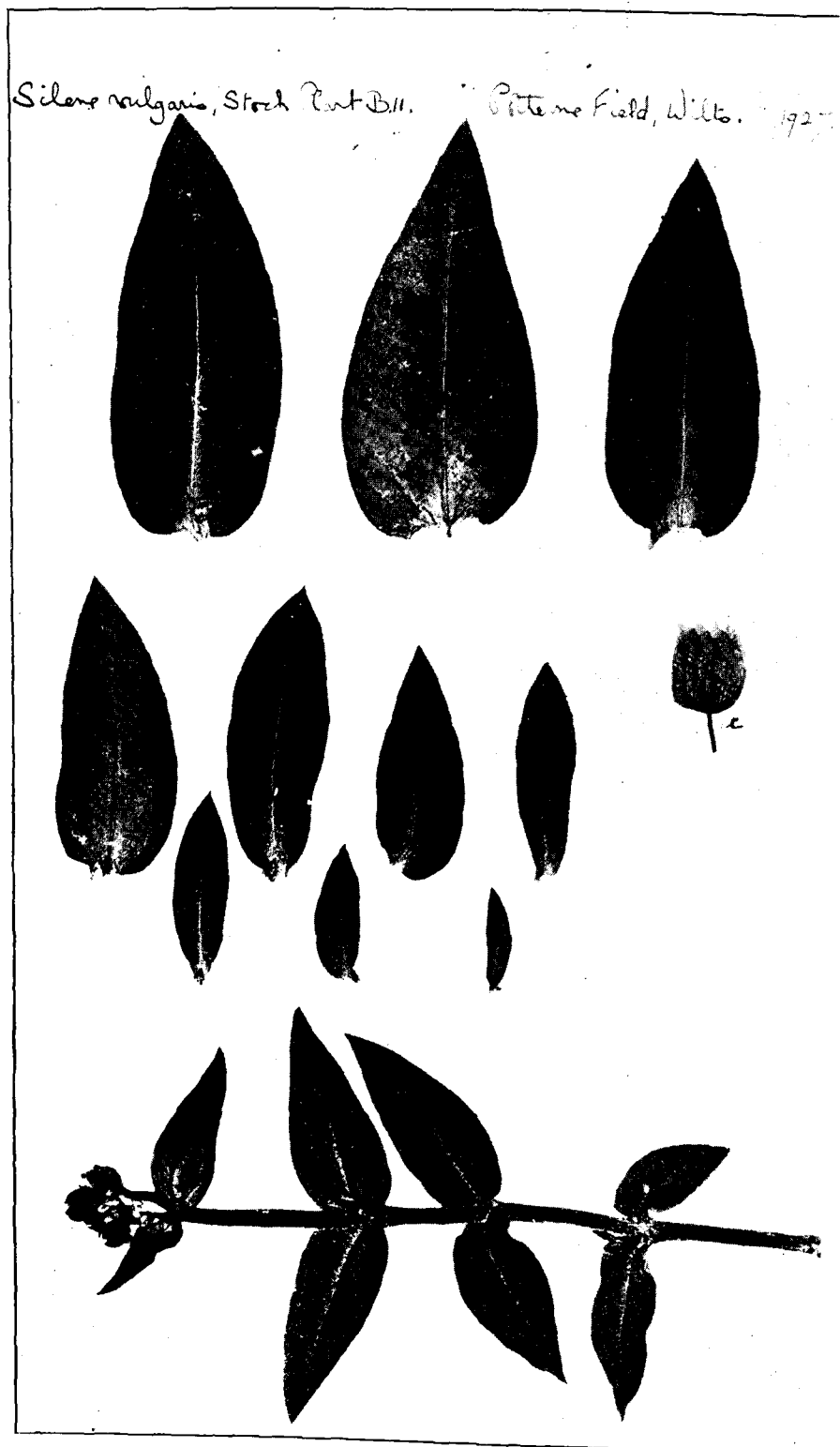
Silene vulgaris, Stock Plant B.1.

Broadsides, 1.4.1922, Hants.



Silene vulgaris. Stock-Plant B. 1.

[To face page 122.]



Corolla with petals divided $\frac{1}{2}$ length of lamina, segments and petals not contiguous, petals 1.4 cm. long, 7 mm. broad, with a boss; corolla diam. 1.6 cm.

Immature seeds pink. Stigmata white.

Ripe capsules intermediate between broadly ovoid-ellipsoid and obloid types, 6 mm. long, 6 mm. diam.; teeth 1.5 mm. long, erect; mouth 2 mm. diam.

Carpophores 2 mm. long, 1.5 mm. diam.

Mature seeds tubercled, but verging strongly to weak armadillo.

B.18. Habit stems erect, up to 3.75 dm. long, with little anthocyanin, densely pubescent, plant hermaphrodite.

Leaves oblong to oblong-ovate, acute, (average) 3.8 cm. long, 1.0 cm. broad, margins long ciliate, pubescent on both surfaces, dark green.

Inflorescence with up to 17 flowers, bracts as in B.1, with very few cilia.

Calyx narrow, with little anthocyanin.

Corolla with petals divided $\frac{3}{4}$ length of lamina, segments and petals not contiguous, petals 1.8 cm. long, 6 mm. broad, with barely a boss; corolla diam. 1.5 cm.

Immature seeds white. Stigmata white.

Ripe capsules intermediate between broadly ovoid-ellipsoid and obloid types, 7 mm. long, 7 mm. diam., teeth 1.5 mm. long, erect; mouth 2 mm. diam.

Carpophores 3 mm. long, 2 mm. diam.

Mature seeds tubercled.

The plant appeared as a weed in the Experimental Grounds at Potterne in 1927.

Variations in the characters of *S. vulgaris*.

The introductory remarks given in our account of the character variations for *S. maritima* (K.B. 1929, p. 155) apply equally to the following account of *S. vulgaris*. The plant organs are dealt with below in the same general sequence as they have been for *S. maritima*.

Roots. The primary root-system of the seedling quickly penetrates the soil and branches tend to descend but often at a slightly less acute angle than in *S. maritima*. The tap-root may remain unbranched, except for small laterals, for several inches, or may fork into two or more main roots within an inch of the crown. The main roots penetrate into the soil and subsoil for a yard or more. From the upper portion of the root stock, usually numerous crowded buds arise and in the early part of the year grow out into erect or nearly erect shoots. The lower parts of the young shoots are more or less covered with decussate scale-leaves, formed from entire leaf-promordia and passing upwards into typical young foliage leaves. The scale-leaves below ground level are yellowish in colour, but above have an increasing chlorophyll content often masked by a considerable amount of anthocyanin. Root-stocks largely deprived of their

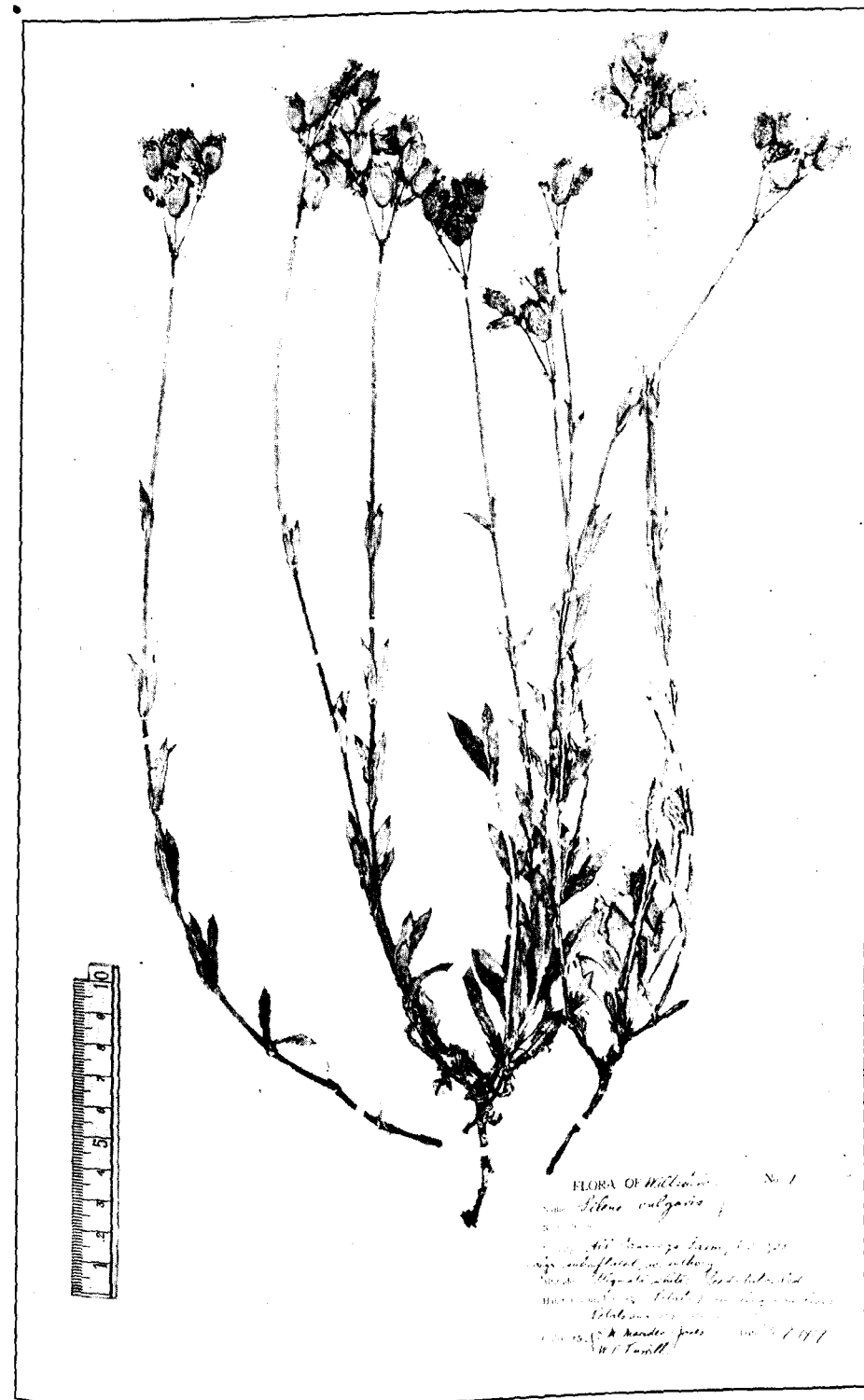
PLATE VIII

main roots and with the aerial parts well cut back transplant easily and successfully. *S. vulgaris* propagates vegetatively from older roots much more readily than does *S. maritima*. This gives the species a decided advantage in such a habitat as arable land, where ploughing not only disturbs the plants but cuts up the roots. This was well exemplified in our studies of the population on Potterne Field where the arable soil is a stiff marly clay derived from the Lower Chalk. Most of the plants here were growing from old cut roots whose adventitious buds had given rise to strong stems bearing well-developed leaves and inflorescences.

STEMS. The main stems are erect or ascending. When growing in shade, as under hedges, or amongst tall herbaceous or shrubby vegetation, the stems become slender, the internodes elongated, and the plant straggling. Thus material collected between Felden and Chipperfield, Herts, 10.6.28, growing on a shady hedge bank, had stems up to 11 dm. long, with middle internodes 10-11 cm. and 14 nodes, as contrasted with material collected north of Chipperfield on the same date in a grass field, with stems up to 4.6 dm. long, middle internodes 4-5 cm. long, and 7 nodes. The lower nodes in the shade-growing plants were close together. Age and habitat certainly modify stem length very greatly. Stem height in addition to being increased by surrounding vegetation is reduced by compactness of soil, while in cultivated soil the stems are taller and more robust. This is well shown in samples of the population at All Cannings, Wilts (see p. 137). Thus on the open grassy downland which had not been recently cultivated the plants were relatively dwarf, but healthy, with a minimum height of 2.5 dm. Around the edges on newly disturbed soil the plants attained a height of 7.4 dm., had thicker stems, and often suffered more from *Marssonina*. The terete, hollow or slightly hollow internodes at about the middle of mature stems average 4.5 cm. long and 3 mm. in diameter. The solid nodes average 3.5 mm. in diameter. We have never found adventitious roots arising at the nodes either in nature or in cultivation.

A peculiar "strict" habit has frequently been observed in wild populations. The plants showing it are generally of or below medium stature, have slender wiry stems, and the relatively narrow and acute leaves tend to stand erect at an acute angle from the nodes, thus hiding the internodes. Strict plants are much more frequent on permanent pastures than on arable land. Thus they are very common on the grass down at All Cannings, Wilts, common at Bradfield, Berks., in permanent pasture, and very rare in the arable Potterne Field, Wilts. We have also found strict plants in Kent, Hampshire, and Surrey. Variations towards the strict habit have been recorded in the Transplant experiments [see Journ. Ecol. xviii. 362 (1930)].

Plants occur absolutely devoid of anthocyanin both in the vegetative and floral parts (as Nos. 16 and 57 from All Cannings),



Silene vulgaris. All Cannings Farm, Devizes. No. 1, to show strict habit.

[To face page 124.]



Silene vulgaris on Thames bank near Old Windsor,
 No. 4, to show not strict habit.

To face page 125.]

while the other extreme is shown by plants with a considerable amount of anthocyanin in the vegetative parts (Nos. 81 and 82 from All Cannings) or in the calyx (No. 94). We have, however, never seen an amount comparable with that in the narrow-leaved plants of *S. maritima* from the Portland end of the Chesil Beach. If factors are present for anthocyanin development there is usually a greater development in the vegetative parts after frost, drought, or disease attack.

Indumentum. Unlike *S. maritima* there is a considerable range in development of hairs in *S. vulgaris*. We have been able to score all the plants examined, both wild and those bred under control, into four groups, with stock-plants as standards.

1. Densely pubescent, as stock-plant B.11.
2. Medium amount of pubescence as stock-plant B.10.
3. Few scattered hairs as stock-plant B.5.
4. Glabrous as stock-plant B.1.

The presence or absence of indumentum has a genetical basis, the pubescent being dominant over the glabrous condition. It is equally certain that modifying factors cause the appearance of plants differing in degree of pubescence. Our groups 1, 3, and 4 are very distinct from one another, but links between groups 1 and 2, and 2 and 3, are sometimes found. The stem pubescence, when present, is most dense a few internodes above the base and ends completely below the last pair of foliage leaves. We have never seen pubescence in the inflorescence region or on the calyx. When present on the stem pubescence is also found on the leaves, normally on both surfaces.

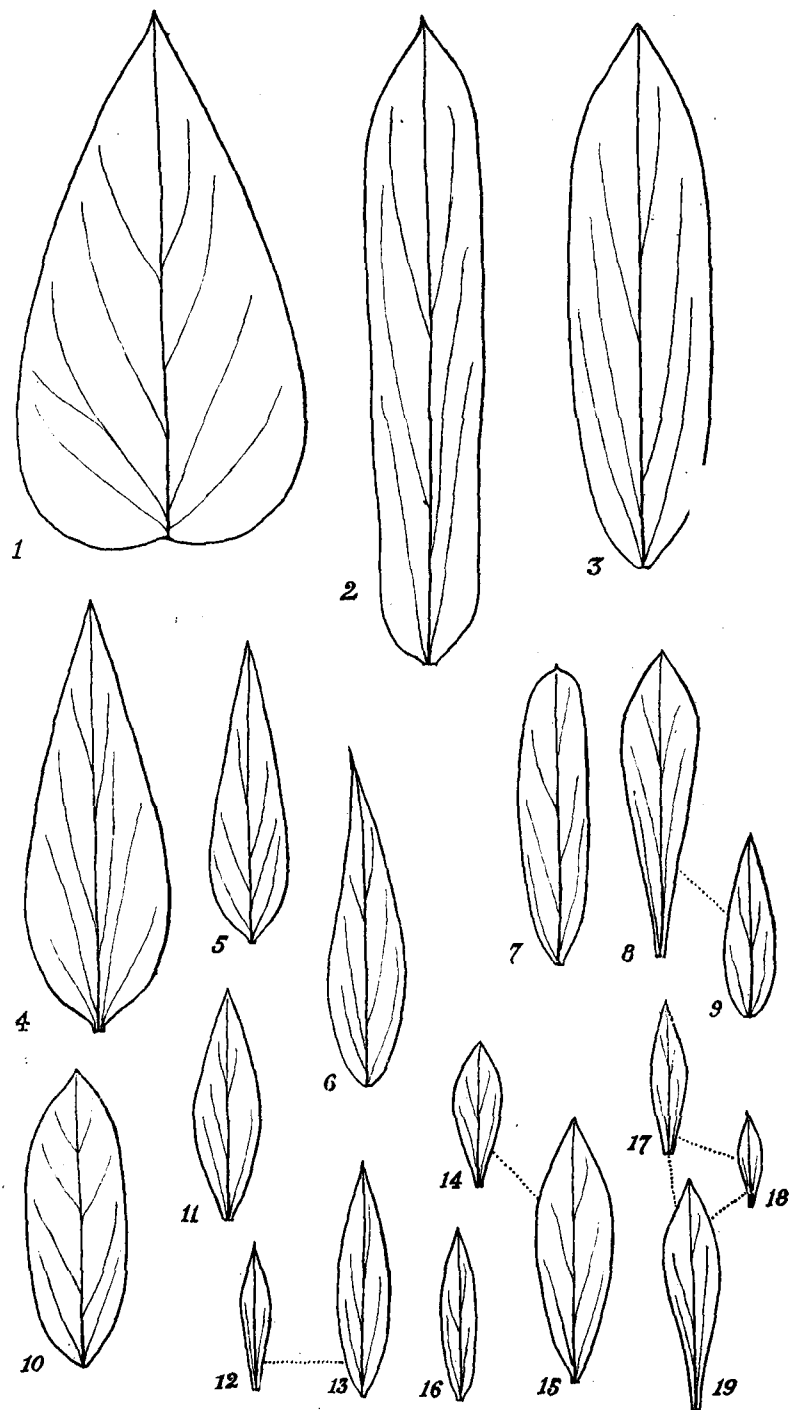
The following figures from wild populations are probably common averages:

Bradfield, Berks ... hairy 20 glabrous 80=1:4.
 All Cannings Farm, Wilts ... " 62 " 38=1:6:1

The absence of *barren shoots* in *S. vulgaris* and its significance has been considered in a previous paper (K.B. 1929, pp. 156 seq.).

LEAVES. General. As in *S. maritima*, although the leaves on an individual plant show a large amount of fluctuation, the general leaf shape of a plant is a scorable character. We do not at present know the limits of plasticity of gene expression or the degree of gene interaction for leaf shape and size, but we know genes are involved. In our measurements we give the size of average well-developed leaves, unless we state to the contrary.

Shape. A central outline shape is from broadly lanceolate or ovate-lanceolate to narrowly elliptic. In all leaf shapes the apex is acute to acuminate-acute in the narrower ones. There is a slight apiculus and sometimes the blade is slightly "pinched in" just below the apex. The lower leaves are narrowed to the base and the upper ones, especially when the blades are broader, are slightly or markedly amplexicaul. Shape variations include linear (Old Windsor No. 7), lanceolate (Old Windsor No. 6) and lanceolate-ovate (Old Windsor No. 4).



Size. Stock-plant B.1 has leaves of a very good medium standard, measuring 4.5 cm. long and 1.2 cm. broad. We propose to use the following terms for leaf size :

- Leaves "very long," 10-8 cm.
- Leaves "long," 8-6 cm.
- Leaves "medium length," 6-4 cm.
- Leaves "short," 4-2 cm.
- Leaves "very short," less than 2 cm.
- Leaves "very broad," 4-3 cm.
- Leaves "broad," 3-2 cm.
- Leaves "medium breadth," 2-1 cm.
- Leaves "narrow," 1-0.5 cm.
- Leaves "very narrow," less than 0.5 cm.

The above classes are based on the whole of the material of the species we have examined, extra-British as well as the British specimens and populations considered in this paper.

Margin. A very narrow membranous margin surrounds the leaf. It often runs out into distinct cilia, especially in pubescent plants.

Texture. The leaf texture is less succulent as shown by the thickness relative to the superficial area of the leaf than in *S. maritima*. Shade-grown plants have more flaccid leaves than those grown in the open.

Colour. The colour of the foliage shows a great range in wild populations. Plants with green, dark-green, and yellowish-green leaves are distinguishable, but intermediates occur and it is difficult to say how far the apparent chlorophyll colours are due to masking by anthocyanin. Some plants show the leaves, or often only some of them, deeply coloured with purple anthocyanin. Young shoots early in the year have frequently much anthocyanin but later develop normal green leaves.

INFLORESCENCE. The flowers are more or less drooping when in bloom and number from a minimum of 5 to a maximum of 80 on each inflorescence; an average number is 20 for a fully developed inflorescence. We regard the numerous drooping flowers as a general specific character. Most of the bracts are at first green-herbaceous, many becoming scarious later. On the whole they are more scarious than in *S. maritima*. Their surfaces are glabrous but the margin may be eciliate, crenulate, or markedly ciliate, varying even on the same plant.

Figs. 1-19. To show range of size and shapes of leaves in *Silene vulgaris*, British material only. All natural size.

1. Thames bank near Old Windsor, No. 4. 2. Thames bank near Old Windsor, No. 7. 3. Bryn-yt-eithen, Cardiganshire, No. 2034. 4. Between Felden and Chipperfield, Herts, No. 2. 5. Thames bank near Old Windsor, No. 5. 6. All Cannings Farm, Wilts, No. 35. 7. All Cannings Farm, Wilts, No. 55. 8 and 9. Thames bank near Old Windsor, No. 6. 10. All Cannings Farm, Wilts, No. 64. 11. All Cannings Farm, Wilts, No. 78. 12 and 13. All Cannings Farm, Wilts, No. 2. 14 and 15. All Cannings Farm, Wilts, No. 42. 16. Barton Stacey, Hants, No. 7. 17, 18, and 19. Barton Stacey, Hants, No. 6.

FLOWERS. The drooping of the flowers is correlated with a slight degree of zygomorphy. This is due to the longer claws of the petals on the side towards which the flower droops. The expanded limbs as a whole slope backwards from the drooping side and the upper petals may even be reflexed. No zygomorphy has been detected in the calyces.

The flowers are quite strongly scented in the evening and the odour is particularly noticeable when the plants are massed. Pollination studies have not yet been made, but both diurnal and nocturnal insects have been observed visiting the flowers.

Anthocyanin may occur in any or all of the floral organs or may be entirely absent. The degree of intensity of colouration has a wide range of fluctuation between different plants or even different floral organs of the same plant. Usually, except for particular plants and for calyces, we have scored for presence or absence and not for degree of anthocyanin development.

CALYX. Both in the flowering and in the fruiting conditions there is considerable range in calyx shape. After many attempts we have scored flowering calyces into three groups, inflated, sub-inflated, and narrow. The first and last are very distinct but there is a continuous series in the middle group linking the end groups together. In the fruiting condition the calyx shape depends partly on the size and shape of the capsule and also on the length of the carpophore.

In some populations, as those studied on the Hog's Back, near Guildford, two extreme types of fruiting calyx can be picked out, (a) with calyces loosely fitting round the fruit, much inflated, often large and drying more or less white, (b) with calyces tightly fitting round the fruit, stiffer, smaller, and often drying darker (to a distinct

Silene vulgaris. Figs. 20-23. To show types of indumentum, x 2.

Fig. 20. Dense, Little Tree Field, Potterne, Wilts, No. 7. Fig. 21. Medium, Stock-Plant 10. Fig. 22. Few hairs, Stock-Plant 5. Fig. 23. Glabrous, near Tentsmuir, Fifeshire.

Figs. 24-26. To show types of calyx-shape, x 2.

Fig. 24. Inflated, All Cannings Farm, Wilts, No. 42. Fig. 25. Subinflated, All Cannings Farm, Wilts, No. 88. Fig. 26. Narrow, All Cannings Farm, Wilts, No. 39.

Figs. 27-31. To show petal characters, x 2 except Fig. 31 which is x 25.

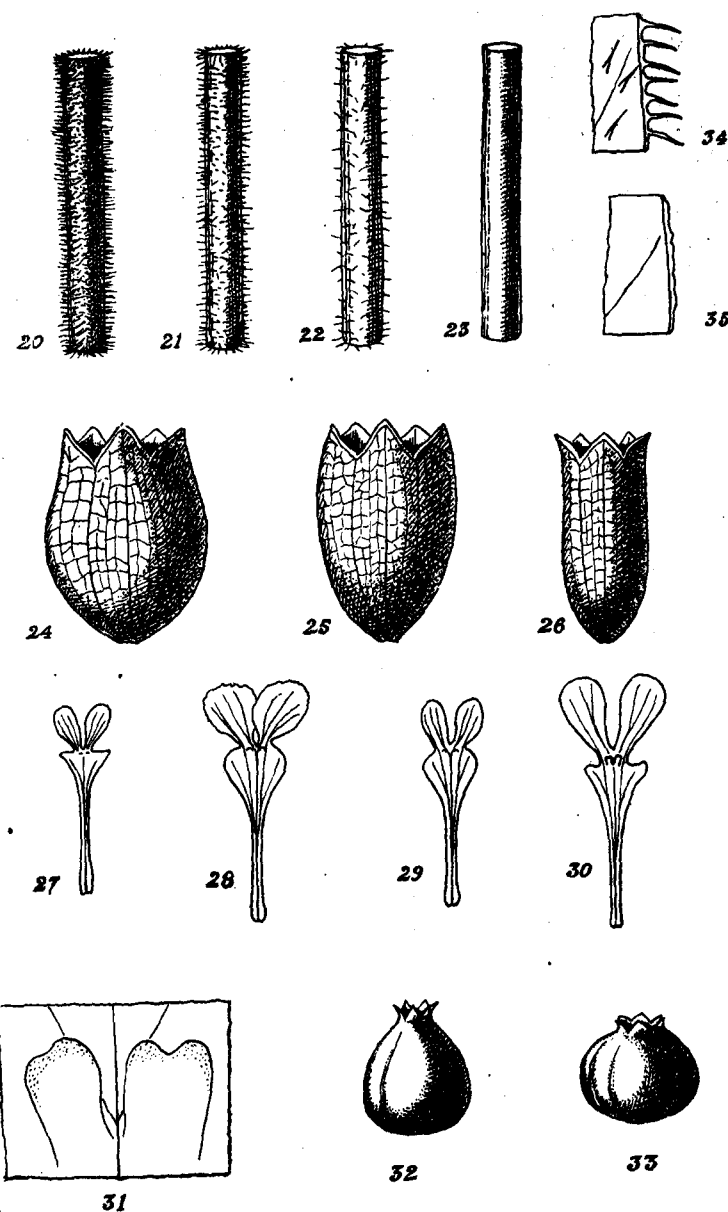
Fig. 27. Short narrow petal, more than $\frac{3}{4}$ lobed, segments not overlapping, scarcely a boss present, All Cannings Farm, Wilts, No. 1. Fig. 28. Long broad petal, more than $\frac{3}{4}$ lobed, segments overlapping, margin slightly crenulate, boss present, All Cannings Farm, Wilts, No. 11. Fig. 29. Short narrow petal, $\frac{3}{4}$ lobed, segments not overlapping, scarcely a boss present, All Cannings Farm, Wilts, No. 39. Fig. 30. Long broad petal, scarcely $\frac{3}{4}$ lobed, segments not overlapping, bifid scale present, All Cannings Farm, Wilts, No. 88. Fig. 31. Bifid scale of Fig. 30, x 25.

Figs. 32-33. To show extremes of capsule shapes, x 2.

Fig. 32. Type I., Hog's Back, No. 7. Fig. 33. Type II., Hog's Back No. 4.

Figs. 34-35. To show extreme types of leaf-margins, x 12.

Fig. 34. Ciliate, All Cannings Farm, Wilts, No. 39. Fig. 35. Not ciliate Thames bank near Old Windsor, No. 4.



brown), than in (a). On the whole mature (fruiting) calyces are the same for all fruits on each plant. The large number of items intermediate between (a) and (b) may be due partly to hybridization and partly to plasticity of the character.

COROLLA. In general the petals are smaller than in *S. maritima*, though it is possible to find exceptions, and the range of size and shape is less in our present experience.

Petal length. This ranges from 1 to 2.3 cm. and we propose to term petals measuring 1.5 cm. and over "long" and petals measuring 1.4 cm. and below "short."

Petal breadth. This ranges from 0.3 cm. to 1.0 cm., and we propose to term petals measuring 0.6 cm. and over "broad" and those 0.5 cm. and below "narrow" (measurements being taken to the nearest mm.). Petal breadth and, less markedly, petal length tend to increase under cultivation.

Shortness and narrowness of petals are correlated in a high degree with femaleness of the flower.

Petal lobing. Normally the blade of each petal is bilobed for $\frac{3}{4}$, or more, or approximately $\frac{3}{4}$, of its length and has two slightly raised bosses (or a two-lobed boss). Exceptions (though not extreme ones) occur. Thus stock-plant B.8 has two small scales on each petal. The depth of lobing is measured from the level of the shoulders, which may be straight or rounded. Up to the present we have observed no plants with extra lateral lobes comparable with the *forma lobata* Salisbury of *S. maritima*, though such have been recorded by other authors. The margins of the lobes may be quite entire or distinctly crenulate. Both the normal two lobes and the petals are most often not contiguous or overlapping in the mature flower in the sense in which they are in some plants of *S. maritima*. One or two pairs of petals or segments in individual flowers may be in contact in connection with the degree of zygomorphy. It should be noted that scoring for many corolla characters must be done in the evening when the flowers are fully expanded; there is then no difficulty in scoring the plant as a whole for these characters.

Anthocyanin blotch. This is not of such frequent occurrence as in *S. maritima* but we have found the character in a few individuals in wild populations in Wiltshire. Pink flowered plants in otherwise typical *S. vulgaris* have not yet been studied as living plants.

ANDROECIUM (and sex). In the wild populations we have studied the majority of plants were hermaphrodite, but entirely female plants are not infrequent. Often female and hermaphrodite flowers may be found in the same individual. Plants with white and others with pink filaments occur in all large populations. The anthers also vary in colour from pure green to deep purple; the colour is particularly pronounced along the lines of dehiscence and the connective.

GYNAECIUM. Stigmata colour. Plants with purplish and others with colourless stigmata occur in the wild.

Colour of immature seeds. In *S. vulgaris* the majority of plants have white immature seeds, but plants with pink immature seeds occur in large wild populations. The following figures from random samples of wild populations are probably fair averages:—

Bradfield, Berks	...	...	white	32	pink	8	=4:1
All Cannings Farm, Wilts	...	..	244	..	68	=3.6:1	

FRUITS. For *shape* of capsule we have scored the items into two main classes: 1 broadly ovoid-ellipsoid and 11 broadly ovoid to obloid. Intermediates undoubtedly occur, though they are more frequent in some populations and generations than in others. The former are the more elongated and taper slightly in the upper part. The latter are as broad as or broader than long and taper very little or not at all in the upper part.

The size and, to a less degree, the shape of the capsule is influenced by:—

1. The vigour of the plant.
2. The vigour of the inflorescence.
3. The position of the flower on the inflorescence (lower flowers have larger and broader capsules than higher ones, on the whole).
4. The number of seeds maturing in the capsule.
5. The degree of development reached when the capsule ripens and opens (this is partly correlated with 3, since the upper flowers usually mature their capsules more quickly than the lower).
6. Accidents, as insect bites and *Marssonina*.
7. Shape of the calyx.
8. Length of the carpophore.
9. Hermaphroditism or femaleness.

The *carpophore* varies in length from 2 to 3 mm. and in breadth from 1.5 to 2.5 mm.

The *capsule teeth* are normally 6 and these are hygroscopic and erect or nearly so.

Mature, open, dried capsules, with the calyces removed, may be caused to close their teeth completely:—

1. by soaking in cold water; the teeth then close gradually in about 45 minutes; and
2. by placing in water and bringing this to boiling point; the teeth then close immediately.

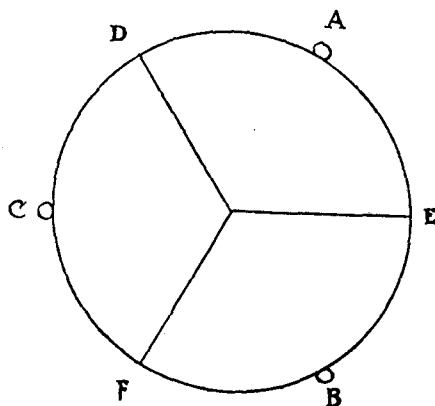
The shape of the closed, but ripe, capsule can be judged excellently in this manner. In both 1 and 2 the teeth re-open gradually as the capsules dry, in ordinary summer room temperature in about 4 to 10 hours, or immediately on drying in a tin over gas.

To study the length, shape, degree of reflexing of the capsule teeth, and the diameter of the mouth, mature capsules are essential. Also, from the above observations, moisture is obviously a factor in degree of reflexing, and all items must be examined under the same degree of humidity.

One other matter deserves comment. One, several, or all of the teeth may retain portions of the styles. Since there are most often three styles (though individual flowers may have 4 or 5), most often 3 of the teeth have style remnants. These style remains must be ignored in considering the reflexing of the teeth, the outward curvature of the teeth proper alone being considered.

The number of capsules occurring with more than six teeth and 3 loculi (i.e. capsules composed of more than three carpels) is smaller relative to the total number examined than in *S. maritima*, but actual figures have not been obtained. The only capsule found (in either species) which was composed of only two carpels (four teeth, two loculi) occurred in stock-plant B.6. At least three capsules were read under each number in all scorings of capsule characters.

As a rule the teeth on either side of a septum are the last to split. Thus in the diagram: ABC represent the position of the styles in the ovary, and DEF the positions of the septa. The splits usually occur at ABC before occurring at DEF. One example of the reverse was, however, seen in a capsule from the Hog's Back.



The characteristic number of teeth is 6 and this number was found on at least some capsules on all plants examined. When only 5 teeth are present, two, usually on either side of a septum, have failed to split. When 7 or 8 are present 4 carpels form the fruit as is shown by the 4 septa, and all the teeth are formed or 2 fail to split apart.

Since the number of teeth is definitely correlated with the number of loculi, and is indeed merely one expression of this, it must have the same basic cause as that which gives 2, 3, 4, (or 5) loculi. Since the locular number varies on the same plant the cause is not a genetic one comparable, for example, with that producing armadillo seeds.

The teeth of the normally mature capsule are usually erect, relative to the strongly recurved teeth of *S. maritima*. Actually there is a slight curving outwards, very rarely is recurving obvious.

Out of the 100 plants whose fruits were collected from the Hog's Back, Guildford (see p. 142), two (Nos. 12, 32) had reflexed teeth, but in neither was the reflexing so great as is normal in *S. maritima*, though for this character again it is possible to obtain a continuous series from the usual fruit type in one species to the usual fruit type in the other.

The width of the capsule mouth is partly, but very imperfectly, correlated with the reflexing of the teeth and the shape of the capsule. The broader capsules show a tendency to have more curved teeth and wider mouths. The samples from the Hog's Back referred to in the previous paragraph were arranged as follows for width of capsule mouth (out of 100 items one was not scorable):—

- (a) very narrow mouths (1-1.5 mm. diam.), 5.
- (b) mouths 1.6 to 2.3 mm. diam., 18.
- (c) mouths 2.4-2.6 mm. diam., 46.
- (d) mouths 2.7-2.9 mm. diam., 20.
- (e) broad mouths 3 mm. or (rarely) more diam., 10.

MATURE SEEDS. As for *S. maritima* we recognize four classes of seed pattern—armadillo, weak armadillo, tubercled, and strongly tubercled. Figures of these types (for *S. maritima*) were published in K.B. 1929, p. 174.

Counts of seeds from single capsules.

F₁ from stock-plant 1 selfed.

49 good 22 bad : 43 good 28 bad : 31 good 39 bad : 34 good
29 bad : 32 good 33 bad : 37 good 24 bad : 34 good 24 bad :
36 good 23 bad : 17 good 33 bad : 37 good 31 bad : 46 good
30 bad.

Range of total seeds from 50 to 76 per capsule.

Range of good seeds from 49 to 17 per capsule.

Range of bad seeds from 39 to 22 per capsule.

Average number of good seeds per capsule 36.

Average number of bad seeds per capsule 29.

Stock-plant 2.

51 good 22 bad : 59 good 30 bad : 45 good 32 bad : 72 good
22 bad : 52 good 47 bad : 36 good 24 bad : 50 good 31 bad :
54 good 27 bad : 27 good 29 bad : 6 good 52 bad : 42 good
26 bad.

Range of total seeds from 56 to 99 per capsule.

Range of good seeds from 6 to 72 per capsule.

Range of bad seeds from 22 to 52 per capsule.

Average number of good seeds per capsule 45.

Average number of bad seeds per capsule 31.

Stock-plant 3.

61 good 37 bad : 53 good 10 bad : 65 good 43 bad : 93 good
19 bad : 62 good 46 bad : 94 good 20 bad : 47 good 52 bad :
45 good 53 bad : 65 good 27 bad : 66 good 25 bad : 70 good
21 bad : 65 good 25 bad : 97 good 22 bad : 82 good 16 bad.

Range of total seeds from 63 to 119 per capsule.

Range of good seeds from 45 to 97 per capsule.

Range of bad seeds from 10 to 53 per capsule.

Average number of good seeds per capsule 69.

Average number of bad seeds per capsule 30.

Stock-plant 4.

18 good 83 bad : 78 good 42 bad : 49 good 95 bad : 51 good

80 bad : 84 good 37 bad : 28 good 98 bad : 70 good 29 bad :

18 good 86 bad : 72 good 43 bad : 99 good 25 bad : 76 good

32 bad : 98 good 34 bad.

Range of total seeds from 99 to 144 per capsule.

Range of good seeds from 18 to 99 per capsule.

Range of bad seeds from 25 to 98 per capsule.

Average number of good seeds per capsule 62.

Average number of bad seeds per capsule 57.

Stock-plant 5.

64 good 39 bad : 50 good 35 bad : 59 good 17 bad : 66 good

20 bad : 49 good 32 bad : 63 good 27 bad : 29 good 73 bad :

68 good 33 bad : 26 good 70 bad : 64 good 18 bad : 49 good

31 bad : 52 good 38 bad : 47 good 57 bad.

Range of total seeds from 76 to 104 per capsule.

Range of good seeds from 26 to 68 per capsule.

Range of bad seeds from 17 to 73 per capsule.

Average number of good seeds per capsule 53.

Average number of bad seeds per capsule 38.

Stock-plant 6.

53 good 34 bad : 88 good 12 bad : 65 good 25 bad : 70 good

25 bad : 86 good 16 bad : 78 good 28 bad : 72 good 23 bad :

50 good 29 bad : 54 good 28 bad : 85 good 12 bad : 61 good

23 bad : 70 good 20 bad.

Range of total seeds from 79 to 106 per capsule.

Range of good seeds from 50 to 88 per capsule.

Range of bad seeds from 12 to 34 per capsule.

Average number of good seeds per capsule 69.

Average number of bad seeds per capsule 23.

Stock-plant 8.

71 good 12 bad : 58 good 28 bad : 69 good 24 bad : 28 good

51 bad : 59 good 30 bad : 61 good 20 bad : 60 good 27 bad :

52 good 33 bad : 50 good 20 bad : 70 good 31 bad : 66 good

30 bad : 78 good 15 bad.

Range of total seeds from 70 to 101 per capsule.

Range of good seeds from 28 to 78 per capsule.

Range of bad seeds from 12 to 51 per capsule.

Average number of good seeds per capsule 60.

Average number of bad seeds per capsule 27.

Stock-plant 9.

78 good 22 bad : 91 good 31 bad : 77 good 32 bad : 68 good

34 bad : 34 good 58 bad : 74 good 15 bad : 74 good 10 bad :

47 good 34 bad : 97 good 21 bad : 89 good 17 bad : 51 good

28 bad : 24 good 74 bad : 77 good 24 bad.

Range of total seeds from 79 to 122 per capsule.

Range of good seeds from 24 to 97 per capsule.

Range of bad seeds from 10 to 74 per capsule.

Average number of good seeds per capsule 68.

Average number of bad seeds per capsule 31.

Stock-plant 10.

50 good 44 bad : 56 good 32 bad : 44 good 20 bad : 52 good

54 bad : 38 good 54 bad : 85 good 24 bad : 47 good 33 bad :

70 good 20 bad : 43 good 60 bad : 53 good 43 bad : 62 good

38 bad : 62 good 41 bad : 72 good 36 bad.

Range of total seeds from 64 to 109 per capsule.

Range of good seeds from 38 to 85 per capsule.

Range of bad seeds from 20 to 60 per capsule.

Average number of good seeds per capsule 56.

Average number of bad seeds per capsule 38.

Stock-plant 11.

56 good 42 bad : 46 good 29 bad : 90 good 18 bad : 55 good

47 bad : 51 good 45 bad : 67 good 28 bad : 42 good 47 bad :

34 good 53 bad : 61 good 40 bad : 48 good 41 bad : 51 good

21 bad : 84 good 9 bad.

Range of total seeds from 72 to 108 per capsule.

Range of good seeds from 34 to 90 per capsule.

Range of bad seeds from 9 to 53 per capsule.

Average number of good seeds per capsule 57.

Average number of bad seeds per capsule 35.

Stock-plant 14.

38 good 39 bad : 39 good 44 bad : 36 good 48 bad : 32 good

46 bad : 41 good 31 bad : 20 good 44 bad : 26 good 55 bad :

52 good 41 bad : 43 good 37 bad : 58 good 37 bad.

Range of total seeds from 64 to 95 per capsule.

Range of good seeds from 20 to 52 per capsule.

Range of bad seeds from 31 to 55 per capsule.

Average number of good seeds per capsule 38.

Average number of bad seeds per capsule 42.

Stock-plant 16.

49 good 21 bad : 45 good 28 bad : 22 good 58 bad : 42 good

51 bad : 36 good 28 bad : 62 good 14 bad : 67 good 6 bad :

40 good 32 bad : 36 good 22 bad : 51 good 13 bad.

Range of total seeds from 58 to 93 per capsule.

Range of good seeds from 22 to 67 per capsule.

Range of bad seeds from 8 to 58 per capsule.

Average number of good seeds per capsule 45.

Average number of bad seeds per capsule 28.

For the whole of the collections examined :—

Number of capsules 143 from 12 plants.

Range of total seeds from 50 to 144 per capsule.

Range of good seeds from 6 to 99 per capsule.

Range of bad seeds from 8 to 98 per capsule.

Average number of good seeds per capsule 56.

Average number of bad seeds per capsule 34.

Note.—High numbers in plants 3, 4, 6, 9.

Low numbers in plants 1 (F_1), 2, 14, 16.

Intra-specific variation.

In our third paper of this series (*Kew Bull.* 168, 1929) we discussed systems of intra-specific classification for *Silene* and devised a scheme for symbolizing characters in *S. maritima*. The scheme proved so useful that it was later applied, with the necessary modifications, to *S. vulgaris*.

Up to the stage at which our researches have arrived the following letter and figure symbols are needed* for intra-specific variation in *S. vulgaris*.

H.1=habit strict.

2=habit not strict.

I.1=indumentum of dense pubescence.

2=indumentum of medium pubescence.

3=indumentum of few hairs.

4=indumentum absent (glabrous except for marginal cilia to the leaves).

L.1=leaves very long, *i.e.*, 8 or more cm. in length.

2=leaves long, *i.e.*, 8 to 6 cm. in length.

3=leaves of medium length, *i.e.*, 6 to 4 cm. long.

4=leaves short, *i.e.*, 4 to 2 cm. long.

5=leaves very short, *i.e.*, less than 2 cm. long.

6=leaves very broad, *i.e.*, 4 or more cm. in breadth.

7=leaves broad, *i.e.*, 4 to 2 cm. in breadth.

8=leaves of medium breadth, *i.e.*, 2 to 1 cm. broad.

9=leaves narrow, *i.e.*, 1-0.5 cm. broad.

10=leaves very narrow, *i.e.*, less than 0.5 cm. broad.

11=leaves with much anthocyanin.

12=leaves with some anthocyanin.

13=leaves with no anthocyanin.

K.1=calyx inflated.

2=calyx subinflated.

3=calyx narrow.

4=calyx with much anthocyanin.

5=calyx with some anthocyanin.

6=calyx with no anthocyanin.

C.1=petals long, *i.e.*, 1.5 cm. or more in length.

2=petals short, *i.e.*, less than 1.5 cm. in length.

3=petals broad, *i.e.*, 6 mm. or more in breadth.

4=petals narrow, *i.e.*, less than 6 mm. in breadth.

5=petals bilobed.

6=petals multilobed.

7=petals overlapping or contiguous.

8=petals not overlapping or contiguous.

9=petal lobes overlapping or contiguous.

10=petal lobes not overlapping or contiguous.

11=anthocyanin blotch present.

12=anthocyanin blotch not present.

13=petal lamina lobed $\frac{3}{4}$.

14=petal lamina lobed $\frac{2}{3}$.

A1=functional stamens present (flowers hermaphrodite).

2=functional stamens absent (flowers female).

3=filaments purplish.

4=filaments colourless (white).

5=anthers purple or with purple colouration.

6=anthers without purple colouration.

G.1=stigmata purplish.

2=stigmata colourless (white).

3=immature seeds pink (purplish).

4=immature seeds colourless (white).

F.1=capsules broadly ovoid-ellipsoid.

2=capsules ovoid to obloid.

Se.1=mature seeds armadillo.

2=mature seeds weak armadillo.

3=mature seeds tubercled.

4=mature seeds strongly tubercled.

Studies on wild populations.

Chalk Down, enclosed as part of ALL CANNINGS FARM, Devizes, Wilts, 5.7.29.

This downland is at an altitude of between 500 and 600 feet about half a mile north-east of All Cannings Farm, 5 miles east by north of Devizes. The area is the end of a chalk down and slopes to the south-west and the south-east. The field is usually mown for hay, but in 1929, owing to the drought in the first half of the year, the crop was too poor to cut. The southern half was last ploughed in 1924, the northern half not since 1919. *Silene* plants were scattered equally throughout the field. Amongst the grass the *Silene* plants were shallow rooted and of rather dwarf stature, but at the edges the plants were tall, robust, many-stemmed, and more deeply rooted, and here the grasses and general vegetation were much coarser. A majority of the *Silene* individuals were hairy and there were a number of conspicuous individuals with no anthocyanin in the calyx or other parts of the plant. Adjacent to a field of oats on the south a considerable number of plants were badly infected with *Marssonina*. The *Silene* population ended abruptly to the south, none occurring amongst the oats. The open down to the west was also devoid of *Silene* and there is no evidence that it has ever been under the plough or in other ways disturbed.

The most conspicuous species in the field, apart from *Silene vulgaris*, were: *Cynosurus cristatus* Linn., *Holcus lanatus* Linn.,

*Not all characters were scored in every population studied.

Trisetum flavescens Pal. de Beauv., *Dactylis glomerata* Linn., *Bromus hordeaceus* Linn., *Briza media* Linn., *Plantago lanceolata* Linn., *Centaurea Scabiosa* Linn., *Chrysanthemum Leucanthemum* Linn., *Thymus Serpyllum* Linn., *Galium verum* Linn., *Linum catharticum* Linn., *Trifolium repens* Linn., *T. pratense* Linn., *T. hybridum* Linn., *Anthyllis Vulneraria* Linn., *Lotus corniculatus* Linn., *Onobrychis viciaefolia* Scop., *Medicago lupulina* Linn., *Potentilla Anserina* Linn., *Gymnadenia conopsea* Br., *Ophrys apifera* Huds., *Scabiosa Columbaria* Linn., *Leontodon hispidum* Linn., *Daucus Carota* Linn., *Lolium perenne* Linn., *Phleum pratense* Linn., *Agrostis alba* Linn., *Asperula cynanchica* Linn., *Reseda lutea* Linn., *Linaria vulgaris* Mill., *Cirsium arvense* Scop., and *Ranunculus arvensis* Linn.

In addition to the sample analyzed below for vegetative and floral characters, different random samples were scored for certain characters with the following results:—

1. *Indumentum*: 100 plants. 62 hairy, 38 glabrous.
2. *Colour of immature seeds*. 312 plants, 68 purplish, 244 white.
3. *Mature seeds*: 163 plants. 4 armadillo, 44 weak armadillo, 95 tubercled, 20 strongly tubercled.
4. *Capsules*: the same 163 plants. 96 type I, 25 type II, 42 intermediate.

No. 1.	H.1.	I.4.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.2.
No. 2.	H.1.	I.2.	L.4.9.12.	K.2.4.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 3.	H.1.	I.4.	L.4.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.1.3.
No. 4.	H.1.	I.2.	L.4.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.1.4.
No. 5.	H.1.	I.4.	L.3.9.12.	K.1.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 6.	H.1.	I.2.	L.3.9.12.	K.2.5.	C.2.4.5.8.10.11.13.	A.1.3.	G.2.3.
No. 7.	H.1.	I.3.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.2.4.
No. 8.	H.1.	I.2.	L.3.8.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.2.4.
No. 9.	H.1.	I.4.	L.3.9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.4.
No. 10.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.2.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 11.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.3.5.8.9.11.13.	A.1.3.	G.1.3.
No. 12.	H.1.	I.4.	L.3-4.9.12.	K.1.5.	C.1.4.5.8.10.11.13.	A.1.3.	G.1.4.
No. 13.	H.1-2.	I.2.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.4.
No. 14.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.2.3.5.8.10.11.13.	A.1.3.	G.1.3.
No. 15.	H.1-2.	I.4.	L.4.9.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.4.	G.2.4.
No. 16.	H.1-2.	I.2.	L.4.9.12.	K.1.6.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 17.	H.1-2.	I.4.	L.3.9.12.	K.2.4.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 18.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.1.4.	G.2.4.
No. 19.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.2.3.
No. 20.	H.1-2.	I.2.	L.4.9.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 21.	H.1.	I.3.	L.3-4.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.2.	G.2.3.
No. 22.	H.1-2.	I.1.	L.4.9.12.	K.1.4.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 23.	H.1.	I.2.	L.4.9.12.	K.1.5.	C.1.3.5.8.10.11.13.	A.1.3.	G.2.4.
No. 24.	H.1-2.	I.1.	L.4.9.12.	K.3.4.	C.2.4.5.8.10.12.13.	A.1.3.	G.1.4.
No. 25.	H.1-2.	I.4.	L.4.9.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.
No. 26.	H.1-2.	I.2.	L.3.9.12.	K.1.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 27.	H.1.	I.4.	L.3.8.12.	K.1.6.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 28.	H.1-2.	I.4.	L.4.9.12.	K.2.5.	C.2.4.5.8.9.12.13.	A.2.	G.1.3.
No. 29.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.3.5.8.10.11.13.	A.1.3.	G.1.
No. 30.	H.1-2.	I.3.	L.4.9.12.	K.1.4.	C.1.3.5.8.10.11.13.	A.1.3.	G.1.
No. 31.	H.1-2.	I.4.	L.4.9.13.	K.2.6.	C.1.4.5.8.10.12.13.	A.1.4.	G.2.4.

No. 32.	H.1.	I.2.	L.4.9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.1.4.	G.2.4.
No. 33.	H.1-2.	I.3.	L.4.9.12.	K.3.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.
No. 34.	H.1-2.	I.4.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.3.
No. 35.	H.1-2.	I.4.	L.3.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.2.4.
No. 36.	H.1.	I.4.	L.4.9.12.	K.1.4.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 37.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 38.	H.1-2.	I.4.	L.3.9.12.	K.1.4.	C.1.3.5.8.10.11.13.	A.1.3.	G.1.4.
No. 39.	H.1-2.	I.3.	L.4.8.12.	K.3.5.	C.2.3.5.8.10.12.14.	A.2.	G.1.4.
No. 40.	H.1-2.	I.4.	L.3.8.13.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.4.	G.2.3.
No. 41.	H.1-2.	I.2.	L.4.9.12.	K.3.5.	C.2.4.5.8.10.11.13.	A.1.3.	G.1.4.
No. 42.	H.1-2.	I.1.	L.4.9.11.	K.1.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.3.
No. 44.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.2.	G.2.4.
No. 46.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.4.5.8.10.11.13.	A.1.3.	G.1.
No. 72.	H.1.	I.4.	L.4.9.12.	K.1.5.	C.1.3.5.8.9.12.13.	A.1.3.	G.2.
No. 76.	H.1-2.	I.4.	L.4.9.12.	K.1.5.	C.1.3.5.8.10.11.13.	A.1.3.	G.2.4.
No. 81.	H.1-2.	I.4.	L.4.9.11.	K.1.5.	C.1.4.8.10.12.13.	A.1.3.	G.1.4.
No. 88.	H.1-2.	I.2.	L.3.8.12.	K.2.4.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 89.	H.1.	I.3.	L.3.8.12.	K.1.6.	C.2.4.5.8.10.12.13.	A.2.	G.2.4.
No. 107.	H.1-2.	I.1.	L.4.8.12.	K.1.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.2.4.

The great intra-specific heterozygosity of this population is evident from the above analysis. Attention should be called to the following:—

1. The predominance of the strict habit. All the plants analyzed above show it to a greater or less degree.
2. All our four grades of indumentum are recorded.
3. The leaves do not show a great range in length or breadth.
4. Two plants showed much anthocyanin, two none, and the remainder an intermediate amount.
5. All three grades of calyx shape occurred.
6. Eight plants had much anthocyanin in the calyx, four had no anthocyanin, and the remainder some anthocyanin.
7. Long, short, broad, and narrow petal characters occurred in all four possible combinations.
8. All the petals were bilobed.
9. None of the petals overlapped but in three plants the lobes overlapped.
10. Eleven plants had anthocyanin blotches on the petals.
11. One individual showed two-thirds lobing of the petals, the remainder three-quarters.
12. Ten plants were functionally female, the hermaphrodite plants (40) had mostly pink filaments, only five plants having white ones.
13. Coloured and colourless styles and immature seeds occurred in all four possible combinations.
14. All flowers had mere bosses, except in No. 88, where distinct scales were present.

POTTERNE FIELD (2 miles S. of Devizes), Wilts., 4.7.27.

This is a large field of arable land subject to rotation which includes clover. The soil is a stiff calcareous clay derived from an outlier of Lower Chalk (grey marly chalk) which is here 50 to 80

feet thick on the top of the Upper Greensand. The weed flora is usually fairly rich and includes *Centaurea Scabiosa* L., *Ranunculus arvensis* L., *R. repens* L., *Scabiosa arvensis* L., *Bartsia Odontites* Huds., *Daucus Carota* L., *Lithospermum arvense* L., *Ornithogalum pyrenaicum* L., *Lychnis Githago* Scop., *Viola arvensis* Murr. (s.l.), *Medicago sativa* L. (relict of cultivation), *Myosotis arvensis* Hill, and *Alopecurus myosuroides* Huds.

The *Silene* plants are fairly abundant and well distributed on the southern slope of the ridge. They here do best when the land is under corn, persisting as poor specimens when it is under temporary ley. It is very remarkable how the thick roots of even old plants can withstand the frequent ploughing and breaking to which they are subjected. Quite small pieces produce adventitious buds and re-establish the plant with branches and flowers of good tone. The removal of plants for breeding purposes has indicated that practically all plants in this field have damaged rootstocks. Exactly the same conditions occurred in arable fields near Barton Stacey, Hants.

This population is very different from that described above from the same county. While the difference in habitats is a possible cause, the action may be by direct modification or by selection. On the other hand the possibility of mutations or of temporal or spatial limitations to actual distribution cannot be ignored. The Potterne Field plants are more robust than those of All Cannings Down, with stouter stems and larger leaves, and on the whole they are more floriferous. No plants of strict habit have so far been found and very few show even a verging towards it. Plants scorable into every one of our four indumentum classes have been collected, from densely pubescent to glabrous. The population shows less development of anthocyanin than that at All Cannings, although fewer plants have been found totally devoid of anthocyanin. The inflorescences show a remarkable range in size and degree of compactness. This often fluctuates even from season to season in the same individual. One plant was collected with very long peduncles—26 cm. from the highest pair of leaves to the first flowers. The calyces of most plants are of the inflated type. Anthocyanin blotch on the petals has been recorded once in this population. Female plants occur, and as usual have smaller flowers than hermaphrodites. The same range in colour of filaments, stigmata, and immature seeds occurs as at All Cannings. A sample of 45 plants collected in the fruiting condition from this population was scored as follows:—

Mature seeds: 2 armadillo, 14 weak armadillo, 27 tubercled, 2 strongly tubercled.

Capsules: 18 type I, 10 type II, 17 intermediate.

BARTON STACEY, Hants, 10.7.29.

The population studied extended over a number of fallow, and neglected, arable fields. The period during which the fields had been fallow varied from one to five or six years. The weed-flora

was abundant in all—*Cirsium arvense* Scop. being the most widespread species. The soil was sandy and gravelly in nature. In the most recently ploughed fields the thick roots and root-stocks had been much broken and practically no entire plants, apart from seedlings, could be found. In the absence of close competition this ploughing up of the plants in no way injures their reproductive power and appears even to increase their vegetative vigour or at least to improve their tone.

No. 1.	H.2.	I.2.	L.2-3.8.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.1.4.	G.2.3.
No. 2.	H.2.	I.4.	L.3.8-9.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.1.4.	G.2.4.
No. 3.	H.2.	I.3.	L.4.8-9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.1.4.	G.2.4.
No. 4.	H.2.	I.1.	L.3.8.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.1.3.	G.1.4.
No. 5.	H.1.	I.4.	L.4.9.12.	K.1.5.	C.2.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 6.	H.1.	I.4.	L.4.9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.1.4.	G.2.
No. 7.	H.1.	I.2.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.1.3.	G.2.4.
No. 8.	H.1-2.	I.4.	L.4.9.12.	K.3.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 9.	H.1.	I.4.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.2.4.
No. 10.	H.2.	I.1.	L.4.8.12.	K.1.5.	C.2.4.5.8.10.12.13.	A.2.	G.2.4.
No. 11.	H.1-2.	I.2.	L.4.9.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.2.	G.2.3.
No. 12.	H.1.	I.4.	L.4.9.12.	K.1.5.	C.2.4.5.8.10.12.13.	A.1.3.	G.2.3.
No. 13.	H.1.	I.2.	L.3.9.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 14.	H.1.	I.4.	L.3-4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.1.3.	G.2.4.
No. 15.	H.1.	I.3.	L.4.8-9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.3.
No. 16.	H.1.	I.1.	L.3-4.9.12.	K.2.5.	C.2.3.5.8.10.12.13.	A.1-2.4.	G.2.4.
No. 17.	H.1.	I.3.	L.3-4.9.12.	K.1.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.1.4.
No. 18.	H.1.	I.3.	L.4.8-9.12.	K.2.5.	C.2.3.5.8.10.12.13.	A.1.3.	G.1.4.
No. 19.	H.1.	I.4.	L.4.9.12.	K.3.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.

HOG'S BACK, Guildford, 2.7.28.

The relatively small population analyzed for vegetative and floral characters was collected on a tall hedge-bank on the top ridge. The plants were scattered along about 200 yards. The soil was derived directly from the Chalk.

No. 1.	H.2.	I.4.	L.4.8-9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.2.3.
No. 2.	H.1.	I.1.	L.4.9.12.	K.3.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.4.
No. 3.	H.2.	I.1-2.	L.3.8.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.2.	G.2.4.
No. 4.	H.2.	I.2.	L.3.8.12.	K.3.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.
No. 5.	H.2.	I.3.	L.3.8.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.2.	G.1.3.
No. 6.	H.2.	I.1.	L.4.9.12.	K.3.5.	C.1.3.5.8.10.12.	A.1.3.	G.1.3.
No. 7.	H.1-2.	I.4.	L.3-4.8.12.	K.1.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 8.	H.2.	I.1.	L.3.8.12.	K.1.	C.1.3.5.8.10.12.	A.1.3.	G.1.4.
No. 9.	H.2.	I.4.	L.3-4. 8-9.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.1.3.
No. 10.	H.2.	I.2.	L.4.8.12.				
No. 11.	H.2.	I.2.	L.4.8-9.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.3.
No. 12.	H.2.	I.2-3.	L.4.9.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.1.4.	G.2.4.
No. 13.	H.2.	I.2.	L.4.9.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.1.3.	G.2.3.
No. 14.	H.2.	I.3.	L.3-4. 8-9.12.	K.2.5.	C.1.3.5.8.9.12.13.	A.1.3.	G.2.4.

In addition to the population analyzed for vegetative and floral characters three populations were sampled for fruits and seeds. The field details are:—

I. Nos. 1-50. On the slopes of the Hog's Back near Guildford. 50 samples were collected from as many plants of the thousands growing in an arable field left fallow. The area from which the 50 items were collected was 50 yards long and 7 yards wide. Within this area there were several hundreds of plants. The remainder of the field was not sampled.

II. Nos. 51-75. From a hedge bank near the highest point of the Hog's Back. 25 samples from as many plants out of a population of about 100. This was the bank from which the flowering specimens had been collected earlier in the year.

III. Nos. 76-100. From various fields and roadsides on the top of the Hog's Back.

The analyses gave the following totals :—

Nos. 1-50.

Capsules type I 17.

Capsules type II 13.

Capsules intermediate 20.

Seeds armadillo 4.

Seeds weak armadillo 5.

Seeds tubercled 34.

Seeds strongly tubercled 7.

Nos. 51-75.

Capsules type I 7.

Capsules type II 12.

Capsules intermediate 6.

Seeds armadillo 1.

Seeds weak armadillo 2.

Seeds tubercled 19.

Seeds strongly tubercled 3.

Nos. 76-100.

Capsules type I 5.

Capsules type II 10.

Capsules intermediate 10.

Seeds armadillo 2.

Seeds weak armadillo 3.

Seeds tubercled 18.

Seeds strongly tubercled 2.

Totals for the 100 items.

Capsules type I 29.

Capsules type II 35.

Capsules intermediate 36.

Seeds armadillo 7.

Seeds weak armadillo 10.

Seeds tubercled 71.

Seeds strongly tubercled 12.

N.E. OF ROMNEY STREET, Shoreham District, Kent, 19.6.28.

The interesting population, a sample of which is analyzed below, was growing on waste grassy land reserved as a building plot. *Silene vulgaris* was the dominant species on the plot.

No. 1.	H.2.	I.2.	L.2.7.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 2.	H.2.	I.2.	L.3.8.12.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	
No. 3.	H.2.	I.4.	L.3-4.8.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.2.4.
No. 4.	H.2.	I.2.	L.3.7.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.2.	G.2.4.
No. 5.	H.2.	I.1.	L.4.8.12.	K.2.5.	G.1.3.5.8.9.12.13.	A.1.3.	G.1.4.
No. 6.	H.1.	I.1.	L.4.9.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.2.	G.1.4.
No. 7.	H.1.	I.4.	L.3.8.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.2.	G.1.4.
No. 8.	H.2.	I.3.	L.4.8.11.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.3.
No. 9.	H.2.	I.4.	L.4.8.12.	K.2.5.	C.1.3.5.8.9.12.13.	A.1.3.	G.1.4.
No. 10.	H.2.	I.1.	L.3-4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.4.
No. 11.	H.1-2.	I.3.	L.4.8-9.12.	K.3.5.	C.2.4.5.8.9.12.13.	A.2.	G.2.
No. 12.	H.1-2.	I.4.	L.4.9.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.4.
No. 13.	H.1.	I.2.	L.4.9.12.	K.3.5.	C.1.4.5.8.10.12.13.	A.2.	G.1.4.
No. 14.	H.2.	I.4.	L.3.8.12.	K.2.5.	C.1.4.5.8.10.12.13.	A.2.	G.1.
No. 15.	H.1.	I.2.	L.4.9.12.	K.2.5-6.	C.1.3.5.8.9.12.14.	A.1.3.	G.1.4.
No. 16.	H.1.	I.4.	L.3-4. 8-9.12.	} K.1.5. C.1.3.5.8.9.12.13. A.1.3. G.1.			

BRADFELD, Berks, 9.7.29.

Two populations were examined. The first (examples Nos. 1 to 9) occurred on a rough piece of ground on the top of a rabbit warren in a hay-field, and the patch is usually avoided by the mowers. The sub-soil is gravel and the soil very shallow. The second population (examples 10 to 14) occurred on and around a disused gravel pit about 1½ miles from the hay-field. The second population was a small one.

In addition to the analyses in the following table different samples were scored for certain characters as follows :—

1. *Indumentum* : 100 plants. 20 hairy, 80 glabrous (the degree of pubescence not being scored).
2. *Colour of immature seeds* : 40 plants. 8 purplish, 32 white.
3. *Mature fruits and seeds*. Armadillo 4, weak armadillo 5, tubercled 44, strongly tubercled 5.
4. *Mature seeds* (another sample). Armadillo 5, weak armadillo 4, tubercled 52, strongly tubercled 5.

No. 1.	H.2.	I.3.	L.3.8.12.	K.1.5.	L.1.3.5.8.10.12.13.	A.1.4.	G.2.4.
No. 2.	H.2.	I.2-3.	L.3.8.12.	K.3.5.	L.1.4.5.8.10.12.13.	A.1.3.	G.1.3.
No. 3.	H.2.	I.1.	L.3-4.8.12.	K.1.5.	L.2.4.5.8.10.12.13.	A.1-2.3.	G.1.4.
No. 4.	H.2.	I.3.	L.3.8.12.	K.2.5.	L.1.3.5.8.10.12.13.	A.1.3.	G.1.3.
No. 5.	H.2.	I.1.	L.3.8.12.	K.1.5.	L.1.3.5.8.10.12.13.	A.1.3.	G.2.4.
No. 6.	H.1-2.	I.4.	L.3.8.12.	K.3.5.	L.2.4.5.8.10.12.13.	A.1.3.	G.2.4.
No. 7.	H.1-2.	I.4.	L.3.8.12.	K.1.5.	L.2.4.5.8.9.12.13.	A.1.3.	G.2.3.
No. 8.	H.1.	I.2-3.	L.4.9.12.	K.3.5.	L.1.4.5.8.10.12.13.	A.1.3.	G.1.4.
No. 9.	H.1-2.	I.4.	L.3.8.12.	K.2.5.	L.2.4.5.8.10.12.13.	A.1.3.	G.2.4.
No. 10.	H.1.	I.4.	L.2-3. 8-9.12.	} K.3.4. L.1.4.5.8.10.12.13. A.1.3. G.1.4.			
No. 11.	H.1.	I.4.	L.2.8.12.	K.2.5.	L.1.4.5.8.10.12.13.	A.1.4.	G.2.4.
No. 12.	H.1-2.	I.1-2.	L.3.8.12.	K.2.5.	L.2.4.5.8.10.12.13.	A.1.3.	G.1.4.
No. 13.	H.2.	I.4.	L.3.8.12.	K.2.5.	L.2.4.5.8.10.12.13.	A.2.	G.1.3.
No. 14.	H.2.	I.4.	L.3.8.12.	K.1.5.	L.2.4.5.8.10.12.13.	A.1.3.	G.1.4.

WINDSOR (Berks).

A population growing on alluvial soil amongst luxuriant grasses, on the sides of the towing path of the bank of the Thames near Old

Windsor, was examined on June 25, 1927. The population was much smaller than most of those recorded above, but showed a remarkable diversity in habit and leaf characters as follows:—

No. 1. Of not strict habit; stems up to 8 dm. long; leaves averaging 4 cm. long and 1 cm. broad, but up to 6.5 cm. long by 2.4 cm. broad.
No. 2. Verging towards a strict habit; stems up to 7 dm. long; leaves averaging 4 cm. long and 1.2 cm. broad, but up to 5.6 cm. long by 1.8 cm. broad.

No. 3. Of not strict habit; stems up to 7.5 dm. long; leaves averaging 4.5 cm. long and 1.2 cm. broad, but up to 6.3 cm. long by 1.5 cm. broad.

No. 4. Of not strict habit; stems up to 9 dm. long; leaves averaging 5.7 cm. long and 2.1 cm. broad, but up to 7.7 cm. long by 3.7 cm. broad. Noteworthy because of its broad ovate leaves.

No. 5. Of not strict habit; stems up to 5 dm. long; leaves averaging 3 cm. long and 8 mm. broad, but up to 4.3 cm. long and 1 cm. broad. Noteworthy for its markedly lanceolate leaves.

No. 6. Of definitely strict habit; stems up to 4 dm. long; leaves averaging 2.5 cm. long and 6 mm. broad, but up to 4.3 cm. long by 11 mm. broad.

No. 7. Of not strict habit; stems up to 8 dm. long; leaves averaging 6.3 cm. long and 1 cm. broad, but up to 8.6 cm. long by 1.3 cm. broad. This plant is unique in our experience by its long parallel-sided (linear) leaves.

The whole population was glabrous.

CHIPPERFIELD (HERTS.).

A series of five plants from the Chipperfield district of Hertfordshire was collected on June 10, 1928, in young flower. The specimens do not represent a sample of a unit population but are of interest because of the occurrence of a strict plant (No. 4) and of a hairy plant (No. 5). Nos. 1, 2, and 3 were from shady habitats and show the effects of shade in their weak, elongated stems and flaccid leaves.

No. 1.	H.2.	I.4.	L.3.8.13.	K.1.5.	C.1.4.5.8.10.12.13.	A.2.	G.1.
No. 2.	H.2.	I.4.	L.3.8.13.	K.2.5.	C.1.3.5.8.10.12.13.	A.2.	G.1.
No. 3.	H.2.	I.4.	L.2-3.8.13.	K.2.5.	C.1.3.5.8.10.12.13.	A.1.3.	G.1.
No. 4.	H.1.	I.4.	L.3-4.8.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.
No. 5.	H.1-2.	I.2.	L.4.8.12.	K.2.5.	C.2.4.5.8.10.12.13.	A.2.	G.1.

Summary and Conclusions.

1. Descriptions are given of stock-plants of *Silene vulgaris*, which have been used up to 1930 for breeding experiments. These descriptions alone indicate that a great range of characters and character-combinations occurs in nature.

2. The characters which have been found in the species as a whole, excluding mountain plants, are considered under the following headings:—roots, stems, indumentum, leaves (general, shape, size, margin, texture, and colour), inflorescence, flowers, calyx, corolla

(petal length, petal breadth, petal lobing, anthocyanin blotch), androecium (sex), gynaecium (stigmata colour, colour of immature seeds), fruits (carpophore, teeth, loculi), mature seeds (testa pattern, number of seeds per capsule).

3. It is shown that there are many different characters exhibited by the various organs within the one species. Moreover these occur in numerous combinations, and, at present, we have no reason for supposing that any theoretically possible combination does not occur in nature.

4. As for *S. maritima* so for *S. vulgaris* a scheme involving the use of letter and figure symbols has been prepared, and used with considerable advantages, for scoring character-combinations in wild populations.

5. An account of wild populations growing near All Cannings Farm (Wilts), Potterne (Wilts), Barton Stacey (Hants), Guildford (Surrey), Shoreham (Kent), Bradfield (Berks), Windsor (Berks), and Chipperfield (Herts) is given.

XX.—THE CASUARINA DISTYLA COMPLEX.

E. D. MACKLIN.

Historical.

For the past fifty years there has been a great deal of confusion among the shrubby species of the genus *Casuarina* occurring in Australia. Recently* it was found that there were seven species, widely distributed through the Continent, grouped under the name of *C. distyla* Vent.

The origin of this confusion can be traced to the later work of Miquel, whose earlier valuable revision of the Casuarinast† was the first authentic account of the then known species. Before the publication of this revision Miquel had examined the specimens contained in Sir William Hooker's vast collection and all the plants growing at that time in the Berlin Gardens. In this work he described, in most cases minutely, and illustrated some thirty species, including *C. Baxteriana*. It is noteworthy that he recognised in Gunn's No. 735 from Tasmania two species, one of which he considered *C. distyla* Vent. and the other he described and named *C. rigida*. Unfortunately his *C. rigida* is synonymous with the *C. distyla* of Ventenat, whilst his *C. distyla* is a new species, *C. paradoxa* E. D. Macklin (q.v. p. 150). In 1859 he described *C. Muellieriana* which had been collected by Mueller in the Mount Lofty Ranges (S. Australia) in 1850. Later‡ he placed *C. Muellieriana* and *C. Baxteriana* as varieties of *C. suberosa* Otto et Dietr. with which they show close affinity. Mueller, Bentham and other botanists of that time, however, regarded them both as being *C. distyla* Vent. In

* Macklin, E. D., "A Revision of the 'Distyla Complex' of the Genus *Casuarina*." Trans. Roy. Soc. S. Australia, li. 257-286 (1927).

† Revisio Critica Casuarinarum, Verh. Akad. Amst. l. xiii (1848).

‡ Flora No. 2, January 1865, p. 24; DC. Prodr. xvi. pt. 2 (1864-1868).

1865, with more specimens available, Miquel again changed his views. He grouped his *C. rigida* and *C. Fraseriana*, forms previously considered by him to be distinct, under the name of *C. distyla* Vent. However he also became firmly convinced that the *C. stricta* of Aiton (1789) was synonymous with *C. distyla* Vent. (1803). This error was corrected by Bentham in 1873* and has been recently verified by the writer.

In 1868 Mueller† published a description of *C. distyla* Vent., under the name of *C. stricta* Ait., widened to embrace all the closely related forms that he had collected but apparently never distinguished. Bentham adopted Mueller's wider definition, regarding *C. rigida* Miq., *C. Baxteriana* Miq. and *C. Muelleriana* Miq. as synonyms of *C. distyla* Vent., but unlike Mueller he retained the latter name. It is to these all-embracing descriptions that one can trace the confusion existing in the Commonwealth to-day in the "*Distyla complex*," for each State claims to have *C. distyla* Vent., and in most of them a different species is represented.

Specific Characteristics.

There are certain reliable characteristics which are constant throughout any given species. The following are the most important vegetative features: the angularity of the ridges, the size and nature of the sheathing teeth in each whorl, and the length of the internodes. As regards the cones of the species dealt with in this paper, only the presence or absence of the dorsal protuberance of the valves and the degree of protrusion of the latter are worth consideration.

The greatest assistance to taxonomic work in the Casuarinas is to be gleaned from the male inflorescence. The average length of the male spike and the colour of the anthers are useful, while the arrangement of the sheaths on the axis, whether they are overlapping, merely touching, or moniliform, is a relatively constant feature. The condition of the male flower when mature has been found to be a very valuable aid to taxonomic work in the genus. The bracteoles may be retained in the open flower as in *C. lepidophloia* F. Muell. (recently found by the writer to be synonymous with the previously named *C. cristata* of Miquel), *C. distyla* Vent. (*C. rigida* Miq.), *C. paludosa* var. *robusta* Macklin, *C. paradoxa* Macklin n. sp., vide p. 150), *C. Muelleriana* Miq. and *C. Baxteriana* Miq. In fewer cases they are shed, leaving the mature flower consisting of one stamen and its sheathing bract, e.g. *C. stricta*, *C. Luehmanni* and *C. striata*. In *C. stricta* the two bracteoles are woody and cohere along the upper abaxial margin by means of branching hairs. The relative size of the persistent bracteoles to the sheathing-teeth also appears to be constant and can therefore rank among the more specific characteristics in the genus.

* Flora Austral. vi. 192-202.

† Frag. Phytog. Austr. vi. 19 (1867-1868).

The anatomical structure of the branchlets has been found to be of valuable help in some cases to taxonomic work in the genus. An account of the anatomy of the South Australian species has recently been published by the writer* and details of the anatomy may be found there. The feature that has been found most useful for the diagnosis of species is the distribution of lignification in the stem and above the cauline bundles. The various types which are illustrated in the diagrams on p. 281 of the work cited above.

Key to the Species of the "Distyla Complex."

- Characters of the group:—Branchlets simple, ascending; sheathing teeth 5-9; cone valves scarcely prominent; valves with a conspicuous dorsal protuberance.
- Bracteoles of male flowers deciduous; internodes 1-2 cm. long; male spikes 2-3 cm. long, cylindrical; anthers golden brown; tall spiky shrub; southern species.....*C. striata* 1.
- Bracteoles of male flowers persistent:
- Internodes usually 1 to 1.8 cm. long; branchlets robust; male spikes up to 8 cm., robust, moniliform; anthers yellow; tall shrub with angular branchlets; eastern species...*C. distyla* 2.
- Internodes 1 cm. or under; branchlets less robust; male spikes less than 6 cm. in length:
- Branchlets terete; cones under 2 cm. long; male spikes not moniliform; small shrubs:
- Sheathing teeth 6-8, narrow-lanceolate, long; bracteoles of male flowers not exerted:
- Slender shrub; male spikes about 2 cm. long, almost imbricate; branchlets heptagonal-terete; grooves frequently hairy; teeth not ciliolate; eastern species...*C. paludosa* 3.
- More robust, spiky shrub; male spikes up to 6 cm. long, robust; branchlets cylindrical; grooves not hairy; teeth ciliolate; southern species.....*C. paludosa* var. *robusta* 3a.
- Sheathing teeth 5-7, ovate-lanceolate, short; bracteoles of male flowers exerted; male spikes 2-3 cm. long, slender; anthers rust-coloured; low cushion-like shrub; southern species.....*C. pusilla* 4.
- Branchlets angular; cones larger; male spikes moniliform; taller shrubs:
- Sheathing teeth 6-8, usually 7, ovate-lanceolate, overlapping, slightly recurved, brown and scarious at the tips; branchlets slender; male spikes 2-3 cm. long; bracteoles of male flowers scarcely exerted; anthers reddish-brown; cones narrow-cylindrical; eastern species.....*C. paradoxa* 5.

* Macklin, l.c. 277-284.

Sheathing teeth triangular, adpressed, convex on back, pale straw-coloured or vermillion tipped; branchlets more robust; male spikes more remote:

Sheathing teeth 5-8, usually 7; male spikes 2-3 cm. long; bracteoles exserted; anthers golden-brown; cones narrow-cylindrical, finely featured; seeds small; western species.....*C. Baxteriana* 6.

Sheathing teeth 5-7, usually 6; male spikes up to 5.5 cm. long; bracteoles more exserted; anthers red; cones more globular, large, coarsely featured; seeds large; southern and south-eastern species...*C. Muellieriana* 7.

Enumeration of Species.

i. *Casuarina striata* Macklin in Trans. Roy. Soc. S. Austral. li. 267 (1927).

SOUTH AUSTRALIA. Mount Lofty Ranges: Belair, *E. D. Macklin* 035 (♂) and 036 (♀) (type in Tate Herb., Adelaide, co-types in Kew, Sydney, Melbourne, and Brisbane Herbaria); Blackwood, 1913, *T. G. B. Osborn* 053 (Tate Herb.); Aldgate, 1907, *J. H. Maiden* (Herb. Kew.); Echunga, *E. D. Macklin* 054 (Tate Herb.); Happy Valley and between Clarendon and McLaren Vale, *J. B. Cleland* (Herb. Cleland); Sturt Creek (1849) and Port Adelaide, *Blandowski* (Natl. Herb. Victoria); Mount Compass, *E. D. Macklin* 057 (Tate Herb.); Myponga, *J. B. Cleland* 043 (Tate Herb.); Encounter Bay, *E. D. Macklin* 058 (Tate Herb.); Ashbourne, *J. B. Cleland* (Herb. Cleland). Kangaroo Island, Dudley Peninsula, 1883 (Tate Herb.). *Flowering Season*: June to December.

A very variable shrub, dioecious or monoecious, usually fastigate and spiky, sometimes divaricate. Frequently it assumes the form of a small tree.

2. *Casuarina distyla* Ventenat in Jard. Cels. t. 62 (1803).—*C. rigida* Miq. Rev. Cas. 61, t. vii D (1848); et in DC. Prodr. xvi. sect. 2. 337 (1868); Macklin in Trans. Roy. Soc. S. Austral. li. 269 (1927).

TASMANIA. 1803, *Ventenat*, type! (Herb. Geneva); Georgetown, 1842, *Gunn* 735 (syntype of *C. rigida* Miq.); Lake St. Clair, 1845, *Gunn* 735 (Herb. Kew.); Hobart, 1840, *Gunn* 735 (Herb. Mus. Brit.); Hobart, *Hooker* (Herb. Kew.); Hobart, 1819, *A. Cunningham* 90 (Herb. Kew.); Browne's R., *Oldfield* (Herb. Kew.); St. Paul's R., *Archer* (Herb. Kew.); Cradle Mts., 1925 (♂ & ♀) *G. Weindorfer* (Herb. Kew.); Flinders' Isd., Grass Tree Plain, 1844, *J. Milligan* (Herb. Mus. Brit.); Flinders' Isd., 1912, *J. B. Cleland* (Herb. Adel.). QUEENSLAND. Moreton Bay, *Fraser* (syntype of *C. rigida* Miq.) (Herb. Kew.). NEW SOUTH WALES. Pt. Jackson, *R. Brown* 3130 (Herb. Kew. & Herb. Mus. Brit.), *Mueller* (Herb. Kew.), and 1897 (♀) (Herb. Adel.); Sydney, *J. D. Hooker* (Herb. Kew.), 1822, *Sieber* 326 (Herb. Kew.), 1835, *J. Backhouse* 317 (Herb. Mus. Brit.), *Stephenson* 371 (♀) (Herb. Kew.), 1909, *J. B. Cleland* (Herb. Adel.); Sydney Heads, 1862,

R. T. Lowne (Herb. Kew.); Botany Bay, *Sinclair* 780 (Herb. Kew.), 1799-1810, *C. Caley* (Herb. Mus. Brit.), *J. D. Hooker* (Herb. Kew.), 1906, *L. Boorman* (Natl. Herb. N.S.W.); Bondi Bay, 1912, *J. E. Tilden* 558 (Herb. Kew. & Herb. Mus. Brit.); Jervis Bay, (Natl. Herb. N.S.W.); Bowen Isd. (Jervis Bay), 1925 (♀), *F. A. Rodway* (Herb. Kew.); Castlereagh R., 1883, *I. Lamont* 22 (Herb. Mus. Brit.); Blue Mts., Katoomba, 1914, *A. B. Rendle* (Herb. Mus. Brit.); Echo Pt., *E. D. Macklin* 045 (Herb. Kew. & Herb. Adel.); 1770, *Banks and Solander* (Herb. Mus. Brit.); 1840, *Armstrong* (Herb. Mus. Brit.); *Sieber* 330 (Herb. Mus. Brit.). WESTERN AUSTRALIA. Swan R., *Drummond* (Herb. Kew.), ♀ cones only, thus scarcely constituting an authentic record. No LOCALITY, *R. Brown* 3134 (Herb. Kew.).

3. *Casuarina paludosa* Sieb. in Spreng. Syst. iii. 803 (1826); Miq. Rev. Cas. 64, t. 8 B (1848); Miq. in DC. Prodr. xvi. sect. 2. 338 (1868).—*C. pumila* Otto et Dietr. in Allg. Gartenz. 1841, 163; Miq. Rev. Cas. 66, t. 8 C (1848). *C. dumosa* A. Cunn. Herb. *C. distyla*, var. *paludosa* Benth. Fl. Austral. vi. 199 (1873).

NEW SOUTH WALES. Port Jackson to the Blue Mountains, *Sieber* 329; Twofold Bay, *A. Cunningham* (both in Herb. Kew.).

3a. Var. *robusta* Macklin in Trans. Roy. Soc. S. Austral. li. 271 (1927).

SOUTH AUSTRALIA. Upper Hindmarsh Valley, *E. D. Macklin* 013 (♂) and 014 (♀) (type specimens in Tate Herb. Adelaide, co-types in Kew, Sydney, Melbourne and Brisbane Herbaria); Mount Compass, *E. D. Macklin* 006 (Herb. Adel.); Kuitpo, *M. R. Jacobs* 008 (Herb. Adel.); Myponga, *J. B. Cleland* (Herb. Cleland); Keith, *J. M. Black* (Herb. Black); Wirrega, *T. G. B. Osborn* 050 (Herb. Adel.); Furner, *T. B. Paltridge* 010 (Herb. Adel.).

Usually occurring on stiff clay soils with little or no depth of sand.

Flowering Season:—January to August.

4. *Casuarina pusilla* Macklin in Trans. Roy. Soc. S. Austral. li. 272 (1927).

SOUTH AUSTRALIA. Encounter Bay, *E. D. Macklin* 021 (♂) and 020 (♀) (type specimens in Tate Herb. Adelaide, co-types in Kew, Sydney, Melbourne and Brisbane Herbaria); Macclesfield to Strathabyn, *J. M. Black* (Herb. Black); Port Elliot, *J. B. Cleland* 015 (Herb. Adel.); Nuriootpa, *Tepper* (Herb. Tepper); Wirrega, 1916, *T. G. B. Osborn* 051 (Herb. Adel.); Keith, South of Lamaroo and Paringa, *J. M. Black* (Herb. Black); South East, *F. J. Paltridge* 017 (Herb. Adel.); Monarto South, *J. B. Cleland* (Herb. Cleland). VICTORIA. N.W. Desert, *Lorton* (Natl. Herb. Vict.); Pt. Lonsdale, 1912, *J. Tilden* (Herb. Mus. Brit.).

Flowering Season:—Not definitely known; flowers have been collected in January and from May to August.

5. *Casuarina paradoxa* Macklin, n. sp.—*C. distyla* Miq. Rev. Cas. 57, t. vii A-C (1848); Macklin in Trans. Roy. Soc. S. Austral. li. 274 (1927); non Vent.

As the type specimen of *C. distyla* Vent. was not available in Australia at the time the previous work* was done full reliance had necessarily to be placed on Miquel's description for the determination of that species. Since then the writer has examined the type of *C. distyla* Vent. and finds that *C. rigida* Miq. is synonymous with it. The species described in the previous paper under the name of *C. distyla* Vent. (also that described by Miquel on p. 57 of his revision) is a new species of which a latin description and full records will shortly be published, probably in the Transactions of the Royal Society of South Australia.

6. *Casuarina Baxteriana* Miquel, Rev. Cas. 37, t. iii C (1848).—*C. suberosa* Otto et Dietr., var. *Baxteriana* Miq. in DC. Prodr. xvi. sect. 2. 338 (1868). As *C. Baxteriana* was not included in the previous paper a description is here given.

A slender upright shrub, monoecious or dioecious. Branches reddish-brown, striate with adnate leaves; branchlets simple, erect, dense, strict, whorled and frequently unilaterally placed, fairly robust, but more slender in male plants, distinctly angular, usually short but may reach 13 cm. in length; internodes 3–7 mm., usually under 5 mm. long, about 1 mm. in diam. Sheathing teeth 5 to 8, usually 7, long, narrow-triangular, adpressed, margins hyaline, ciliate when young but merely lacerate in mature teeth, convex on the back; sheaths and teeth pale straw-coloured; teeth of branches longer and sometimes recurved, truncate in age. Male spikes up to 3 cm. in length, sheaths remote, leaving small portions of the axis bare; bracteoles persistent, as long as or slightly longer than the sheathing teeth; anthers golden-brown. Cones borne in whorls or singly upon the old wood, subsessile or on a peduncle of 0.5 cm. in length; cones up to 3 cm. long, frequently shorter, 1 to 1.5 cm. in diam., narrowly cylindrical, usually obtuse, but sometimes conical or beaked and partly sterile; valves broadly elliptical, scarcely prominent, dorsal protuberance present, bluntly pyramidal; bracts large, broadly ovate-acuminate, light in colour. Cones when well formed are very regular and finely featured; seeds very small and dark coloured.

WESTERN AUSTRALIA. King George's Sound, 1892-3, Veitch (Herb. Kew.); Claremont, Lower Swan R., A. Morrison (Herb. Kew.); Between Perth and King George's Sound, 1854 (♂ & ♀), W. H. Harvey (Herb. Kew.); Hills near Albany, 1902 (♀), C. Andrews 862 (Herb. Mus. Brit.); Westbourne, Dwalganup (♀), 1915, C. B. Carter 32 a (Herb. Kew.); S. W. Plantagenet, 1901, Pritzel 238 (♀) & 239 (♂) (Herb. Kew.); Kalgan R. (♀), Oldfield 137 (Herb. Kew.); Pemberton, F. J. Paltridge 060 & 064 (monoecious) (Herb. Adel.); 1845, Drummond 232 (♂) (Herb. Kew.).

* Loc. cit.

Flowering Season :—unknown.

* *C. Baxteriana* Miq. (1848) has for many years been known as *C. distyla* Vent. However, apart from differences in the sheathing teeth, male spikes and anatomical structure these two species are widely separable geographically, *C. distyla* being, so far as is known at the present time, an eastern species and *C. Baxteriana* confined to the West, neither occurring in the intervening state, South Australia. More closely related to *C. Baxteriana* is *C. Muellieriana*, which occurs in South Australia and in the west of Victoria. These are also readily distinguished morphologically and indeed the anatomy of each is sufficiently distinct to warrant them being recognised as definite species.

7. *Casuarina Muellieriana* Miq. in Ned. Kruidk. Arch. iv. 99 (1856).—*C. suberosa* Otto et Dietr., var. *Muelleriana* Miq. in DC. Prodr. xvi. sect. 2. 338 (1868).

SOUTH AUSTRALIA. Mount Lofty Range, 1850, Mueller (Natl. Herb. Vict.); Hills above Magill, 1885 (Herb. Kew.); Belair, 1902, Koch 866 (Herb. Kew.), E. D. Macklin 032 (♀ and ♂) (Herb. Kew. & Herb. Adel.); between Aldgate and Mylor, E. D. Macklin 027 (♀) (Herb. Adel.); Mount Torrens, E. D. Macklin 024 (♂) (Herb. Macklin) (type locality); between Hallett's Cove and Noarlunga, Mount Compass to Encounter Bay, Ashbourne, Coonalpyn, all J. B. Cleland (Herb. Cleland); Streaky Bay, Tepper (Herb. Tepper); Ardrossan, Tepper (Herb. Adel.); Port Lincoln, J. B. Cleland (Herb. Cleland); 40 miles north of Point Bell, Tepper (Herb. Adel.); Wilpena Pound, B. B. Beck (F. N. S. Herb. Adel.); Kangaroo Isd., J. B. Cleland (Herb. Cleland). VICTORIA. Mount Abrupt, H. B. Williamson; Borung, 1904, F. M. Reader (Natl. Herb. Vict.); Glenelg R., Robertson (Herb. Kew.).

Flowering Season : May to October.

XXI.—THE "AERENCHYMA" OF SESBANIA AND NEPTUNIA. C. R. METCALFE.

* An examination has been made in the Jodrell Laboratory of some material sent to Kew in July, 1930, by Miss E. R. Napier, of the Coryndon Memorial Museum, Nairobi. The substance was stated to have been found growing on the stem bases and roots of an aquatic species of *Sesbania*. In appearance it superficially resembled a resupinate Basidiomycete of a somewhat spongy consistency, but under the microscope it could be seen that it was not fungoid in origin. Before its structure was at all clear it was found necessary to heat sections in 10 per cent. caustic soda solution, when it became apparent that it was made up of very loosely arranged, slightly elongated, parenchymatous cells with abundant air spaces between them, the whole structure resembling a sponge. A tissue very similar in structure was first described on the roots of *Sesbania*

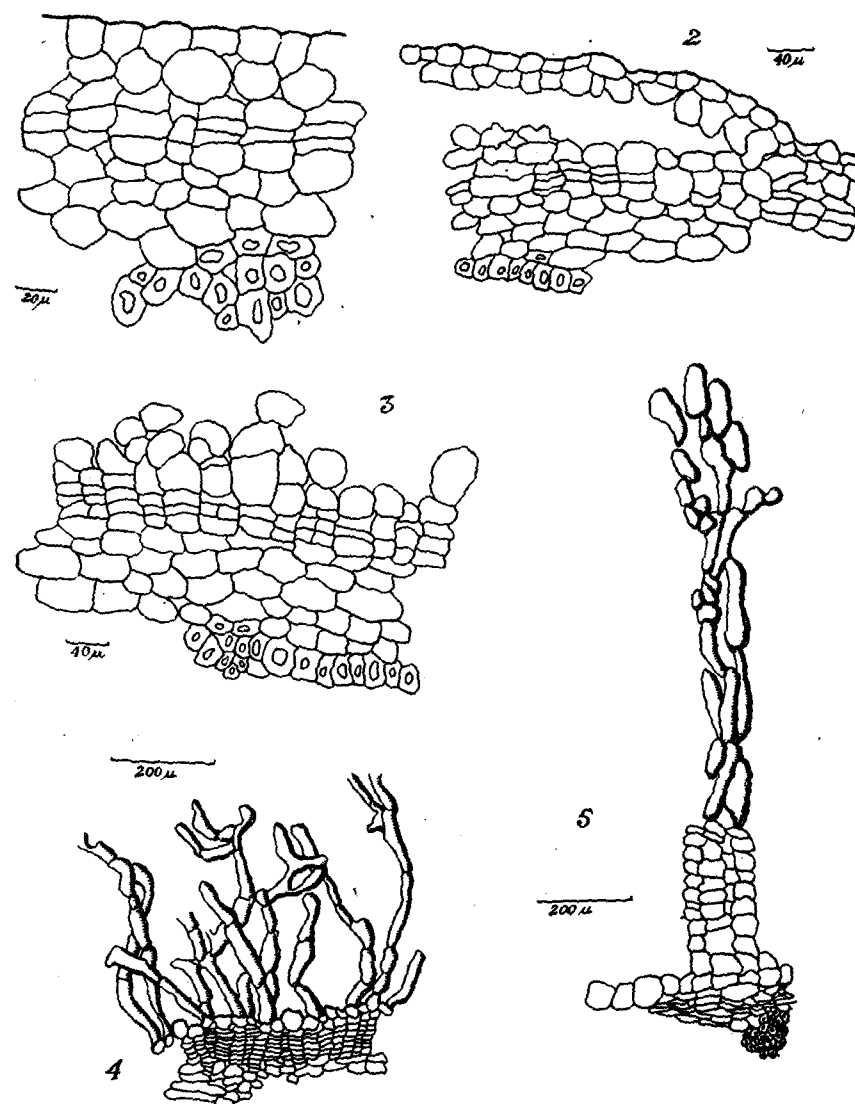
aculeata by Scott and Wager (1) in 1888, who regarded it as a floating tissue which served to facilitate respiration in the roots when these were growing in waterlogged conditions. These authors concluded that the tissue was homologous with cork, having traced its origin to the activity of a phellogen which arose immediately outside the endodermis in the roots. It differs from true cork, however, in having cellulose walls and in retaining the living cell contents.

In a more comprehensive investigation in 1889 Schenk (2) described similar tissues homologous with cork in several different families, including the species *Sesbania aculeata* and *S. marginata*. Since then the aerenchyma in this genus has received little attention. It is to Schenk that the term "aerenchyma" is due.

It has been very difficult to obtain any evidence concerning the mode of origin of the tissue in question, since the first material received was already detached from the plant on which it had been growing. In December, 1930, further supplies of *Sesbania aculeata*, and also an unidentified species of the same genus, were received from Miss Napier. This material was unsatisfactory because a great deal of the aerenchyma had already become detached, as it always does when it is old. However, it was found possible to corroborate the conclusions of Scott and Wager, and of Schenk, that the tissue arises as a secondary development from a phellogen situated in the cortex not far outside the endodermis. Between the spongy tissue and the phellogen there are formed radially arranged rows of cells. The general arrangement of the tissues is shown in Fig. 5, which must be regarded as partly diagrammatic since it has been reconstructed from two separate lots of material. In this figure a group of fibres is shown in the phloem.

Amongst other plants in which aerenchyma has been described is *Neptunia oleracea*. It was first noted on this plant by Humboldt and Bonpland (3) who, however, mistook the spongy tissue present on the submerged internodes of the stems for a foreign body. It was not until later observations were made by Rosanoff (4) in 1871, that the aerenchyma was recognised as a secondarily developed tissue arising from a phellogen at a short distance within the epidermis. These researches were noted by Arber (5) but otherwise the aerenchyma of this plant does not appear to have received any further attention. The present writer was enabled in December, 1930, to reinvestigate the formation of the aerenchyma, thanks to a supply of living *Neptunia oleracea* being obtained from the Oxford Botanic Garden.

The origin and development of the aerenchyma of *Neptunia oleracea* is illustrated in figs. 1-4. In the first of these it can be seen that certain cells a few layers within the epidermis are dividing and cutting off new cells towards the outside. Owing to the pressure set up by this growth the epidermis becomes ruptured (fig. 2) and the parenchymatous cells formed by the activity of the phellogen become exposed to the surface (fig. 3). The cells become separated



Neptunia oleracea, origin and development of aerenchyma. 1, Division of cells below the epidermis. 2, Rupture of the epidermis. 3, Exposure of parenchyma. 4, Separation and elongation of cells to form the aerenchyma. 5, Aerenchyma of *Sesbania* sp.

from one another and elongated in shape and the abundant spaces between them are filled with air. The mature aerenchyma is made up of these cells, which retain their cellulose walls and living contents (fig. 4).

From the manner in which the aerenchyma arises in these plants it is clear that the tissue is homologous with cork, since it arises from a phellogen in the same way as does true cork. Similar tissue arising in the same way is well known in *Jussiaea* spp. and other unrelated genera. It is of interest, however, that amongst the Leguminosae (to which *Sesbania* and *Neptunia* both belong) a similar tissue is sometimes formed by the normal cambium in plants growing in aquatic conditions. This is especially well seen in species of *Aeschynomene* where a pith-like tissue is produced in the place of the normal xylem of typical land plants.

Concerning the function of aerenchyma two main views have been put forward. One of these regards the aerenchyma as a development to facilitate the respiration of roots growing under waterlogged conditions, whilst the other looks upon the tissue as being of primary importance as "floating-tissue." In the author's opinion, however, it is probably safer to agree with Arber that "the formation of the secondary air-tissues is directly induced by environmental conditions and that their serving any purpose is to be regarded as quite fortuitous."

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3. Humboldt and Bonpland. Plantae Aequinoctiales, p. 56, Paris, 1808.
4. Rosanoff, S. Ueber das Bau der Schwimmorgane von *Desmanthus natus* Willd. Bot. Zeit. Jahrg. 1871, pp. 829-838, 1 plate.
5. Arber, A. A. Water Plants. Cambridge, 1920.

XXII.—PALMSTRUCKIA OF THE FLORA CAPENSIS. C. A. SMITH.

Under International Rules the name *Palmstruckia*, assigned by Sonder (Harv. & Sond. Fl. Cap. i. 35: 1859-60) to a monotypic South African genus of *Cruciferae*, is invalidated by the much older *Palmstruckia* Retz. (Obs. Bot. Pugill. 15: 1810), given to a Scrophulariaceous genus [= *Sutera* Roth (1807)], both names commemorating J. W. Palmstruck, the then editor of *Svensk Botanik*. Thus Sonder (loc. cit.) states "*Palmstruckia*, M. C. Retz. Obs. Bot. 1810 = *Chaenostoma* Benth. [= *Sutera* Roth], a name now universally adopted, and which it seems undesirable to alter. The genus now proposed [i.e. *Palmstruckia* Sond.] will equally preserve Palmstruck's name to a Cape plant." The new genus and species, *Palmstruckia capensis* Sond., was established by him on a specimen collected by Thunberg, probably on the Roggeveld mountains between the 16th

and 18th November, 1774 ("Here the country was called the Lowermost [= Ondersté] Roggeveld. . . ." Thunb. Trav. ii. 168), near the southern limits of the present Calvinia Division. This plant had apparently been confused by Thunberg (Fl. Cap. ed. Schult. 490: 1823) with *Peltaria capensis* Linn. f. (Suppl. 296: 1781), i.e. *Heliophila capensis* (Linn. f.) C. A. Sm., comb. nov. [= *Heliophila Peltaria* DC. Syst. ii. 685 (1821); Sond. in Harv. & Sond. Fl. Cap. i. 43 (1859-60)], which according to Sond. (loc. cit. 43) is conspecific with the plant Thunberg (loc. cit. 491) had described as *Lunaria pinnata* Thunb., a strange confusion, since the younger Linnaeus and Thunberg must have described from the same types.

Palmstruckia capensis seems to have been missed by all collectors subsequent to Thunberg for more than a century until 1883, when, in September of that year, Harry Bolus rediscovered this interesting little plant in abundance "in lapidosis, Kasteelpoort, prope Klipfontein, in montibus Kaus," about 56 miles east of Port Nolloth in Little Namaqualand (Bolus 6502!). At that time Bolus regarded the plant as a species of *Heliophila*, which it closely resembles, and it was not until October 1885 that Mr. N. E. Brown at Kew confirmed the specific identity of Bolus' specimens with the type of *Palmstruckia capensis* Sond. from Thunberg's Herbarium at Upsala. Besides rediscovering the species in a new locality, and so considerably extending the known range, Bolus was able to amplify Thunberg's and Sonder's descriptions in several important details, the emended description of the species with a short note appearing in the Journal of the Linnean Society, vol. xxiv, p. 171 (1887). Thus for the first time details of the flower structure (Thunberg's specimen being in the fruiting stage) and the foliage leaves were made available. Thunberg's description of the leaves as "filiform," noted by Sonder, applies, according to a ms. note by Mr. Brown, to the foliaceous bracts subtending the inflorescence branches, the specimen being without leaves.

It should, however, be pointed out at this stage that, while there appears to be no reason to doubt the conspecificity of the Bolus and Thunberg specimens, satisfactory confirmation can only be obtained by gathering the species in the "locus classicus" and comparing these specimens with the Bolus material.

Since it has been shown that Sonder's generic name cannot be retained under International Rules, the genus must receive a new name, for which the following, with details of synonymy, is proposed:

***Thlaspeocarpa* C. A. Sm., nom. nov.**

Palmstruckia Sond. in Harv. & Sond. Fl. Cap. i. 35 (1859-60); Benth. & Hook. f. Gen. Pl. i. 138 (1862); Harv. Gen. S. Afr. Pl. ed. 2. 10 (1868); Prantl in Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 2, 158 (1891); Marloth, Fl. S. Afr. i. 242 (1913); Thonn. Fl. Pl. Afr. 220 (1915); Phill. Gen. S. Afr. Pl. 272 (1926); non Retz. (1810).

Peltaria Thunb. Fl. Cap. ed. Schult. 490 (1823), non Linn. (1753).

T. capensis (Sond.) C. A. Sm., comb. nov.

Peltaria capensis Thunb. Fl. Cap. ed. Schult. 490 (1823); non Linn. f. (1781).

Palmstruckia capensis Sond. in Harv. & Sond. Fl. Cap. i. 35 (1859-60); Bolus in Journ. Linn. Soc. xxiv. 171 (1887).

CALVINIA DIV.: In the Onderste Bokkeveld, in the vicinity of the Roggeveld Mountains, Nov. 1774, *Thunberg* (type in Herb. Thunb.).

LITTLE NAMAQUALAND: In stony mountainous places at Kasteelpoort, near Klipfontein, 1060 m., Sept. 1883, *Bolus* 6502! and in the same locality, 900 m., Aug. 1886, *Bolus* in Herb. Norm. Austro-Afr. 1102!

XXIII.—A RAINING OR WEEPING TREE IN AUSTRALIA. W. D. FRANCIS.

In the "Brisbane Courier" of 8th November the existence of a "raining" tree in Queensland is reported. Specimens of the tree were sent to Mr. C. T. White, the State Government Botanist, who identified them as belonging to *Glochidion Ferdinandi* of the family Euphorbiaceae. It was suggested by Mr. White that the moisture deposited from the tree might be due to insects. In a subsequent issue of the "Brisbane Courier" appears a statement from Mr. Longman, Director of the Queensland Museum. Mr. Longman remarks that the surmise of the Government Botanist that the moisture is due to insect associations is entirely correct. Mr. H. Hacker, Entomologist of the Queensland Museum, investigated the matter and found that the liquid was derived from the larvae of homopterous insects belonging to the family Cercopidae. The insects of this family, according to Mr. Hacker, are sometimes called frog-hoppers or spittle insects. It appears that the larvae suck the sap of the tree and excrete it in the form of froth. After losing some of its included gases the froth falls from the tree as a clear liquid.

Some years ago the present writer experienced the rain-like effect of the moisture released from *Glochidion Ferdinandi*. The tree was growing on the banks of the Dams Creek, One Tree Hill, near Brisbane. The falling droplets of moisture undoubtedly give one the impression of very fine rain. On returning to the Botanic Gardens, Brisbane, I informed Mr. Bick, the Director, and gave him the name of the tree. It transpired that one of his correspondents a few days previously had noticed moisture falling from a tree and had enquired as to its identity.

Glochidion Ferdinandi is a very common species in the coastal portion of Eastern Australia, where it ranges from Southern Illawarra (South of Sydney) in New South Wales to the Gulf of Carpentaria in Northern Australia. The tree is mostly found in Eucalyptus forests in damp situations and in luxuriant rain forests. It usually

attains about 50 feet in height and develops a large, sive head of foliage even in rain forests. Occasionally, however, as in the rain forests of the Eungella Range to the West of Mackay it assumes the typical rain-forest habit which is characterized by a tall, slender bole and a small head of foliage.

XXIV.—MISCELLANEOUS NOTES.

MR. R. A. DYER, M.Sc., has succeeded Mr. C. A. Smith, B.Sc., as representative of the Division of Plant Industry, Department of Agriculture, Union of South Africa, at the Herbarium, Royal Botanic Gardens, Kew.

IGNATZ URBAN.—The death, on January 7, 1931, of Dr. Ignatz Urban, on his eighty-third birthday, removes an outstanding figure in Systematic Botany. Born at Warburg, Westphalia, in 1848, Urban studied Botany at the University of Berlin under Braun and Ascherson, and after a break in his studies due to the Franco-Prussian war, took his Ph.D. in 1873, with a thesis on germination, flower- and fruit-formation in the genus *Medicago*. After a few years as a schoolmaster at Lichterfelde b. Berlin he was appointed First Assistant in the old Botanic Garden at Gross-Lichterfelde, becoming successively Custos, Unterdirektor and Zweiter Direktor of the Botanic Garden and Museum, and took a considerable share in the planning of the new establishment at Dahlem.

Urban's interests were by no means confined to taxonomy, but he soon began to devote himself especially to the flora of tropical America, becoming editor of the monumental Martius' *Flora Brasiliensis* on Eichler's death in 1891. From 1893 onwards he paid special attention to the flora of the West Indies, on which he became an authority of world-wide reputation. During the thirty years, 1898-1928, he issued, under the title "*Symbolae Antillanae*," nine volumes containing researches, by himself and other workers, on West Indian plants, two of them being floras of Porto Rico and Santo Domingo respectively.

Unlike some taxonomists, Urban clearly appreciated the importance of the history of botany, his most important contribution in this field being an account of Plumier's Life and Writings (*Fedde, Repert., Beih. v.*, 1920).

It is impossible, within the limits of this notice, to give even a brief outline of Urban's contributions to botany. Here it must suffice to mention his Monographs of Turneraceae (1883) and Loasaceae (1900), and to refer the reader to the Royal Society's Catalogue of Scientific Papers and other bibliographical works, for lists of his papers. His published work was polished and scholarly, and accompanied by full bibliographical references.

CARL HANSEN OSTENFELD.—With great regret we have to record the death of Prof. C. H. Ostenfeld, Professor at the University and Director of the Botanic Gardens of Copenhagen.

Prof. Ostenfeld had a wide range of interests and published many papers on taxonomy, geographical distribution, phytoplankton, marine spermatophytes, cytology and genetics. He is best known for his work on arctic and subarctic plant-life, and his studies on the botany of the Faeröer and Greenland are models of their kind. Professor Ostenfeld travelled extensively and frequently visited Kew. He was personally known to a wide circle of British botanists whom he met at the meetings of the British Association for the Advancement of Science, both in England and overseas. In 1927 he accepted the invitation of the Royal Horticultural Society to deliver the Masters Memorial Lectures in London and took for his subject "The present state of knowledge of hybrids between species of flowering plants." The Linnean Society of London recognised his merits by electing him a Foreign Member in 1929. At the Fifth International Botanical Congress, held at Cambridge in 1930, he represented the Government of Denmark, the Royal Danish Academy of Sciences and Letters, and the University of Copenhagen, and he contributed a paper on the genus *Larix* to the Section for Taxonomy and Nomenclature. On the taxonomy of northern genera and species he was an acknowledged authority. His loss will be felt by many to whom he had endeared himself by the sympathetic consideration which he showed to all who sought his valued assistance.

THORE C. E. FRIES.—We learn with deep regret of the death of Dr. Thore C. E. Fries at Umtali, Southern Rhodesia. Dr. Fries arrived in South Africa in August, accompanied by two students, to undertake a botanical expedition to Matabeleland. For this purpose he had fitted out at Port Elizabeth a large Ford lorry which was to be their home for several months. With this they hoped to make a large collection in Rhodesia during the summer months.

Dr. Thore Fries was Director of the Botanical Museum at Lund. In addition to his work on Swedish botany, he published, in conjunction with his brother, Prof. R. E. Fries, some valuable work on the flora of Rhodesia and East Africa. Prof. R. E. Fries was botanist of which were published between 1916 and 1921. The two brothers collected together in East Africa from 1920 to 1922 and gathered a wealth of material in the Aberdares, Mt. Kenia and Mt. Elgon. In consequence numerous joint papers on the flora of these mountains have appeared, mainly in the *Svensk Botanisk Tidsskrift* and the *Notizblatt* of the Berlin Botanic Gardens. These have dealt with a number of genera, particularly *Alchemilla*, *Impatiens*, and the arborescent species of *Senecio* and of *Lobelia*.

DR. PAUL ASCHERSON.—Mr. C. J. Ascherson has presented a life-sized bust of his uncle, the late Dr. Paul Ascherson of Berlin. Dr. Ascherson entered the Royal Herbarium of Berlin in 1865 and was appointed Second Kustos in 1871. He was also Professor of Botany at the University of Berlin.

Dr. Ascherson was particularly interested in the flora of North Africa and made five expeditions to different parts of that region, publishing with Schweinfurth his "Illustration de la Flore d'Egypte" in 1887. In 1894 he commenced to collaborate with Graebner on the monumental work, "Synopsis der mitteleuropäischen Flora," 12 volumes of which have so far been published.

The Botanical Name of the Japanese "Old Woman"

Lily.—The plant which bears this quaint vernacular (see Makino, *l.c. infra*) is generally known to botanists by the name *Lilium cordifolium* Thunberg (1794). This name was adopted by the late E. H. Wilson in his recent "Lilies of Eastern Asia," the latest monographic work on the genus (1925). He, however, in common with most authors who have dealt with this plant, quotes as a synonym *Hemerocallis cordata* Thunb. (1784). Investigation of these two names shows that Thunberg certainly had only one species in view, for he quotes his *H. cordata* as a synonym of *L. cordifolium*. He merely gave, *more temporis*, what perhaps he considered a "more suitable" specific epithet on transferring the plant from *Hemerocallis* to *Lilium*. Why subsequent crinologists have persistently adhered to the later trivial, although aware of the earlier one, is not clear.

This earlier trivial was not, however, overlooked by Makino (1913), when treating as a distinct genus the group of Lilies to which this species belongs, viz. *Lilium* Sect. *Cardiocrinum* Endl. He gives as authorities for the generic name " (Endl.) Makino," being apparently unaware that both Lindley and Klotzsch had already (in 1847 and 1854 respectively) independently raised Endlicher's group to generic rank. Makino uses the correct combination *Cardiocrinum cordatum* (Thunb.) Mak. for the species under discussion, citing *L. cordifolium* Thunb. in synonymy. It is therefore all the more strange that Wilson, whose monograph must long remain a standard work of reference on the species of the area dealt with, should have cited the combinations of Thunberg and Makino, under *Hemerocallis* and *Cardiocrinum* respectively, in synonymy, and yet have failed to make the correct combination under *Lilium*.

This is therefore now made, as below. Besides a few references apparently overlooked by Makino and Wilson, only relevant synonymy is subjoined.

Lilium cordatum (Thunb.) Airy-Shaw, comb. nov.

Hemerocallis cordata Thunberg, Fl. Jap. 143 (1784); Gaertner, De Fruct. iii. 484, t. clxxix, f. 5 (1791); Endlicher, Gen. Plant. i. 141 (1836).

Lilium cordifolium Thunberg in Trans. Linn. Soc. ii. 332 (1794); Klotzsch in Otto et Dietr., Allgem. Gartenzeit. xxii. 195-6 (1854), et ex Mohl et Schlechtend., Bot. Zeit. xiii. 445 (1855); Wilson, Lil. East. Asia 97 (1925); K. Krause in Engler, Pflanzenfam. ed. 2, xva. 331 (1930).

Cardiocrinum cordatum (Thunb.) Makino in Bot. Mag. Tok. xxvii. 124 (1913).

For further synonymy and copious references, Makino's and Wilson's monographs should be consulted. H.K.A.-S.

Edible and Poisonous Fungi.*—Increasing demand has necessitated a third edition of the little guide to common species of Edible and Poisonous Fungi which is issued by the Ministry of Agriculture and Fisheries. Originally issued as Miscellaneous Publications No. 54, it now appears as Bulletin No. 23. In the matter of production this third edition is a great improvement on the earlier issues. Better paper and larger type render the text easier to read, while the larger size of page improves the appearance of the plates. The edition in cloth boards is nicely bound and makes a little volume of pleasing effect.

Jelutong.—It should have been stated that the note on Jelutong published in *K.B.* 1930, pp. 502-503, was prepared from information published, from time to time, in the Malayan Agricultural Journal, and from the Report on Forest Administration for the year 1929, pp. 17, 18, published as a Supplement on the 29th August, 1930, to the Federated Malay States Government Gazette.

*Edible and Poisonous Fungi. Bulletin no. 23, Ministry of Agriculture and Fisheries, 10 Whitehall Place, London, S.W.1. Prices: cloth boards 3s. net, post free; quarter boards 2s. 6d. net, post free.

BULLETIN OF MISCELLANEOUS INFORMATION

No. 4 1931

ROYAL BOTANIC GARDENS, KEW.

XXV.—THE FLORA OF THE LIBYAN DESERT.

An account of the recent expedition into the Libyan Desert under Major R. A. Bagnold was published in "The Times" of January 3rd and 4th last. The expedition went in a general line due south-west from Cairo for some 350 miles to the Oasis of Ain Dalla. Thence the region of high sand dunes to the south-west was entered.

Mr. W. B. K. Shaw, lately of the Anglo-Egyptian Sudan Forest Service, who already had experience of the Libyan Desert, accompanied the party, and to him we are indebted for the specimens which he collected and for information about the vegetation of this little-known part of Africa.

In a letter dated the 10th November last, written on the return journey, at the Kharga Oasis, Mr. Shaw states that the great distances covered, the use of motor cars instead of camels, and the very limited amount of baggage which could be carried, afforded little opportunity for collecting specimens.

His observations on the vegetation are as follows.

"We accomplished our round trip Cairo-Baharia-Owenat-Selima-Halfa-Kharga and covered a lot of new ground.

"I found Shabatai's name* in the Rest House at Baharia and so did not do any botanizing there.

"Between Baharia and Ain Iddaila I collected *Salsola tetrandra* Forsk.† and *Cleome arabica* Linn. where the bare limestone rock collects water from an occasional rain.

"At Ain Iddaila, a very small water point, hardly an oasis, were a few date palms and *Phragmites communis* Trin., *Salix Safsaf* Forsk., *Tamarix mannifera* Ehrenb., and *Alhagi Maurorum* Medic.

"From Ain Iddaila we entered the unknown sand-sea to the west, and here the only species I saw was *Ephedra alata* var. *Decaisnei* Stapf, usually as single isolated plants in pure sand. While in this region we struck the Kufra—Abu Mongar camel route and for some hundreds of yards in several places it was clearly marked by the shrivelled remains of plants. They were not worth collecting, but I think they must have been 'nissa' or 'gau' (?*Aristida* sp.). It was an interesting find; there appear two possible explanations. Either the seeds fell in the camel dung and germinated, though I think this unlikely because from what I can remember these plants

*Mr. Yusef Shabatai of the Egyptian Ministry of Agriculture.

†Mr. Shaw refers to his specimens by their Field Numbers. The identifications have now been completed, and the names are here substituted.

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are too small to be worth collecting for camel fodder, and also because camels on this route would most probably be fed on dates—we found old camel dung with date stones embedded in the centre; or the moving of the surface sand by the camels' feet created a 'mulch' which enabled the existing seeds to take the most advantage of an occasional shower, or dew. In the Sudan one could always see the trees and grass greener along the edges of sandy tracks than a few yards away from them.

"From here on to Owenat I saw no vegetation save for an occasional withered plant of the aforesaid 'nissa,' in fact virtually nothing.

"Our activities at Owenat were curtailed and so we were unable to explore round the mountain.

"The vegetation is confined to the 'kaihuis' or 'wadis' which are eroded back into the mountain mass and run out a little way to the surrounding plain. There had been no rain at Owenat this year, so the existing vegetation was not in a very luxuriant state. We only met with one man there, a rather miserable Bornawi slave who knew very little Arabic. He said the only trees were Talh and Seyal, and this was all I saw, . . . I did see one other tree about 3000 ft. up on the great central cliff, when trying to reach the summit. It reminded me of *Maerua rigida* (?) of the Sudan; I took a specimen but by the time I got back to camp all the brittle leaves had fallen off.

"Apart from the trees, *Pulicaria crispa* Bth. & Hook. f., *Cleome droserifolia* Del., *Panicum turgidum* Forsk., *Pergularia tomentosa* Linn., *Aerva tomentosa* var. *Bovei* C. B. Cl. and *Heliotropium undulatum* Vahl. (which smelt like mint) were all I saw at Owenat, *Panicum turgidum* Forsk. by far the most common. I think *Fagonia Bruguieri* DC. was also there. There was only xerophytic vegetation.

Yours, etc.,

W. B. K. SHAW."

Under cover of a subsequent letter Mr. Shaw sent a piece of wood from "a dead, leafless, low plant 3 to 4 feet high, found in the heart of the sand-sea to the West of Ain Iddaila." This has proved to be a specimen of *Ephedra*, probably *E. Alte* or *E. altissima*.

Thanks to the information and specimens Mr. Shaw has kindly supplied, we are in a position now to know that the flora of the area traversed belongs to the Floral Province of the Sahara, of Engler's North African and Indian Desert Region. We are also now in a position to state that the whole of this country falls within the Biological Region of Africa and is the outer fringe of many types found in the West African Botanical Region.

The following is a list of the plants collected by Mr. Shaw, with notes on their distribution by Mr. J. Hutchinson.

Gnetaceae.

***Ephedra alata*, var. *Decaisnei* Stapf** Die Arten der Gattung *Ephedra* 37 (1889); Muschler Fl. Egypt 1: 8.

Sand-desert west of Ain Iddaila, about 600 ft., woody shrublet 18 ins. high, No. 7.

Distrib.—From the Libyan desert to Sinai.

Capparidaceae.

***Cleome droserifolia* Del.** Fl. Egypt. 317, t. 36, fig. 2; Oliv. Fl. Trop. Afr. 1: 77.

Owenat: high up Karkui Talh; aromatic herb 18 in. high, No. 11.

Distrib.—Extends through the Sinai Peninsula to Southern Syria and to Muskat in Arabia. According to Ascherson and Schweinfurth this species also occurs in Nubia and Abyssinia. I have not seen specimens from either of these countries. Their record for Abyssinia was probably based on Salt's specimen, which may not have been collected in Abyssinia, for Salt quotes Forskål, Fl. Aegypt.-Arab. p. 35, where the species is recorded only from Suez.

This species is a very striking one and belongs to a small and very advanced group of the genus characterised by simple orbicular leaves and usually only four stamens. This group occurs only from the Egyptian Sudan through Arabia to Western India, and it is a very distinct desert type, quite different from the remainder of the genus as represented in Tropical Africa generally.

***Cleome arabica* Linn.** Cent. Plant. 1: 20 (1755); Oliv. Fl. Trop. Afr. 1: 77.

In small drainage lines on rugged limestone plateau between Baharia and Ain Iddaila, about 600 ft., No. 2.

Distrib.—A weedy type widely spread from Algeria through North Africa to Eastern Sudan, Abyssinia and Arabia. It has a disagreeable smell.

Cruciferae.

***Morettia Philaena* DC.** Syst. 2: 427 (1821); Oliv. Fl. Trop. Afr. 1: 61; Boiss. Fl. Or. 1: 145.

Near Gebel Kissu, 20 miles south of Owenat, about 1500 ft., No. 17.

Distrib.—Northern part of Eastern Sudan, Nubia and Egypt. The Sinai and Palestine records by Muschler (Fl. Egypt 1: 403) probably refer to *N. parviflora* Boiss. Boissier's *M. asperrima* from Muscat is no doubt a distinct species.

Morettia is a small desert genus of three species distributed from Algeria and the Central Sahara to the Eastern Coast of Arabia.

Chenopodiaceae.

***Salsola tetrandra* Forsk.** Fl. Aegypt.-Arab. 58 (1775).—*Salsola tetragona* Del.—Boiss. Fl. Or. 4: 946.

Between Baharia and Ain Iddaila, in small drainage lines on rugged limestone plateau, low herb 1-2 ft. high, No. 1.

Distrib.—Desert regions through North Africa from Tunis to Palestine.

Cornulaca monacantha Del. Fl. Egypt. 234, t. 22 (1813); Boiss. Fl. Or. 4: 984; Muschler Fl. Egypt 1: 302.

In sand, approx. lat. 27°, long. 27° 10', 500 ft., low prickly herb 18 in. high, No. 9.

Distrib.—From Mauritania through the Algerian and Central Sahara through Egypt to Afghanistan.

Haloxylon Schweinfurthii Aschers. in Aschers. & Schweinf. Ill. Fl. Egypt 128, No. 903 (1887); Muschler Fl. Egypt 1: 294.

In scattered clumps on limestone, approx. lat. 26° 10', long. 27° 10', about 900 ft., low bush 2 ft. high, No. 8. Vernacular name *Dumran*.

Distrib.—Endemic to Egypt.

Amarantaceae.

Aerva tomentosa var. **Bovei** C. B. Clarke in Dyer, Fl. Trop. Afr. 6, 1: 38.

In drainage line on plain near south foot of Gebel Owenat, about 1500 ft., bushy herb 3 ft. high, No. 16.

Distrib.—Central Sahara to Nubia and Kordofan.

Zygophyllaceae.

Fagonia Bruguieri DC. Prodr. 1: 704 (1824).—*F. echinella* Boiss. *F. diversifolia* Boiss. *F. myriacantha* Boiss. *F. cretica* Oliv. Fl. Trop. Afr. 1: 287, partly, not of Linn.

In drainage lines, approx. lat. 21° 30', long. 26° 30', about 1400 ft., low prickly herb 12 ins. high, No. 20.

Distrib.—Widely spread in desert areas from Algeria and the Central Sahara to Western India; in Tropical Africa extending to Somaliland.

Tamaricaceae.

Tamarix mannifera Ehrenb. ex Bunge Tentam. Gen. Tamar. 60 (1852); Boiss. Fl. Or. 1: 775; Muschler Fl. Egypt 1: 648.

Ain Iddaila, near the well, about 300 ft., low tree or bush on sand-mounds, No. 5.

Distrib.—Libyan Desert through Egypt to Persia and Arabia, Nubia and the island of Socotra.

Mimosaceae.

Acacia flava Schweinf. in Bull. Herb. Boiss. 4, App. 2: 214 (1896).—*Mimosa flava* Forsk. Fl. Aegypt.-Arab. 176 (1775). *A. Ehrenbergiana* Hayne Arzeneigew. 10: t. 29; Schweinf. in Linnaea 35: 352, tt. 15, 16.

Owenat, 2000 ft., low tree up to 20 ft., No. 15. Vernacular name ? *Seyal*.

Distrib.—Occurs, according to Schweinfurth, from Nubia to Arabia.

Acacia tortilis Hayne Arzeneigew. 10: t. 31 (1827).

Owenat, at foot of cliff, tree 25 ft. high, 2000-4000 ft., Nos. 14, 19. Vernacular name *Talh*.

Distrib.—In the dry parts of West Africa from Senegambia to N. Nigeria; Egypt to Palestine.

Note.—A useful key to the *Acacia* species of the Nile Region is given by Schweinfurth in Linnaea 35: 318.

Papilionaceae.

Alhagi Maurorum Medic. in Vorles. Churpf. Phys. Ges. 22: 397 (1787); Desv. Journ. 1: 120, t. 4 (1813); Boiss. Fl. Or. 2: 558; Oliv. Fl. Trop. Afr. 2: 142; Muschler Fl. Egypt 1: 536.

Ain Iddaila, about 330 ft., No. 6. Vernacular name *Agul*.

Distrib.—A desert type. Widely spread from North Africa through Cyprus, Asia Minor, and Egypt to Afghanistan. Occurs also in Nubia, just within the tropics.

Salicaceae.

Salix Safsaf Forsk. Fl. Aegypt.-Arab. lxxvi (1775); Boiss. Fl. Or. 5: 1183; Skan in Dyer Fl. Trop. Afr. 6, 2: 318.

Near Ain Iddaila well, about 300 ft., low bush 6 ft. high, No. 4.

Distrib.—Widely spread in Tropical Africa, extending through Egypt to Syria and Palestine.

Asclepiadaceae.

Pergularia tomentosa Linn. Mant. 1: 53 (1767); Hutch. & Dalz. Fl. West Trop. Afr. 2: 55. *Daemia tomentosa* Vatke—Muschl. Fl. Egypt 2: 745. *D. cordata* R. Br.—N. E. Brown in Dyer Fl. Trop. Afr. 4, 1: 386.

Owenat, about 3000 ft., shrub 2 ft. high, with milky juice, No. 13.

Distrib.—Widely distributed in North Africa from the Atlantic sea-board to Northern Nigeria and the Eastern Sudan to Syria and as far as Beluchistan.

Compositae.

Pulicaria crispa Benth. & Hook. f. Gen. Pl. 2: 336 (1873); Oliv. & Hiern Fl. Trop. Afr. 3: 366; Boiss. Fl. Or. 3: 206.

Owenat, high up Karkan Talh, 3000 ft., low herb 1 ft. high, No. 10.

Common from Senegal to Northern Nigeria and to the Eastern Sudan; extends through Arabia and the near east generally to India.—Mostly well protected by woolly hairs.

Boraginaceae.

Heliotropium undulatum Vahl. Symb. 1: 13 (1790); Boiss. Fl. Or. 4: 147; Baker & Wright in Dyer Fl. Trop. Afr. 4, 2: 37.

Owenat, on cliff top, about 4000 ft., low plant 8 ins. high, No. 18.

Distrib.—Widely spread from the Cape Verde Islands through North Africa to Palestine and Arabia and in Tropical Asia.

Gramineae.

Aristida acutiflora Trin. & Rupr. in Mém. Acad. Petersb. ser. 6, 5: 167 (1842); Boiss. Fl. Or. 5: 497; Muschler Fl. Egypt 1: 79; Henrard Monogr. Aristida 1: 64 (1929).

In clumps in drainage lines, approx. lat. 21° 30', long. 26° 30', about 1400 ft., No. 21.

Distrib.—Western Sahara to Egypt and Nubia.

Aristida pungens Desf. Fl. Atlant. 1: 109, t. 35 (1798); Boiss. Fl. Or. 5: 498; Muschler Fl. Egypt 1: 80; Henrard Monogr. Aristida 1: 57 (1929).

Dibbis, grass on low sandy mounds, No. 22.

Distrib.—From Tunis to Egypt and Nubia. According to Muschler this grass is common in Egyptian cotton fields.

Panicum turgidum Forsk. Fl. Aegypt.-Arab. 18 (1775); Stapf in Fl. Trop. Afr. 9: 706; Muschler Fl. Egypt 1: 57.

Owenat, 2000-3000 ft., 2 ft. high in clumps, the most frequent plant in the Wadis, No. 12.

Distrib.—From Senegal eastwards to Palestine and Sind.

Phragmites communis Trin. Fund. Agrost. 134 (1820); Boiss. Fl. Or. 5: 563.

Near Ain Iddaila well, about 300 ft., tall reed 6 ft. high, No. 3.

Distrib.—Widely spread nearly all over the world.

XXVI.—THE NATIONAL PINETUM AT BEDGEBURY. W. DALLIMORE.

The First Quinquennial Review.

Increasingly unsatisfactory atmospheric conditions at Kew, together with natural soil that is not very suitable for certain genera of coniferous trees, proved, after a long trial, that the attempt to cultivate a full collection of hardy conifers in the Royal Botanic Gardens, Kew, must sooner or later be abandoned. With this in mind an arrangement was made whereby Kew and the Forestry Commission should become jointly responsible for the formation of a new National Pinetum on Forestry Commission land at Bedgebury in Kent, where numerous well-grown conifers, forty-five years old and upwards, already existed (*K.B.* 1924, p. 113: 1925, p. 293).

In view of the difficulties created in the past through lack of historical data connected with many famous collections of trees, the Committee responsible for the undertaking made provision for recording planting operations, the enumeration of plants, and a quinquennial review of the Pinetum and its contents. To aid in this a planting book has been kept in which all the trees are entered with species index numbers from 1 upwards, whilst the individual plants of a species are given a letter from A onwards:—e.g. *Abies Lowiana* 3. A: 3. B: 3. C: 3. D: 3. E: 3. F. Varieties are further separated by means of other signs as *Abies Lowiana* var.

glauca 3. × A: 3. × B: 3. × C. As these indicative signs are given on the permanent labels attached to the plants it is possible with little trouble to keep a definite record of each individual.

A number of plants were sent from Kew to the Forestry Commission's nursery for the new Pinetum in 1924, but it was in March 1925 that planting was begun; the first quinquennial period, therefore, closed in 1930. In order to bring later planted trees into line with those planted in 1925 for the review in 1935, all plants were remeasured at the end of the 1930 growing period. Thus, whilst some plants had had six growing seasons at Bedgebury, others had had only five, four, three, two or one. The majority, however, were planted in February 1926.

Where a large collection of trees from all the temperate parts of the world is assembled, there are bound to be some that do not thrive so well as others, and the collection at Bedgebury is no exception. The general condition of the trees, however, justifies optimistic opinions for the future of the undertaking. In some instances extraordinary growth has been made, and the trees have an appearance of rude health. In other cases growth has not reached expectations, but even in such instances it is comforting to find that root action has been particularly vigorous, even though branch development has been slow.

The five years 1925-30 were not particularly favourable to tree growth, and the more or less expected cultural difficulties incidental to the establishment of a large collection of trees have been present.

During the springs of 1926, 1927 and 1928 there were severe frosts which seriously injured the earlier-growing species, more particularly *Abies* and *Picea*. Some did not recover; others, due to an excellent root system, have formed strong new leading shoots from adventitious stem buds. As the small plants have been found to suffer from spring frosts much more severely than taller ones, it is hoped that as height increases so danger from late spring frosts will gradually disappear. Unusually severe weather was experienced during the winter of 1928-1929, which resulted in the death of a number of more or less tender species, some of which had passed through one, two or three winters with little injury. The growing seasons of 1929 and 1930 were favourable and little harm was caused by spring frost.

Insect pests have been troublesome throughout the five years the Pinetum has been in existence. Pine Weevils and Pine Beetles, in the earlier days, caused a good deal of injury amongst young pine trees, but constant trapping had the desired effect and no damage from these pests has been noticed during the last two years. A little injury is being caused by the Pine-Shoot Tortrix Moth and the Pine Sawfly, but hand-picking has kept them from making progress. The presence of Green Spruce Aphis on several species of *Picea*, and *Dreyfusia* on certain species of *Abies*, is a more serious problem, for the pests are abundant on large trees in the vicinity, and as fast as

young trees are cleaned by spraying, insects appear again from surrounding trees. The Piceas most susceptible to attack are *P. alba*, *P. sitchensis*, *P. pungens*, and *P. Engelmanni*, and throughout the growing season it is necessary to spray them at least once a fortnight. In January of the present year the Green Spruce Aphis was active and breeding. The Larch Shoot Moth (*Argyresthia laevigatella*) is present on the larches, but it is not doing much harm. Larch Aphis is present but not troublesome, and two or three other insect pests have been noted, but they have done little harm.

Fungus diseases have caused the death of a number of trees. Of these the Honey Fungus (*Armillaria mellea*) has taken the highest toll. As there are so many dead stumps of trees about the ground losses from this disease must be expected. It is curious, however, to note that whereas in certain species and varieties only odd trees have been killed from amongst others of the same kind, five plants of *Cupressus Lawsoniana* var. *Pottensii* that had grown exceptionally well have already been killed by this disease, whilst other varieties of *Cupressus Lawsoniana* near by have so far been unaffected. Weymouth Pine Rust (*Cronartium ribicolum*) has been noted amongst the five-leaved pines, and affected trees of *Pinus Strobilus*, *P. excelsa* and *P. Armandii* have been destroyed in an endeavour to prevent the spread of the disease. Although Larch Canker Fungus is prevalent in a plantation a short distance from the collection of Larches, the young trees are quite free from the fungus, doubtless by reason of wide spacing and well-worked ground. The diseased appearance of some of the branches of the more tender species of *Cupressus* caused some alarm, but on microscopic examination it was found to be the result of frost bite; it is hoped that as the trees increase in age and height they may be less subject to this injury.

An item of considerable interest in the Pinetum is the natural regeneration that is in progress. In some parts young Scots Pine have been numerous enough to form a well-stocked forest. Other naturally-regenerated trees are Lawson Cypress, Douglas Fir, Sitka Spruce, *Thuja plicata*, *Tsuga albertiana*, and *Abies grandis*, in addition to common trees such as Holly, Oak, Sweet Chestnut, etc. Amongst the Scots Pines a good deal of difference is noticeable in length, width, and shape of leaf.

The violent winds experienced during the autumns of 1928 and 1929 blew down between 30 and 40 old specimens of *Pinus sylvestris*, *Abies grandis*, *Cupressus thyoides*, *C. Lawsoniana*, *Thuja plicata*, *Pinus Banksiana* and other trees. Many of these were between 70 and 90 feet high and 50 or 60 years old. Most of the trees blown down were in places where the water table was within 12 or 15 inches of the surface and the trees were very shallowly rooted.

Whilst it is not possible to refer to the whole of the trees in the collection, the following list, which is a fair sample, gives some interesting measurements. (The indicatory letters refer to the individual plant cited.)

				Height at planting time (1925)		Present height (1930)	
				ft.	ins.	ft.	ins.
25	<i>lasiocarpa</i> var. <i>arizonica</i>	...	A	2	3	5	6
	"	"	B	2	1	6	3
	"	"	C	2	4	5	3
	"	"	A	4	9	5	3
	<i>lasiocarpa</i>	...	...				
	(Badly injured by <i>Dreyfusia</i> sp.)						
	<i>lasiocarpa</i> var. <i>coerulescens</i>	...	A	4	2	5	7
	(Badly injured by <i>Dreyfusia</i> sp.)						
	<i>concolor</i>	...	A	4	1	10	11
	"	...	B	3	4	10	6
	"	...	C	4	0	10	6
	"	...	A	4	3	9	3
	<i>grandis</i>	...	B	3	5	10	3
	"	...	C	4	2	10	2
	"	...	B	3	0	10	6
	<i>nobilis</i>	...	B	3	0	10	6
	<i>nobilis</i> var. <i>glauca</i>	...	A	2	0	4	3
	(Grafted plant)						
	<i>Fraseri</i>						
	(All plants have been badly injured by spring frosts and no plant has made satisfactory growth. All are stunted and subject to attack by <i>Dreyfusia</i> sp.)						
	<i>magnifica</i>	...	A	1	7	6	2
	(A poor stunted plant in 1925, now growing freely)						
	<i>religiosa</i>	...	...				
	(Killed by spring frosts)						
	<i>pectinata</i>	...	...				
	(All the plants were badly frozen during three successive springs and the average growth since 1925 has been only 2 ft.)						
	<i>koreana</i>	...	A		7	4	5
	"	...	B		10	5	1
	"	...	...				
	(This has been the most successful of the new Eastern Firs. It has escaped injury by frost)						
	<i>3a canadensis</i>	...	A	4	5	7	1
	"	...	B	4	5	8	3
	"	...	C	4	5	6	9
	"	...	A	1	0	4	9
	<i>caroliniana</i>	...	B	1	1	5	2
	"	...	...				

				planting time (1925)		Present height (1930)	
				ft.	ins.	ft.	ins.
<i>Pseudotsuga Douglasii</i>	...	...	A	2	0	8	0
"	"	...	B	2	2	6	3
"	<i>japonica</i>	...	A	2	0	5	0
<i>Larix leptolepis</i>	...	...	A	3	9	16	3
"	"	...	B	3	7	15	0
"	"	...	C	3	9	14	0
"	<i>eurolepis</i>	...	A	1	7	13	6
"	"	...	B	1	5	12	0
"	<i>europaea</i>	...	A	2	0	9	0
"	"	...	B	3	2	15	3
"	"	...	C	3	0	20	0
"	<i>occidentalis</i>	...	A	2	6	5	3
"	"	...	B	2	6	8	9
"	"	...	C	2	6	5	0
<i>Cedrus atlantica</i>	...	...	A	2	4	8	0
"	"	...	B	1	9	7	9
"	"	...	C	1	9	7	5
"	<i>Deodara</i>	...	A	1	11	7	6
"	"	...	B	1	7	5	4
"	"	...	C	2	0	10	0
"	<i>Libani</i>	...	A	1	1	4	7
"	"	...	B	1	0	3	1
"	"	...	C		8	1	9
<i>Cryptomeria japonica</i>	...	...	A	2	10	13	0
"	"	...	B	3	4	9	6
"	"	...	C	3	0	14	0

XXVII. — CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA. VI.* NEW AND NOTEWORTHY SPECIES FROM BRITISH GUIANA, DILLENIACEAE-CONNARACEAE. N. Y. SANDWITH.

The following descriptions, new combinations and records refer to species collected by the Oxford University Expedition to British Guiana in 1929, or to others which have been studied in the course of recent investigations into the flora of the Colony. Preference has been given to the more noteworthy trees, many of which are of local interest and possess vernacular names. Thanks are due to the authorities of the Utrecht herbarium for the generous loan of type material, and to those of the Herbarium of the Muséum d'Histoire Naturelle, Paris, and the British Museum (Natural History) herbarium for the privilege of examining numerous historic specimens.

*Continued from *K.B.* 1931, p. 61.

Tetracera surinamensis *Miq.* in *Linnaea* xviii. 265 (1844). Moraballi Creek, Essequibo River, Oct. 18th, 1929, *Sandwith* 479. Demerara River, May, 1889, *Jenman* 4897. Compared with the type.

Vernacular name (Arawak), Kabaduli.

Distr. Surinam, French Guiana.

Doliocarpus major *J. F. Gmel.* Syst. 805 (1791).—*D. dentosus* Mart. in *Flora* xxiv. App. ii. 65 (1841); Eichl. in Mart. Fl. Bras. xiii. pars i. 75 (1863).

Wooded shore of islet at the Akaio Falls, Cuyuni River, Nov. 25th, 1929, *Sandwith* 686: climber over low trees; petals and filaments creamy-yellow; fruit deep vermilion. Corentyne River, Nov. 1879, *Jenman* 333.

Distr. Widely spread over Continental Tropical America, from Guatemala to Southern Brazil.

VIOLACEAE.

Rinorea pubiflora (*Benth.*) *Sprague et Sandwith*, comb. nov.—*Passoura guianensis* Aubl. Hist. Pl. Guiane, ii. Suppl. 21, t. 380 (1775), non *Rinorea guianensis* Aubl. *Conohoria Passoura* DC. ex Ging. apud DC. Prodr. i. 312 (1824) partim. *Alsodeia pubiflora* Benth. in Hook. Journ. Bot. iv. 106 (1842). *A. guianensis* Eichl. in Mart. Fl. Bras. xiii. 387 (1871) partim, excl. vars. *Rinorea Passoura* Kze. Rev. Gen. i. 42 (1891); Blake in Contr. U.S. Nat. Herb. xx. 507-9 (1924); Melchior in Engl. et Prantl, Pflanzenfamilien, 2 Aufl., Band 21, p. 352 (1925).

Plentiful in mixed and mora forest on the right bank of the Cuyuni River below the Akaio Falls, Nov. 20th, 1929, *Sandwith* 624. Not found by the Moraballi Creek, where the common species was *R. Riana* (DC.) Kze.

The combination *Rinorea Passoura* (DC. ex Ging. apud DC.) Kze. has been adopted for this common species of Northern South America by Blake and Melchior in their recent important contributions to the study of the genus, but it is invalid (as a combination) since it is founded upon a name which was itself invalid. *Conohoria Passoura*, as pointed out by Blake, was based on two distinct species, *C. flavescens* Aubl., which was the original species of *Conohoria*, and *Passoura guianensis* Aubl.; Gingins and de Candolle appear to have seen specimens only of the first of these, and the very meagre description of the leaves and flowers may also be taken to apply to it rather than to *Passoura guianensis*, of which only the fruit and leaves were seen and collected by Aublet. The name *Conohoria Passoura* was therefore invalid, for the prior name *C. flavescens* should have been retained; and even if we ignore the synonym *flavescens*, and consider that the description applies to *Passoura guianensis*, the trivial *guianensis* should have been adopted under *Conohoria*. Thus Eichler rightly made the combination *Alsodeia guianensis* (Aubl.)

Eichl. when dealing with this plant in the *Flora Brasiliensis*, in which he adopted the name *Alsodeia* for the genus. The adoption of the trivial *guianensis* under *Rinorea* for this plant is, however, precluded, as Aublet himself had already used *Rinorea guianensis* for another species; and even if he had not, his *Riana guianensis*—now *Rinorea Riana* (DC. ex Ging. apud DC.) Kze.—would have a prior claim, as it was published in an earlier volume of his work. The first valid trivial for *Passoura guianensis* in the genus *Rinorea* is therefore Bentham's *pubiflora*, which was published as a species of the genus *Alsodeia*, and the necessary new combination is accordingly made here. There seems to be no doubt that Bentham's plant is the same as Aublet's, but even if it were proved to be different, his name *pubiflora* would stand for the large series of specimens from the Guianas and Brazil which agree so well with Bentham's type.

R. flavescens (Aubl.) Kze. Rev. Gen. i. 42 (1891); Blake in Contr. U.S. Nat. Herb. xx. 507 (1924).—*Conohoria flavescens* Aubl. Hist. Pl. Guiane, 239, t. 95 (1775).

Comparison with Aublet's specimen at South Kensington and with other more recently collected material from French Guiana shows that the following sheets from British Guiana are referable to this very distinct species with glabrous ovary and fruit and (in dried specimens) reddish veins on the lower surface of the papery leaves: bank of the Moraballi Creek, Essequibo River, Sept. 14th, 1929, *Sandwith* 255; without locality, *Parker*; Hurishi, Karakara Creek, Demerara River, Feb. 1910, *C. W. Anderson* 468; Moblissa Creek, Demerara River, Feb. 1910, *C. W. Anderson* in Forestry Department record no. 562; Canje River, Berbice, Dec. 1914, *Hohenkerk* in ditto no. 638.

Vernacular names (Arawak): Ifa-kuti (Duck's foot); Baridi-kuti (Chicken Hawk's foot); Mamusaru (Swizzle-stick Tree).

Paypayrola longifolia Tul. in Ann. Sci. Nat. sér. iii. vii. 372 (1847).

A very plentiful small tree by the Moraballi Creek, Essequibo River, Aug. 21st, 1929, *Sandwith* 81.

Vernacular name (Arawak), Adebero.

No specimens have been seen from the colony which can be referred to *P. guianensis* Aubl., which differs in its broader leaves and broader, more roundish sepals. *Sagot* 32 and *Wachenheim* 43 agree very well with Aublet's specimen of *P. guianensis* in Herb. Mus. Brit.

FLACOURTIACEAE.

Laetia procera (Poepp. et Endl.) Eichl. in Mart. Fl. Bras. xiii. pars i. 453 (1871).—*L. caseareoides* Sagot ex Benth. in Journ. Linn. Soc. v. App. ii. 85 (1861). *Samyda procera* Poepp. et Endl. Nov. Gen. et Sp. iii. 67 (1845).

Moraballi Creek, Essequibo River, Nov. 5th, 1929, *Sandwith* 559. Tall tree, 110-120 ft. high, 15 in. diam., in mixed forest. Fl. white,

on pink pedicels. Stamens about 15. The other collection in Herb. Kew. is *Hohenkerk* in Forestry Department record no. 830, from hill-slope at head of Paidaka Creek, Berbice River, Nov. 1919.

Vernacular name (Arawak), Warakaiaro.

Distr. Trinidad, Guiana, Amazonian Brazil.

Casearia singularis Eichl. in Mart. Fl. Bras. xiii. pars i. 473, t. 95, f. ii. (1871).

Moraballi Creek, Essequibo River, Oct. 2nd, 1929, *Sandwith* 364. Middle-sized tree, 60 ft. high, 6 in. diam., in mixed forest. Bark dark grey, with conspicuous eye-like lenticels. Fl. white.

Vernacular name (Arawak), Shibadan.

Distr. Surinam; Pará, coll. *Ducke*, det. *Kuhlmann*. Apparently the first record for British Guiana.

POLYGALACEAE.

Securidaca pyramidalis Sprague, sp. nov.; affinis *S. pubiflorae* Benth., a qua sepalis lateralibus (alis) margine excepto glabris, racemis paucioribus brevioribus pyramidalibus, foliis plerumque minoribus ovatis differt.

Frutex scandens. *Ramuli* subteretes, nigrescentes, circiter 2.5 mm. diametro 20 cm. infra apices, breviter dense furfuraceo-pilosi; internodia plerumque 1-2.5 cm. longa. *Folia* breviter petiolata, ovata vel rarius ovato-oblonga, vix vel breviter obtuse cuspidata, basi rotundata, 4-9 cm. longa, 2.5-4.7 cm. lata, coriacea, aetate manifeste discoloria, supra valde intricate reticulata, rete elevato, nitidula, nervo medio inferne et marginis parte basali plus minusve pilosis exceptis glabra, exsiccando brunnea, subtus opaca, minute appresse pubescentia, satis reticulata rete elevato; nervi laterales utrinque 7-9, subarcuato-ascendentes, supra prominuli, subtus prominentes; petioli 3-5 mm. longi, ut ramuli induti. *Racemi* terminales et in axillis foliorum superiorum axillares, 3-6 cm. longi, anguste pyramidales; pedunculi usque ad 1.5 cm. longi, ut rhachis bracteae pedicellique subappresse striguloso-pubescentes; bracteae lineari-lanceolatae, 3-4 mm. longae; pedicelli 3-4 mm. longi. *Sepala* 3 exteriora ciliata, extra praeter areas marginales glabrata densius sparsiusve appresse pubescentia, intus glabra; sepalum posticum cymbiforme, 4-5 mm. longum; sepala antica elliptica, 3 mm. longa, 2-2.3 mm. lata; alae unguiculatae, late elliptico-suborbiculares, 8.5 mm. longae, 7.5 mm. latae, margine anteriore basi auriculatae, margine posteriore basi rotundatae, dimidio marginis inferiore ciliato, superiore breviter inflexo non ciliato, alae ceterum glabrae; nervi e basi 9-10, flabelliformi-divergentes, laterales pluries furcati, procul a margine anastomosantes; alarum unguis 2 mm. longi. *Petala* 2 lateralia ungue 2 mm. ad vaginam staminum antice adnato valde incrassato extra postice piloso intus velutino; lamina petalorum lateralium oblongo-obovoidea, 4.5 mm. longa, 3.5 mm. lata, sed primo visu minor ob marginem anteriorem ad medium inflexum, dimidio inferiore tantum

ciliato, ceterum glabra; carina ungue 2 mm. longo vix 2 mm. ad vaginam staminum adnato, late cymbiformis, 6 mm. longa crista exclusa, marginibus dimidio inferiore ciliatis, crista 0.8 mm. longa flabellata crenulato-dentata. Ovarium glabrum.

BRITISH GUIANA. Kurupung River, by water-side, fl. Sept. 1925, *Altson* 415 (type). Also collected on the Potaro River, Kaieteur Savannah, by *Jenman* (no. 806), in Sept.-Oct. 1881.

Securidaca pyramidalis seems to be closely related to *S. pubiflora* Benth., which has leaves of much the same texture and indumentum, but larger, more oblong, and with the midrib pubescent on the upper surface. The inflorescences of the two species are more dissimilar, *S. pubiflora* having 5-6 racemes grouped in bracteate corymbs towards the end of the branchlets, whereas *S. pyramidalis* has fewer racemes on each flowering branchlet, and the lateral ones arise in the axils of foliage-leaves. An additional diagnostic character is that the lateral sepals (alae) of *S. pubiflora* are silky-pubescent outside, whereas those of *S. pyramidalis* are glabrous, apart from the margins, which are ciliate below.

In Martius, Fl. Bras. vol. xiii. pars iii, p. 66 (1874), A. W. Bennett included at least two species under the name *Securidaca longifolia* Poepp. et Endl., namely *S. pubiflora* Benth., and *S. latifolia* Benth. *S. pubiflora* may possibly be conspecific with *S. longifolia*, though the latter seems from description to differ in having relatively narrower, acute leaves, 6 inches long and 2 inches broad. *S. latifolia*, however, may be distinguished by the glabrous alae, and by the leaves which are puberulous and dull on the upper surface, and with spreading hairs on the midrib on the lower surface.—T.A.S.

HYPERICACEAE.

Vismia angusta Miq. in Linnaea xviii. 27 (1844); Stirp. Surinam. Sel. 88 adnot. (1850).—*V. macrophylla* Benth. in Hook. Lond. Journ. Bot. ii. 371 (1843), non H.B.K. Nov. Gen. et Sp. Pl. v. 184 (1822).

Moraballi Creek, Essequibo River, Oct. 7th, 1929, *Sandwith* 395. Middle-sized tree, 61 ft. high, 10 in. diam., in "low bush." Bark dark brown, peeling in longitudinal flakes; timber yellow. Branchlets, inflorescence, all veins of lower surface of leaves, and midrib of upper surface, ferruginous-tomentose. Sep. and pet. greenish.

Vernacular names, Orali (Arawak); Bloodwood.

From a comparison with *Hostmann* 162, which Miquel himself referred to his *V. angusta*, the above seems to be the correct name for this common species of Northern South America and especially of Guiana, which has been repeatedly identified with *V. macrophylla* H.B.K. and with *V. latifolia* (Aubl.) Choisy. A recent examination of the Humboldt and Bonpland specimen of *V. macrophylla* at Paris shows that it differs, as would be expected from the description, in the indumentum of the lower surface of the leaves, which are glabrous with black gland-dots, except for very scattered, minute, reddish stellate hairs. The nearest approach to this specimen which

has been seen is Spruce's plant from San Gabriel da Cachoeira, Rio Negro, ann. 1852, without number. This was referred to *V. macrophylla* by Reichardt in his account of the genus in the Flora Brasiliensis, and it is the type collection of *V. macrophylla* var. *glabrescens* Hochr. in Ann. Cons. Jard. Bot. Genève, xxi. 53 (1919). It is clear from Hochreutiner's remarks, and from the distinguishing characters which he assigns to his variety, that he had not examined the type collection of *V. macrophylla*; this plant of Spruce, in fact, agrees well with that type. It is not improbable that future monographers will decide to treat *angusta* as a variety of *macrophylla*, since further good distinguishing characters are not apparent. The size and shape of the leaves of *angusta* are extraordinarily variable on the same tree.

V. latifolia (Aubl.) Choisy, based upon *Hypericum latifolium* Aubl., is proved by Aublet's specimen in Herb. Mus. Brit. to be a very different species. The leaves are up to 8 inches in length and 4.25 inches in width. They are thin, and dry green on the upper surface, which is prominently reticulate (the veinlets not impressed) as in Aublet's figure. They are rounded or scarcely cordate at the base, and the acumen is 5-12 mm. long. The petals are glabrous, and hardly dotted on the outer surface. Two sheets of Martin (no. 27 and another) in Herb. Mus. Brit. agree well with this plant, while the nearest approach to it at Kew is a specimen of Sagot collected (without number) at Roura in March, 1859, and labelled *Vismia acuminata* Pers. The species seems to be related to *V. falcata* Rusby.

V. latifolia H.B.K. l.c. 183 (1822, *fide* Barnhart in Bull. Torr. Bot. Club. xxix. 595) is invalidated by *V. latifolia* (Aubl.) Choisy (1821). This species and *V. ferruginea* H.B.K. l.c. 183 have been examined at Paris and neither agrees with *V. angusta*; while the Schomburgk collections referred by Reichardt (Mart. Fl. Bras. xii. pars i. 201) to *V. ferruginea* are certainly not that species.

GUTTIFERAE.

Clusia Fockeana Miq. in Hoev. et De Vriese, Tijdschr. x. 82 (1843).

The following collections are referable to this species, which is a tree characteristic of wallaba forest and sandy districts: Moraballi Creek, Essequibo River, Sept. 28th, 1929, *Sandwith* 352; tree with stilt roots, 57 ft. high, in wallaba forest on sandy ridge; buds pink; petals white, purplish at base. In "high bush" east of Ikwaka Lake, Oct. 1923, *Altson* 144. West side of Ikuruwa Lake, Canje River, Berbice, Jan. 1915, *Hohenkerk* in Forestry Department record no. 660. Kuruabaru River, Demerara River, in "Muri" white sand area, Aug. 1919, *Hohenkerk* in ditto, no. 660D. Upper Demerara River, Sept. 1887, *Jenman* 4262. Santa, Demerara River, Dec. 1908, C. W. Anderson 239.

Vernacular names, Kupe and Madaburi.

Distr. Surinam.

Tovomita cephalostigma Vesque, Epharmosis iii. t. 96 (1889); in DC. Monog. Phan. viii. 207 (1893).—*T. guianensis* Engl. in Mart. Fl. Bras. xii. pars i. 446 (1888) partim, non Aubl.

Moraballi Creek, Essequibo River, Oct 7th, 1929, *Sandwith* 391, ♀. Middle-sized tree, 60–80 ft. high, in wallaba forest on ridge. Leaves rather leathery. Bracteoles and buds reddish-brown. Sep. and pet. 4, greenish-white. Stamens white.
Distr. Guiana.

The specimens were found to agree excellently with the type material (*Mélinon* 435, ♀) in the Paris Herbarium. The male inflorescences of this species are remarkably elongated, repeatedly branched and many-flowered, in strong contrast with the short, few-flowered inflorescences of female trees. Four sheets of the male plant, collected by Mélinon—no. 79 (1862) and three sheets *sine numero* (1864)—were found in the Paris Herbarium in the herbier de la Guyane; these had not been identified by Vesque and have perhaps been laid in quite recently. The following additional collections in the Kew Herbarium should be referred to this species, which has sometimes been identified with *T. guianensis* Aubl.

FRENCH GUIANA. Poiteau in Herb. Gay, ♀; *Wachenheim* 325, ♂.

BRITISH GUIANA. Demerara River, May, 1887, *Jenman* 3909, ♂; Upper Demerara River, Sept. 1887, *Jenman* 4259, ♀; Berbice-Demerara watershed, on hill top on white sand, *Hohenkerk* in Forestry Department record no. 140 C, ♂; on brown sand and clay on hill-slope, Jutura Creek, Siropia River, Essequibo River, July 1920, *Hohenkerk* in ditto, no. 140 D, ♂; on sand bank, Macreba Falls, Kurupung River, Mazaruni River, Aug. 1925, *Altson* 350, ♂.

From the evidence of the field-notes, it would appear that this species is characteristic of sandy soil on hills, and that it is a common member of the wallaba (*Eperua*) forest-type.

T. guianensis Aubl. Hist. Pl. Guiane, 956, t. 364 (1775).

It is clear that this species has been misinterpreted both in the Flora Brasiliensis by Engler, who described the lateral nerves of the leaves as 3–5 mm. apart, and in the De Candolle Monographia of the Guttiferae by Vesque, who similarly placed it in his section *Clusiaefoliae*, comprising species with very numerous, approximate, parallel and straight lateral nerves. The Guiana material cited by Engler evidently belongs to *T. cephalostigma*, while Vesque admits his uncertainty as to the identity of this species. Aublet's specimen at the British Museum proves to be nothing like the specimens which have been referred to it in the Kew Herbarium, but to belong to Vesque's section *Chrysochlamydidifoliae*, which consists of species with few, widely separated, arcuate nerves. One would have thought that this much would have been gathered from Aublet's figure. The leaves of his specimen are reddish beneath, the lateral nerves very arcuate, and the minor venation conspicuous. The affinity seems to be with *T. Schomburgkii* Pl. et Tr. The only specimen at Kew

which approximates to *T. guianensis* is one of Poiteau, presented to Herb. Gay. in July 1824.

T. Schomburgkii Pl. et Triana in Ann. Sci. Nat. sér. iv. xiv. 274 (1860).

The following recent collections agree with Schomburgk's type material: Moraballi Creek, Essequibo River, in various forest-types, Sept.-Oct. 1929, *Sandwith* 240, 409, 519; small tree, up to about 40 ft. high. Malali, Demerara River, Oct.-Nov. 1922, *la Cruz* 2733.

Vernacular name (Arawak), Fine-leaved Awasakuli; but this name is probably applied to other small species of *Tovomita*.

Quapoya bracteolata *Sandwith*, nom. nov.—*Rengifa acuminata* Pl. & Triana in Ann. Sci. Nat. sér. iv. xiv. 243 (1860); Engl. in Mart. Fl. Bras. xii. pars i. 434 (1888). *Quapoya acuminata* Kze. Rev. Gen. 61 (1891); Engl. in Engl. et Prantl, Pflanzenfam. 2 Aufl., Band 21, p. 205 (1925); non *Q. acuminata* Walp. Rep. i. 393 (1842)=*Clusia acuminata* Spreng. Syst. Veg. ii. 599 (1825).

The species of *Rengifa* have to be transferred to the genus *Quapoya* Aubl., since *R. scandens* (Aubl.) Pl. & Triana is the original species of *Quapoya*; and, unfortunately, the trivial name *acuminata* is preoccupied in *Quapoya* by the West Indian plant which is now known as *Rheedia portoricensis* Urb. The above new name is therefore proposed for the curious, scrambling, epiphytic shrub which appears to be endemic in British Guiana, and of which the following specimens have been seen:—

BRITISH GUIANA. Roraima, *Schomburgk* 999 (type) and 1715 B; Kalakoon, Nov. 1886, *Jenman* 2432; Demerara River, March 1898, *Jenman* 7334; Macouria River, Essequibo River, Nov. 1886, *Jenman* 2478; Moraballi Creek, Essequibo River, in mora swamp-forest, Aug.-Sept. 1929, *Sandwith* 16, 242; Rockstone, March 1899, *Jenman* 7502.

Rheedia floribunda (Miq.) Pl. et Tr. in Ann. Sci. Nat. sér. iv. xiv. 319 (1860).—*Garcinia floribunda* Miq. Stirp. Surinam. Sel. 89 (1850).

In mixed forest, Moraballi Creek, Essequibo River, Oct. 25th, 1929, *Sandwith* 522. Small tree with yellow latex, 50 ft. high, 4½ in. diam. Leaves very variable in size. Fruit green, reticulate-rugose when fresh, turning yellow, edible.

Vernacular name (Arawak), Assashi.

Distr. Surinam.

The fruits are characteristic of the section *Verticillaria*, and the leaves agree with those of the type collection (*Hostmann and Kappler* 593a) at Paris. On the Paris specimen one of the leaves is 8 in. long and slightly more than 3 in. wide, dimensions exceeding those given by Miquel; and since the specimen is only the top of a flowering shoot, the lower leaves would almost certainly be still larger.

QUIINACEAE.

Quina indigofera *Sandwith*, sp. nov.; inter species floribus unisexualibus gaudentes floribus masculis pentameris, fructibus longis, praesertim partibus gummiferis exsiccatis contusis indici colorem conspicuum exhibentibus distinctissima.

Arbor mediocris, 15–24 m. alta, verosimiliter ad 30 cm. diametro, gummam fragrantem praebens quae in statu sicco per medullam ramulorum faciem foliorum praesertim juniorum inferiorem atque flores ipsos colore indici insigni tincta videtur; truncus basi anteridibus gralliformibus parvis praeditus. *Ramuli* summi subteretes, hic illic lenticellati, novelli pubescentes, vulgo 3–7 mm. diametro; internodia 2–8 cm. longa. *Folia* opposita, elliptica, obovato-elliptica vel obovato-lanceolata, apice acuta vel brevissime cuspidata, basi attenuata cuneata, 14–35 cm. longa, 4.5–14 cm. lata, rigide chartaceo-coriacea, integra, glabra, costa nervisque primariis utroque costae latere vulgo 16–20 marginem versus valde arcuatis utrinque perconspicuis, venulis supra impressis subtus haud valde prominentibus, subtus siccitate hic illic (juniora nonnunquam passim) colore indici plus minusve conspicue tincta; petiolus corrugato-striatus, glaber vel sparse pubescens, 1.3–2.5 cm. longus, sursum 2–3 mm. diametro, basi valde incrassatus. *Stipulae* pubescentes, summae annotinae ac hornotinae lineares, 1.3–2.5 cm. longae, 2–3 mm. latae, nonnunquam ferrugineae vel indico coloratae; annotinae inferiores multo breviores ac angustiores, subulatae, pungentes, 5–10 mm. longae, basi excepta plerumque vix 1 mm. latae. *Inflorescentiae* axillares, breves, petiolo breviores; racemi complures aggregati, pluriflori, basi bracteis conspicue congestis, pubescentes; bractee bracteolaeque confertae, pubescentes, illae ferrugineae triangulari-ovatae 1.2 mm. longae atque latae, hae minores. *Flores* singuli vel ad 3 cymoso-fasciculati, unisexuales, masculi tantum visi; pedicelli graciles, glabri, paullo supra basim articulati, ad 1.3 cm. longi; alabastra globosa, ad 2 mm. diametro. *Sepala* 5 inaequalia, late rotundato-ovata, ciliata, intus glabra, siccitate ochracea vel indico maculata, exteriora 1 mm. longa 1.5 mm. lata, interiora 1.5–2 mm. longa 1.75–2 mm. lata. *Petala* 5, obovato-oblonga, minute ciliata, siccitate saepius passim indico tincta, 4–4.5 mm. longa, 3 mm. lata. *Stamina* circiter 30, 4–4.5 mm. longa, filamentis siccitate passim indico coloratis basi cohaerentibus. *Fructus* complures aggregati, pedicellis ferrugineis glabris 1–1.5 cm. longis 1.5–2 mm. diametro, statu vivente virides, siccitate brunneo-purpurei, tenuiter conspicue multistriati, gummiferi, glabri, recti vel falcati, apice attenuati saepe acuti, basi rotundati, anguste lanceolati vel lanceolato-ellipsoidei, 3–5.5 cm. longi, 0.8–1.5 cm. diametro, endocarpio fibroso, biloculares sed saepius ut videtur abortu monospermi; semen anguste obconico-obovoideum, densissime lanatum, lana subnitente pallide fulva, 1.2–1.4 cm. longum, apice 5–6 mm. diametro.

BRITISH GUIANA. Moraballi Creek, Essequibo River, October 15th, 1929, *Sandwith* 458 (type). A middle-sized tree in mixed

forest, 78½ ft. high, 9 in. diameter, with small stilt buttresses. Fruit green, finely and conspicuously striate.

Karakara Creek, Demerara River, February 15th, 1910, C. W. Anderson in Forestry Department record no. 51. "Large tree with very hard wood, and yellow, edible, stringy fruit."

Dense upland forest, Tumatumari, June–July 1921, *Gleason* 424. "Tree, 50 ft. high." The description of the inflorescence is taken from this collection.

Vernacular names: Large-leaved Okokonshi (Arawak); Ariwiwa (Warrau).

Q. guianensis *Aubl.* Hist. Pl. Guiane, Suppl. 19 (1775).

A small tree, 15–30 ft. high, very abundant in mixed forest and low bush by the Moraballi Creek, Essequibo River, Nov. 8th, 1929, *Sandwith* 576. This, like other collections from British Guiana, agrees with the authentic specimen in Herb. Mus. Brit.

Vernacular name (Arawak), Small-leaved Okokonshi.

Distr. Trinidad, Guiana.

BOMBACACEAE.

Bombax flaviflorum *Pulle* in Rec. Trav. Bot. Néerl. ix. 150 (1912).

Moraballi Creek, Essequibo River, Oct. 29th, 1929, *Sandwith* 532. Small tree, in wallaba forest on sandy ridge. Compared with authentic material (*Gonggrijp*, and *Forestry Bureau* 6283 and 1607) borrowed from Utrecht. The indumentum, leaflets, and long solitary peduncle of the young fruit agree well, but flowering material is required for confirmation of the identification.

Vernacular name (Arawak), Kamakuti (of wallaba).

B. surinamense *Uitt.* in Rec. Trav. Bot. Néerl. xxii. 365 (1925).

Moraballi Creek, Essequibo River, Oct. 24th, 1929, *Sandwith* 511. Tall tree, 135 ft. high, 3 ft. 8 in. diam., in morabukea forest. Petals creamy yellow within, whitish-sericeous on the back.

Vernacular name, Kamakuti (Tapir's Foot).

The specimens agree perfectly with the type. Previously unrepresented at Kew, although there are British Guiana specimens of an allied species which is apparently referable to *B. globosum* *Aubl.* The type of the latter was not found at South Kensington.

TILIACEAE.

Lueheopsis flavescens (*Uitt.*) *Burret* in Notizbl. Bot. Gart. Berlin, ix. 837, 842 (1926).—*Luehea flavescens* *Uitt.* in Rec. Trav. Bot. Néerl. xxii. 363 (1925).

Moraballi Creek, Essequibo River, Oct. 19th, 1929, *Sandwith* 486. Tall tree, 116 ft. high, 19 in. diameter, in wallaba forest on sandy ridge. Fallen fruits and old, very rugose, leaves collected.

The tree was scarce in the area, and was unknown to the Arawaks who felled it. The material agrees with that from the type tree (*Zaandam* 6678), which was borrowed from Utrecht, in its fruits and the very characteristic indumentum of the lower surface of the

leaves. First record for British Guiana. The inflorescence, which appears before the leaves, is now required.

Apeiba Petoumo Aubl. Hist. Pl. Guiane, 544, t. 215 (excl. fructu) (1775).—*A. echinata* Gaertn. emend. Uittien in Rec. Trav. Bot. Néerl. xxii. 360 (1925).

In mixed forest, Moraballi Creek, Essequibo River, Aug.-Nov. 1929, *Sandwith* 73, 430, 622. Other British Guiana collections, compared with Aublet's specimen in Herb. Mus. Brit., are *Jenman* 1616 (Pomeroon River, Dec. 1882); *Jenman* 4135 (Upper Demerara River, Sept. 1887); *Appun* 344 ("Essequibo"); and *im Thurn* (Cabalebo River, Corentyne River, Sept. 1879). The Moraballi Creek examples were trees about 100 ft. high and 1½-3 ft. in diameter.

Vernacular name (Arawak), Duru.
Distr. Guiana to Pará.

ELAEOCARPACEAE.

Sloanea sinemariensis Aubl. and **S. Eichleri** K. Schum.

In Rec. Trav. Bot. Néerl. xxii. 352-4 (1925) H. Uittien has some remarks on *Sloanea sinemariensis* Aubl. and its allies, and shows how much confusion has attached to this name, which has been incorrectly applied to several different species from the West Indies and Northern South America. It is unfortunate that Uittien himself has omitted to examine Aublet's specimen, and has fallen into the rather frequent error of treating Aublet as a careless observer who omitted to mention important details and therefore gave inaccurate or incomplete descriptions. Uittien gives two localities for *S. sinemariensis* Aubl. in Surinam, and goes on to say that "Aublet has overlooked the dense but extremely short indumentum of the lower surface of the leaves, which induced Sagot to describe a variety *Melinonis* 'foliis subtus puberulo-subcanescentibus.'"

But Aublet's specimen at the British Museum agrees with his description and figure, and although the reddish-brown lower surface of the leaves is not completely glabrous when examined with a lens, it certainly appears so to the naked eye; whereas the leaves of var. *Melinonis* are conspicuously and densely cinereous-tomentellous all over the lower surface, and are so strongly reticulate that they present a totally different appearance. Again, the characters of the stamens of *Melinonis* seem to be quite different from those of *sinemariensis*; the filaments of *Melinonis* are long and pilose, while the pilose anthers are short, whereas the filaments of *sinemariensis* are, as described by Aublet, very short, and the anthers are long and glabrescent. Var. *Melinonis* is, in fact, a well-marked and remarkably uniform species with a wide range in Guiana, and cannot possibly be treated as a variety of *sinemariensis*, from which it was admirably differentiated by Sagot himself.

As has been correctly pointed out by Uittien, this plant (*S. sinemariensis* var. *Melinonis* Sagot = *S. sinemariensis* Uitt. non

Aubl.) is conspecific with *S. Eichleri* K. Schum.; this name must therefore be adopted for it in the future. The Guiana material appears to bear better developed inflorescences than the Brazilian specimens which were originally examined by Schumann, and there are therefore certain discrepancies in the shape and measurements of some of the floral parts; but there seems to be no reasonable doubt, from a comparison with *Riedel* 1452 in Herb. Kew., that the same species is represented. The following is a description of *S. Eichleri* taken from Guiana material:—

Sloanea Eichleri K. Schum. in Mart. Fl. Bras. xii. pars iii. 183, t. 38 (i) (1886); a *S. sinemariensis* Aubl. foliis subtus passim dense cinereo-tomentellis, nervis tertiariis creberrimis fortiter reticulatis, filamentis longis conspicue pilosis, antheris brevioribus pilosis differt.—*S. sinemariensis* Aubl. var. *Melinonis* Sagot in Ann. Sci. Nat. sér. vi. xi. 156 (1881); H. Uittien in Rec. Trav. Bot. Néerl. xxii. 353 (1925).

Arbor mediocris, ramulis summis dense minute cinereo-vel fulvo-tomentellis. *Folia* elliptico-oblonga ad suborbicularia, apice truncata vel rotundata, nunc brevissime triangulariter acute ad 5 mm. cuspidata, nunc late emarginata, basi rotundata, 6.5-31 cm. longa, 5-19.5 cm. lata, margine praesertim dimidio superiore plus minusve sinuato-angulato nonnunquam fere dentato, supra siccitate opaca vel subnitida brunnea vel plumbeo-purpurascencia, adulta glabra nisi costa nervisque primariis impressis dense tomentellis vel glabrescentibus, nervis tertiariis vix conspicuis, subtus opaca cinerea intricatissime reticulata passim minute densissime tomentella, nervis primariis arcuantibus utrinque conspicuis utroque costae latere 6-10; petiolus subteres, indumento ramulorum tomentello praeditus, 1.3-8.5 cm. longus, ad 2.5 mm. latus. *Inflorescentiae* axillares, solitariae, composito-racemosae, apice corymbosae, saepe ramulis longis e basi exorientibus, totae dense cinereo-pilosulae, 2-4 cm. longae; bractae bracteolaeque subulatae, 0.5-3.5 mm. longae; pedicelli 0.3-1.5 cm. longi. *Calyx* irregulariter ad 8-lobus, lobis fere subulatis vel triangulari-lanceolatis 0.5-1.5 mm. longis, ad 0.75 mm. latis, extra dense intus sparse pilosulis. *Stamina* numerosissima: filamenta conspicue pilosula, longitudine valde variabili, 1-2.75 mm. longa; antherae elliptico-oblongae, obtusae, 1.25-1.5 mm. longae, conspicue satis dense pilosulae. *Ovarium* 4-loculare, ovoideo-subglobosum, 1.75 mm. altum, ad 1.5 mm. diametro, dense tomentellum; stylus quadrangulatus, sulcatus, apice truncato 4-fido, ad 2.2 mm. longus, basim versus tomentellus, ceterum glaber; ovula in quoque loculo 10-12. *Fructus* ovoideo-ellipsoideus, 1.5-1.7 cm. longus, ad 1 cm. diametro, densissime cinereo-vel fulvo-tomentellus, setis fulvo-rubentibus vel purpurascenscentibus patulis 0.4-1.2 cm. longis prorsus minute pilosulis satis tenuiter rigidis facile caducis indutus.

BRAZIL. Ann. 1828, *Riedel* 1452.

FRENCH GUIANA. Ann. 1864, *Mélinon*; *Poiteau*.

SURINAM. Vide *Uittien*, l.c. supra. Watramiri, tree no. 1676, June 1916!

BRITISH GUIANA. Berbice: Huruwe Creek, Ituni River, Berbice River, March 1919, *L. S. Hohenkerk* in Forestry Department record no. 345. "Tree 55 feet high, growing in brown sand with clay. Fruit covered with long reddish and purplish-brown stiff hairs; seed vermilion-coloured."

It may be useful to add a description of Aublet's specimen of *S. sinemariensis* at the British Museum:

Sloanea sinemariensis *Aubl.* Hist. Pl. Guiane, 534, t. 212 (1775).

Folia late elliptico-oblonga ad semiorbicularia, obtusa vel emarginata sinu apicali latissimo, 7–20 cm. longa, 5–16 cm. lata, margine sinuata sed haud revera dentata, supra glabra colore plumbeo costa nervisque primariis profunde impressis, subtus rubro-brunnea oculo nudo glabra et mesophyllo venulisque revera glaberrimis, sed costa nervisque primariis atque secundariis sub lente minute tomentellis valde prominentibus, primariis utroque costae latere 5–9 sursum arcuantibus; petiolus striatus, minutissime tomentellus, 2.2–8 cm. longus, 1.5–3 mm. diametro. *Inflorescentia* unica tantum valde immatura adest e floribus compluribus ut videtur male evolutis in axilla dense fasciculatis constans. *Sepala* late ovata, obtusa, circiter 2 mm. longa atque 1.5 mm. lata, extra dense tomentella, intus striato-pubescentia ceterum glabra. *Antherae* lineari-oblongae, obtusae, nigrescentes, ut videtur glabrae; filamenta evidenter brevissima, ut dicit cl. Aublet, vix cernenda. *Ovarium* tomentellum.

FRENCH GUIANA. *Aublet* in Herb. Mus. Brit. No further material has been seen.

LINACEAE.

Hebepetalum humiriifolium (*Planch.*) *Benth.* in *Benth. et Hook. fil. Gen. Pl. i.* 245 (1862).—*Roucheria humiriifolia* *Planch.* in *Hook. Lond. Journ. Bot. vi.* 143 (1847).

Moraballi Creek, Essequibo River, Sept. 24th, 1929, *Sandwith* 332: tall tree in morabukea forest by creek bank: petals yellowish orange, covered within with white hairs. *Ibid.*, in wallaba forest, Oct. 8th, 1929, with young fruit, *Sandwith* 397: tall tree, 91½ ft. high, 8 in. diam. Demerara River, May 1889, *Jenman* 4856.

Vernacular name (Arawak), Shiballidanni.

Distr. Guiana to Pará.

HOUMIRIACEAE.

Houmiri balsamifera *Aubl.* Hist. Pl. Guiane, 564, t. 225 (1775).

Moraballi Creek, Essequibo River, Oct. 8th, 1929, *Sandwith* 399: tall tree, 121 ft. high, 3½–4 ft. diam., in wallaba forest: bark thinly fluted. Upper Demerara River, Sept. 1887, *Jenman* 4136.

Vernacular name (Arawak), Tauroniro or Tawaranru.

Distr. Guiana; Brazil (Rio Uaupes).

Compared with Aublet's specimen at the British Museum. The leaves of non-flowering shoots are larger and more amplexicaul than the others. One of the larger forest trees, and remarkably distinct from the well-known "Muri bush," *H. floribunda* Mart., of the savannah districts.

MALPIGHIACEAE.

Diplopterys microcarpa *Sandwith*, sp. nov.; *D. pauciflorae* (G. F. W. Mey.) Ndz. (*D. Paralias* Juss.) affinis, forma foliorum, petalis multo minus fimbriatis extra multo magis sericeo-pilosis, praesertim fructu multo minore, alis lateralibus singulis vel si binis omnino confluentibus sine ulla cavitate cristifera marginali differt.

Planta per frutices humiles in fluviorum ripis scandens; ramuli teretes, purpurascens, glabri vel parce arcte adpresse pilosi, copiose lenticellati; internodia 3–14 cm. longa. *Folia* opposita, ovata ad ovato-elliptica, apice conspicue sensim vel satis abrupte acuminata acumine vulgo 1–1.2 cm. longo, basi attenuata cuneata vel rotundata, 7–17 cm. longa, 2.5–8.5 cm. lata, chartacea, utrinque subnitida, integra, oculo nudo glaberrima, sed utrinque sub lente pilis adpressis malpighiaceis hic illic nonnunquam satis regulariter nonnunquam raris conspersa, utrinque conspicue reticulata, nervis primariis arcuantibus utroque costae latere vulgo 8–10, margine incrassato revoluta hic illic depresso-glanduloso; petiolus supra canaliculatus, adpresse pilosus vel glabrescens, 0.7–1.4 cm. longus. *Inflorescentiae* axillares oppositae atque terminales ternae, breves, congestae, multiflorae, 2–5 cm. longae, totae adpresse sericeo-tomentosae; umbellae vulgo 4-florae in paniculas dispositae, raro simplices; bractae lineari-subulatae, 2–8 mm. longae; bracteolae ultimae paullo supra basim pedicelli positae, minutae, vix 1 mm. longae; pedicelli plane evoluti 0.4–2 cm. longi. *Alabastra* matura ovoideo-subglobosa, 4–5 mm. longa, 3–4 mm. diametro, sericeo-pilosa. *Sepala* obovato-oblonga vel oblonga, valvata, 2.5–3 mm. longa, 1.5–2 mm. lata, extra apice marginibusque exceptis sericeo-pilosa, intus glabra; glandulae 8, sepalis facile superatae, illae sepalis cuiusque inter se liberae, statu vivente virides, siccitate nigrescentes, oblongae vel obovoideo-oblongae, 2–3 mm. longae, ad 1.25 mm. latae. *Petala* lutea; limbus orbicularis ad obovato-oblongus, 6–8.5 mm. longus, circiter 6 mm. latus, regulariter sed haud conspicue fimbriato-laceratus, extra apice marginibusque exceptis sericeo-pilosus, intus glaber; unguis adpresse pilosus, ad 3.5 mm. longus. *Stamina* filamentis ad 3 mm. longis basi dilatatis connatis; antherae glabrae, 1.2–1.5 mm. longae. *Ovarium* dense sericeo-pilosum, circiter 1.2 mm. altum, 1.75 mm. diametro; styli glabri, recti, stigmatibus truncatis umbilicatis inclusis fere 3 mm. longi. *Samarae* dense adpresse pilosae, ad 1 cm. longae, ad 1.4 cm. latae, totae indurato-lignosae; alae laterales utroque latere singulae, vel si binae omnino confluentes, 4–5 mm. latae, basi 3–4 mm. crassae, margine angusto acuto irregulari saepe profunde sinuato; ala intermedia dorsalis semiannuliformis, margine rotundato, 2 mm. lata; nux 6 mm. crassa.

BRITISH GUIANA. Moraballi Creek, Essequibo River, September 18th, 1929, *Sandwith* 289 (type): climber over low trees and shrubs on creek bank near its mouth: flowers yellow, with green glands. Mazaruni River, September 1880, *Jenman*, 649, 680; *ibid.*, August 1889, *Jenman* 5353, 5370.

RUTACEAE.

Hortia regia *Sandwith*, sp. nov.; *H. excelsae* Ducke affinis, foliis gigantibus aequilongis reticulatione simili, his tamen multo angustioribus subtus glabris statim distinguenda.

Arbor excelsa, 18-33 m., vulgo 30 m., alta, 25-27 cm. diametro, per silvas Guianae anglicae septentrionalis pervagata; ramuli summi novelli siccitate rubro-purpurei, nitidi, minutissime pilosuli, 10-12 mm. diametro. *Folia* gigantia apice ramulorum in rosulis insignibus stellatim patule conferta, forma generis typica anguste obovato-lanceolata, apice acuta subacuminata vel juniora 0.5-2 cm. cuspidata, versus basim longissime anguste attenuata, basi ipsa paullum auriculata, 50-95 cm. longa, 7.5-13.5 cm. lata, sub inflorescentia decrescentia, juniora chartacea, adulta coriacea, supra nitida, utrinque glaberrima, crebre nigro-punctata, nervis primariis utroque costae latere circiter 80 parallelis patulis fere rectis a se 5-15 mm. distantibus in nervum marginalem 1-4 mm. a margine crasso revoluta distantem anastomosantibus, nervis primariis atque rete venularum utrinque subaequaliter conspicuis subtus etiam elevatis, costa subtus praesertim basi crassissima. *Inflorescentia* composite corymbose cymoso-paniculata, terminalis, in centro rosulae foliorum surgens, 16 cm. alta, verticem densum immensum omnino planum mensae instar vulgo 30 cm. diametro praebens; ramuli statu vivente brunneo-olivacei, siccitate brunneo-purpurei, primarii 10-12 mm. diametro, tum sensim tenuiores, summi minute pilosuli 2-4 mm. lati; bractee imae foliaceae, virides, coriaceae, sursum decrescentes; bractee superiores bracteolaeque brunneo-purpureae, ovatae, concavae, 1-5 mm. longae, 1-3.5 mm. latae; pedicelli roseo-brunnei, minute pilosuli, crassi, 2-4 mm. longi, statu vivente 2 mm. siccitate 1.25-1.5 mm. lati, in calycem sensim ampliati. *Flores* densissime conferti; alabastra matura pulcherrime rosea, ovoidea vel late ovoideo-ellipsoidea, 5-7 mm. longa, 3-4.5 mm. diametro. *Calyx* roseo-brunneus, cupuliformis, extra pilosulus atque verruculoso-glandulosus, intus glaber, 3-4 mm. longus, 4-6 mm. latus, vertice truncato sed in lobos quinque breves, imbricatos, tenues, subscariosos, ciliolatos, late rotundatos, subsemicirculares, ad 0.75 mm. longos, ad 3 mm. latos, divisus. *Petala* anguste elliptico-oblonga, flore aperto 1 cm. longa, 3 mm. lata, apice mucrone ad 1.5 mm. longo inflexo praedita, extra glabra, intus secus medium incrassatum pilis densis barbata, margine intus roseo-purpureo. *Stamina* petalis aequilonga; filamenta albo-carnea, glabra, crassa, sulcata, vix ad 1 mm. lata; antherae 3-4 mm. longae. *Discus* circiter 1 mm. altus, 2.5 mm. diametro, conspicue 5-lobus. *Ovarium* glabrum, statu vivente viride, ovoideum,

3-loculare, sulcatum, vix 1.5 mm. altum, 1.25 mm. diametro, sensim in stylos roseo-purpureos connatos sulcatos ovario fere aequilongos transiens. *Fructus* carnosus, flavus, forma atque magnitudine fructum *Citri aurantifoliae* Swingle simulans, 4 cm. longus, ad 3.5 cm. diametro.

BRITISH GUIANA. In wallaba forest on sandy ridge, Moraballi Creek, Essequibo River, Nov. 11th, 1929 (fully mature buds), *Sandwith* 596 (type); *ibid.*, in greenheart forest, Oct. 19th, *Sandwith* 189; *ibid.*, in mora-morabukea forest, August 16th (leaves and young shoots only), *Sandwith* 32; opposite Bartica, Essequibo River, April 1887 (flowers and fruit), *Jenman* 3880; Kalakoon, Nov. 1886 (leaf only), *Jenman* 2562; Upper Demerara River, Sept. 1887 (open flowers), *Jenman* 4228; Upper Kamuni River, Demerara River, Dec. 1908 (open flowers), *C. W. Anderson* 153 in part.

Vernacular names: Warunanna (Arawak); Bush Orange; Powis' Tail Tree.

This is one of the most striking and easily recognised trees found in British Guiana. Individuals were scattered through all the types of forest studied by the Moraballi Creek. The tree from which the type material was collected was 102 feet high and 10 inches in diameter, while another example felled (no. 489) was 97 feet high and 15 inches in diameter. The inflorescence, as described above, forms an enormous flat-topped compound thyrse enclosed by the leaf-rosette. The pedicels and calyx are pinkish-brown, the mature buds a beautiful rose-pink, the filaments flesh-white, the ovary green with pinkish-purple styles. The fruit, according to *Jenman* and the Arawaks, is yellow, juicy and edible, about as large as a lime. *Ducke* gives no description of the mature floral parts of his *D. excelsa*, but the leaf of his no. 10518 in *Herb. Kew.* is immediately distinguished by its much greater width and by the conspicuous indumentum of the lower surface.

BURSERACEAE.

Trattinickia demerarae *Sandwith*, sp. nov.; inflorescentia *T. choisifoliae* Willd. simulans, foliolis 3-5-jugis angustioribus utrinque laevibus nec asperulis prominentius reticulatis basi rotundatis vel obtusis neque cordatis differt.

Arbor gummifera excelsa, circiter 39 m. alta, 80 cm. diametro, cortice laevi cinereo; ramuli summi floriferi cinerei, nitidi, punctis elevatis obtecti, ceterum glabrati, laeves, leviter sulcati. *Folia* 20-30 cm. longa, imparipinnata, petiolo supra applanato subtus tereti minute pubescente mox glabrato cinereo 5-10 cm. longo, internodiis glabratis cicatricibus gummae notatis 2-3 cm. longis; petioluli transverse rugosi, corrugati, glabri, 4-7 (vulgo 5) mm. longi; foliola 3-5-juga, vulgo opposita, lanceolata, oblongo-lanceolata, vel ovato-lanceolata, apice sensim conspicue 1-2 cm. acute acuminata, basi plerumque rotundata nonnunquam obtuse cuneata, 6-13 cm.

longa, 2-4 cm. lata, coriacea, supra nitida punctis minutis elevatis, oblecta sed laevia nec asperula, subtus punctata glabra laevia, utrinque praesertim subtus reticulata venulis intricatis manifestis elevatis, nervis primariis utroque costae latere circiter 16-25 parallelis usque ad furcam vulgo rectis a se 3-8 mm. distantibus. *Inflorescentia* laete pyramidalis, 15-25 cm. longa, basi 12-25 cm. lata, ramis subparallelis rectis vulgo (praesertim inferioribus) horizontalibus striatis pilis griseo-fulvis dense tomentellis. *Flores* pallide roseo-brunnei, ut in *T. rhoifolia* per ramos in ramulis abbreviatis densissime congesti; fasciculi florum globosi, 0.5-2 cm. diametro; pedicelli dense tomentelli, brevissimi, subnulli vel vix ad 1.5 mm. longi; bractee bracteolaeque ut in *T. rhoifolia* in compluribus seriebus, conspicuae, caducae, brunnescentes. *Calycis* tubus campanulatus, inaequaliter fissus, 2-2.5 mm. longus, 2-3 mm. latus, utrinque griseo-tomentellus; dentes triangulari-ovati, obtusi, 1.5-2 mm. longi, 2-2.5 mm. lati, utrinque tomentelli. *Corollae* tubus cylindricus, 4-4.5 mm. longus, ad 2.75 mm. latus, extra basi excepta dense griseo-tomentellus, intus nisi sub lobis glaber; lobi triangulari-ovati, obtusi, primo erecti, denique patuli, 1.5 mm. longi atque lati, extra griseo-tomentelli, intus sparsius pilosuli. *Antherae* 1.3 mm. longae, ad 0.75 mm. latae; filamenta brevissima. *Ovarium* glabrum, nigrescens, circiter 1.2 mm. diametro, 1 mm. altum, in stylum glabrum circiter 1 mm. longum transiens. *Drupa* siccitate nigra, ovoideo-subglobosa, ad 1 cm. diametro.

BRITISH GUIANA. Yarikita River, North-west District, April 13th, 1929, *Forestry Department* record no. 915 (type). "Very plentiful in mixed forest (dominants, Black Kakaralli and Haiariballi) on hill slope, on brown sand overlying ochreous-yellow clay. Large tree, slightly buttressed, 127 ft. high, 70 ft. to the first branch, 32 in. in diameter. Bark smooth, grey, moderately thick, yellowish when blazed. Tree has an aromatic gum like Haiowa gum, and is one of the Bastard Haiowas."

Moraballi Creek, Essequibo River, November 1929 (leaf only), *Sandwith* 708. Tall tree with straight smooth trunk, in morabukea-mixed forest, used as an observation-post by members of the Oxford Expedition.

Vernacular name (Arawak), Ulu.

CELASTRACEAE.

Maytenus myrsinoides Reiss. in Mart. Fl. Bras. xi. pars i. 21 (1861).

Moraballi Creek, Essequibo River, Oct. 3rd, 1929, *Sandwith* 369. Tall tree, 97 ft. high, 18 in. diam., in mixed forest. Flowers very small, with greenish-white petals.

Vernacular name (Arawak), Kaiarima.
Distr. Surinam, French Guiana.

It is hoped that more and better flowering material of this tree will be collected, for the confirmation of this identification.

HIPPOCRATEACEAE.

Salacia podostemma *Sandwith*, sp. nov.; *S. cognatae* (Miers) Peyr. affinis, inflorescentiis dichotome ramosis, pedunculo primario multo longiore, ramis omnibus gracilibus, pedicellis cymarum summarum distinctis nec capitellatim aggregatis differt.

Frutex alte scandens, ramulis ultimis glabris purpureis leviter sulcatis subteretibus 2-4 mm. diametro; internodia 4-7 cm. longa. *Folia* elliptica vel ovata, apice breviter 0.3-1 cm. cuspidata, nonnunquam rotundata vel emarginata, basi in petiolum abrupte cuneata, 8-18.5 cm. longa, 5-8.5 cm. lata, juniora chartacea utrinque nitida, adulta subcoriacea opaca, glabra, margine integro vel obsolete obscure crenato, juniora utrinque valde reticulata praesertim supra rete venularum subtilissimo, adulta supra nervis primariis impressis obscuris secundariis venulisque fere omnino immersis saepius haud distinguendis, subtus primariis secundariisque paullo elevatis sed venulis impressis, nervis primariis utroque costae latere 10-15 valde arcuatis; petiolus glaber, 1-1.6 cm. longus. *Inflorescentiae* solitariae, axillares, oppositae, nonnunquam in axillis cataphyllorum ovatorum vel ovato-lanceolatorum 2.5-6 mm. longorum 2-3 cm. latorum repertae, 5-10 cm. longae, pedunculo communi 3-5 cm. longo, tum repetite dichotomo-ramosae, apice cymis floriferis corymbosis 2-4 cm. latae; pedunculus ramique glabri, siccitate pruinoso-purpurascens, graciles, flexuosi; bractee bracteolaeque ovatae, concavae, 0.5-2 mm. longae, circiter ad 1.5 mm. latae. *Flores* albo-virides, satis laxae dispositi nec capitellatim aggregati; pedicelli distincti, parce verruculosi, 1-2 mm. longi. *Sepala* ovata, glabra, extra parce verruculosa, fimbriata, 0.75 mm. longa, 1 mm. lata. *Petala* rotundato-obovata, glabra, minute fimbriata, inaequalia, 1.5-2.25 mm. longa, 1.25-1.75 mm. lata. *Stamina* circiter 0.6 mm. longa, in cavitatibus disci ovariique lateralibus conspicuis suberecta. *Ovarium* cum disco confluentis, 1 mm. altum atque diametro, subglobosum, glabrum, lateraliter profunde tri-excavatum, vertice late rotundato-subumbilicato; stigmata 3, ovarii vertici horizontaliter adnata, tum ultra paullum producta, staminibus opposita, 0.5 mm. longa. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, August 24th, 1929, *Sandwith* 108. Bush-rope in mixed forest. Flowers whitish-green.

SAPINDACEAE.

Talisia squarrosa Radlk. in Sitz. Math.-Phys. Akad. Muench. viii. 346 (1878).

This fine tree, characteristic of wallaba forest, has very rarely been collected. The following agree with the type material (*Schomburgk* 736): Moraballi Creek, Essequibo River, Sept.-Oct. 1929, *Sandwith* 333, 357, 490; a large tree with silvery-grey bark. Moraballa-bisi Creek, Mapenna River, Corentyne River, May 1918, *Hohenkerk* in *Forestry Department* record no. 715.

Vernacular name (Arawak), Moroballi.

Matayba inelegans Radlk. in Sitzb. Math.-Phys. Acad. Muench. ix. 627 (1879).

In wallaba forest on dry soil by the Moraballi Creek, Essequibo River, Aug.-Oct. 1929, *Sandwith* 95, 96, 536. A low tree 25-30 ft. high, with white flowers and bright scarlet fruit.

Distr. British Guiana, Amazonian Venezuela.

M. opaca Radlk. l.c. 628.

In wallaba forest on high ground near the Moraballi Creek, Essequibo River, Sept.-Nov. 1929, *Sandwith* 330 and 566. A middle-sized tree, no. 566 being 70 ft. high and 9 in. in diameter. Other British Guiana collections are *Jenman* 4237 and 4269 (Upper Demerara River, Sept. 1887); *Jenman* 4330 (Lower Demerara River, Jan. 1888); *Jenman* 6860 and 6878 (Demerara River, Jan. 1896); *Hitchcock* 17304 (Rockstone, Dec. 1919—Jan. 1920).

Vernacular name (Arawak), Red Kuleshiri.

Distr. British Guiana, Surinam, Amazonian Brazil.

CONNARACEAE.

Rourea surinamensis Mig. in Linnaea xxvi. 221 (1853).

Moraballi Creek, Essequibo River, Sept. 7th, 1929, *Sandwith* 183; bush-robe in mixed forest. Canje River, April 1884, *Jenman* 1822.

Distr. West Indies, Guiana.

XXVIII.—TWO RUTACEAE FROM QUEENSLAND AND NEW GUINEA. W. D. FRANCIS.

A package of *Evodia* from Queensland and Papua (British New Guinea) was recently transmitted from the Queensland Herbarium to Kew for identification. The specimens collected in Queensland were labelled *Evodia accedens* Blume. After examining the collections at Kew, Berlin and Leiden I came to the conclusion that the Queensland material from the Queensland Herbarium, labelled *Evodia accedens* Blume, was not that species, but *Evodia Elleryana* F. Muell.

At Leiden I had the opportunity of examining a large series of specimens labelled by Blume as *Evodia accedens*. The botanists of the Rijks Herbarium kindly assisted me with their advice and experience. Unfortunately it was not possible to come to a decision as to which specimens constituted Blume's type of this species. However, the characters of *E. accedens* could be inferred from the many specimens written up in Blume's handwriting. It is evident that *E. accedens* Blume, which is a native of Java, is a large-leaved species with large panicles (at least twice the length of those of *E. Elleryana* F. Muell.) and small flowers (less than half the size of those of *E. Elleryana*).

Most of the Papuan specimens in the package from the Queensland Herbarium were also found to be *Evodia Elleryana*.

Two varieties of *E. Elleryana* are recognized by the writer, namely var. *pilosa* (Lauterb.) and var. *tetragona* (K. Schum.).

The latter was described by K. Schumann as a new species, *Evodia tetragona*, but hardly differs from typical *E. Elleryana* except in having a glabrous style. The former, which coincides with typical *E. Elleryana*, was published by Lauterbach as a variety *pilosa* of *E. tetragona*. It has a pilose style.

The synonymy of the two varieties is as follows:—

Evodia Elleryana F. Muell. *Fragm. Phytogr. Austr.* v. 4 (1865-1866).

1. var. **pilosa** (Lauterb.).

Evodia tetragona K. Schum. var. *pilosa* Lauterb. in Lorentz Nova Guinea, xiv. 140 (1924).

2. var. **tetragona** (K. Schum.).

Evodia tetragona K. Schum. Fl. Kaiser Wilhelms Land, 57 (1889).

The variety *pilosa* includes all specimens of the species collected in Queensland. It ranges from Stradbroke Island near Brisbane in the South to Bellenden-Ker Range near Cairns in the North. It also occurs in New Guinea.

The variety *tetragona* is evidently very common in New Guinea, as there is a large series of specimens from that island in the Herbarium of the Botanic Gardens, Berlin.

Another species of Rutaceae from Eastern Australia was distributed by F. Mueller as *Evodia accedens* Blume. Specimens of it from Mueller are in the Herbaria at Kew and Berlin and in the Rijks Herbarium, Leiden. Engler, recognising that the species was different from Blume's *accedens*, named it *Evodia Muellieri* in Engler & Prantl, Pflanzenfamilien iii. 4, 121 (1896). The specimens at Kew are labelled in exactly the same way as those at Berlin, and the same two species are concerned. The label in each instance reads: "*Evodia accedens* Blume, Rockingham Bay, Dall(achy)." In both cases a capsule contains the cocci of an *Evodia*. One of the branchlets of the Kew specimens bears both flowers and fruit. The fruits are very different from those in the capsule and show that the species is not an *Evodia* but an *Acronychia*. The flowers on the Berlin specimens match those on the Kew specimens. The cocci in the capsules accompanying the Kew and Berlin specimens match those of *Evodia Elleryana* F. Muell. var. *pilosa* (*E. tetragona* K. Schum. var. *pilosa* Lauterb.).

As well as I can remember the specimens from Mueller in the Rijks Herbarium, Leiden, bear a label similar to those of the specimens at Kew and Berlin. In this instance, however, I believe the fruits in the accompanying capsule match those which are *in situ* on the Kew branchlet.

In accordance with the observations outlined above I propose to transfer *E. Muellieri* Engl. to *Acronychia*, as it evidently belongs to the tetrastemonous section of that genus.

It should be pointed out that *Evodia Muellieri* is illustrated in the Pflanzenfamilien iii. 4, 120, by Fig. 67, G.H.J. According to my conclusions, J represents the fruit of *Evodia Elleryana* F.

Muell., and G and H the flowers of *Acronychia Muelleri* comb. nov. Obviously the confusion has arisen through the collector, or the person who transmitted the specimens, mixing parts of two species.

According to his remarks, Lauterbach (Engl. Bot. Jahrb. lv. 234, 1919; Nova Guinea, xiv. 140, 1924) evidently considered *Evodia Muelleri* Engl. and *E. tetragona* K. Sch. as very closely allied or probably identical species. On first viewing the types of the two species I formed a similar opinion of their relationship. After a further examination of the material in the Kew Herbarium as well as of that in the Herbarium of the Botanic Garden, Berlin, I found that there were considerable differences as under:—

Evodia Elleryana F. Muell.
(*E. tetragona* K. Sch.)

Leaflets mostly elliptical,
acuminate.

Filaments of stamens glabrous.

Anthers oblong, with a distinct
sinus between the thecae at
the apex.

Disk of flower very large, con-
spicuous, 4-lobed and densely
fulvous-pubescent.

Ovary deeply 4-lobed, finely
pubescent.

Fruits of 1-4 separate cocci.

Acronychia Muelleri (Engl.)
comb. nov. (*Evodia Muelleri*
Engl.)

Leaflets mostly lanceolate,
long-acuminate.

Filaments of stamens pubescent
in lower part.

Anthers ovate, the apex without
a sinus between the thecae.

Disk of flower almost impercep-
tible.

Ovary entire, hyper-hemis-
pheric, densely fulvous-
pubescent.

Fruit pyriform, fulvous-pubes-
cent, slightly 4- or 8-lobed.

A comparison of Fig. 67, G and H, in the Pflanzenfamilien iii. 4, 120 (1896) with Fig. 1 in Engler's Bot. Jahrb. lv. 235 (1919) will demonstrate some of the points of difference outlined above.

From the characters given, it is evident that *Evodia Muelleri* differs from *E. Elleryana* not only specifically but also generically. Because of the confusion associated with this species a description of it is appended.

Acronychia Muelleri (Engl.) W. D. Francis, comb. nov.

Apparently a tree. Glabrous throughout except the inflorescence and fruit. Branchlets terete, 3.5 mm. in diameter 14 cm. from the apex. Leaves opposite, 3-foliate; petioles 3-6 cm. long; leaflets lanceolate, apex long acuminate, blade finely decurrent into the petiolule, with 10-12 principal lateral nerves visible on both sides of midrib; blades 7-13 cm. long [about 3 times as long as broad]. Inflorescence just above the scars of fallen leaves, 2-3 cm. long; the common peduncle 7-12 mm. long, bearing 3-6 flowers at its apex and sometimes 1-4 flowers lower down; or at times the common peduncle bears one or a few cymes of 3 flowers each pedicels

3-5 mm. long. Calyx disc-shaped or concave, 3-4 mm. diameter, divided almost to the base into 4 imbricate, orbicular lobes 1.5-2 mm. in diameter. Petals 4, ovate or elliptic, punctate outside, fulvous-pubescent inside, 5-6 mm. long, 3 mm. broad. Stamens 4; filaments filiform, or slightly flattened below, pubescent towards the base, 10-12 mm. long; anthers attached near middle of their back, ovate or cordate, 2 mm. long, 1 mm. broad. Disc inconspicuous or wanting. Ovary hyper-hemispheric, very densely fulvous-pubescent; style slender, pilose in lower part. Fruit pyriform, fulvous-pubescent, slightly 4- or 8-lobed, wrinkled and reticulate outside in the dry state, 12-14 mm. long and about 10 mm. in diameter.

QUEENSLAND. Rockingham Bay, Dallachy.

PAPUA. Borabere, 1000 ft., 30.11.1925, Brass 728.

Brass describes the species as an erect sparsely-branched tree, 20-25 ft. high, with a close light-brown bark; flowers pink, borne on branches below the leaves or on the main branches.

XXIX.—NOTES UPON SOUTH AFRICAN PLANTS.

N. E. BROWN.

I. Iridaceae.

Aristea torulosa Klatt.

Through the courtesy of Dr. L. Diels, the Director of the Botanical Garden and Museum, Berlin, I have had the opportunity of examining the specimens upon which Klatt founded *Aristea torulosa* and find, as I had expected, that they are quite distinct not only from the plant described by Baker (in Dyer, Fl. Cap. vi. 49) under the name *Aristea torulosa*, but also from any specimens in the Kew Herbarium.

Klatt (Ergänz. 48) founded *A. torulosa* upon two specimens collected by Drège, numbered 4558 and 4559 respectively. Upon examination, I find that these two specimens represent two distinct but allied species. The general description given by Klatt applies equally well to both specimens, but the characters "caulis 2-pedalis" and "ramis brevibus alternantibus" apply only to the specimen numbered 4558, and as this is also the first number quoted for the species by Klatt it may be considered to be the type of *A. torulosa*. A revised description of the species is now supplied.

Aristea torulosa Klatt, emend. N. E. Brown.

Stem (broken away from the basal part) 56 cm. high, probably 60 cm. or more when alive, 4 mm. thick, compressed and slightly 2-edged (not triangular as described by Klatt), bearing two leaves (besides three at its base) and 4 sheaths. Leaves 20-30 cm. long, one being 3 mm. broad and the remainder 5.5-7.5 mm. broad (not 2 lines—4 mm.—as stated by Klatt). Inflorescence 10 cm. long, with four internodes 8-30 mm. long; each node bears an ascending branch with 1-3 flower-clusters upon it (the alternating branches of Klatt's description) and one sessile cluster in its axil; the uppermost branch is 8 mm. long and the lowest 4.5 cm. long. Flower-clusters as

dried, with flowers all shrivelled, 8–10 mm. in diameter; the outer or cluster-bract with more than half its area firm and brown (or perhaps green when alive) and the margins membranous, lacerate; inner bracts membranous, much lacerate, whitish. *Flowers* not dissectable, their twisted remains about 6 mm. long.

CAPE PROVINCE. Kentani or Willowvale Division, between Kei (Gekau of Drège) River and Bashee River, *Drège* 4558.

***Aristea congesta* N. E. Brown, sp. nov.**

Planta similis *A. torulosae* Klatt sed tantum 32.5 cm. alta. *Folia* 20–28 cm. longa, 6–9 cm. lata, linearia, acuta, inferiora curvata. *Spica* 5 cm. longa, densa, internodiis indistinctis, basi tantum sub-biramosa, e capitulis globosis 12 mm. diametro composita. *Perianthii* reliquiae 6–9 mm. longae.

Plant, including rhizome, 32.5 cm. high, with about 3 basal leaves (two of them much curved), 20–28 cm. long and 6–9 mm. broad, linear, acute, and 3 reduced leaves and 1 sheath on the compressed and faintly 2-edged stem. *Inflorescence* 5 cm. long, composed of two short basal branches and about 8 sessile densely crowded flower-clusters, 12 mm. in diameter, without apparent internodes between them. Outer bracts with broader membranous margins than in *A. torulosa*, and, together with the whitish membranous inner bracts, much lacerated. *Flowers* not dissectable, their twisted remains 6–9 mm. long.—*A. torulosa* Klatt, *Ergänz.* 48 (1882), pro minore parte.

CAPE PROVINCE. Pondoland: between Umsikaba River and Umtentu River, *Drège* 4559.

For the plant actually described by Baker in *Flora Capensis* as *A. torulosa* I propose the name *Aristea Woodii*.

***Aristea Woodii* N. E. Brown, nom. nov.**—*A. torulosa* Baker in Dyer, *Fl. Cap.* vi. 49 (1896), quoad descr., non Klatt.

NATAL. Inanda, *Wood* 751 (type); Clairmont, *Wood* 206; without locality, *Krauss*.

Under *A. torulosa*, Baker also included the following species:—

***Aristea affinis* N. E. Brown, sp. nov.**

Planta 50–76 cm. alta. *Caules* basi 2.5–4 mm. crassi. *Folia* 15–30 cm. longa, 4–8 mm. lata, linearia, acuta. *Inflorescentia* 10–20 cm. longa, internodiis 0.8–3.6 cm. longis, inferne 2–3 ramulis brevibus, superne simplex. *Capitula* 6–10 mm. diametro. *Perianthii* reliquiae 9–12 mm. longae.

Plant 50–76 cm. high with about 4 basal leaves 15–30 cm. long and 4–6 mm. broad, straight, linear, acute, and about 3 reduced leaves and 3 sheaths on the slightly compressed stem, which is about 4 mm. thick at the base. *Inflorescence* 10–20 cm. long with 4–8 nodes, and the internodes 0.8–3.6 cm. long, the lower 1–3 nodes producing short ascending branches bearing 2–4 flower-clusters, and

the upper nodes all with sessile clusters, 6–10 mm. in diameter. *Flowers* pale blue, their remains 9–12 mm. long.

TRANSVAAL. Near Barberton, on grassy mountain slopes at Upper Moodies, *Galpin* 1209.

***Aristea curvata* N. E. Brown, sp. nov.**; similis *A. affinis* N. E. Brown quoad caulem et inflorescentiam, sed foliis valde falcato-recurvatis 15–18 cm. longis et 7–8 mm. latis differt.

In height and inflorescence this plant is very like *A. affinis* N. E. Brown in the dried state, but differs conspicuously in its foliage; the basal leaves are only 15–18 cm. long, 7–8 mm. broad, and are strongly falcately recurved, and the free tips of the stem-sheaths are 2–3 cm. long and 4–5 mm. broad. There also seem to be indications that *A. curvata* is a more glaucous plant than *A. affinis*, but this may be due to drying. The flowers of neither species are dissectable and cannot therefore be compared.

TRANSVAAL. Pietersburg Division: Houtbosch, *Rehmann* 5770.

***Aristea gracilis* N. E. Brown, sp. nov.**

Planta 30–38 cm. alta. *Caules* graciles, basi 1.5–2 mm. crassi. *Folia* 9–20 cm. longa, 3–5 mm. lata, leviter curvata, linearia, acuta; caulium vaginae arcte convolutae. *Spica* 2.5–8 cm. longa, simplex. *Capitula* 3–5, sessilia, 4–8 mm. diametro, bractearum marginibus albidis. *Perianthii* lobi circiter 7 mm. longi, 3–4 mm. lati, obovati, apice obtuse rotundati, caerulei.—*A. torulosa* var. *monostachya* Baker in Dyer, *Fl. Cap.* vi. 49 (1896).

TRANSVAAL. Lydenburg Division: Spitzkop Goldmine, *Wilms* 1420 (type).

NATAL, without precise locality, *Buchanan*.

***Watsonia Ardernei* Mathews et L. Bolus** in *Ann. Bolus Herb.* iv. 25 (1925).

This appeared as a new species, but the name *Watsonia Ardernei* was effectively published twenty-eight years earlier, the correct reference being to Sander, *New Plants*, 1897, pp. 19–21, with figure.

The account given by Sander can hardly be regarded as a technical description, and the illustration cannot be accepted as equivalent to a description, since it does not contain analyses. The name *Watsonia Ardernei* Sander was, however, validated by the citation, as a synonym, of *Watsonia iridifolia* var. *O'Brieni* N. E. Brown, which had been published with a description in *Gard. Chron.* 1889, vi. 350.

The history of this handsome plant appears to be as follows:—There is a specimen of it in Thunberg's Herbarium, collected by Thunberg between 1772 and 1775 (see *Journ. Linn. Soc., Bot.* xlviii. 26), so that he must be credited with the discovery of this beautiful species. No other collector appears to have found it until 1889, when it was introduced into cultivation and described by the writer

as *W. iridifolia* var. *O'Brieni* N. E. Brown, and eight years later was published as a distinct species by Sander.

***Watsonia juncifolia* Baker**, Handb. Irid. 178 (1892).

Although placed under *Watsonia*, this plant cannot belong to that genus, as the perianth-tube is very slender and not at all widened from or below the middle to the throat as it is in *Watsonia*, and the stamens are inserted at the throat instead of at the middle of the tube. As the above characters are those that distinguish *Lapeyrousia* from *Watsonia*, this plant must be transferred to the former genus. I therefore propose for it the name ***Lapeyrousia juncifolia* (Baker) N. E. Brown**, comb. nov.

***Watsonia densiflora* Baker** in Journ. Bot. 1876, 336.

This species was founded upon Drège 4536, Plant 29, Cooper 3186, Cooper 886, and a specimen collected by Miss Armstrong, without a number. As these quoted specimens represent several different species, a type for *W. densiflora* has to be selected from among them; therefore, as the original description seems to have been drawn up chiefly if not entirely from Drège 4536, and as that is the first specimen quoted by Baker, I propose that it should be accepted as the type of *W. densiflora* Baker. Drège collected it in Pondoland, between St. John's River and Umtata River.

For the other specimens I propose the following names:—

***Watsonia Plantii* N. E. Brown**, sp. nov.; planta *W. densiflorae* Baker simillima, sed internodiis inter flores distinctis, bracteis 3 cm. (nec 2.5 cm.) longis, perianthio 5–5.5 cm. longo segmentis 5 mm. (nec 7 mm.) latis et brevissime apiculatis differt.

NATAL. Near Durban, Plant 29.

In 1878 a plant collected by Mr. C. Mudd in Natal was figured in Bot. Mag. t. 6400 as being *W. densiflora* Baker. But this plant differs from *W. densiflora* (as to Drège 4536) by having narrower leaves, narrower and more acuminate bracts, displaying the internodes of the spike between the flowers, and narrower perianth lobes. No specimen of this plant appears to have been preserved, but the figure of the inflorescence as depicted in Bot. Mag. t. 6400 agrees so exactly with that of Plant 29, that I believe it to represent the same species. Unfortunately Plant's specimen is destitute of leaves, so that those organs cannot be compared with the figure.

***Watsonia lepida* N. E. Brown**, sp. nov.

Planta circiter 60–70 cm. alta, foliosa, glabra. Folia 7–15 cm. longa, 4–8 mm. lata, linearia, acuta, marginibus incrassatis. Spica 11–17 cm. longa, 14–16-flora, internodiis inter flores distinctis ad 10 mm. longis. Bractee 2–3 cm. longae, 4–6 mm. e margine ad carinam latae, acuminatae. Perianthii tubus 3–4 cm. longus, ad medium curvatus et superne inflatus; lobi 2–2.3 cm. longi, 7–8 mm.

lati, lanceolati, oblongi, acuti, apiculati, pallide rosei. Stamina e tubo perianthii 2–3 mm. exserta.

ORANGE FREE STATE. In the vicinity of Harrismith, Cooper 886.

***Watsonia neglecta* N. E. Brown**, sp. nov.

Planta circiter 90 cm. alta, glabra. Folia ad vel ultra 45 cm. longa, 5–8 mm. lata, linearia, marginibus incrassatis. Spica circiter 20 cm. longa, 30-flora, partibus internodiorum inter bracteas conspicuis 2–5 mm. longis. Bractee 16–18 mm. longae, 5 mm. e margine ad carinam latae, subobtusae vel breviter acutae. Perianthii tubus circiter 3 cm. longus, subrectus vel vix curvatus, supra medium dilatatus; lobi 14–16 mm. longi, 7 mm. lati, oblongi, breviter acuti, apiculati.

NATAL, Cooper 3186.

The apical part of all the leaves on the specimen seen has been cut off, and the longest of them is 39 cm. long, but has evidently been very much longer. The colour of the flower is not stated by the collector, who could not localise his specimens, as the places where he collected during his journey were unnamed at that date, about 1861.

***Morea obtusa* N. E. Brown**, sp. nov.; *M. angustae* Ker simillima sed humilior, floribus multo minoribus, segmentis exterioribus lilacinis vel violaceis.

Bulbus globosus, 1.2 cm. diametro, tunicis in segmenta linearilanceolata imbricata sectis nigro-fuscis. Caulis 15–30 cm. altus, simplex, unifolius. Folium 20–40 cm. longum, 0.7–1.3 mm. crassum, teres, glabrum. Bractee tres, superiores 3–4 cm. longae, omnes apice truncato-rotundatae, virides, saepe purpureo-marginatae. Perianthium circiter 4.5 cm. diametro, segmentis lilacinis vel violaceis, exterioribus unguibus 1.2 cm. longis et limbis 1.8 cm. longis et 8 mm. latis, interioribus circiter 1.8 cm. longis et 3 mm. latis. Antherae croceae vel aurantiacae. Styli ramorum cristae 1.2–1.4 cm. longae, acute bilobae, albae.

CAPE PROVINCE. Cape Division: in a marsh at Crawford, Cape Flats, Weintroub in Herb. Moss 18185 (type); Wynberg, Prior; Simon's Bay, Wright; Devil's Mountain, Scott Elliott; between Constantia Nek and Hout Bay, Wolley Dod 3268; near Camps Bay Toll, Wolley Dod 1358.

This plant has hitherto been confused with *M. angusta* Ker, but is readily distinguished by its smaller size and differently coloured flowers, those of *M. angusta* being pale yellow or creamy-yellow and much larger than those of *M. obtusa*. Both these species are distinguished from the other species of the genus by the truncately rounded tips of the bracts.

II. Liliaceae.

***Bulbine lagopus* (Thunb.) N. E. Brown**, comb. nov.

Baker cited *Anthericum lagopus* Thunb. as a synonym of *Bulbine longiscapa* Willd., in Dyer, Fl. Cap. vi. 363, but although

allied to that species *A. lagopus* differs conspicuously by having shorter and blunter leaves and entire bracts; in *B. longiscapa* the bracts are somewhat woolly-ciliate at the base. I therefore separate Thunberg's plant under the above name. Thunberg does not mention where it was collected, but a plant collected on Table Mountain (Rogers 17728) appears to be this species, which is remarkable for the manner in which the pedicels from which the unfertile flowers have fallen recurve or are revolute.

Bulbine Zeyheri Baker.

This species was founded in Journ. Linn. Soc. Bot. xv. 347, upon specimens collected by Zeyher bearing the numbers 4219 and 4224. But as these numbers represent two distinct species, one of them has to be renamed. As the specimens bearing the number 4219 are evidently those from which the description was chiefly made, since they best conform to it, and that number is the one first quoted by Baker, it (No. 4219) should be taken as the type of *B. Zeyheri*, which according to one label at Kew was collected in Worcester district. A new name, *B. inops*, is now given to the other number.

Bulbine inops N. E. Brown, sp. nov.

Acaulis, tuberosa, 15-17.5 cm. alta. *Folia* 3-4, erecta, 5-9 cm. longa, 2-3 mm. lata (siccata), attenuata, acuta, glabra. *Scapus* 7.5-10 cm. longus, 1-1.5 mm. crassus. *Racemi* 5-9 cm. longi, 6-12-flori. *Bracteae* 2 mm. longae, ovatae, mucronatae, pallide brunneae. *Pedicelli* ascendentes vel suberecti, 6-8 mm. longi. *Perianthium* 5 mm. longum, segmentis vix 1.5 mm. latis. *Capsula* 4 mm. longa.

CAPE PROVINCE. Swellendam Division: Hassaquas Kloof, near the Zonder Emde River, Zeyher 4224.

III. Orchidaceae.

Eulophia robusta Rolfe.

This species was founded in *Kew Bull.* 1910, 369, upon a specimen collected near Heidelberg, in the Transvaal, "*McLea in Herb. Bolus* 5818." In Dyer, Fl. Cap. v. part 3, 35, a large number of other localities are quoted for the species. Upon examination, however, I find that two distinct species have been confused, for No. 5818 of Herb. Bolus is identical with *E. Cooperi* Reichb. f., while the other specimens confused with it are the same as *E. Bakeri* Rolfe, which was founded upon a leaf and one flower only. I find too that *E. fragrans* Schlechter and *E. Sankeyi* Rolfe are also identical with *E. Cooperi* Reichb. f., although placed in a different part of the key. The following therefore will be the synonymy of the above species:—

Eulophia Cooperi Reichb. f. in Flora, lxiv. 330 (1881).—*E. fragrans* Schlechter in Engl. Bot. Jahrb. xx. Beibl. 50, 27 (1895). *E. robusta*

pt. 3, 46 (1912).

The types of *E. Cooperi* and *E. Sankeyi* are both from Harrismith, and the types of *E. fragrans* and *E. robusta* are both from Heidelberg.

It may be of interest to those who have sets of Cooper's plants to know that all his specimens noted as having been collected in the Orange Free State were obtained in the vicinity of Harrismith or upon or near Nelson's Kop, as Mr. Cooper informed the writer that he collected in no other part of the Orange Free State.

Eulophia Bakeri Rolfe.—*E. robusta* Rolfe in Dyer, Fl. Cap. v. pt. 3, 35, as to specimens quoted, excluding *McLea in Herb. Bolus* 5818, not as to *Kew Bull.* 1910, 369.

The above two species may be distinguished as follows:—

Leaves 5-15 cm. long; sheaths on the flowering stem about 8-9 mm. in diameter as they grow on the stem, which they loosely surround, open at the top; lip of flower with 4-5 rows of papillae or small tubercles which towards the tip of the lip sometimes change into a few filiform processes.....*E. Cooperi*.
Leaves 13-32 cm. long; sheaths on the flowering stem 4-6 mm. in diameter and rather closely embracing the stem; lip of flower with 4-5 rows of small tubercles on the basal part, which change into numerous filiform processes or crests on the front part.....*E. Bakeri*.

IV. Ficoidaceae.

Mesembryanthemum lunulatum Berger.

Having examined the type of this species, I find it to be identical with *M. Frederici* L. Bolus and that *M. argenteum* L. Bolus is also conspecific, therefore the synonymy of the species is:—

Mesembryanthemum Frederici L. Bolus in Ann. Bolus Herb. ii. 31 (1916).—*M. lunulatum* Berger in Engl. Bot. Jahrb. lvii. 638 (1922). *M. argenteum* L. Bolus in Ann. Bolus Herb. iv. 8 (1925).

Mesembryanthemum squalidum N. E. Brown.

This is the plant figured and described in Flowering Plants of South Africa, vii. t. 277, under the name of *Ruschia cymbifolia* L. Bolus, and there supposed to be the same as *Mesembryanthemum cymbifolium* Haw. But it differs from the latter species by its mode of branching, smaller and different leaves, longer pedicels and smaller flowers, and is from a different locality. I have therefore changed the name as above. With reference to the genus *Ruschia*, this does not differ structurally in any way from *M. umbellatum* Linn., which I selected for the type of *Mesembryanthemum* when I restricted and emended that genus, and it must therefore be treated as a synonym of *Mesembryanthemum*.

XXX.—SUGGESTED CONSERVATION OF POLLICHIA.
C. A. SMITH.

The generic name *Pollichia* Dryand. in Ait. Hort. Kew. ed. 1, i. 5 (1789) has been used in standard works for over 140 years for a monotypic African genus of *Caryophyllaceae* (*Illecebraceae*). Under International Rules, ed. 2, Art. 56, it was the correct name for this genus, since the prior homonym *Pollichia* Schrank (1782) was a superfluous name for *Galeobdolon* Adans. (1763), and *Pollichia* Medic. (1783) is a *nomen rejiciendum* in respect of *Trichodesma* R. Br., of which it is a nomenclatural synonym.

At the Fifth International Botanical Congress held at Cambridge in August, 1930, however, a rule was proposed rejecting all later homonyms, except such as are or may be conserved, and was passed on the understanding that any well-known generic names invalidated by it would be considered for conservation. A case for the conservation of *Pollichia* Dryand. is accordingly presented for consideration by the appropriate International Committee. The running number prefixed to the name is that of Dalla Torre & Harms, *Genera Siphonogamarum*.

2467. *Pollichia* Dryand. in Ait. Hort. Kew. ed. 1, i. 5 (1789): versus *Meerburgia* Moench (1802).

Pollichia Dryand. would under the revised Rules be superseded by *Neckeria* Gmel. (Syst. 16: 1791), but for the fact that the latter is in its turn invalidated by the earlier homonym *Neckeria* Scop. (1777). Thus the next oldest name, *Meerburgia* Moench (Meth., Suppl. 116: 1802), must now be used in place of *Pollichia* Dryand., unless the latter is conserved. *Meerburgia* Moench has, however, apparently not been used for nearly 130 years, i.e., since the date of its publication. *Pollichia* Dryand., on the other hand, has been adopted in Ait. Hort. Kew. ed. 1, i. 5 (1789); Schreb. Gen. ii. 782 (1791); Willd. Sp. Pl. i. 23 (1798); Pers. Syn. i. 4 (1805); Ait. Hort. Kew. ed. 2, i. 11 (1810); Roem. & Schult. Syst. Veg. i. 17 (1823); DC. Prodr. iii. 377 (1839); Harv. Gen. S. Afr. Pl. ed. 1, 112 (1838); Endl. Gen. 959 (1839); A. Rich. Tent. Fl. Abyss. i. 304 (1847); Harv. & Sond. Fl. Cap. i. 133 (1859-60); Harv. Gen. S. Afr. Pl. ed. 2, 320 (1868); Benth. & Hook. f. Gen. Pl. iii. 14 (1880); Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 1 B, 89 (1889); Dalla Torre & Harms, Gen. Siphonog. 158 (1900); Dyer, Fl. Trop. Afr. vi. sect. 1. 10 (1909); Dyer, Fl. Cap. v. sect. 1. 399 (1910); Marloth, Fl. S. Afr. i. 213 (1913); Thonner Fl. Pl. Afr. 193 (1915); Phill. Gen. S. Afr. Pl. 255 (1926).

The original specimens of *P. campestris* Soland.—those of the wild parent plant and the cultivated specimens from which Solander described—are preserved in the British Museum (Natural History) Herbarium, while there exists also a fine plate made from the type plant by Sir James Edward Smith (Spicil. Bot. t. 1: 1791). So far as the writer is aware, it is not known whether the type specimen of *Meerburgia glomerata* Moench is still in existence.

XXXI.—ADDITIONS TO INDEX KEWENSIS: XI.*

Griffith, Itinerary Notes (Posthumous Papers, vol. ii., edited by John M'Clelland), 1848.

Attention having been drawn to the omission from the Index Kewensis of certain names contained in the above work, it was decided to examine thoroughly the entire volume with the view to abstracting any others that had been overlooked. This has resulted in the addition of 65 names that either have been entirely omitted from the Index or were included from a work bearing a later date.

The "Itinerary Notes" contain an Introduction including Letters of Griffith to Wight covering the period 1838-44, as well as an explanatory note by the Author.

The body of the work is divided into four books which are continuously pagged, books I-III. dealing respectively with the Khasyah Flora, the Bootan Flora and the Afghan Flora. It is from these three books that the following names have been abstracted. According to the Author's note on p. lxiv. of the Introduction, the Khasyah Catalogue (Book I) corresponds with the set of Khasyah plants reserved for his own use and made in the months of October and November 1837. He also gives a record of the numbers of those plants which were collected in the near neighbourhood of the Khasyah Hills and included in the Flora.

Book II. (Bootan Flora, pp. 99-204).

The numbers in this book correspond with the original numbers attached to the specimens collected during Captain Pemberton's Mission to Bootan in 1837-38.

Book III. (Afghan Flora, pp. 205-367).

This deals with the collections made between Shikapore and Peshowur, with numbers up to 1273. Additional numbers 1-201, the second year's collection, also a supplementary list numbers 1-15, are included.

These notes as edited by M'Clelland have been compared with the original manuscript, and where it has been considered necessary certain corrections have been made. These mostly concern typographical errors.

The following is the list of names which will be included in Supplement VIII. of the Index Kewensis. Each name is followed by the number of the page on which it occurs in the Itinerary Notes and by the running number of the specimen. Binominals followed by descriptions are cited first. Those that have nothing more than collector's notes or are bare names are so indicated by the words "nomen subnudum" or "nomen."

M. L. G.

- * Adhatoda cymosa 7, no. 96.
- Villarsia eglandulosa 15, no. 225.
- Crotalaria hoveoides 26, no. 396.

*Continued from *Kew Bull.* 1930, p. 45.

Begonia orchidiflora 38, no. 627.
Anisadenia pubescens 54, no. 833.
Parnassia nana 58, no. 903.
Dendrobium Bolbophylli 65, no. 1019.
Thibaudia affinis 84, no. 1218.
Ficus papyrifera 101, no. 32.
Ficus terminalioides 101, no. 33.
Solanum farinaceum 111, no. 148.
Leptospartion pp. iii, 114, no. 193.
Leptospartion grandiflorus, pp. iii, 114, no. 193.
Thibaudia myrtifolia 125, no. 434.
Panax rhododendrifolium 127, no. 487.
Cupressus pendula 131, no. 529; et l.c. 143, no. 679a.
Acanthus carduaceus 144, no. 688.
Rhododendron macranthum 144, no. 690.
Thibaudia orbicularis 160, no. 820.
Swertia plantaginifolia 171, no. 880.
Pythonium ecaudatum 185, no. 941a.
Convallaria cirrhosa 191, no. 1019.
Polygonum rheiflorum 224, no. 170.
Bignonia puniceoides 227, no. 202.
Euonymus spinosus 279, no. 721a; et l.c. 430.
Heliotropium flavum 322, no. 1271.
Typha angustissima 342, no. 77.
Diospyros Umlovok 355, no. 137.
Justicia lobatum 10, no. 131, sphalm.: J. Ecbolium.
Paspalum flagellatum 15, no. 216.
Hedyotis subscandens 18, no. 270.
Tradescantia aspera 19, no. 292.
Vandellia rotundifolia 27, no. 414, nomen subnudum.
Saxifraga ligularis 38, no. 628; et l.c. 156, no. 777, nomen subnudum.
Betula corylifolia 54, no. 834, nomen subnudum.
Ophiopogon leptophylla 62, no. 955, nomen subnudum.
Eriocaulon fluitans 65, no. 1005, nomen subnudum.
Dendrobium eriiflorum 66, no. 1020, nomen subnudum.
Dendrobium fuscescens 73, no. 1123, nomen.
Quercus vestita 90, no. 1325, nomen subnudum.
Callicarpa salviifolia 94, no. 1390; et l.c. 406, nomen subnudum.
Cephalanthus spinosus 94, no. 1407, nomen subnudum.
Cymbopogon hispidus 96, no. 1429a, nomen subnudum.
Knoxia exaltata 96, no. 1431, nomen subnudum.
Peristrophe nodosa 111, no. 152, nomen subnudum.
Bambusa andropogonifolia 124, no. 417, nomen subnudum.
Smilax gaultheriifolia 126, no. 463, nomen subnudum.
Maesa salicifolia 128, no. 491, nomen subnudum.
Mespilus microphyllus 130, no. 518, nomen subnudum.
Cirsium decurrens 132, no. 539, nomen subnudum.
Cerastium canum 134, no. 557, nomen subnudum.
Scirpus kysooroides 155, no. 765, nomen subnudum.
Morus ribesioides 157, no. 795, nomen subnudum.
Viburnum canum 186, no. 959, nomen subnudum.
Rhodora deflexa 187, no. 969, nomen subnudum.
Pyrus arioides 194, no. 1060, nomen subnudum.
Croton malvifolia 200, no. 1166, nomen subnudum.
Populus amygdalacifolius 286, no. 812, nomen subnudum.
Aconitum salisburifolium, 306 no. 1045, nomen subnudum.
Onosma versicolor 315, no. 1175, nomen subnudum.
Lythrum hypericoides 318, no. 1215, nomen subnudum.
Rubia oppositifolia 356, no. 144, nomen subnudum.

The following names appear for the first time in Griffith, Journals of Travels, one year earlier than in the above work. The references to both works are quoted.

Abies spinulosa *Griff.* Journ. Trav. 259, 265 (1847); *Griff. Itin. Notes* (Posth. Papers, ii.) 145, no. 694 (1848).
Santonica *Griff.* Journ. Trav. 349 (1847), in obs. et adnot., nomen (Compositae).
Santonica achillaeoides, *Griff. l.c.*; *Griff. Itin. Notes* (Posth. Papers, ii.) 259, no. 499 (1848).

XXXII.—FUNGI EXOTICI: XXVII. E. M. WAKEFIELD.

Merulius miniatus *Wakef.*

Resupinatus, effusus, arcte adnatus, tenuis, mollis, circiter 10 cm. longus, 1–2 cm. latus, margine indeterminato aurantiaco. Hymenium miniatum, poroso-reticulatum, sicco facile e subiculo separandum. Contextus 140–160 μ crassus, ex hyphis hyalinis, 2–4 μ diametro, tenuiter tunicatis, non nodoso-septatis, laxe intertextis, compositus. Basidia clavata, 4-sterigmatica, 15–18 $\times$ 5 μ . Sporae hyalinae, allantoideae, 5–6 $\times$ 1–1.5 μ . Gloeocystidia cylindrica vel fusiformia, 40–60 $\times$ 5–7 μ , tenuiter tunicata, succo rubido repleta, e plicis ad 20 μ emergentia.

NEW ZEALAND. York Bay, Wellington, on dead twigs on the forest floor, *E. J. Butler*, No. 1218, July 1923.

In general appearance this species recalls *Poria taxicola* (Pers.) Bres. and *Merulius Ravenelii*, but the colour is brighter than in either. From *Poria taxicola* it differs in the narrower basal hyphae and from *M. Ravenelii* in the presence of thin-walled gloeocystidia, with coloured contents, on the folds of the hymenium.

Aleurodiscus peziculoides *Wakef.*

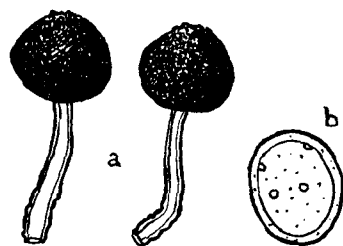
Fructificationes circiter 1 mm. diametro, gregariae, erumpentes, haud confluentes, convexae, genus *Pezicula* in mentem referentes, margine libero, haud incurvo, infra brunneo. Hymenium convexum, pruinatum, ex alutaceo roseo-cinnamomeum. Basidia juvenilia clavata, intus granulata, 75–80 (–200) $\times$ 12–16 μ . Paraphyses (acanthophyses) elongatae, supra vix incrassatae, apice aculeatae, 4–6 μ diametro. Sporae non visae. Hyphae hyalinae, dense intertextae, vix distinguendae, crasse tunicatae, non nodosae, 4–4.5 μ diametro, accretionibus mineralibus magnis subglobosis intermixtis.

NEW ZEALAND. York Bay, Wellington, on dead twigs on the forest floor, *E. J. Butler* and *G. H. Cunningham*, No. 1210, July 1923.

In habit the species recalls *A. Farlowii* Burt and *A. Grantii* Lloyd. From the former it differs in the more slender paraphyses, aculeate only at the apex, and from the latter in the microscopic characters, in so far as they were indicated by the author. The flesh is remarkably firm for the genus and the elements difficult to distinguish. Scattered throughout the subhymenial tissue are large globose clusters of mineral matter, reaching up to 30 μ in diameter.

***Uromyces rhodesicus* Wakef.**

Sori teleutosporiferi amphigeni, plerumque epiphylli, maculis decoloratis insidentes, sparsi vel irregulariter aggregati, ad 0.5 mm. diametro, hinc inde confluentes, epidermide fissa cincti, pulverulenti, atrobrunnei. Teleutosporeae globosae vel depresso-globosae, apice rotundatae, non vel lenissime incrassatae, obscure castaneo-brunneae, $23-27 \times 26-29 \mu$ (plerumque $25 \times 27 \mu$), episporio minute reticulato, 3μ crasso, ad apicem usque 4μ crasso. Pedicellus hyalinus, subpersistens, $30-50 \mu$ longus, deorsum rugulosus. Uredosporeae immixtae subglobosae vel late ellipticae, $25-26 \times 28-32 \mu$, episporio 3μ crasso, poris germinationis 3-4 plerumque equatorialibus instructo.



Uromyces rhodesicus Wakef.
a, Teleutospores ($\times 500$). b, Uredospore ($\times 500$).

TROPICAL AFRICA. Chakari, Southern Rhodesia, on leaves of *Bauhinia* sp., J. C. F. Hopkins, No. 1321, May 26, 1930.

The species differs from *U. congensis* Syd. in the reticulate teleutospores. All other known reticulate-spored species of *Uromyces* on *Bauhinia* are from South America, and all differ somewhat from the present form. The most marked character of *U. rhodesicus* is the almost constant depressed-globose shape of the teleutospore; it is never elliptical. The spore wall is very dark and opaque, so that the reticulate markings can be seen well only after treatment with a clearing reagent.

***Aecidium Hederae* Wakef.**

Pycnidia amphigena, praecipue hypophylla, laxe gregaria, primo mellea demum obscurantiora, $80-120 \mu$ diametro. Aecidia hypophylla vel petiolicola, conferta, per folii totam superficiem aequaliter distributa, matricem deformantia, cupulata, $0.5-1.5$ mm. diametro, margine albido pulchre revoluta $5-7$ inciso. Pseudoperidii cellulae angulatae, firme conjunctae, $15-20 \mu$ diametro, vel $25 \times 20 \mu$, pariete $2-2.5 \mu$ crasso, verrucoso-striato. Aecidiosporeae globosae vel subglobosae, leviter angulatae, subhyalinae, laeves, $18-19 \times 15 \mu$, tenuiter tunicatae, poris germinationis $4-5$ instructae.

INDIA. Murree, Punjab, 7000 ft., on leaves of *Hedera Helix*, W. T. Saxton, No. 2335, May 12, 1921 (type); Malkandi, Kagan, W. Himalaya, 4500 ft., on leaves of *Hedera Helix*, J. F. Duthie, May 25, 1897.

Ivy leaves attacked by this fungus have very swollen petioles and much reduced and distorted laminae. The aecidia, which are large and conspicuous, cover the whole surface of the petiole and the under side of the leaf. The fungus is said to be fairly common in the forest at Murree.

***Aecidium Lophopetali* Wakef.**

Aecidia ramicola, in apicibus tumores globosos vel irregulares $4-9$ mm. diametro efformantia, in substantia tumorum dense disposita profundeque immersa, $0.5-1$ mm. diametro. Pseudoperidii cellulae irregulares, crasse verrucosae, $40-60 \times 15-18 (-20) \mu$. Sporeae a pseudoperidii cellulis vix distinctae, elongato-rhomboideae vel irregulariter fusoideae, subhyalinae, $35-50 (-65) \times 15-20 \mu$, dense et crasse verruculosae, verrucis facile deciduis, episporio $2-3 \mu$ crasso.

INDIA. Dehra Dun, on branches of *Lophopetalum Wightianum*, A. Hafiz Khan, 1922.

This is a very remarkable fungus. The aecidia form the entire contents of small globose or irregular galls which occur singly at the apices of the branchlets of a "witch-broom"-like structure. The galls resemble those formed by *Aecidium ponderosum* Syd., but are smaller, and the peridial cells are larger. Unfortunately the aecidia in the present specimens are all closed, so that there is no indication as to how the spores from the interior of the gall are set free. The whole structure appears to be somewhat abnormal, the aecidiospores being hardly distinct from the outer cells, which adhere and form a sort of pseudoperidium round each sorus. The spores are unusually large and coarsely warted, and the warts are apparently very brittle, since they fall off to some extent in the process of mounting for microscopic examination.

***Sphacelotheca Sclerachnes* Wakef.**

Sori in inflorescentiis evoluti, easque omnino destruentes, primitus a vagina inclusi circiter $1-2$ cm. longi, membrana cellulis subhyalinis $10-12 \mu$ diametro tecti, columella centrali praediti. Massa sporarum atrobrunnea, mox pulverulenta. Sporeae maxime variabiles, globosae, subglobosae, pyriformes vel citriformes, brunneo-violaceae, laeves, 10μ diametro, vel $12-15 \times 9-10 \mu$.

SIAM. Bangkok, in the inflorescence of *Sclerachne punctata*, A. Kerr, No. 3, Nov. 10, 1921.

No other smut appears to have been recorded on this host. The irregularly shaped spores are unusual.

***Septoria Cotyledonis* Wakef.**

Maculae rotundatae, fuscidulae, $3-10$ mm. diametro, margine elevato circumdatae. Pycnidia minutissima, vix sub lente distinguenda, tenue subhyalino-tunicata. Conidia filiformia, curvula, utrinque rotundata, $50-65 \times 2.5 \mu$.

SOUTH AFRICA. Elsenburg, Natal, on leaves of *Cotyledon orbiculata*, P. A. van der Bijl, No. 890, Sept. 22, 1922.

Septogloeum punctatum Wakef.

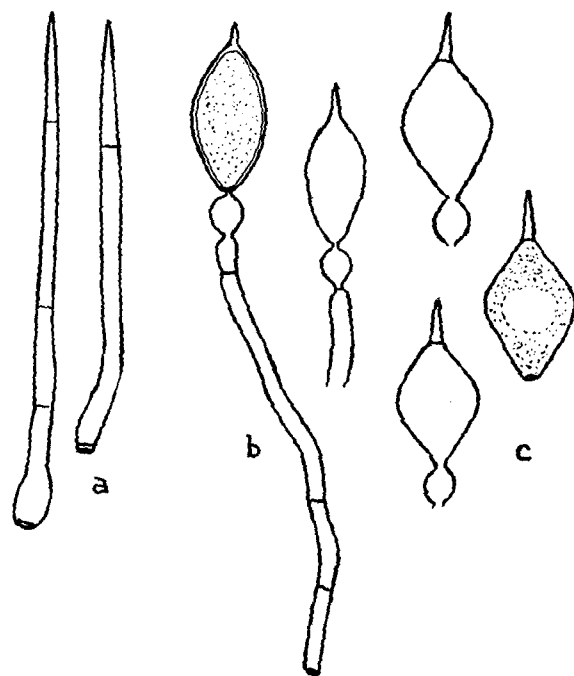
Maculae aridae, elongatae, angulatae, nervis limitatae, fusco-marginatae, circiter 8 mm. latae. Acervuli hypophylli, atro-olivacei, punctati, compacti, pulvinati, primo epidermide tecti, demum erumpentes. Conidiophora filiformia, densissime aggregata, olivacea. Conidia cylindracea, utrinque rotundata, dilute olivacea, $25-32 \times 5$ (-6) μ , demum 3-septatae.

SOUTH AFRICA. Durban, Natal, on leaves of *Eugenia cordata*, P. A. van der Bijl, No. 323, 1922.

Differs from *S. hirudinisporum* Speg. in several characters, and especially in the shape of the conidia.

Beltrania (?) malaiensis Wakef.

Hyphae fertiles erectae, flexuosae, simplices, dense aggregatae, 1-4-septatae, dilute fuligineae, $110-160 \times 5-6$ μ , sursum paulum incrassatae. Setulae rigidae, 1-3-septatae, atrobrunneae, apicibus acutis pallidioribus, laeves, $120-140 \times 4$ μ , basi geniculatae, saepe usque 9 μ incrassatae. Conidia rhomboidea, e sterigmatibus ellipticis, hyalinis, 9-10 μ diametro oriunda, brevissime stipitata, medio non constricta, primo continua (an demum 1-septata?), $32-35 \times 22-25$ μ , apice rostro tenuissimo acuto hyalino $10-14 \times 2$ μ praedita.



Beltrania (?) malaiensis Wakef.
a, Setae ($\times 500$). b, Conidiophores with conidia ($\times 500$).
c, Detached conidia ($\times 500$).

• FEDERATED MALAY STATES. Kuala Lumpur, isolated from seedlings of *Dichopsis Gutta* and grown on sterilised blocks of *Hevea* wood, A. Thompson, February 1924.

The fungus was isolated from the roots and collar of *Gutta* Percha seedlings. In culture on blocks of *Hevea* wood it forms a dense, dark brown, almost black crust, easily separable in small pieces. The rhomboidal shape of the conidia, their mode of origin from a swollen sterigma, and the presence of scattered setae, agree in general with the characters of the genus *Beltrania* and of the original species, *B. rhombica* Penzig. The conidia however, have not been found septate in any of the present material. This species is marked by its very large conidia, as compared with the two other described species of the genus *Beltrania*.

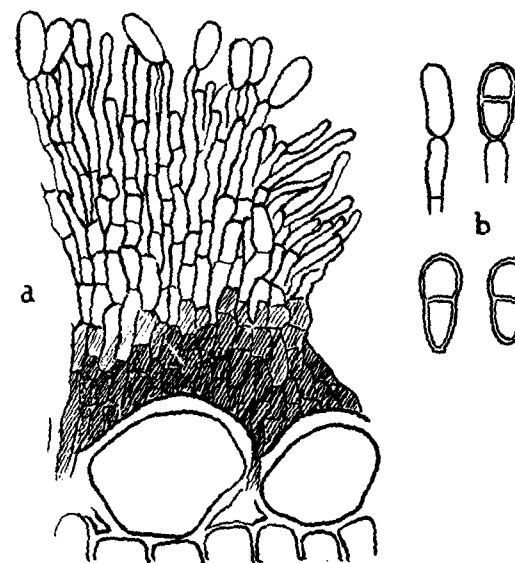
Cercospora Didymochitonis Wakef.

Maculae epiphyllae, parvulae, indistinctae, sparsae vel aggregatae quandoque confluentes, luteae, 1.5-2 mm. diametro. Acervuli hypophylli, minuti, densissime congesti, plagulas effusas, olivaceas, velutinas, vix 1 mm. diametro efformantes. Conidiophora fuliginea, flexuosa, $20-70 \times 4$ μ , demum 1-3-septata. Conidia dilute olivacea, fusoido-clavata, 3-5-septata, $30-55 \times 3-3.5$ μ .

FIJI. On leaves of *Didymochiton Richii*, W. Greenwood, No. 18, July 1922.

Pucciniopsis caffra Wakef.

Sporodochia plerumque epiphylla, convexo-pulvinata, erumpenti-superficialia, ex olivaceo atra, 200-400 μ diametro. Stroma atrobrunneum, compactum, sub cuticulo oriundum. Conidiophora



Pucciniopsis caffra Wakef.
a, Portion of acervulus ($\times 500$). b, Conidia and conidiophores ($\times 500$).

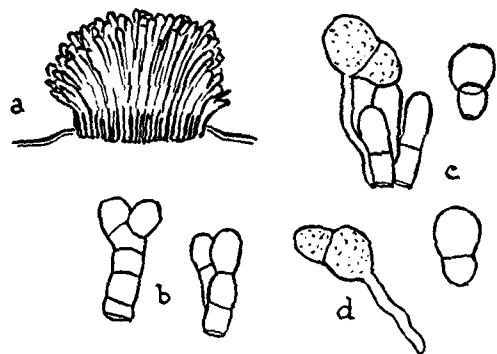
dense stipata, flavo-brunnea, cylindrica vel clavata, non septata, $10-15 \times 4-5 \mu$. Conidia brunnea, laevia, obclavata, 1-septata, vix constricta, cellula superiore interdum latiore, $18-20 (-24) \times 8-10 \mu$. SOUTH AFRICA. Van Stadens Pass, Cape Province, on leaves of *Erica caffra*, E. M. Doidge, No. 10865, Nov. 13, 1917.

Pucciniopsis quercina Wakef.

Maculae irregulares, 4-12 mm. diametro, saepe confluentes. Sporodochia epiphylla, rarissime hypophylla, dense aggregata, atra, orbicularia, 200-300 μ diametro. Conidiophora erecta, dense aggregata, ad 4-5-septata, simplicia vel sursum bifurcata, fuscidula, 7-8 (-9) μ diametro. Conidia fusca, pyriformia, leviter verruculosa, inaequaliter 1-septata, $18-22.5 \times 12-14 \mu$.

INDIA. Kamalban Forests, Kagan Valley, Hazara, 6500-7000 ft., on leaves of *Quercus dilatata*, A. Hafiz Khan, Sept. 11, 1924.

The leaves are sometimes almost entirely covered by the black stromata. The conidia have not been seen attached to the conidiophores, being practically all shed and germinating. The germ-tube emerges from the larger (presumably upper) cell, and frequently penetrates downwards between the conidiophores.



Pucciniopsis quercina Wakef.
a, Acervulus. b, Conidiophores ($\times 500$). c, Conidia, showing one germinating on the surface of acervulus ($\times 500$). d, Germinating conidium detached ($\times 500$).

XXXIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.*
ADDITAMENTUM XXX.

Gilibertia siamensis Craib [Araliaceae-Panaceae]; a *G. Chevalieri* R. Vig. nervis multo minus prominentibus recedit.

Frutex circa 2 m. altus (ex Kerr), partibus omnibus glaber; ramuli saepissime pallescentes. *Folia* alterna, interdum subopposita, lanceolato-ovata, apice acuminata vel subacuminata, acuta, basi cuneata vel rotundata, haud rarius parum inaequilateralia, 5.5-13 cm. longa, 2-5 cm. lata, rigide chartacea, sicco pallide

viridia vel fusciscentia, costa supra prominula subtus prominente, e basi trinervia, nervis duobus lateralibus obliquis, nervis secundariis (e costa ortis) utrinque 5-6 rectis intra marginem anastomosantibus pagina utraque subconspicuis, margine integra, parum recurva, petiolo 6-16 mm. longo supra canaliculato suffulta. *Umbellae* terminales, simplices (an semper?), pedunculo communi apice parvibracteato circa 1 cm. longo suffultae; pedicelli sub anthesin 5 mm. longi. *Receptaculum* 2 mm. longum, sulcatum. *Calyx* circa 1 mm. longus, vix lobatus. *Petala* 5, inter se libera, 3 mm. longa, 2.25 mm. lata. *Stamina* 5, filamentis 2 mm. longis, antheris versatilibus 1.25 mm. longis. *Discus* carnosus, corrugatus. *Styli* 5, liberi, vix 1 mm. longi. *Fructus* ellipsoideus, pallide brunneus, circa 1 cm. longus, stylis persistentibus coronatus.

Krat, Kao Kuap, 1000 m., light evergreen forest, Kerr 17812.

Viburnum Kerrii Geddes [Caprifoliaceae]; a *V. odoratissimo* Ker foliis haud tam longis basi latis, inflorescentia minore, a *V. Simonsii* Hook. f. et Th. foliis latoribus, floribus maioribus, a *V. sessilifloro* Geddes nervis lateralibus magis approximatis obliquis differt.

Arbor circa 4 m. alta, etiam in silvis densis sempervirentibus ut arbor magna crescens (ex Kerr); rami primo rubro-brunnei, compressi, glabri, mox grisei, teretes. *Folia* ovata vel ovato-elliptica, apice acuminata, basi rotundata vel truncata, 6-8-12 cm. longa, 4.6-6.4 cm. lata, supra brunnea, glabra, subtus pallidiora, inter costam nervosque subtus pilosa, ceteris partibus glabra, coriacea, nervis lateralibus utrinque circa 7 pagina superiore impressis inferiore prominentibus, margine ab apice ad medium breve serrata, deinde integra, petiolo 1.3-2 cm. longo crasso supra canaliculato glabro suffulta. *Cymae* terminales, ramulis striatis puberulis; bracteae bracteolaeque lineari-lanceolatae, acutae, puberulae; flores aut sessiles aut brevipedicellati. *Calyx* 0.75 mm. longus, lobis 5 brevibus et obtusis. *Corolla* alba (ex Kerr); tubus 1.5 mm. longus; lobi 5, patentes, rotati, orbiculares, circa 2.5 mm. diametro. *Stamina* 5, ad tubum corollae infra os affixa, filamentis subulatis basi latis 2.5 mm. longis glabris, antheris exsertis ellipticis apice obtusis basi bifidis 1.5 mm. longis 0.9 mm. latis glabris; a situ staminum ad basem tubi corollae distat 1 mm., antheris summis usque ad summum corollae tubum 2 mm. distat. *Ovarium* uniloculare, ovulo singulo pendulo; stylus 1.5 mm. longus, subulatus, basi latus; stigma inconspicue trilobatum.

Doi Angka, 2400 m., edge of open swamp, Kerr 5318.

Viburnum sessiliflorum Geddes [Caprifoliaceae]; a *V. arboricolo* Hayata bracteis conspicue maioribus, a *V. odoratissimo* Ker inflorescentia petiolisque stellato-pubescentibus, floribus maioribus differt.

Arbor circa 8 m. alta (ex Kerr). *Folia* elliptica, oblonga, vel oblongo-oblancoolata, apice breviter obtuse acuminata vel rotundata, basi cuneata, 8-16.5 cm. longa, 4.2-8.2 cm. lata, subcoriacea, supra

*Continued from K.B., 1930, p. 427.

brunnea vel brunneo-viridia, subtus pallidiora, minute nigro-maculata, pagina utraque ad costam pilis paucis stellatis deciduis instructa, subtus ad nervorum axillas saepissime pilosa, nervis lateralibus utrinque 4-6 pagina superiore impressis inferiore prominentibus, costa crassa, nervis transversis inter se parallelis subtus subconspicuis, margine revoluta, apicem versus pauci-denticulata, petiolo 1.8-2.3 cm. longo crasso stellato-pubescente supra canaliculato suffulta. *Cymae* terminales, ad 13 cm. longae, ramulis sicco ferreis stellato-pubescentibus; bracteae lineari-lanceolatae, et stellato-pubescentes et ferreo-hirsutae; flores albi (ex *Kerr*), sessiles. *Receptaculum* glabrum. *Calyx* brevis, glaber, lobis 5 obtusis. *Corollae* tubus 0.5 mm. longus, glaber; lobi 5, oblongi, obtusi, rotati, 3 mm. longi, 2.5 mm. lati. *Stamina* 5, ad tubi corollae os inter lobos affixa, filamentis brevissimis, antheris ambitu elliptico-oblongis 1.8 mm. longis. *Ovarium* uniloculare, ovulo singulo pendulo, stylo breve et lato, stigmate inconspicue trilobato.

Lôl, Kao Krading, 900 m., evergreen forest, *Kerr* 8651.

Nauclea brunnea *Craib* [Rubiaceae-Naucleae]; a *N. subdita* (Korth.) foliis maioribus, a *N. Junghuhnii* (Miq.) foliis tenuioribus, ab ambabus cortice rubro-brunneo, haud cinereo, recedit.

Arbor circa 20 m. alta (ex *Kerr*); ramuli glabri, obtuse angulati, cortice rubro-brunneo obtecti, lenticellis parvis conspicuis. *Folia* saepissime oblongo-ovata vel suboblonga, apice obtuse acuminata vel subrotundata, basi cuneata rotundatave, 11-18 cm. longa, 5-8 cm. lata, chartacea, supra glabra, subtus ad nervorum axillas paucipilosa, aliter glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7-8 sat obliquis subrectis intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis subtus conspicuis, reticulatione vix conspicua, petiolo 7-17 mm. longo supra canaliculato glabro suffulta; stipulae delapsae. *Pedunculi* axillares et solitarii vel terminales, solitarii vel saepius ternati, 1.5-2.5 cm. longi, breviter pubescentes, medio vel infra medium bracteis deciduis instructi; capitula paulo post anthesin 1 cm. diametro, pubescentia.

Nakawn Sritamarat, Kao Luang, 500 m., evergreen forest, *Kerr* 15572.

Adina dissimilis *Craib* [Rubiaceae-Naucleae]; ab *A. rubescente* Hemsl. ramulis tenuioribus, foliis pro longitudine angustioribus subtus haud pubescentibus recedens.

Arbor circa 8 m. alta (ex *Kerr*); ramuli graciles, primo breviter pubescentes, mox puberuli, cortice cinereo-brunneo vel cinereo obtecti, lenticellis obscuris. *Folia* parum inaequilateralia, elliptico-oblonga, oblongo-oblancoolata, vel oblanceolata, apice obtuse acuminata vel caudato-acuminata, basi inaequilateralia, cuneata, 7-11 cm. longa, 2-3.5 cm. lata, rigide chartacea, sicco viridia, subtus pallidiora, supra glabra, subtus costa et plus minusve nervis lateralibus puberula praeterea ad nervorum axillas pilosa, nervis

lateralibus utrinque saepissime 9 supra conspicuis subtus subprominentibus intra marginem anastomosantibus, petiolo usque ad 2 cm. longo supra apicem versus canaliculato aliter subcanaliculato puberulo suffulta; stipulae pallide virides, cito deciduae, 7 mm. longae, fere ad basem bifidae, segmentis linearibus acutis circa 1 mm. latis. *Capitula* saepissime 5-7, rarius 3, in racemos terminales ad 7 cm. longos disposita, rarissime solitaria, axillaria, pedunculis inferioribus ad 2.5 cm. longis ad medium vel paulo supra medium bracteatis superioribus vix 1 cm. longis, omnibus cum rhachi breviter pubescentibus; capitula sub anthesin stylo exserto excluso 1 cm. diametro; bracteae inter flores graciles, 1.75-2 mm. longae; alabastra sulcata, parce puberula. *Receptaculum* adpresse hirsutum, vix 1 mm. longum. *Calycis* tubus brevis, segmenta 5, inter se parum inaequalia, linearia, obtusa, ad 1.5 mm. longa, apicem versus pauperius ciliolata. *Corollae* tubus circa 3 mm. longus, 5-sulcatus, superne parum ampliatus, lobi 5, suboblongi, apice cucullati, 1.75 mm. longi, 0.75 mm. lati. *Stamina* 0.75 mm. infra tubi apicem inserta, filamentis brevibus, antheris circa 1 mm. longis. *Stylus* longe exsertus, 8.5 mm. longus, glaber, stigmate clavato.

Krabi, Lanta, 200 m., common in evergreen forest, *Kerr* 18977.

Adina polycephaloides *Craib* [Rubiaceae-Naucleae]; ab affini *A. polycephala* Benth. partibus omnibus praesertim foliis et corolla maioribus, bracteolis tenuioribus, calyce intra piloso recedit.

Arbor parva vel mediocris (ex *Winit*); ramuli glabri, brunnei vel fusco-brunnei, lenticellis pallidis angustis longitudinaliter extensis vel rotundatis. *Folia* opposita, oblongo-elliptica vel oblongo-ovata, apice obtuse acuminata, basi cuneata sed saepe inaequilateralia, latere altero cuneata, altero cuneata vel rotundata, 13-21 cm. longa, 6-10 cm. lata, matura coriaceo-chartacea, sicco supra fusco-viridia, subtus saepissime plus minusve brunnescentia, subtus ad nervorum axillas saepissime breviter pilosa, aliter glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 8-10 supra conspicuis subtus prominentibus, nervis transversis pagina utraque conspicuis vel inferiore subprominulis, petiolo 1-1.5 cm. longo glabro supra canaliculato suffulta; stipulae circa 5 mm. longae, breviter vel altius bilobatae, cito deciduae. *Capitula* in racemos simplices vel iterum ramosos axillares et terminales sessiles 4.5-7.5 cm. longos disposita, sub anthesin usque ad 2 cm. diametro pedunculo fere 1 cm. longo inconspicue parce puberulo suffulta; flores lutei, odorati (ex *Winit*), sessiles; bracteolae lineari-spatulatae, pilosae, calyci subaequilongae. *Receptacula* inter se libera, 1 mm. longa, pilosa. *Calycis* tubus brevis, utrinque pilosus, segmenta oblonga, apice obtusa rotundatave, 1 mm. longa, circa 0.5 mm. lata, inferne utrinque sparse pilosa, aliter glabra. *Corollae* glabrae tubus 3.5 mm. longus, lobi 5, oblongi vel deltoideo-oblongi, obtusi, circa 1.5 mm. longi et 1 mm. lati. *Stamina* apicem versus corollae tubi inserta, filamentis circa 0.25 mm. longis, antheris exsertis linearibus 1.25 mm. longis.

Stylus 9.5 mm. longus, stigmatē generis; ovarium biloculare, placentis pendulis, ovulis numerosis.

Chiangmai, Ta Yak, 400 m., evergreen forest, *Winit* 1860.

Uncaria glaucescens Craib [Rubiaceae-Naucleae]; species *U. velutinae* Hav. habitu similis a qua calycis lobis subacutis haud clavatis distinguenda.

Frutex cirrhis deflexo-uncinatis scandens; ramuli pallide brunnei, primo breviter hirsuti, plus minusve conspicue 4-angulati, mox conspicue quadrangulares, ad 8 mm. diametro, puberuli, internodiis elongatis. *Folia* saepissime oblango-elliptica vel subelliptica, apice brevius obtuse acuminata, basi rotundata, ima basi truncata vel cordatula, 11-15 cm. longa, 4.5-8.5 cm. lata, chartacea, subtus matura plus minusve glaucescentia, supra ad costam nervosque laterales breviter adpresse ferrugineo-hirsuta, aliter sparse hirsuta, subtus ad costam nervosque laterales sparse hirsuta, pilis paucis mox deciduis, ad nervulos breviter adpresse hirsuta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7-9 supra conspicuis subtus prominentibus, nervis transversis inter se parallelis subtus prominulis, petiolo ad 8 mm. longo supra canaliculato indumento ei ramulorum simili tecto suffulta; stipulae deciduae. *Pedunculi* axillares, infructescentes 4.5-5 cm. longi, indumento ei ramulorum simili tecti, circa 1 cm. infra apicem bractearum cicatricibus notati; pedicelli 1.5-2 cm. longi, breviter adpresse ferrugineo-hirsuti. *Calycis* capsulam coronantis tubus 4 mm. longus, lobi lanceolati angustave deltoidei, subacuti, 1.5 mm. longi, cum tubo pilis brevibus ferrugineis adpressis obtecti. *Capsula* 1 cm. longa, costata, indumento ei pedicelli simili oblecta; semina, alis inclusis, 5 mm. longa.

Ranawng, Kao Pawta Luang Keo, 200 m., evergreen forest, *Kerr* 16997.

Wendlandia nobilis Geddes [Rubiaceae-Rondeletieae]; a *W. glomerulata* Kurz foliis brevioribus pro longitudine conspicue latioribus haud longe acuminatis inter alia facile distinguenda.

Arbor circa 8 m. alta (ex *Kerr*); ramuli primo adpresse hirsuti, cito glabri, angulati, cortice rubro obtecti, lenticellis haud conspicuis. *Folia* opposita, oblango-lanceolata vel lanceolata, interdum oblonga, apice subacute acuminata, basi cuneata, saepe inaequilateralia, latere altero cuneata, altero acuminata, 4-9 cm. longa, 1.5-3.5 cm. lata, sat rigida, supra glabra, subtus ad costam nervosque laterales pilis paucis adpressis instructa, costa supra parum prominula subtus prominente, nervis lateralibus utrinque 7-8 supra plus minusve conspicuis subtus prominulis intra marginem anastomosantibus, reticulatione gracili subconspicua, margine parum recurva, petiolo 6-10 mm. longo primo breviter adpresse hirsuto supra canaliculato suffulta; stipulae deciduae, circa 4 mm. longae, medio constrictae, apice complanatae, breviter adpresse hirsutae. *Paniculae* terminales, sessiles, saepissime circa 12 cm. longae et latae, rhachi et pedunculis

hirsutis, pilis subadpressis; bractee ad ramulorum bases foliaceae, anguste lanceolatae, circa 1 cm. longae, bracteis aliis minoribus, ultimis circa 2 mm. longis. *Receptaculum* adpresse hirsutum. *Calyx* circa 0.75 mm. longus, fere ad basem 5-fidus, segmentis ovato-oblongis obtusis dorso breviter adpresse hirsutis. *Corollae* tubus circa 3 mm. longus, intra apice barbatus, lobi 5, circa 1.25 mm. longi et 0.5 mm. lati, obtusi. *Stamina* ad corollae tubi apicem posita, antheris parvis apiculatis exsertis. *Stylus* filiformis, glaber.

Nan, Doi Pu Ka, 1700 m., savannah on ridge, *Kerr* 4931.

Greenea oblonga Craib [Rubiaceae-Rondeletieae]; a *G. Wightiana* Wight et Arn. eiusque affinioribus corollae lobis anguste oblongis recedit.

Arbor circa 5 m. alta (ex *Kerr*); ramuli pilis sat rigidis adpressis primo pallidis mox ferrugineis tecti. *Folia* oblango-oblanceolata, oblanceolata, vel rarius oblanceolato-obovata, apice acute acuminata, basi in petiolum longius angustata, 16-29 cm. longa, 4-7 cm. lata, rigide chartacea, sicca supra fuscescentia, subtus brunnescentia, supra ad costam adpresse setosa, ad nervos laterales et marginem versus sparsius adpresse setulosa, subtus ad costam nervos nervulose adpresse setulosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 18 supra conspicuis vel subprominulis subtus prominulis, nervis transversis subtus subprominulis, petiolo 10-15 mm. longo supra canaliculato apicem versus lamina decurrente alato suffulta; stipulae oblongae, 1-1.5 cm. longae, indumento dorso ei ramulorum et petiolorum simili instructae. *Cymae* paniculam terminalem ad 10 cm. longam et 14 cm. diametro formantes; flores albi (ex *Kerr*), sessiles; bractee saepissime receptaculo subaequilongae, saepe tridentatae. *Receptaculum* 1.5 mm. longum, hirsutum. *Calycis* tubus brevis, lobi 5, lanceolati, subacuti, saepe inter se inaequales, 1.5-1.75 mm. longi, inferne saepe dentati, dorso hirsuti, intra glabri, ciliati, post anthesin arcte reflexi. *Corolla* extra pubescens; tubus ad 8 mm. longus, intra glaber; lobi 5, oblongi, apice emarginati, ad 2 mm. longi et 1 mm. lati, intra inferne pilosi. *Filamenta* brevia; antherae sicco fuscae, ad corollae tubi apicem attingentes, 2 mm. longae. *Stylus* exsertus, stigmatibus duobus mox recurvis inclusis ad 1.3 cm. longus, glaber.

Takuapa, Kapong, 100 m., evergreen scrub, *Kerr* 17136.

Greenea siamensis Craib [Rubiaceae-Rondeletieae]; a *G. Wightiana* Wight et Arn. receptaculo pilis longioribus paucioribus rigidis instructo, corolla breviori latiore indumento densiore instructa distinguenda.

Frutex circa 4 m. altus (ex *Kerr*); ramuli primo adpresse hirsuti, mox glabrescentes, cinnamomeo-corticati. *Folia* opposita, oblonda, oblango-elliptica, vel oblango-oblanceolata, apice acute acuminata, basi longius attenuato-cuneata, 20-30 cm. longa, 5-9.5 cm. lata, rigide chartacea, sicco supra olivacea vel fusco-brunnea, subtus viridi-brunnea, supra ad costam nervosque

laterales setis adpressis instructa, aliter sparse setosa, subtus ad costam densius adpresse hirsuta et ad nervos laterales nervulosque setulosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque fere 30 supra conspicuis subtus prominentibus, nervis transversis sat numerosis subtus prominulis, petiolo vix distincto ad 1 cm. longo supra canaliculato suffulta; stipulae deciduae, suboblongae, obtusae, 1-1.3 cm. longae, dorso adpresse hirsutae. *Cymae* paniculam terminalem pedunculo communi ad 1.5 cm. longo incluso ad 8 cm. longam 10 cm. latam formantes, rhachi et pedunculis subadpresse hirsutis; flores sessiles, approximati, albi, mox lutescentes (ex *Kerr*). *Receptaculum* 1 mm. longum, pilis albis rigidis subadpressis instructum. *Calycis* tubus brevis, lobi 4, lanceolati, subacuti, receptaculo subaequilongi vel eo paululo longiores, sicco receptaculo pallidiores, pilis similibus dorso instructi, ciliati. *Corollae* tubus 6.5 mm. longus, basi 1.5 mm. diametro, superne gradatim ampliatus, apice 3 mm. diametro, extra pallide pubescens, intra 1-1.5 mm. supra basem pilis rigidis horizontalibus annulatum dispositis instructus, aliter glaber, lobi quattuor, 2.5 mm. longi, 2 mm. lati, dorso breviter sparse pubescentes, intra densius subpilosi. *Stamina* 4, filamentis 0.5 mm. longis, 5 mm. supra corollae tubi basem affixis; antherae e tubo paululo exsertae, breviter acuminatae, 2.25 mm. longae, loculis basi inter se liberis. *Stylus* ante anthesin exsertus, 1 cm. longus, glaber, stigmatibus duobus recurvis.

Satul, Ban Ton, 50 m., light evergreen by stream, *Kerr* 14424.

***Argostemma condensum* Craib** [Rubiaceae-Hedyotideae]; ab affini *A. parvifolio* Benn. foliis minoribus, pedicellis et receptaculis glabris, haud pilosis, recedens.

Herba caule 6-8 cm. longo nodis inferioribus radicante glabro sicco angulato subviridi albo-maculato. *Folia* approximata, iuniora sicco imbricata, opposita, paribus inter se valde inaequalibus, oblanceolata, lanceolata, vel anguste suboblonga, apice acuta, saepe apiculata, basi cuneata, maiore 6-11 mm. longo 2.5-3.5 mm. lato, minore saepissime 4 mm. longo et 1 mm. lato, sicco subviridia, chartacea, pagina superiore ad costam setis 1-2 primo instructa, aliter glabra, setis demum deciduis, costa supra prominente subtus conspicua, nervis lateralibus utrinque 5-6 subtus in foliis iunioribus subconspicuis, nervulis obscuris, margine apicem versus setoso-subdenticulata, petiolo brevi suffulta vel subsessilia; stipulae foliaceae, persistentes, saepissime ovatae, apice subulatae, circa 3 mm. longae. *Flores* albi (ex *Kerr*), solitarii, terminales, pedicello 7-13 mm. longo glabro pauci-bracteolato suffulti. *Receptaculum* circa 1 mm. longum, glabrum, albo-lineolatum. *Calyx* glaber, sicco viridis, fere ad basem 5-fidus, segmentis lanceolatis longius acute attenuatis fere 2 mm. longis et basi vix 1 mm. latis. *Corollae* tubus 1.5 mm. longus, lobi 7 mm. longi, 2.5 mm. lati. *Stamina* circa 7 mm. longa, antheris apice attenuatis inter se in columnam coalitis. *Stylus* stamina paululo superans.

• Satul, Klawng Ton, 200 m., rock by stream in evergreen forest, *Kerr* 14440.

***Argostemma dispar* Craib** [Rubiaceae-Hedyotideae]; ab affini *A. involucrato* Hemsl. calyce quam corolla conspicue, haud parum breviora recedit.

Caules annui, inferne defoliati, nodis inferioribus radicales, 15-30 cm. longi, simplices vel interdum ramosi, pilis elongatis divaricatis sat copiose primo induti, sicco sulcati. *Folia* opposita inter se valde inaequalia, maiore inaequilaterali latere altero dimidiatim oblanceolato basi attenuato vel acuminato altero dimidiatim obovato basi late cuneato apice subacuta acuminato vel interdum subacuto 3-6.5 cm. longo 1.3-2.8 cm. lato chartaceo sicco supra fusco-viridi subtus pallide viridi supra ad costam et marginem versus pilis elongatis instructo aliter saepissime fere glabro subtus ad costam nervosque laterales pilis similibus instructo costa supra conspicua subtus prominente nervis lateralibus utrinque 7-9 supra obscuris vel subprominulis subtus conspicuis margine conspicue ciliato apicem versus subdenticulato petiolo 3-5 mm. longo suffulto, minore ovato vel subelliptico circa 4-8 mm. longo et 3.5-6.5 mm. lato; stipulae foliaceae, diu persistentes, foliis minoribus subsimiles sed paululo minores. *Inflorescentia* terminalis, pedunculo communi 4-8 mm. supra basem bracteis stipulis similibus verticillatis instructo et in pedunculum simplicem 8-18 mm. longum flores tres umbellatim gerentem vel rarissime uniflorum vel interdum ibi furcato pedunculis lateralibus partialibus unifloris, pedunculis partialibus apice bracteis foliaceis 3-4 mm. longis verticillatis instructis, pedicellis 10-12 mm. longis, et pedunculis et pedicellis villosis; flores albi (ex *Kerr*). *Receptaculum* villosum, vix 2 mm. longum. *Calycis* tubus circa 1 mm. longus, lobi 5, ovato-lanceolati, acuti, 3.5 mm. longi, 2.25 mm. lati, dorso parce pilosi, longius ciliati. *Corollae* tubus 2.5 mm. longus, lobi 5, oblongo-lanceolati, acuti, 10 mm. longi, 4 mm. lati, dorso pilis sparsis elongatis instructi, longius ciliati. *Filamenta* corollae tubo subaequilonga, antheris inter se cohaerentibus 9 mm. longis. *Stylus* 11 mm. longus, stigmate parvo ambitu suboblongo.

Krabi, Panom Bencia, 1300 m., evergreen forest, *Kerr* 18720.

***Argostemma fuscum* Craib** [Rubiaceae-Hedyotideae]; ab *A. spinuloso* C. B. Clarke inflorescentia haud glabra, ab *A. stipulaceo* Ridl., cui probabiliter maxime affine, foliis apicem versus angustatis recedit.

Herba caule inferne radicante ad 25 cm. longo iuventute sicco fusco sulcato crispatis piloso vel subhirsuto. *Folia* opposita inter se valde inaequalia, maiora saepe parum inaequilateralia, oblanceolata vel oblongo-oblanceolata, apicem versus angustata vel acuminata, summo apice breviter acute acuminata, basi inaequalia, latere altero dimidiatim cordatula vel rotundata, altero dimidiatim cordatula vel cuneata, usque ad 14 cm. longa et 4.5 cm. lata, sicco

fuscescentia, subtus pallidiora, pagina superiore setis paucis praesertim marginem versus instructa, inferiore ad costam nervosque laterales subadpresse hirsuta vel fere setulosa, ad nervulos pilis brevibus sparsius instructa, nervis lateralibus utrinque 12-15 supra conspicuis subtus prominulis, nervulis subtus subprominulis, margine ciliata, petiolo 1-2 cm. longo indumento ei caulis simili tecto suffulta, minora stipuliformia, saepe decidua; stipulae foliaceae, diu persistentes, 10-12 mm. longae, 4-6 mm. latae. *Cymae* terminales, pedunculo communi 5 cm. longo incluso 8 cm. longae, pedunculis partialibus 3-5, inferioribus fere 1.5 cm. longis trifloris, superioribus brevioribus unifloris, pedicellis circa 5 mm. longis, bracteis angustis circa 3 mm. longis, pedunculis cum rhachi et pedicellis breviter subsparsius crispatis pilosis; flores albi (ex Kerr). *Receptaculum* 1 mm. longum, cum calyce sparse crispatis pubescens, sicco fuscum. *Calyx* circa 1.25 mm. longus, ad medium 5-lobatus, lobis deltoideis basi 1 mm. latis ciliatis. *Corollae* tubus 2 mm. longus, lobi 5, ovato-lanceolati, superne angustati, apice acuti, 6.5 mm. longi, 3 mm. lati, intra glabri, dorso puberuli. *Filamenta* 0.5 mm. longa, glabra; antherae inter se cohaerentes, apice attenuatae, 7.5 mm. longae. *Stylus* ex antherarum columna brevissime exsertus.

Nakawn Sritamarat, Kao Luang, 400 m., evergreen forest, Kerr 15413.

***Argostemma lobulatum* Craib** [Rubiaceae-Hedyotideae]; ab *A. acuminato* King foliis maioribus, nervis lateralibus magis numerosis, floribus maioribus inter alia recedit.

Herba erecta, caule ad 25 cm. alto glabro sicco fusco sulcato squamarum oppositarum paribus 1-3 instructo. *Folia* ad caulis apicem per 5-7 verticillata, plus minusve lanceolata, oblanceolata, vel oblongo-lanceolata, acuminata, basi cuneata, saepe inaequilateralia, 7-20 cm. longa, 2-4.5 cm. lata, membranacea, sicco supra fusca, subtus saepissime fusco-viridia, supra pilis brevibus hic et illic instructa, subtus pilis similibus ad nervos nervulosque marginem prope sparse instructa vel fere glabra, nervis lateralibus utrinque 15-30 pagina utraque conspicuis intra marginem anastomosantibus, nervulis rete laxum efficientibus, sessilia vel subsessilia; stipulae parvae, oblongae. *Pedunculi* terminales, solitarii, rarissime gemini, 1-3.5 cm. longi, puberuli, apice bracteati, cymas umbelliformes vel corymbiformes gerentes, pedunculis partialibus brevibus vel ad 12 mm. longis, pedicellis ad 1 cm. longis breviter pubescentibus; flores albi, medio subrubri (ex Kerr). *Receptaculum* breviter pubescens, circa 1.5 mm. longum. *Calycis* tubus 1.25 mm. longus, lobi 5, subovati, acuti, apice dorso indurati, circa 2.5 mm. longi et 2.25 mm. lati, dorso puberuli, intra glabri, ciliolati. *Corollae* tubus 3.5 mm. longus, lobi 5, deltoidei, acuti, 3.5 mm. longi, basi 3 mm. lati, nervosi. *Filamenta* 1.25 mm. longa, antheris 2 mm. longis obtusis inter se cohaerentibus. *Stylus* 5 mm. longus, glaber, stigmatem parvo bilobulato.

* Prachuap, Kao Luang, 1000 m., rocks in evergreen forest, Kerr 10822.

***Argostemma saxicolum* Craib** [Rubiaceae-Hedyotideae]; ab affini *A. Lobbiai* Hook. f. floribus minoribus, corollae lobis conspicue minoribus recedit.

Herba, ut videtur, annua; caulis gracilis, 4.5-8 cm. longus, glaber, angulatus. *Folia* opposita, lineari-lanceolata vel lanceolata, obtusa, basi cuneata, paribus inter se inaequalibus, altero 1-2 cm. longo 2.5-4 mm. lato petiolo usque ad 3 mm. longo suffulto, altero ad 8 mm. longo brevius petiolato, membranacea, supra viridia, subtus pallide viridia, pagina superiore marginem versus et inferiore ad costam setulis paucis brevibus praetereaque inferiore pilis paucis brevibus adpressis inconspicuis primo instructa, nervis lateralibus tenuibus obscuris utrinque circa 10; stipulae persistentes, foliis minoribus fere omnino similes. *Flores* albi (ex Put), terminales, solitarii, pedicello glabro ad 1 cm. longo suffulti et ex axillis superioribus in cymam trifloram pedunculo communi glabro ad 1 cm. longo apice folia duo et stipulas iis caulium similes sed minores gerente dispositi, rarius solitarii, orti. *Receptaculum* glabrum, sicco fuscum, 0.75 mm. longum. *Calycis* tubus 0.5 mm. longus, lobi late deltoidei, obtusi, tubo paululo longiores, circa 1 mm. lati. *Corollae* tubus circa 0.5 mm. longus, lobi 5, oblongo-lanceolati, subacuti, 2.5 mm. longi, 1.5 mm. lati. *Stamina* inter se libera, filamentis usque ad 1.5 mm. longis, antheris 2 mm. longis. *Stylus* 3 mm. longus, stigmatem parvo capitato.

Kanburi, Baw Re, among rocks, Put 217.

***Argostemma septatum* Craib** [Rubiaceae-Hedyotideae]; ab *A. involucrato* Hemsl. calycis lobis conspicue brevioribus, ab *A. dispare* Craib foliis pro longitudine angustioribus nervis lateralibus magis approximatis et numerosis inter alia recedit.

Caules annui, 15-24 cm. longi, pilis elongatis divergentibus albis transverse septatis sat copiose instructi. *Folia* opposita inter se valde inaequalia; maiora inaequilateralia, latere altero dimidiatim oblanceolata, basi rotundata, altero oblanceolata vel oblongo-oblanceolata, basi cuneata, apice acute acuminata, 5.5-7.5 cm. longa, 1.7-2 cm. lata, tenuiter chartacea, sicco supra viridia, subtus pallida, pagina superiore pilis elongatis albis transverse septatis inter se sat distantibus sed ad costam magis approximatis, inferiore pilis similibus ad costam nervosque laterales aliter sparsis instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11-14 rectis pagina utraque conspicuis, nervis transversis obscuris, longius ciliata, apicem versus subdenticulata, petiolo ad 7 mm. longo piloso suffulta; minora saepissime ovata, circa 7 mm. longa; stipulae diu persistentes, foliaceae, foliis minoribus similes sed paululo minores. *Cymae* terminales, 2-3-florae, pedunculo communi 2-2.5 cm. longo saepe paulo supra medium bracteis circa 3 mm. longis instructo apice bracteis similibus instructo suffultae, pedicellis ad 1.5 cm. longis cum pedunculo pilosis; flores albi (ex Kerr).

Receptaculum pilosum, 1.25 mm. longum. *Calycis* tubus 1.5 mm. longus, lobi 5, subovati, acuti, paululo ultra 2 mm. longi, 2-2.25 mm. lati, dorso pilis paucis elongatis instructi vel glabri, longius ciliati. *Corollae* tubus 3 mm. longus, lobi 5, ovato-lanceolati, acuti, 10 mm. longi, 5 mm. lati, longe ciliati, aliter glabri. *Filamenta* 3.5 mm. longa; antherae inter se cohaerentes, 9 mm. longae. *Stylus* 11.5 mm. longus, glaber, stigmatem parvo.

Tung Song, Kao Sung, 1100 m., evergreen forest, *Kerr* 15261.

Clarkella siamensis Craib [Rubiaceae-Hedyotideae]; a *C. nana* (Edgew.) Hook. f. partibus omnibus maioribus distinguenda.

Herba saxicola, 4.5-12 cm. alta, caule erecto sicco fusco puberulo folium basale solitarium et superne folia 4-6 gerente. *Folia* basalia ima basi vel paulo supra basem caulis orta, oblongo-ovata, ovata, vel elliptico-ovata, apice subacuta, basi truncata vel inaequaliter cordata, saepissime 5-7 cm. longa et 2.7-4.5 cm. lata, membranacea, sicco supra viridia, subtus subplumbea, pagina utraque puberula vel superiore subglabra, nervis lateralibus utrinque 6-8 pagina utraque conspicuis, ciliolata, petiolo 2-4.7 cm. longo puberulo sicco fusco suffulta; folia caulinarum opposita, basalia subsimilia nisi saepissime multo minora; stipulae parvae, lineari-lanceolatae deltoideaeve integrae, pallide apiculatae. *Cymae* terminales, solitariae, e floribus circa 7 constitutae, pedunculo communi circa 1.5 mm. longo glabro suffultae; bracteae flabelliformes, 1.5 mm. longae, apice fimbriis paucis brevibus rigidis pallidis instructae, aliter fuscae, puberulae; pedicelli vix a receptaculo distinguendi, 3 mm. longi, apice puberuli, aliter glabri. *Receptaculum* circa 2 mm. longum, puberulum, inferne in pedicellum angustatum. *Calycis* tubus brevis, lobi 5, inter se inaequales et variabiles, interdum uno interdum duobus aliis conspicue longioribus lanceolatis subacutis 2.5-3.5 mm. longis 1.25-1.5 mm. latis pagina utraque puberulis ciliolatis, minoribus circa 1.25 mm. longis aliter maioribus similibus. *Corolla* in alabastro claviformis, extra conspicue longius puberula; tubus 1 cm. longus, inferne paululo ultra 1 mm. diametro, intra glaber; lobi valvati, ad 5 mm. longi et 2.75 mm. lati. *Stamina* 5, filamentis brevibus glabris circa 1 mm. supra corollae tubi basem affixis, antheris linearibus circa 1.8 mm. longis. *Styli* duo, fere e basi liberi, 2 mm. longi, graciles; ovarium biloculare, ovulis numerosis. *Fructus* indehiscens, calyce persistente coronatus, seminibus numerosis parvis fuscis pallide lineolatis varie angulatis interdum subulatis.

Tung Song, Kao Chem, on rock, *Rabil* 139.

Hedyotis betongensis Geddes [Rubiaceae-Hedyotideae]; ab affini *H. havilandii* King indumento densiore, corolla quam calyce conspicue longiore, filamentis brevibus, capsula magis globosa, inter alia recedens.

Herba ramulis pubescentibus angulatis mox duriusculis ad 2.5 mm. diametro. *Folia* saepissime ovato-lanceolata, apice acuta, basi cuneata vel acuminato-cuneata, 2.5-5 cm. longa, 1.2-2.2 cm.

lata, chartacea, sicco viridia, subtus pallidiora, pagina utraque scabridula, costa supra conspicua subtus prominente, nervis lateralibus utrinque 4-5 sat obliquis supra plus minusve conspicuis subtus subprominulis, nervulis obscuris, margine scabridula, petiolo 4-8 mm. longo pubescente suffulta; stipulae persistentes, 3-5 mm. longae, lanceolatae vel late lanceolatae, pinnatim lobatae, lobis angustis apice glandulosis, hirsutae. *Cymae* axillares, glomerulatae, pedicellis ad 0.5 mm. longis parce pubescentibus, bracteis angustis quam pedicellis brevioribus. *Receptaculum* vix 1 mm. longum, hirsutum. *Calyx* fere ad basem 4-fidus, segmentis lineari-lanceolatis 1 mm. longis dorso hirsutis. *Corolla* alba (ex *Kerr*), dorso apicem versus pilis paucis rigidis instructa; tubus 2 mm. longus, intra apicem versus paucipilosus; lobi 4, deltoidei, subobtusiusculi, 0.75 mm. longi. *Filamenta* brevia, fere ad corollae tubi apicem inserta, antheris circa 0.5 mm. longis. *Stylus*, stigmatibus inclusis, 2.75 mm. longus. *Capsula* crustacea, vix 2 mm. longa, septicida et deinde loculicide dehiscens; semina numerosa, parva, fusco-brunnea, triangulata.

Betong, 600 m., evergreen forest, *Kerr* 7651.

Hedyotis corymbiformis Geddes [Rubiaceae-Hedyotideae]; ab affini *H. contracta* (Pierre ex Pitard) stipulis pinnatim lobatis, receptaculo puberulo, calycis segmentis brevioribus recedit.

Frutex circa 3 m. altus (ex *Kerr*); ramuli primo angulati, puberuli, sublutei, mox obtuse angulati, glabri, saepissime brunnei vel rubro-brunnei, circa 4 mm. diametro. *Folia* lanceolata vel late lanceolata, apice attenuata vel subacuminata, acuta, basi cuneata, saepe parum inaequilateralia, 7-12 cm. longa, 1.2-2.8 cm. lata, sicco plus minusve lutescentia, rigide chartacea, costa supra impressa subtus prominente, nervis lateralibus utrinque 7-8 sat obliquis intra marginem anastomosantibus pagina utraque prominulis, margine parum recurva, petiolo ad 5 mm. longo supra canaliculato lamina decurrente saepissime subulato suffulta; stipulae persistentes, circa 7 mm. longae, dorso inferne puberulae, marginem versus incrassatae, ibi et superne breviter pubescentes. *Paniculae* terminales, corymbiformes, ad 5 cm. longae et 9 cm. diametro, et rhachi et ramulis puberulis; flores subsessiles. *Receptaculum* breve, puberulum. *Calycis* segmenta 4, deltoidea, inter se inaequalia, circa 0.5 mm. longa. *Corollae* dorso puberulae tubus 1.75 mm. longus, lobi 4, apice inflexi, 2.25 mm. longi, intra basi villosi. *Stamina* 4, filamentis fere ad corollae tubi apicem insertis 1.5 mm. longis, antheris 0.75 mm. longis. *Stylus*, stigmatem bilamellato incluso, circa 2 mm. longus, medio ampliatus. *Fructus* fere maturus anguste pyriformis, puberulus, seminibus loculo quoque pluribus.

Chantabun, Tamun, 200 m., edge of evergreen forest, *Kerr* 9707.

Hedyotis cytisoides Craib [Rubiaceae-Hedyotideae]; ab affini *H. praecoxe* (Pierre ex Pitard) caule altiore nisi iuventute glabro, calycis segmentis et fructu maioribus recedit.

Caules e radice lignosa plures, erecti, 45–70 cm. alti, simplices vel pauci-ramosi, iuventute inconspicue puberulo-scaberuli, mox glabri, conspicue angulati, inferne ad 3.5 mm. diametro, sicco virides, inferne plus minusve brunnescentes. *Folia* opposita, linearia, apice subacuta, ad 5 cm. longa et 2 mm. lata, sat rigida, glabra vel subglabra, costa supra impressa subtus prominente, nervis lateralibus omnino obscuris, margine revoluta, sessilia; stipulae virides, saepissime lineares, saepe pauci-denticulatae vel pauci-lobulatae, circa 7 mm. longae, mox deciduae. *Cymae* paniculam terminalem ad 25 cm. longam et 20 cm. diametro efficientes, singulis pedunculo communi circa 1.5 cm. longo incluso ad 6 cm. longis, pedunculis glabris vel inconspicue puberulis; pedicelli ad 0.5 mm. longi; bracteae pedicellis duplo longiores vel iis subaequilongae; flores albi (ex Kerr). *Receptaculum* 0.5 mm. longum, puberulum. *Calycis* segmenta 4, lanceolata, acuta, dorso medio carinata, 1.5 mm. longa, viridia. *Corollae* tubus 2 mm. longus, intra pilosus, lobi oblongo-lanceolati, 1.5 mm. longi. *Stamina* 4, filamentis circa 0.5 mm. longis ad corollae tubi apicem insertis, antheris oblongis circa 0.75 mm. longis. *Stylus* gracilis, 1 mm. longus, glaber, stigmatibus duobus 1.25 mm. longis. *Fructus* puberulus, circa 2 mm. diametro, septicide dein loculicide dehiscens.

Korat, Chan Tuk, 100 m., open grassy forest, Kerr 8046.

Hedyotis Dawsoniana Craib [Rubiaceae-Hedyotideae]; species *H. fulvae* Hook. f. habitu persimilis sed haud villosa.

Caules e radice lignosa orti, annui, erecti, saltem 35 cm. alti, quadrangulares, primo interdum bifacialiter parce pilosi, mox glabri, sicco virides, duri, ad 2.5 mm. diametro. *Folia* lanceolata angustave lanceolata, apice acuta, basem versus angustata, obtusa, rotundata, vel subcordata, 3–4 cm. longa, 0.5–1 cm. lata, rigida, sicco viridia vel parum lutescentia, subtus pallidiora, supra pilis brevibus rigidis scabridula, subtus ad costam nervosque laterales pilis similibus sparse instructa, nervis lateralibus utrinque 3–4 obliquis cum costa supra impressis subtus prominentibus, nervulis obscuris, margine recurva, sessilia vel subsessilia; stipulae membranaceae, lobis tribus subulatis quorum mediano circa 4.5 mm. longo lateralibus 2 mm. longis et paucis aliis parvis glanduliformibus instructae, primo parce pilosae. *Pedunculi* axillares, cymas glomerulatas gerentes, inflorescentia tota 2 cm. longa, pedunculis puberulis, floribus albis (ex Kerr). *Receptaculum* breve, puberulum. *Calyx* ultra medium in lobos 5 sublanceolatos circa 1 mm. longos divisus. *Corollae* tubus 1.25 mm. longus, apice villosus, lobi 5, lanceolati, circa 1.5 mm. longi et 0.8 mm. lati. *Stamina* 5, filamentis brevibus ad corollae tubi apicem insertis, antheris vix 0.5 mm. longis. *Stylus*, stigmatibus bilobato incluso, 2.5 mm. longus; ovarium biloculare, ovulis loculo quoque pluribus.

Lôi, Kao Krading, 1200 m., open grassy ground, Kerr 8675.

lobos inter *H. Maingayi* Hook. f. et *H. elegantem* Wall. posita, ab illa lobis brevioribus ab hac lobis longioribus recedit.

Herba circa 0.5 m. alta (ex Kerr); ramuli herbacei, virides vel interdum brunnei, primo albo-maculati, glabri, bisulcati. *Folia* lanceolata vel late lanceolata, rarius oblongo-lanceolata, apice angustata acuminatave, summo apice subacuta, basi cuneata vel rarius rotundata, 4.5–8 cm. longa, 1.5–2.2 cm. lata, sicco rigide chartacea, pagina utraque viridia, inferiore parum pallidiora vel utraque plus minusve brunnescentia, matura glabra, nervis lateralibus utrinque circa 5 obscuris inferioribus sat obliquis superioribus magis patulis intra marginem anastomosantibus, margine revoluta, petiolo 1–6 mm. longo supra canaliculato suffulta; stipulae circa 2 mm. longae, late deltoideae, interdum apice obtuse acuminatae et margine breviter obtuse glanduloso-fimbriatae, plus minusve pubescentes, diu persistentes. *Cymae* in paniculam terminalem foliatam circa 10 cm. longam dispositae, ramulis inferioribus ad 3 cm. longis paniculam 2.5 cm. longam et 3.5 cm. diametro gerentibus superioribus gradatim brevioribus, glabrae; bracteae lineares, persistentes. *Receptaculum* 1 mm. longum, glabrum. *Calycis* tubus brevis, lobi 4, late lanceolati, sub anthesin paulo ultra 1 mm. longi, dorso medio carinati. *Corolla* alba (ex Kerr); tubus 2.5 mm. longus, extra glaber, intra superne pilosus; lobi quattuor, 2 mm. longi, intra basi pilosi. *Stamina* 4, filamentis 0.75 mm. longis ad corollae tubi apicem affixis, antheris circa 1.3 mm. longis. *Stylus* 1.75 mm. longus, stigmatibus duobus 0.75 mm. longis; ovarium biloculare, ovulis numerosis. *Capsula* calyce persistente coronata.

Nakawn Sritamarat, Kao Luang, 1300–1700 m., very common in evergreen forest, Kerr 15497.

Hedyotis densa Craib [Rubiaceae-Hedyotideae]; ab *H. congesta* R. Br. ex G. Don foliis angustioribus magis conspicue nervosis, floribus magis numerosis et congestis, calycis segmentis longioribus angustioribus inter alia recedit.

Caules annui, e radice lignosa orti, ad 40 cm. alti, simplices vel parce ramosi, iuventute conspicue 4-angulati, fere subulati, sicco brunnei, mox conspicue angulati, brunnei vel olivacei, glabri. *Folia* lanceolata, superne angustata vel subacuminata, summo apice subacuta, basi cuneata, ad 7 cm. longa et 1.7 cm. lata, subcoriacea, sicca plus minusve lutescentia, glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 4–6 obliquis supra argute impressis subtus prominentibus, nervulis obscuris, margine recurva, petiolo 5–8 mm. longo glabro supra canaliculato suffulta; stipulae ad 7 mm. longae, pinnatim lobatae, marginem et apicem versus parce pilosae, marginem versus incrassatae, mox deciduae. *Glomeruli* axillares, densi, petiolo subaequilongi; flores albi (ex Kerr); bracteae parvae, glanduloso-fimbriatae; pedicelli circa 0.5 mm. longi, glabri. *Receptaculum* 1 mm. longum, viride, superne pilis paucis instructum. *Calycis* tubus 0.5 mm. longus, lobi 4, lanceolati, subacuti, 2.75 mm.

longi, circa 1 mm. lati, parum recurvi, dorso pilis albis rigidis instructi, intra glabri et latere utroque basi glandula brevi filamentosa brunnea instructi, ciliati. *Corollae* tubus 2.5 mm. longus, intra superne villosus, lobi 4, deltoidei, obtusi, 1.75 mm. longi, 1.25 mm. lati, dorso breviter hirsuti, intra puberuli, ciliolati. *Stamina* 4, filamentis 1 mm. longis brunneis glabris ad corollae tubi apicem insertis, antheris medifixis filamentis subaequilongis. *Stylus* vix 3 mm. longus. *Fructus* 2.5 mm. longus, 1.25 mm. diametro, septicide dein loculicide dehiscens, calyce persistente coronatus; semina loculo quoque circa 6, triangulata, foveolata, brunnea.

Ranawng, Kao Pawta Luang Keo, 1300 m., open ground on ridge, *Kerr* 16952.

Hedyotis diversifolia *Geddes* [Rubiaceae-Hedyotideae]; *H. patenti* Ridl. habitu similis sed inflorescentia magis robusta, pedicellis brevioribus inter alia recedit.

Herba circa 50 cm. alta; caulis pro longitudine saepissime sat robustus, ad 5 mm. diametro, glaber, primo angulatus, mox subteres, sicco pallide viridis vel purpurascens. *Folia* inferiora oblongo-lanceolata, apice acuminata, subacuta, basi cuneata rotundatave, 10–14 cm. longa, 2.5–4.5 cm. lata, superiora saepissime ovata, basi cordatula, ad 10.5 cm. longa et 5.5 cm. lata, rigide chartacea, sicco supra luteo-viridia, subtus pallide viridia, glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 9 supra conspicuis vel prominulis subtus prominulis, nervulis paucis subtus subprominulis, margine recurva, petiolo 3–4 mm. longo supra canaliculato suffulta, vel superiora fere sessilia; stipulae persistentes, oblato-triangulares, marginem versus incrassatae. *Panicula* terminalis, ad 10 cm. longa, ramis patentibus inferioribus ad 7 cm. longis supremis circa 1.5 cm. longis, pedicellis circa 1.5 mm. longis, partibus omnibus glabra, ramulis ultimis interdum sicco purpurascens; bractae angustae, plus minusve persistentes; flores purpurei (ex *Kerr*). *Receptaculum* breve. *Calycis* segmenta 4, circa 1 mm. longa et lata. *Corollae* tubus circa 1.5 mm. longus, lobi 4, lineares, 4 mm. longi, 1.25 mm. lati, intra pilosi. *Stamina* 4, filamentis vix 0.5 mm. longis, antheris 1.5 mm. longis. *Stylus* 4.5 mm. longus; stigmata duo, complanata, 1 mm. longa. *Fructus* subglobosus, circa 2.25 mm. longus et 2 mm. diametro, septicide dein loculicide dehiscens; semina loculo quoque plura.

Krat, Baw Rai, 200 m., by stream in evergreen forest, *Kerr* 9464.

Hedyotis Garrettii *Craib* [Rubiaceae-Hedyotideae]; ab *H. punicea* Craib et *H. Wallichii* Kurz corollae tubo intra glabro recedit.

Herba annua, caule erecto gracili simplice vel apice tantum ramoso 8–17 cm. alto quadrangulare sicco parum lutescente pilis longiusculis divaricatis sparse instructo. *Folia* opposita, saepissime oblanceolata vel anguste oblanceolata, apice subacuta, basi angustata, 4–8 mm. longa, 1.5–3 mm. lata, rigide chartacea, sicca plus minusve lutescentia, pagina utraque pilis longiusculis sparse instructa,

costa supra obscura vel parum impressa subtus prominente, nervis lateralibus obscuris, margine recurva, sessilia vel petiolo brevi vix distincto suffulta. *Cymae* et caulem et saepe etiam ramulos breves ex axillis supremis ortos terminantes, sessiles, ad 4 cm. longae, pedicellis terminalibus sub fructu usque ad 8 mm. longis quam aliis conspicue longioribus; bractae parvae. *Receptaculum* 0.75 mm. longum, puberulum. *Calycis* tubus brevis, segmenta 4, lanceolato-delloidea, subacuta, receptaculo paululo longiora, basi 0.5 mm. lata, glabra. *Corolla* dorso glabra, tubo 1.75 mm. longo intra glabro; lobi supra albi, infra pallide violacei (ex *Garrett*), 4, subelliptici, subobtusius, circa 1.25 mm. longi et 0.8 mm. lati, glabri. *Antherae* e tubo paululo exsertae, 0.5 mm. longae. *Stylus* glaber, stigmatibus inclusis 1.75 mm. longus. *Fructus* plus minusve glabrescens, circa 2 mm. longus, septicide dein loculicide dehiscens, calyce persistente coronatus.

Doi Pa Mawn, 1570 m., wet rocks, *Garrett* 494.

Hedyotis Geddesiana *Craib* [Rubiaceae-Hedyotideae]; ab *H. lineata* Roxb. foliis minoribus, inflorescentiae indumento conspicue brevior et minus denso, calycis segmentis brevioribus recedit.

Caules e radice crassa lignosa annui, erecti, sub anthesin 8–18 cm., demum ad 60 cm. alti, primo pilosi, mox fere sparse pilosi. *Folia* saepissime ovata vel subovata, apice subacuta, breviter indurata, basi rotundata, haud rarius cordatula, 1.5–2 cm. longa, 0.7–1.2 cm. lata, rigide chartacea, sicco luteo-viridia, supra breviter hirsuta, subtus ad costam nervosque laterales patule pubescentia, aliter breviter hirsuta, costa supra conspicua vel parum impressa subtus prominente, nervis lateralibus utrinque 3–5 obliquis supra saepissime parum impressis subtus prominentibus, nervulis obscuris, margine recurva, subsessilia vel petiolo circa 1 mm. longo suffulta; stipulae diu persistentes, lobis 2–3 filiformibus deciduis instructae. *Pedunculi* axillares, plures, sub anthesin 1.2 cm. longi, apice ramosi, pedunculis partialibus circa 3 mm. longis flores sessiles gerentibus, breviter pubescentes; flores albi (ex *Kerr*), dimorphi. *Receptaculum* breve, puberulum. *Calycis* segmenta 4–5, circa 0.5 mm. longa, dorso puberula. *Corollae* tubus circa 1 mm. longus, lobi 4–5, suboblongi, 1.5 mm. longi, 1 mm. lati, intra basi villosi, margine pauperius ciliati. *Filamenta* ad corollae tubi apicem inserta, aut breviora aut 1 mm. longa; antherae parvae. *Stylus* vel 1.25 vel 3 mm. longus, medio pilis paucis divergentibus instructus.

Nakawn Panom, Ta Uten, 200 m., open grassy ground, *Kerr* 8470.

XXXIV.—MISCELLANEOUS NOTES.

THE DIRECTOR has been elected an Honorary Member of the California Academy of Sciences.

National Botanic Gardens of South Africa.*—The Publicity Association of Cape Town has issued an attractive illustrated Guide to the National Botanic Gardens at Kirstenbosch written by the Director, Professor R. H. Compton. A short history of the origin of the gardens with notes on their aims and functions, geology, climate, and a description of the principal features are included.

A better spot than Kirstenbosch as the site of a botanic garden could probably not have been found in the whole of South Africa. It possesses great natural scenic beauty enhanced by a wealth of indigenous forest of great botanical interest. Chief amongst the trees is the rare and almost extinct Silver Tree, *Leucadendron argenteum*, which now grows only on the Peninsula and a few isolated spots in the mountains on the other side of the Cape Flats. In Skeleton Gorge, particularly, the visitor finds himself amongst examples of trees found elsewhere only in the Knysna and Zitzikamma forests, several hundreds of miles to the east, and on the eastern slopes of the Drakensberg.

A plan of the Kirstenbosch Garden is included in the booklet, with a short description of the Public Gardens in Cape Town, Claremont and Wynberg.

Reference may also be made to the Journal of the Botanical Society of South Africa,† part xvi of which, containing a number of interesting articles, has just appeared. Amongst other papers is one by Prof. F. E. Lloyd on the structure and mechanism of the trap of *Utricularia capensis*, another by Mrs. Levyns on the Rhenoster Bush, *Elytropappus Rhinocerotis*, and another by Professor Compton, who contributes some observations on his recent visit to botanic gardens in Ceylon and Java. It is pleasing to note that the membership of the Society has now reached 1,133.

Turpentine from Pinus Merkusii.—*Pinus Merkusii* Jungh. et de Vriese, sometimes referred to as the "Tenasserim Pine," is the most tropical of all pines and is of wide distribution, occurring in various parts of the Eastern Tropics. The most extensive areas of the species are perhaps to be found in Burma, where it has been estimated to cover about twelve hundred square miles,‡ occupying low hills and spurs at elevations of five hundred to two thousand feet. It may exist as a pure stand or, as is more commonly the case, occur intermixed with broad-leaved trees.

It has long been known that the species produces a good quality resin, but it has not been exploited to any extent in the past as a

*The National Botanic Gardens of South Africa and the Public Gardens of Cape Town. Cape Peninsula Publicity Association, Cape Town, pp. 36 (1930).

†The Journal of the Botanical Society of South Africa, edited by R. H. Compton; Part xvi. 1930. Kirstenbosch, Newlands, C. P., South Africa, pp. 30, pl. iii., fig. iii.

‡Indian Forest Bull. No. 24, p. 3.

source of turpentine. This has probably been due to the inaccessibility of the forests. During the last few years, however, special interest has been taken in the production of turpentine from this species on a commercial scale in Sumatra, and towards the end of 1928 an up-to-date Government factory for the production of turpentine was established in the district of Atjeh. In tapping the "quarre" system as employed in the Landes of France has been adopted. The product from the factory was found to be of good quality and superior to former samples from Sumatra. In aroma it is stated to differ but little from the French and American product, and reports received from various users of turpentine in Holland, to whom samples were submitted, were favourable. A study of the composition and physical constants of the oil made at the Koloniaal Instituut, Amsterdam,* revealed the fact that it complied in every respect with the demands of the Dutch Pharmacopoeia for *Oleum terebinthinae*. A notable feature was the low refractive index compared with the French and American oils (the French oil is obtained from *P. Pinaster* Mill., and the American mainly from *P. palustris* Mill. and *P. caribaea* Morel.). This is attributed to the high percentage of α -pinene, 85–90 per cent. as against 60–70 per cent. for French and American oils. As this constituent is regarded as the one of most value in turpentine, this feature is claimed to enhance rather than diminish the value of the Sumatran oil. F. N. H.

Anemopaegma rugosum (Schlecht.) Sprague, comb. nov.—*Bignonia rugosa* Schlecht. in Linnaea, xxvi. 656 (1855); Hook. f. in Bot. Mag. t. 7124 (1890); Knuth in Fedde, Repert., Beih. xliii. 638 (1927).—The plant figured in Bot. Mag. is undoubtedly referable to the genus *Anemopaegma*, the disc and ovary being characteristic. It seems to agree in all essentials with Schlechtendal's description of *Bignonia rugosa* except that a staminode is present. Schlechtendal's mention of the occurrence of foliaceous pseudostipules, and his description of the capsule, also clearly point to *Anemopaegma*.

The species is a native of Venezuela, though it was included in the Index Kewensis with the geographical distribution "N. Granat." i.e. Colombia. This mistake was due to the very misleading title "*Plantae Wagerianae Columbicae*" adopted by Schlechtendal for his account of Wager's collections in northern Venezuela, the only justification for this title being the fact that Venezuela formed part of the Republic of Colombia during the third decade of the nineteenth century. All the Venezuelan species described in the above-mentioned paper appear to have been erroneously ascribed to Colombia in consequence of Schlechtendal's ill-chosen title.

T. A. S.

*Atjeh-Turpentijn, tegenwoordige kwaliteit en nieuwe beoordeelingen, door Ir. W. Spoon. Berichten van de Afdeeling Handelsmuseum van de Kon. Vereeniging Koloniaal Instituut, No. 57, pp. 30. (Druk J. H. Bussy, Amsterdam.)

Hypericum lanceolatum.—From the Cameroons Mountain Mr. T. D. Maitland has forwarded to Kew flowering and timber specimens of *Hypericum lanceolatum* Lam. This is widely spread in the mountains of East Africa as far south as Houtbosch in the Northern Transvaal, also in the Mascarene Islands, and was first recorded from Cameroons Mt. by Mann in 1862. It was also recently collected there by Dr. J. M. Dalziel. The species is found from about 4000 ft. to 10,000 ft. altitude. The chief point of interest in Mr. Maitland's notes is that the highest development of the species occurs at about 7000 ft., where he has observed trees 40 ft. high with a girth of 37 inches at 3 ft. from the ground. He notes that plants on the grassy slopes at higher altitudes never reach beyond a shrubby stage.

A similar range of habit is known for the East African high mountains and is recorded by Chipp (*K.B.* 1929, p. 189) in the Imatong Mountains, on the borders of Uganda, where on the top of Mt. Kineti at nearly 10,000 ft. it forms scrub, whilst in forest ravines at 8000 ft. it is a tree 40 ft. high. According to B. D. Burt, the species grows at over 11,000 ft. on the Hamang Mountain in Tanganyika Territory, forming scattered scrub up to 3 ft. high. I collected this at Woodbush in the Northern Transvaal, where it grows as a small shrub. A figure is published in the *Flora of West Tropical Africa* 1: p. 230, fig. 99.

J. H.

Brittonia, a new botanical periodical.*—We have received from Dr. E. D. Merrill, Director-in-Chief of the New York Botanical Garden, the first number (Vol. 1, No. 1, Feb. 1931) of *Brittonia*, a new periodical to be issued by that Institution at irregular intervals as material becomes available. It is named in honour of Dr. N. L. Britton, and is "planned to cover primarily the fields of systematic botany and plant geography, although papers in other fields of botanical science are not excluded." The first number contains, besides an introductory note by Dr. Merrill, papers on Brazilian Algae by M. A. Howe and W. R. Taylor, on Pleistocene plants by A. Hollick, and "A short phytogeography of the Prairies and Great Plains of Central North America," by P. A. Rydberg.

* Subscription price per volume of about 500 pp. \$5. Single numbers 50 cents each. Published by the New York Botanical Garden. 8vo.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1931 ROYAL BOTANIC GARDENS, KEW

XXXV.—GENERAL SMUTS' BOTANICAL EXPEDITION TO NORTHERN RHODESIA, 1930. J. HUTCHINSON.

When General the Rt. Hon. J. C. Smuts was in England in 1929 he referred to a possible botanical expedition that he hoped to be able to make through Northern Rhodesia as far as the African Lakes. He also expressed the desire that Mr. J. Hutchinson, who had collected with him when he visited South Africa on behalf of Kew in 1928, might be allowed to join the proposed expedition.

Since General Smuts is so keen a Botanist and possesses so wide a knowledge of the flora of South Africa, the opportunity of assisting in this collecting tour was gladly accepted and Mr. Hutchinson left Kew on June 6th and returned to duty on October 4th, 1930.

The party travelled by motor-cars from Pretoria via Messina, Zimbabwe, Victoria Falls and Broken Hill to the south end of Lake Tanganyika. Later Mr. Hutchinson visited independently the Katanga region of the Belgian Congo, the Matopos, and with various companion botanists the botanically little-known Zoutpansberg mountains in the Northern Transvaal, the Mont-aux-Sources in the National Park, Natal, and finally spent a week in the neighbourhood of Port Elizabeth, which he had previously visited during a period of drought.

With the active co-operation of General Smuts, Mrs. Arthur Gillett, Mr. J. B. Gillett, and other botanists, a large and interesting collection was secured, particulars of which are given at the end of the account. In the present paper only some of the more striking plants are mentioned and a few new species described (see pp. 245-254). The general working out of the collection* will have to be deferred until the final part of the *Flora of West Tropical Africa* has been completed and it is hoped that it may not be long before a full account of this interesting expedition can be published.

The expenses connected with Mr. Hutchinson's share in General Smuts' expedition were met from the funds placed at the disposal of Kew for collecting work of this character by the Empire Marketing Board.

A. W. H.

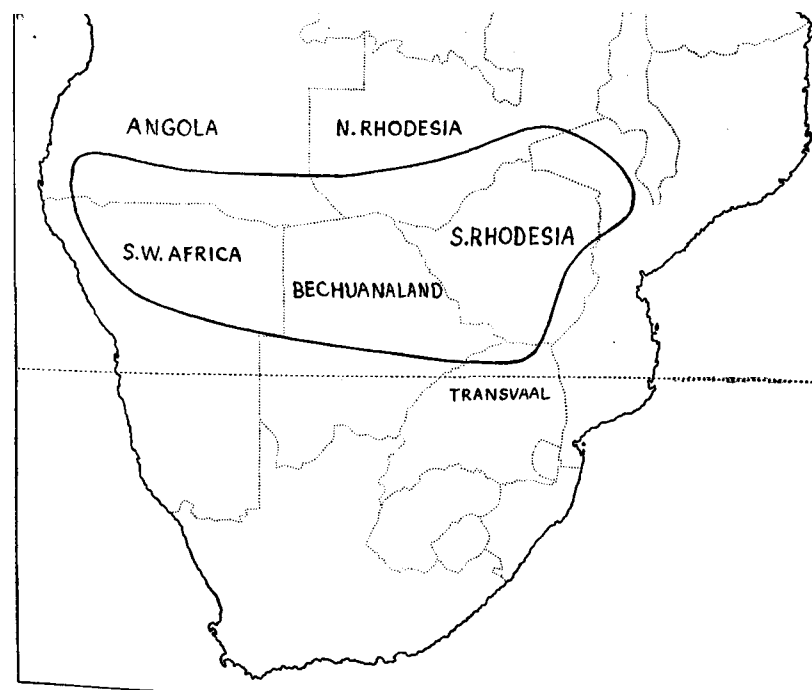
* The total number of specimens collected by Mr. Hutchinson on his two African tours has now reached 5,200. See also *K.B.* 1929, 273.

I arrived at Irene, Transvaal, on Thursday evening, June 26th. After a day of preparation spent in the purchasing of additional kit, etc., and paying a visit to the National Herbarium at Pretoria, our party started from Doornkloof, General Smuts' residence at Irene, early on Saturday morning, June 28th. At this season the early morning on the high-veld of the Transvaal is usually very cold and there had been several degrees of frost during the night. As I had previously visited the Pretoria district in midsummer, I was much struck by the contrast in midwinter, the veld looking very brown and dried up, and the vegetation by the roadsides being covered with dust. The roads, however, were in fairly good condition. Near Pienaar's River, the "Triumfetta veld" (*Triumfetta Sonderi* Fic. & Hiern), so conspicuous in summer, was now scarcely recognisable as such.

Our first camp was beyond Potgietersrust. At this season the vegetation thereabouts was quite uninteresting from the collector's point of view, and the bush-veld further north was even less attractive. Next morning an early start enabled us to reach Louis Trichardt in good time and proceed northwards via Wylie's Poort. By the roadside on the ascent we collected specimens of a fine *Cineraria* (*C. monticola* Hutch.) see p. 251, a new species which was in full flower. In the gorge towards the northern entrance the whole party lunched and then botanised along the neighbouring slopes, where we found a nice red-flowered *Kalanchoë*, which appears to be a new species, and other interesting plants. *Pterolobium exosum* Bak. f. (*P. lacerans* R.Br.), scrambling over the vegetation, with its bright winged fruits gave an autumnal effect and broke the monotony of the dull green shrubs and trees. Soon we passed our former camping ground at Fogwell's Paradise, at the northern entrance to the gorge, and almost immediately encountered fine specimens of the Baobab (*Adansonia digitata* Linn.).

About eight miles further on the dominant plant was the "Mopane" (*Copaifera Mopane* Kirk). A little to the east, however, we found later that the "Mopane" extends right to the base of the northern range of the Zoutpansberg. This "Mopane" bush continues without a break to the Limpopo and occupies much of Southern Rhodesia to beyond the Zambesi at this longitude.

About 10 miles south of Messina we camped out in the bush, and as we were now into "lion country" we made a circle of the cars and spread our mattresses as near them as possible and hoped for the best. The country thereabouts was at this season in a dry and parched condition and little botanising was possible. From Messina we crossed the Limpopo by the magnificent new bridge, whereon were waiting to join us Dr. I. B. Pole-Evans, C.M.G., Chief of the Division of Plant Industry of the Union of South Africa, and two assistants, with a new lorry-caravan specially fitted for botanical exploration. Dr. Pole-Evans accompanied us to Lake Tanganyika and back, the two parties collaborating and frequently rendering



Range of "Mopane," *Copaifera Mopane* Kirk. (Since this map was printed Dr. Burtt-Davy informs me that the species occurs at Liwonde and near Chiromo in S. Nyasaland. J.H.)

mutual assistance. At this season the flat "Mopane" bush country as far as the Lundi River was not particularly interesting, but here and there bushes of *Iboza riparia* N. E. Br. (*Moschosma riparium* Hochst.) served to brighten the wayside. We arrived at the Lundi River in the late afternoon and after a refreshing bathe in its cool waters were soon botanising along its picturesque banks, soothing to our eyes tired with the dusty roads and sombre "Mopane" bush. If we had known that a huge python had been seen amongst the boulders within a few yards of our beds, our sleep that night might not have been quite so profound. Early next morning we explored the granite kopjes nearby, finding a large quantity of quite big trees of *Androstachys Johnsonii* Prain growing in company with *Croton subgratissimus* Prain. The *Androstachys* is called "Mzumbite," and numerous seedlings were observed, regeneration evidently being very good. Some of the trees had trunks quite 18 ins. in diameter. Here, on the granite, there were numerous specimens of the interesting resurrection plant, *Myrothamnus flabellifolia* Welw., which extends from the Magaliesberg to Angola and far up into Northern Rhodesia. In the afternoon we set off to the north-east in the direction of Victoria, passing through beautiful but apparently almost uninhabited country between large granite kopjes. At the edge of

the range we again entered "Mopane" bush, characterising poor and uninteresting country.

Late in the evening we arrived at the Zimbabwe ruins and camped out. During the night there was a heavy dew and a slight frost. It was a weird and novel experience to wake up at dawn almost in the shadow of the famous Zimbabwe ruins about which there has been so much speculation and controversy. We thoroughly explored the ruins and collected a large number of specimens during the two days we stayed there. A striking plant by the roadside and around our camp was a Labiate, *Pycnostachys urticifolia* Hook., with dense spikes of sky-blue flowers and nettle-like leaves. This species is widely spread from Tanganyika to Natal. A short botanising excursion was also made a few miles to the east.

Early on the morning of July 3rd, we left Zimbabwe by a rather bad road to Umvuma and reached Gwelo about midday. We had passed through much *Combretum* and *Acacia* bush, but beyond Gwelo for about 50 miles or so to where we camped for the night the country was mostly of the high-veld type, undulating long-grass country with a few trees at long intervals. We collected fine specimens of *Loranthus* and *Asparagus*, and *Clematopsis* was common in fruit. Our camp was by the Shangani River amongst a dense stand of spiny species of *Acacia*. We found the night very cold, with 4 degrees of frost. Mr. J. B. Gillett and I were up at daybreak in order to transfer our partly dried plants to thin papers ready for making into parcels and despatching from Bulawayo to Pretoria, where the drying was to be completed.* Our presses were filled already and they were in this state during most of our journey. It was no light task to contrive to have enough paper dried each evening for the next day's collection. For this purpose we usually lighted a separate fire, the "botanical fire," to be out of the way of cooking. This botanical fire eventually grew quite popular, for the presses provided suitable seats for most of the party, some of whom regaled us each evening with various stories, including usually a lion story. This particular morning we did not finish the presses until after 10.30, when we followed the trail of the remainder of the party to Bulawayo as fast as possible. This part of the route was through rather poor and somewhat uninteresting country, the road running parallel with the railway through grass-veld most of the way.

We left Bulawayo soon after midday, much precious time being saved by a friendly store-keeper kindly offering to pack our nine parcels of specimens and despatch them by rail to Pretoria. The road from Bulawayo was quite good as far as Lonely Mine, the veld being mostly covered with *Combretum* and *Acacia*, very like the bush-veld of the Northern Transvaal. After leaving Lonely Mine we passed through "Mopane" forest glowing with autumnal tints, accentuated by the setting sun facing us to the north-west. About

*We were greatly indebted to Dr. E. P. Phillips and the assistants at the National Herbarium in Pretoria for the care taken with our collections, which we sent to them, dried or partially dried, at intervals *en route*.



Copaifera mopane Kirk, the dominant plant in the extreme northern Transvaal and Southern Rhodesia. A, longitudinal section of flower. B, stamens. C, longitudinal section of ovary. D, fruit. E, seed showing lines and dots of resin.

30 miles beyond Lonely Mine we at last found a suitable camp in a picturesque spot at the edge of "Mopane" forest, with a wide vista of tall brown grass in front of us—a typical African setting. Our fires were lighted in the midst of a grove of beautiful little trees, which proved to be *Monotes glaber* Sprague, a member of an interesting Dipterocarpaceous genus. This and the allied *Marquesia* are the only representatives of this family in Africa, the remainder being natives of Indo-Malaya. General Smuts was particularly pleased to see examples of this interesting genus.* Across the valley during most of the night we could hear the tom-toms from a village, the natives evidently celebrating in great style. Although far from wakeful I found myself not unwilling to hear the roar of some wild beast to complete the setting.

July 5th, a Saturday, proved to be a motoring day, the road being very bad and passing through sandy vleis and rough "Mopane" forest. Near Dett, however, I stopped the car to collect a beautiful blue-flowered Acanthaceous plant, of which there was only a small patch in an otherwise long flowerless stretch of country. Our destination that night was to be the Wankie Coal Mine, but fortunately we stopped short of that somewhat dreary place, and camped out near a dried-up river bed. As we were short of water we enquired of a wild looking native, who took us to the bed of the river, and I learned how to obtain a plentiful supply of palatable water where apparently none existed by scooping out a deep hole in the sand into which water by seepage at length slowly trickles. Dr. Pole-Evans, who had failed to appear in camp the previous night, now turned up, having covered, in order to overtake us, 190 miles in the day, including a very bad stretch over the Mica Hill during the last stage. That piece of road was the worst I experienced in Africa, and I have motored over some really bad ones.

In the afternoon of the next day (July 6th) we arrived at the Victoria Falls. The visitor to Africa from overseas, accustomed as he may be to the beauties of the Alps, the Pyrenees, or the charm of the English lakes, is apt to find some of the scenery falling short of the descriptions given by African writers. Not so, however, with the Victoria Falls; they were all and even more than I had ever pictured them, and not in the least overrated in any account which I have read.

The Administration of Northern Rhodesia had kindly arranged for us to camp on a beautiful site about a mile above the Falls on the northern bank of the river. This was a delightful place and we stayed there for four nights. Mr. Pardy, District Forest Officer, who accompanied us on our botanical trips in the neighbourhood, was of great assistance as guide, and the Curator of the Falls gave us every help. One morning was devoted to making a collection in the so-called "rain-forest" at the Falls. A luxuriant vegetation, quite different from the flora of the surrounding country, grows under

*On p. 251 I give a key and enumeration of the Rhodesian species of *Monotes*.

the spray of the great cataract. We collected everything in flower, and in another paper I hope to give a list of the species which are known to grow under these peculiar conditions, with notes as to their distribution. At the time of our visit the river was high and the spray was ascending to a very considerable altitude. Our collecting books show that we gathered about 40 species of plants in flower or fruit. A complete collection from the rain-forest, if made at monthly intervals throughout the year, would no doubt yield very interesting results, and I hope that some resident or official interested in botany may be able to carry out this desirable project.

On Thursday, 10th July, we parted from a number of our companions who had accompanied us so far, amongst whom was Mrs. J. C. Smuts, who had looked after our personal comfort so well. They left to return to Pretoria, whilst we departed for the botanically little-known regions of North-Eastern Rhodesia. For the next few days I have few notes in my diary. My whole time was taken up with collecting and drying specimens after long days in the cars. The roads were tolerably good and most of the journey was fairly rapid, stops being made at various points to collect specimens. The country beyond Livingstone was open sand-veld covered with scattered *Brachystegia* and *Combretum*, grass and *Copaifera Mopane*. About 30 miles away we met with *Protea*, and at 43 miles we seemed to part with the Baobab. The first day yielded only about 30 numbers, gathered at ten different spots between Livingstone and Choma, where we camped for the night. Conspicuous in burnt places by the roadside were a dwarf species of *Combretum* (*C. platypetalum* Welw.), with bright scarlet flowers close to the ground, and a *Triumfetta*, probably *T. Mastersii* Bak. f. The country thereabouts, and indeed as far as Lake Tanganyika, was a succession of wide open long-grass vleis, quite dry at this season, and *Brachystegia* forest, with groves here and there of *Uapaca*. Both appear to possess wonderful powers of regeneration, the *Brachystegia* mainly by stool shoots, the *Uapaca* by seedlings. One species of *Uapaca* (not yet determined) with large leaves bore a striking resemblance in growth-form to *Rhododendron Falconeri* Hook. f.

Between Mazabuka, where there is an agricultural research station, and the Kafue River, through the country known as the "Ridgeway," we observed numerous scattered examples of a remarkable *Phyllanthus* 4-6 ft. high, with fascicles of branchlets; also a great quantity of *Clematopsis Stanleyi* Hutch., in fruit. Approaching the Kafue River were steep ridges covered with *Brachystegia*, etc., with beautiful autumnal effects due to the red leaves of *Hymenocardia acida* Tul. (Euphorbiaceae). The Kafue River was crossed by pontoon. We explored its northern bank for some distance, and found the thorny scrub of *Albizzia*, various Capparidaceae and *Balanites* very difficult to penetrate.

We arrived at Broken Hill on the morning of July 13th, where the cars were greased and overhauled. Whilst that was being done a



Faurea argentea Hutch. A, lower surface of leaf. B, opening flower-bud. C, open flower. D, pistil and hypogynous scales.

friendly storekeeper allowed us to use his premises to pack up our dried and partly dried material for despatch to Pretoria. As it was a public holiday that day the railway officials refused to accept our box for transmission by rail and we were compelled to leave it at the store, the manager kindly promising to send it away the next day.

From Broken Hill for the first ten miles there was much *Brachystegia* and *Uapaca*, and for quite another 90 miles an endless forest dominated by these two genera, with a carpet of grass and other herbs. We camped that night, after a rather long and uncertain search in the semi-darkness for a suitable spot, amongst the trees by the road some 8-10 miles beyond Chiwefwe. At the latter place General Smuts, who was behind the rest of the party, had called at the farm of Mr. Stephenson, and arrived late in camp with a generous supply of large and beautiful oranges presented by the proprietor. At the close of my expedition Mr. Stephenson kindly sent a box of these luscious fruits to the steamer at Cape Town and they travelled the vast distance by rail and sea to England in excellent condition. The expense of the long rail journey in South Africa, however, mitigates against their importation into this country in any quantity.

The next day, from Chiwefwe to Serenje Corner, proved somewhat eventful to Jan Gillett and myself. After breakfast we all botanised on the neighbouring hills, and returned about 10.30. The remainder of the party left for our next camp which was to be about 110 miles further on, whilst we two remained behind to label and put in the press the numerous specimens we had gathered. This was not completed until nearly midday. We had gone only a few miles, however, when the back wheel of the car struck the stump of a *Brachystegia* in the road and completely jammed. The car would go backwards but not forwards, and to travel a hundred miles or so in reverse gear was not to be thought of in such a country. We tried our best to release the wheel, but had not the necessary tools to remove all the fittings. As it was now late afternoon there seemed nothing to be done but prepare to spend the night where we were, although we fully expected the General to return for us sometime about midnight. A rather shy native had watched us for some time and when he realised that we had decided to sleep there he obligingly dragged a large quantity of dead timber and lighted a fire. Soon, however, and to our great relief, we heard in the distance the hum of an engine from the direction of Chiwefwe (a sweet, musical sound under the circumstances!) and at length the Government Post lorry with a crowd of passengers on top drew up beside us. The driver had the necessary tools and in a very short time the jammed rear-brake was removed and we were following his trail northwards in the darkness. About ten miles from the camp which had been established near Serenje Corner, we met the General on his way back to see what was the matter. Next morning Mr. Chicken, the District Commissioner, arrived early in camp and was very helpful with information as to our further journey. The previous day, whilst we were delayed, General Smuts and Mrs. Gillett had collected

towards Serenje Corner a new species of *Monotes* which is described on p. 246 as *Monotes cordatus* Hutch. In fact, between Broken Hill and Lake Tanganyika our party collected no fewer than five new species of *Monotes* (see pp. 246-248), and no doubt there are still more in these *Brachystegia* forests. In places the bright red enlarged sepals subtending the fruits gave quite a gay colour to the landscape. An account of the genus in Rhodesia is given on p. 251.

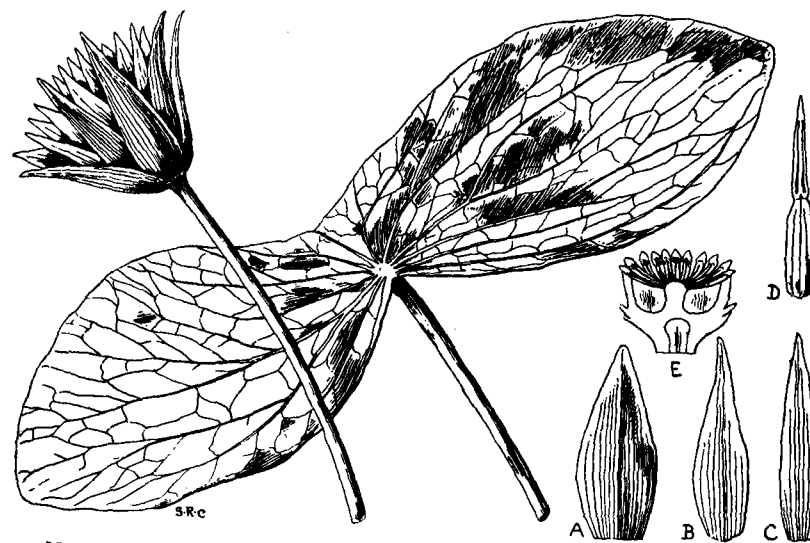
Between Serenje Corner and Mpika, our next halting place, some interesting plants were collected. Before leaving camp we gathered a beautiful silver-leaved *Faurea* which proves to be new, *F. argentea* Hutch. (p. 249). At 22 miles along the road we pulled up quickly at the sight of a beautiful and very striking Labiate growing by the road-side amongst the bracken which formed a carpet below the *Brachystegia*. This proved to be an interesting species of *Coleus*, *C. elegantissimus* Taylor, a new name for *Plectranthus Baumii* Gürke, there already being a *Coleus Baumii* Gürke. On the banks of the Lukulu River we found fairly large trees of *Myrica conifera* Burm. f., a common Cape species, and beneath them fine examples of the Royal Fern, *Osmunda regalis* Linn., a beautiful scarlet-flowered *Erythrina*, another new *Monotes* (*M. lukuluensis* Hutch., see p. 247), and various other plants. On the rocky kopjes at Kaloswe we again met with the *Myrothamnus* associated with species of several purely tropical genera such as *Landolphia*, *Strophanthus*, *Hymenodictyon*, *Harungana* (*Haronga*) and *Artabotrys* (*A. collinus* Hutch., n. sp., see p. 245).

Much of the forest around Mpika has been cleared, and the grounds around the station resemble an English park. We were welcomed by Mr. Hill, the District Commissioner, who made every possible arrangement for our comfort. Huge fires were built by his "boys" around our camp and for that night at any rate we had no fear of lions.* Growing amongst the grass was a beautiful species of *Pleirotaxis* (not yet determined), with scarlet flower-heads. I obtained seeds of this and sent them to Kew, but so far they have not germinated.

In a swamp near a river about six miles north-east of Kasama, however, we encountered the most handsome herbaceous plant seen on the whole journey. This proved to be *Coleus leucophyllus* Baker, which is synonymous with *C. mirabilis* Briq., the latter name having priority by about a year. It is a very handsome plant about 6 ft. high, with silvery-white foliage and multiflorous oblong panicles of sky-blue flowers, the panicles 1-1½ ft. long. In gathering specimens I sank nearly to the knees in the mud, so that its cultivation in a greenhouse in this country might prove very difficult. Unfortunately there were no seeds to be found at that time. On our return journey, when we had more time allowed us here by our leader, we collected a host of interesting plants in this same locality.

*Shortly after our visit, however, a man-eating lion gave some trouble here.

including two new species of *Nymphaea*, one, *N. primulina*, with beautiful primrose-yellow flowers, and a second with pale blue flowers, but with all the leaves submerged and bilobed (see fig. below and p. 246). So far as we know this is the first species to be found in Tropical Africa with all the leaves submerged; the same characteristic has been recorded for *N. oxypetala* Planch. from Ecuador, *N. amazonum* forma *submersa* Sagot, and occasionally for *N. alba* Presl. I have named our new species *N. divaricata* in reference to the divaricately lobed leaves. The plants were growing in deep and fairly slow-moving water and the leaves formed a dense carpet about 2½ ft. below the surface of the water.



Nymphaea divaricata Hutch. A and B, outer and inner sepals. C, petal. D, stamen. E, longitudinal section of pistil.

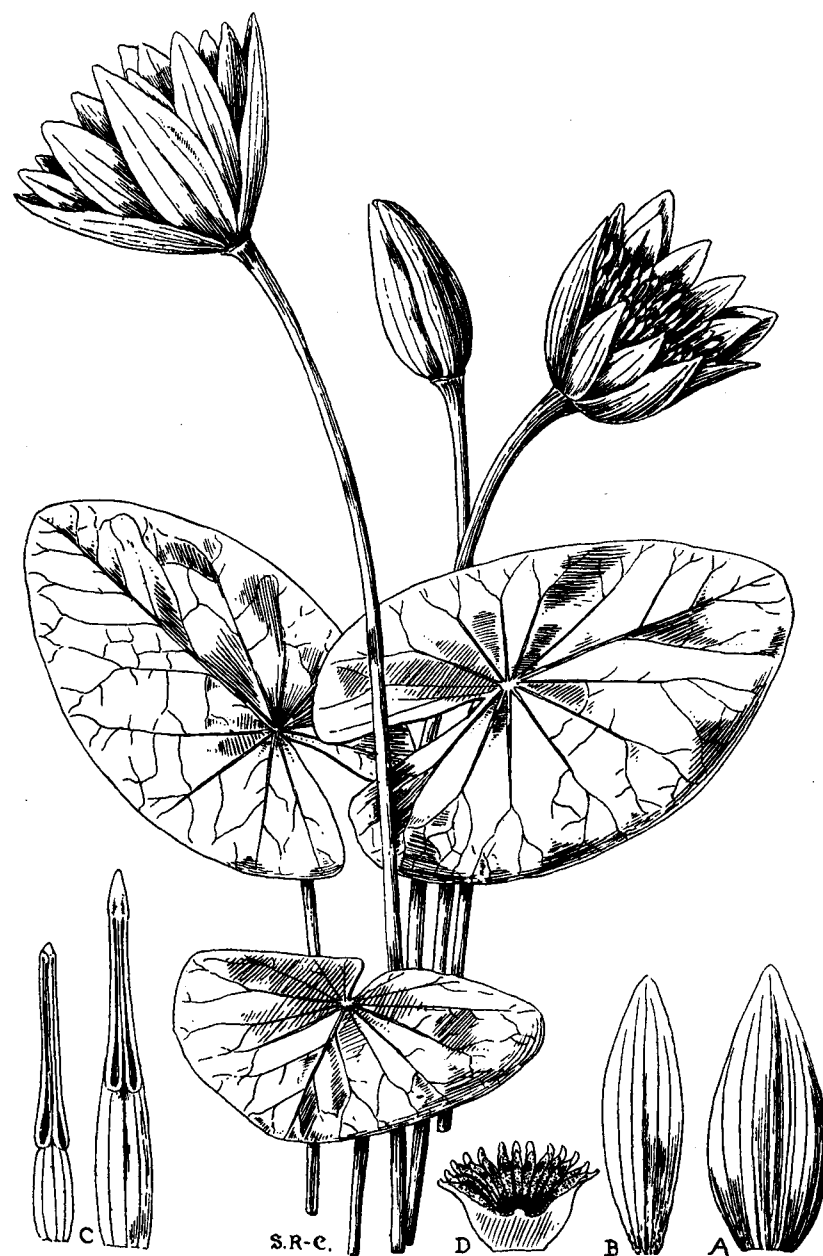
We camped on the evening of July 17th some miles north of Kasama beneath a light mosaic-like blanket of *Brachystegia*, under which one lay, with the wonderful southern sky and its myriads of stars as a roof. We were now within an easy day's drive of Abercorn near the south end of Lake Tanganyika. We started the next morning at eight o'clock along a good level road of brown sand, the light *Brachystegia* forest thereabouts much resembling a Devonshire wood in autumn, some of the young shoots giving the necessary colouring to the landscape. At 30 miles north from Kasama we collected for the first time *Dodonaea viscosa* Jacq. in full fruit, and also species of *Bridelia* and *Canthium*. The somewhat sombre green of much of this forest was brightened by an occasional tree of *Monotes*, with beautiful crimson enlarged sepals which contrasted well with the bright yellow-winged fruits and foliage of the *Dodonaea*. About 30 miles south of Abercorn we found the road carpeted with *Pentanisia*, some *Acanthaceae*, *Scutellaria* and *Indigofera*. Another

three miles northwards we found a vast quantity of *Vernonia obocephala* Baker, a plant I knew to have been for a long time represented in the Kew herbarium by only one specimen. From the manner in which Abercorn is recorded on the map with which I had been familiar for many years, I had imagined it to be something of a town, and we were much surprised, therefore, to find it consisted of but a few houses, with only twelve Europeans. The District Commissioner had selected a site for our camp near the lake about a mile from Abercorn, and we collected a number of specimens in the neighbourhood.

Next day, July 19th, we proceeded towards Lake Tanganyika. By a small stream at 7 miles we were checked in our progress by the sight of a beautiful tree 20 ft. high full of white flowers. This proved to be a flowering specimen of a tree collected a little later in fruit in the Lunzua Valley about half way between this point and Lake Tanganyika. I have named this beautiful new species, of which we have seven to eight sets of specimens, after Mrs. Arthur Gillett, who took a keen interest in our work and assisted us throughout. It is a species of *Ochthocosmus* (Erythroxylaceae), *O. Gillettae* Hutch., n. sp. (see p. 249).

Our camp on Saturday, July 19th, was amongst rather high *Brachystegia* forest and during the night there was a gale of wind. Before nightfall we ascended the very fertile valley by a stream and got badly pricked by the hairs of *Mucuna* and scared out of the water whilst bathing by a vicious-looking water-snake. Forming almost a carpet below the *Brachystegia* were numerous examples of a very dwarf sub-herbaceous species of *Tetracera* (Dilleniaceae), another example of a woody type reduced to the herbaceous habit.

Next morning we started early on our last stage to Lake Tanganyika, a gradual descent through picturesque scenery. We soon had a magnificent view of this splendid inland sea with a few islands dotted here and there at the southern end. By the roadside the more tropical conditions of the lower elevation were apparent by the occurrence of very slender and lofty palms swaying in the wind. On the shore of the lake we were met by Mr. Maxwell, of the African Lakes Corporation, who took the whole party in his motor-boat to botanise on the other side of the lake. There we also visited a large and most interesting native village, "Tom's village," where the whole of the inhabitants turned out to see us. Beyond the village are some picturesque falls. Returning in the late afternoon the "sea" became quite rough, the boat shipping some water before we reached the landing place. The kopje nearby yielded some interesting botanical specimens. Most of the bush-forest for some miles from the lake consisted of a few scattered *Brachystegia*, a great quantity of *Diplorrhynchus mossambicensis*, some *Dalbergia*, *Rhus*, *Terminalia*, a bush *Vernonia*, *Grewia* spp., *Bauhinia*, etc., and a beautiful red-fruited *Monotes*. Here and there were plants of a very large-fruited species of *Uapaca*. An elegant small-flowered



Nymphaea primulina Hutch. A, sepal. B, petal. C, stamens. D, longitudinal section of pistil.



Cryptosepalum fruticosum Hutch. A, flower laid open. B, longitudinal section of flower. C, bracteole from inside. D, pistil. E, anthers.

'*Brachystegia*' with precocious pink flowers giving colour here and there, proved to belong to the closely allied genus *Cryptosepalum*, of which it is a new species, *C. fruticosum* Hutch. (see pp. 238, 250). Perhaps there is no better example of the progressive reduction in habit from trees to herbs with woody rootstocks than in the two genera *Brachystegia* and *Cryptosepalum*. *Brachystegias*, except one Angolan species, *B. Russelliae* Johnston, are trees varying in height from 10 ft. to about 60 ft. Many of them reproduce readily from sucker-shoots. Species of *Cryptosepalum*, however, are mostly very dwarf, the shoots appearing annually from a woody underground stock. Accompanying this reduction in habit is a corresponding reduction in floral structure, *Brachystegia* having 5 to sometimes no petals and 15 to 10 stamens, whilst *Cryptosepalum* has only 1 petal and 5, 4 or usually only 3 stamens.

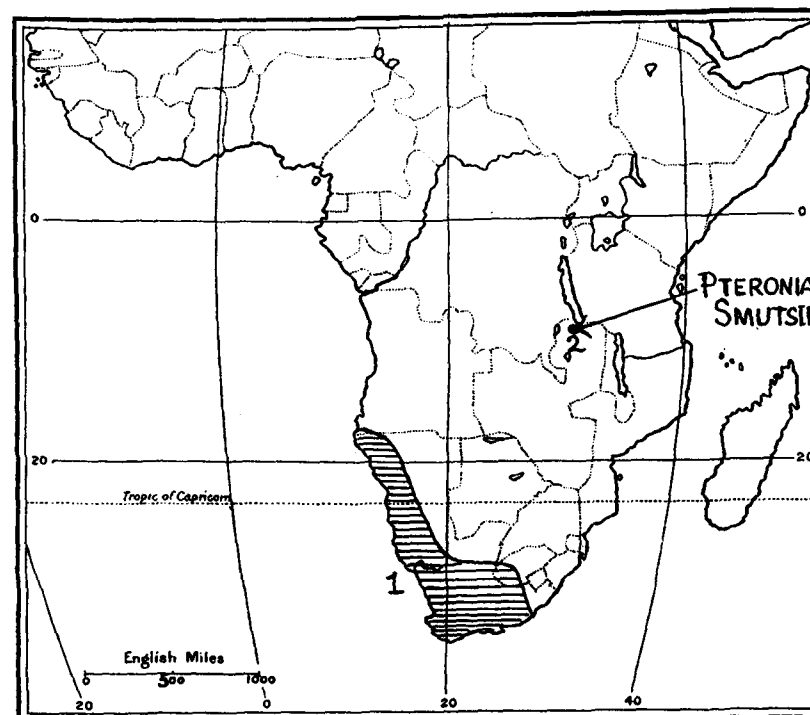
Before leaving our last camp some miles south of Lake Tanganyika, we explored the country on the south side of the Luanza River, a swift-running stream. After collecting through very difficult country for some hours I crossed the stream and returned with our spoil to get it into the presses as soon as possible. In so doing I unfortunately missed seeing the collection of the most interesting plant during the whole trip. General Smuts and the others had proceeded to explore the mountains to the south and on the top of the escarpment they discovered a plant which I recognised as a *Pteronia*, a genus I knew to be confined to South Africa. This proved to be a fine new species which I have named *Pteronia Smutsii* (see pp. 240, 250) in honour of our leader. Whilst undoubtedly a South African species. The discovery of this genus on these mountains is thus of considerable phytogeographical interest, being one more example of a South African genus, such as *Protea*, which has migrated northwards along the eastern mountains. As will be seen on the sketch map (p. 241) *Pteronia Smutsii* is separated from its congeners by over a thousand miles.

On reaching Abercorn we packed up several parcels of dried plants and despatched them by post to Pretoria, our cars being already fully loaded. Between Abercorn and Broken Hill there is little to record except minor motor mishaps, none of which was serious enough to delay us more than a few hours. We had now set our faces homewards and collecting was only done at likely spots which we had noted and missed on our journey northwards. We arrived at Broken Hill on Saturday morning, July 26th, when I left the motoring party, which was to return to Pretoria, I myself spending two days at Broken Hill to clear the presses and despatch the dried plants by post. On Monday evening, July 28th, I left Broken Hill by a goods train for Elizabethville, arriving at the frontier station Sakania early the next morning. Sakania is not an attractive place to stay at for even one day, especially as the forest round about was similar in every way to what I had already seen. I took a couple of native boys with me and penetrated into the forest a few



Pteronia Smutsii Hutch. A, leaf. B, lower surface of leaf. C, flower. D, stamen. E, pappus and separate bristle. F, style-arms.

miles but found little to collect. The ant-heaps in the neighbourhood were covered, not with *Euphorbia* and other spiny plants as they had been towards the lake, but by a dense growth of a fine Bamboo, *Oxytenanthera abyssinica* Munro. Sakania is the rail-head for the Rhodesian railways, but through-coaches proceed to Elizabethville. I was not sorry to leave next morning; the train, however, was three hours late, and arrived at Elizabethville at nine in the evening. The *Brachystegia* forest continued to be much the same all the way and rarely was there any view of the landscape from the train.



Shaded area 1, showing distribution of genus *Pteronia* before the discovery of 2, *Pteronia Smutsii* Hutch., on a mountain top south of Lake Tanganyika.

I collected in the neighbourhood of Elizabethville with Mr. von Hirschberg, then acting British Vice-Consul, who is keenly interested in orchids. We explored together the banks of a small river bearing quite a different kind of forest vegetation from the *Brachystegia* type, with genera represented which are characteristic of the closed forests of the Congo. Indeed the closed forest of the River Congo stretches its arms in all directions by means of these innumerable small tributaries and enables it to penetrate far into the quite different dry forest of the plateau region. A large burnt area some miles from Elizabethville was a beautiful sight on account of a great quantity of a pale mauve or pink-flowered species of

Cryptosepalum (*C. maraviense* Oliv.) with dwarf shoots a few inches high. This species extends to beyond Lake Nyasa. Associated with it was a tiny *Euphorbia* (*E. zambesiana* Benth.) with conspicuous white involucre glands.

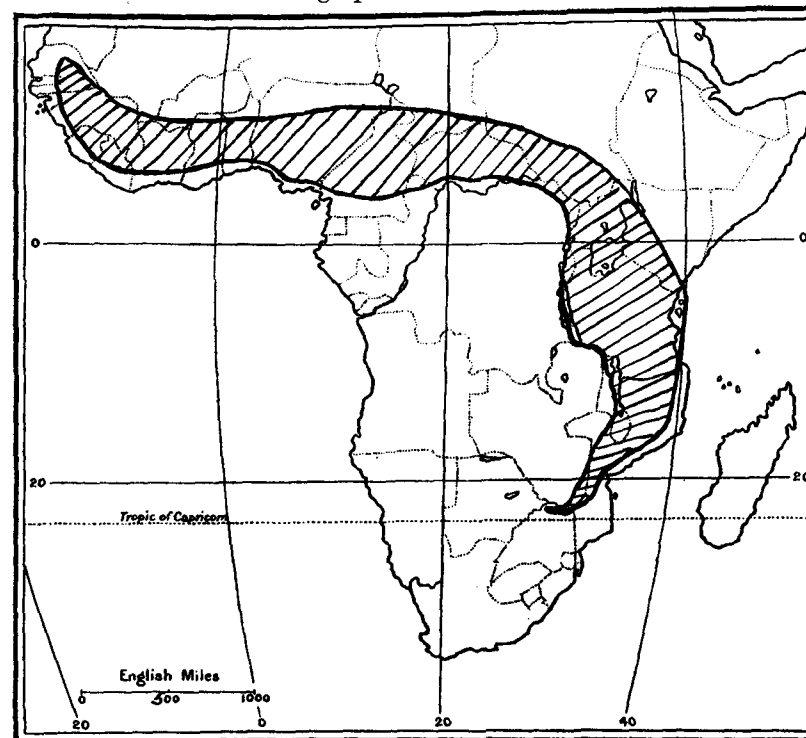
I left Elizabethville, which in the winter months is rather a dusty town, at nine o'clock in the evening on Sunday, 3rd August, arriving at Bulawayo on the Tuesday morning. The next day was occupied by a visit to the Matopos, Miss Cheeseman, an artist interested in botany and a correspondent of Kew, kindly acting as guide. On the granite boulders around Cecil Rhodes' grave we secured a quantity of living specimens of the very rare *Anacampseros rhodesiaca* N. E. Br., which we had recorded for the first time for the Transvaal at Matoks, on my former visit. The Matopos yielded a number of interesting plants in spite of the unfavourable time of year.

From Bulawayo I returned by rail to Pretoria, in order to arrange for the despatch of the collections to Kew. I was very much gratified to find that all our parcels had arrived safely and that every care had been taken of the specimens. Dr. Pole-Evans' assistants had not only finished off the drying but had poisoned every specimen thoroughly, and I had no further anxiety as to their condition.

On my former visit I had explored with General Smuts and a party of friends Wylie's Poort and Gorge, and part of the Eastern Zoutpansberg range of mountains in the Northern Transvaal. This range has had a peculiar fascination for me personally ever since I shared in the preparation of Mr. Legat's notes on his tour in these mountains published in the *Kew Bulletin* as long ago as 1910 (p. 49). Since then scarcely any collecting has been done in this region apart from our own visit at the end of 1928. With General Smuts' approval, therefore, Mr. Jan Gillett and I set off on the 16th of August for a week's botanising in these delightful mountains. The Forestry Department at Pretoria very kindly informed their officers of our intended visit and we received much help and kind hospitality from them. The first night we slept out beyond Potgietersrust in full view of miles of bush fires on the opposite side of the valley. A little south of Louis Trichardt we turned eastwards, collected many interesting plants in the grass-veld on the way, and arrived at the house of Mr. Evans at Klein Australe in the late afternoon. We botanised in his company in the evening and the next day, and then proceeded by a picturesque and beautifully graded road over the mountains to Entabeni, where we stayed for two days with a former Kewite, Mr. R. R. Mentzel, who has been for many years in the Forestry Service of South Africa. His house stands amidst most picturesque scenery, and the winter climate as experienced by us was delightful. Mr. Mentzel acted as our guide in exploring the hills and forests near the forestry station. The Zoutpansberg consists of two or more parallel ranges of hills or low mountains, the southern range being very fertile, with a heavy rainfall, and bearing a forest flora similar in many respects to that of the eastern slopes of the

Prakensberg and even of the Zitzikama and Knysna forest in the extreme south of the Union. When our collections are completely worked out no doubt considerable light will be thrown on the flora of the Zoutpansberg and its phytogeographical connections. That will be done in a separate paper.

From Entabeni we proceeded further eastwards towards Palmary Ville, noting on the way numerous scattered examples of *Parinarium curatellaefolium**, a tree with a close head 30-40 ft. high and a stem 1-2 ft. in diameter. This tree is quite characteristic of this part of the country. By the roadside here and there were fine examples in full flower of *Dombeya rotundifolia* Harv., resembling plum trees in Europe, the flowers being precocious. We camped out on the grassy banks of the river near the Pepiti Falls, and had the assistance of several small boys from the neighbouring village. They were keenly interested in our collecting operations.



Range of *Parinarium curatellaefolium* Planch., a distinctive Savannah tree.

After returning to Louis Trichardt we proceeded up the pass and at the top turned left in a westerly direction. So far as we know no botanical collection has been made in the Western Zoutpansberg,

*This had been formerly identified as *P. Mobola* Oliv. I have made a careful comparison with the type specimens of this from the Batoka Highlands and our plant appears to be *P. curatellaefolium* Planch., common through East Africa as far as the Eastern Sudan and through the Shari to West Africa.

and we made a fine haul of specimens, penetrating as far as the road continued to Crewe Farm (Mr. Oosthuysen). Here again we were very surprised to find several representatives of the typical Cape flora mixed up with Northern Transvaal types such as *Chrysophyllum magalismontanum* Sond. and *Myrothamnus flabellifolia* Welw. Amongst these plants were species of *Erica*, and *Metalasia muricata* R. Br., quite true to type as it occurs on the sand dunes of the Cape Flats. So far as the Kew Herbarium is concerned this latter species had not been collected further north than Basutoland. A fine dwarf *Lopholaena* and a pretty *Aster*, almost a counterpart of *A. fruticosus* Linn., a common Cape species, were conspicuous. I have named this *A. brevipedunculatus* in reference to the very short stalks of the flower-heads which serve to distinguish it from the Cape plant (see p. 250). Even the Namaqualand type of flora was not unrepresented, for we collected fine specimens of a *Senecio* (section *Kleinia*) which proved to be *S. babertonicus* Klatt.

On our return to Wylie's Poort we again went north to the far end of the gorge, where we turned eastwards in the direction of Lake Fundusi, which we had visited in December, 1928. This side of the range was very dry and we found little to collect. We were very interested to observe, however, that *Copaifera Mopane* reached right to the foot of the mountains, and that very numerous examples of the Baobab, indeed almost a forest, grew quite high up the northern slopes. We saw, also, large forests of *Androstachys* with *Acacia* and *Peltophorum africanum*, the northern face of the mountains apparently being the path of migration of the tropical types from the eastern side.

The road eventually became rather difficult and sometimes troublesome to follow, but at length when it was nearly dark we obtained our bearings and recognised the country we had previously visited. From there we returned in one day to Pretoria, collecting on the way all the plants we could find on a granite kopje at Matoks.

Before returning from Cape Town I collected in the National Park with two members of the Botanical Survey, Miss Verdoorn, from Pretoria, and Miss Forbes, from the Natal Herbarium, Durban. We made the Government hostel our headquarters and from there made excursions up the mountains. We ascended the Mont-aux-Sources (10,763 ft.), staying one night at the hut. Unfortunately a few days before our visit a disastrous fire had occurred and most of the lower mountains were completely burnt over. Although it was for the first time *Greyia Sutherlandii* Hook. & Harv. in full flower, its scarlet trusses giving colour here and there.

At Durban, Mr. McClean and Miss Forbes kindly acted as my guides and I saw and collected some interesting herbaceous plants at Botha's Hill, and visited the mangrove swamps south of Durban. Finally, a week at Port Elizabeth with Mr. F. R. Long proved to be very profitable, large collections being made on the way to and near

Hankey, and towards Addo. The veld near Port Elizabeth, with the typical south-western Cape flora, was at its best, a remarkable contrast to what I had seen on my former visit to this area during a drought period in November, 1928.

Two interesting days were spent at the Cape, one on my arrival in June, a day on the mountains near Kalk Bay with Mrs. Levyns and students from the University, and another on my return with Professor and Mrs. Compton on Paarden Island, north of Cape Town, where the flora was seen at its best.

With the assistance of many botanical friends, only some of whom it has been possible to mention in these notes, I was able to collect four to five sets of herbarium specimens represented by nearly 2000 numbers. Of these about 900 were gathered in Rhodesia, 40 in the Katanga Region of the Belgian Congo, 315 in the Zoutpansberg, N. Transvaal, 18 at Matoks, N. Transvaal, 168 in the National Park, Natal, 82 at Botha's Hill, Natal, a few in the Mangrove area south of Durban, about 380 in the neighbourhood of Port Elizabeth, 43 on Paarden Island and 30 at Kalk Bay.

Artabotrys collinus Hutch. sp. nov. [Annonaceae]; affinis *A. nitido* Engl., sed foliis minoribus costa utrinque pubescente, carpellis fructiferis rostratis differt.

Frutex subscandens usque ad 1.65 m. altus; rami teretes, breviter rufo-pubescentes. *Folia* elliptica vel oblongo-elliptica, basi obtusissima vel rotundata, apice obtusa vel late acuminata, 3-5.5 cm. longa, 2-2.5 cm. lata, utrinque costa media breviter pubescentia; petioli 3 mm. longi, tomentosi. *Inflorescentia* brevissime hamata, subuniflora, rufo-tomentosa. *Flores* non visi. *Carpella* fructifera oblongo-ellipsoidea, conspicue rostrata, 1.5-1.8 cm. longa, glabra, rugulosa.

Northern Rhodesia: granite kopje near Kaloswe, straggling shrub 5 ft. high, fr. July, *Hutchinson and Gillett* 3770.

Nymphaea primulina Hutch. sp. nov. [Nymphaeaceae]; affinis *N. sulphureae* Gilg, sed floribus majoribus, sepalis latioribus, antherarum exteriorum connectivo multo brevior differt.

Folia longissime petiolata, ambitu late ovato-orbicularia, basi profunde et arcte cordata, circiter 8 cm. longa et 6-7 cm. lata, integra, sicco infra pustulato-scabridula et purpurascens, e basi radiatim 15-nervosa, nervis superne divaricato-ramosis; petioli graciles, apicem versus parce puberuli. *Flores* supra aquam breviter elevati, primulini; pedunculi elongati, minute puberuli. *Sepala* 4, late oblongo-lanceolata, apice rotundata, basi extra transverse callosa-incrassata, 3.5-4 cm. longa, vix 1.5 cm. lata, obscure striata, glabra. *Petala* circiter 10, biseriata, sepalis subaequilongia, late oblanceolata, obtusa, 5-nervosa, usque ad 1.2 cm. lata, interioribus angustioribus. *Stamina* 5-seriata, flava, exterioribus petalorum $\frac{3}{4}$ longitudine aequantibus; filamenta late complanata; antherae usque ad 1 cm. longae, exteriores connectivo

lato obtuso circiter 3 mm. longo, interiores connectivo brevissimo. *Carpella* circiter 12, stigmatibus breviter pubescentibus 8 mm. longis.

Northern Rhodesia : in pool of nearly still water, stream 6 miles north of Kasama, 1350 m., 23 July 1930, *Hutchinson and Gillett* 4048 (see p. 237).

***Nymphaea divaricata* Hutch.** sp. nov.; inter species africanas foliis omnibus submersis divaricato-bilobatis distincta.

Folia omnia sub aqua submersa, breviter petiolata, basi leviter peltata, divaricato-bilobata, tenuissima, lobis oblique ellipticis usque ad 12 cm. longis integris, nervis e basi patulis multum ramosis; petioli breves, glabri. *Flores* fluitantes vel leviter immersi, pallide caerulei; pedunculi glabri. *Sepala* 8, biseriata, exteriora ovato-lanceolata, late acuminata, interiora angustiora marginibus hyalinis roseis, omnia extra sulcato-striata, 4-4.5 cm. longa, usque ad 1.5 cm. lata. *Petala* circiter 15, lanceolata, sepalis subaequilonga, acuta. *Stamina* 2- vel sub-3-seriata, flava, exteriora petalis dimidio breviora; filamenta late complanata; antherae usque ad 8 mm. longae, exteriores connectivo late lineari 3-4 mm. longo. *Carpella* circiter 18, stigmatibus late oblanceolatis apice triangularibus.

Northern Rhodesia : near pool in slowly running water, stream 6 miles north of Kasama, 1350 m., 23 July 1930, *Hutchinson and Gillett* 4045 (see p. 235).

***Monotes cordatus* Hutch.** sp. nov. [Dipterocarpaceae]; foliis magnis basi conspicue cordatis, sepalis fructiferis anguste obovatis distincta.

Arbor 10 m. alta; ramuli annotini breviter stellato-pubescentes. *Folia* late elliptica, basi cordata et supra glandulo magno instructa, apice late emarginata, 10-18 cm. longa, 8-10 cm. lata, supra furfuraceo-glandulosa, infra breviter pubescentia et crebre reticulata, nervis lateralibus utrinsecus 12-16 a costa sub angulo 60°-70° abeuntibus prominentibus, nervis tertiariis subparallelis plerumque furcatis prominentibus; petioli 1.5-2 cm. longi, stellato-tomentelli. *Flores* non visi. *Sepala* fructifera anguste obovata, apice rotundata, basi breviter attenuata, 4-6.5 cm. longa, 1.5-3 cm. lata, utrinque minutissime stellato-puberula, 5-7-nervia, reticulata. *Fructus* depresso-globosus, circiter 1.8 cm. diametro, appresse pubescens.

Northern Rhodesia : 20 miles south west of Serenje Corner, 1750 m., fr. 15 July 1930, *Hutchinson and Gillett* 3703 (type); Solwezi Distr., Mutanda Bridge, fr. June, *Milne-Redhead* 598; Chitambo Mission, fr. June, *Stevenson* 64; 142.

***Monotes glandulosissimus* Hutch.** sp. nov., insignis foliis ellipticis basi plerumque cordatis supra in nervorum inferiorum axillis 5-6-glandulosus.

Arbor 6.5 m. alta; ramuli annotini breviter pubescentes, hornotini molliter tomentosi. *Folia* elliptica, basi plerumque cordata, apice rotundata et mucronata vel plerumque late emarginata vel subbilobata, 6-10 cm. longa, 3.5-5.5 cm. lata, supra breviter

pustulato-puberula, in nervorum inferiorum axillis prominente nigro-glandulosa, infra molliter pubescentia et crebre reticulata, nervis lateralibus utrinsecus 13-15 a costa sub angulo 45° abeuntibus infra prominentibus marginem versus leviter curvatis, nervis tertiariis gracilibus furcatis; petioli vix 1.5 cm. longi, molliter tomentelli. *Inflorescentia* anguste paniculata, subspiciformis, circiter 10 cm. longa, ubique molliter tomentosa; bractee ovatae, acutae, concavae, extra pubescentes. *Sepala* valde imbricata, ovato-orbicularia, 3 mm. longa, leviter carinata, crassa, tomentella. *Petala* late oblongo-oblanceolata, circiter 8 mm. longa, extra appresse tomentosa, unilateraliter membranacea, intra basi appresse villosa. *Stamina* numerosa, petalis dimidio breviora, filamentis gracilibus glabris. *Ovarium* globosum, dense pubescens, stylo ovario brevior coronatum. *Fructus* ellipsoideo-globosus, vix 1 cm. diametro, sericeo-tomentosus. *Sepala* fructifera obovato-oblanceolata, circiter 2 cm. longa, utrinque stellato-puberula.

Northern Rhodesia : 7½ miles north-east of Lusaka, 1300 m., tree 20 ft. in *Brachystegia* forest, flowers cream, 12 July 1930, *Hutchinson and Gillett* 3595 (type); between Minga River and Sewa, about 300 miles N.E. of Lusaka, slender tree 35 ft., fr. Aug., *Burt Davy* 950; Great East Road, 73 miles east of Lusaka, fr. Aug., *Burt Davy* 857.

***Monotes lukuluensis* Hutch.** sp. nov.; foliis magnis basi rotundatis infra crebre reticulatis parce pubescentibus, sepalis fructiferis elongatis angustissimis distinctissima.

Arbor circiter 7 m. alta; ramuli annotini rugulosi, breviter et parce pubescentes. *Folia* late obovato-elliptica, apice late emarginata, basi rotundata sed vix cordata, glandulo magno instructa, 8-15 cm. longa, 6-10 cm. lata, supra minute furfuraceo-glandulosa, infra breviter pubescentia et crebre reticulata, nervis lateralibus utrinsecus circiter 15 a costa sub angulo 45° abeuntibus prominentibus ad marginem conjunctis, nervis tertiariis plus minusve parallelis et distinctis; petioli 2 cm. longi, teretes, minute pubescentes. *Flores* non visi. *Sepala* fructifera elongato-oblongo-oblanceolata, apice obtusa vel rotundata, basi angustata, usque ad 5.5 cm. longa et 1 cm. lata, utrinque stellato-puberula, 5-nervia, reticulata. *Fructus* depresso-globosus, obtuse mucronatus, molliter sed parce pubescens.

Northern Rhodesia : Lukulu River, tree about 20 ft. high, 16 July 1930, *Hutchinson and Gillett* 3741.

***Monotes obliquinervis* Hutch.** sp. nov.; foliis utrinque cuneato-angustata, nervis lateralibus valde obliquis et prominentibus, sepalis fructiferis fere lineari-oblanceolatis distincta.

Arbor 7 m. alta; ramuli annotini molliter tomentosi. *Folia* obovato-elliptica vel anguste rhomboideo-elliptica, utrinque plus minusve cuneato-angustata, 6-10 cm. longa, 4-6 cm. lata, supra primum molliter pubescentia demum glabrata, infra puberula et crebre reticulata, nervis lateralibus utrinsecus circiter 10-12 valde

obliquis infra prominentibus et parallelis; petioli teretes, 1-1.5 cm. longi, tomentelli. *Inflorescentia* paniculata, multiflora, interdum foliis minoribus instructa; bracteae caducae, extra molliter pubescentes; pedicelli usque ad 3 mm. longi. *Sepala* ovata, carinata, 4 mm. longa, tomentosa. *Petala* oblongo-lanceolata, fere 1 cm. longa, extra tomentella, intra basin versus appresse pubescentia. *Ovarium* dense tomentosum. *Fructus* ovoideo-globosus, rostratus, tomentosus, sepalis persistentibus fere lineari-oblancoelatis rubescentibus circumdatus.

Northern Rhodesia: 8 miles south of Mpulunga, 1100 m., fl. and young fruit July 1930, tree 20 ft., flowers cream, calyx red in fruit, *Hutchinson and Gillett* 3963.

Monotes oblongifolius *Hutch.* sp. nov.; foliis oblongis nervis lateralibus intra marginem evanidis venis haud conspicuis distincta.

Arbor circiter 8 m. alta; ramuli rugosi, brevissime pubescentes. *Folia* oblonga, utrinque rotundata vel basi breviter cordata, 6-8 cm. longa, 2.5-3.5 cm. lata, supra puberula, basi glandulosa, infra crebre tomentella, nervis lateralibus utrinsecus 9-11 marginem versus subevanidis et leviter curvatis; petioli supra anguste sulcati, 1-1.5 cm. longi, parce pubescentes. *Flores* non visi. *Fructus* depressoglobosus, 1-1.3 cm. diametro, verrucosus, molliter tomentellus. *Sepala* fructifera rubra, oblongo-oblancoelata, circiter 4 cm. longa, utrinque minutissime stellato-puberula, conspicue nervosa.

Northern Rhodesia: Kaloswe, at foot of kopje, tree 25 ft., fr. July, *Hutchinson and Gillett* 3765.

Monotes tomentellus *Hutch. et Milne-Redhead* sp. nov.; affinis *M. Engleri* Gilg, sed foliis minoribus nervis lateralibus paucioribus a costa sub angulo latiore abeuntibus differt.

Arbor parva; ramuli annotini leviter flexuosi, cortice longitudin-aliter fisso, hornotini tomentelli. *Folia* elliptica vel leviter elliptico-obovata, apice rotundata vel late emarginata, breviter mucronata, basi subcordata vel rotundata et conspicue glandulosa, 4.5-7.5 cm. longa, 2.5-5 cm. lata, supra puberula demum fere glabra et areolato-reticulata, infra molliter tomentella et inconspicue reticulata, nervis lateralibus utrinsecus 9-12 e costa media sub angulo 45° abeuntibus marginem versus furcatis supra fere immersis infra valde conspicuis; petioli graciles, circiter 1 cm. longi, teretes, tomentelli; stipulae mox deciduae, spatulato-lanceolatae, 5 mm. longae. *Inflorescentiae* axillares, pauciflorae, foliis multo breviores, ubique molliter tomentosae; bracteae mox deciduae, lanceolatae. *Sepala* ovato-orbicularia, circiter 2.5 mm. longa. *Petala* oblongo-lanceolata, apice rotundata, circiter 1 cm. longa, 3.5 mm. lata, extra tomentella, intra parce puberula. *Stamina* circiter 6 mm. longa, glabra. *Ovarium* piloso-tomentosum; stylus glaber. *Fructus* subglobosus, rostratus, 1 cm. longus, sicco corrugatus, breviter tomentosus. *Sepala* fructifera plerumque 6, oblongo-oblancoelata, usque ad 3.5 cm. longa et 1 cm. lata, reticulata, parce stellato-pubescentia.—

M. hypoleucus Bak. f. in Journ. Linn. Soc. Bot. 40: 27; Eyles in Trans. Roy. Soc. S. Afr. 5: 421 (1916), non Gilg.

Southern Rhodesia: Salisbury, occasional in savannah forest, 1550 m., fl. Dec., Jan., Eyles 4555, 4646; Odzani River Valley, Teague 431 (type). Buzi district, Swynnerton 157, 1314.

Ochthocosmus Gillettiae *Hutch.* sp. nov. [Erythroxylaceae]; foliis parvis superne denticulatis racemis numerosissimis foliis brevioribus distincta.

Arbor circiter 7 m. alta, floribus praecocibus albidis numerosissimis oblecta; ramuli breviter pubescentes. *Folia* decidua, oblongo-oblancoelata vel oblongo-elliptica, apice obtusa vel breviter et late acuminata, basi acute cuneata, 4-7 cm. longa, 1.3-3 cm. lata, superne denticulata, glabra, utrinque crebre sed obscure reticulata; petioli brevissimi. *Racemi* numerosi, circiter 3 cm. longi; axis molliter pubescens; pedicelli 3 mm. longi, glabrescentes; bracteae ovatae, parvae, brunneae. *Sepala* ovato-orbicularia, extra basi minute pubescentia. *Petala* late obovato-orbicularia, 4 mm. longa, glabra, multistriata. *Stamina* margine disci inserta; filamenta gracilia, petalis aequilonga. *Ovarium* glabrum; stylus glaber, 3 mm. longus. *Fructus* sepalis et petalis persistentibus crebre cinctus, obovoideo-ellipticus, 8 mm. longus, glaber.

Northern Rhodesia: open woodland by stream 7 miles northwest of Abercorn, 1500 m., tree 20 ft., covered with small white flowers, July, *Hutchinson and Gillett* 3910 (type); Lunzua valley, near stream, 1100 m., fr. July, *Hutchinson and Gillett* 3975 (see p. 236).

Faurea argentea *Hutch.* sp. nov. [Proteaceae]; foliis argenteis utrinque crebre tomentellis valde distincta.

Arbor 5 m. alta, ubique argentea; ramuli annotini parce lanati, hornotini cinereo-tomentosi, dense foliati. *Folia* late oblancoelata, ad basin attenuata, apice abrupte apiculata, 9-12 cm. longa, 2.5-3.5 cm. lata, utrinque cinereo-tomentella, nervis lateralibus utrinsecus 9-10 infra vel supra medium bifurcatis utrinque prominulis; petioli circiter 5 mm. longi, supra complanati. *Inflorescentia* terminalis, multiflora, leviter curvata, circiter 10 cm. longa et 3 cm. lata, brevissime pedunculata; bracteae ovato-triangularis, tomentosae, 2 mm. longae. *Perianthium* alabastro 1.5 cm. longum, superne clavatum, extra appresse tomentosum, limbo ellipsoideo obtuso circiter 5 mm. longo, tubo inferne lateraliter fisso stylo mox exserto. *Squamae hypogynae* late triangulares, glabrae. *Receptaculum* intra squamas dense et longissime villosum. *Antherae* 3 mm. longae. *Ovarium* glabrum; stylus infra medium curvatus, glaber.

Northern Rhodesia: near Serenje Corner, 1650 m., edge of *Brachystegia* wood, tree 15 ft., July, *Hutchinson and Gillett* 3707.

A very handsome silvery-leaved *Faurea* quite distinct from any known species. It grew at the edge of the forest in sandy soil (see p. 234).

Cryptosepalum fruticosum Hutch. sp. nov. [Caesalpiniaceae]; *C. exfoliato* De Wild. peraffinis sed inflorescentia multiflora glabra differt.

Frutex usque ad 4 m. altus; ramuli purpurascens, dense lenticellati, junioribus glabris. *Foliola* 4-5-juga, e basi ad apicem foliorum sensim majora, oblique oblongo-elliptica, apice rotundata, basi inaequilateraliter cuneata, inferiora circiter 2.5 cm. longa, superiora usque ad 7 cm. longa et 3 cm. lata, glabra, laxe reticulata; stipulae mox deciduae. *Flores* praecoces, rosei. *Racemi* multiflori, graciles, usque ad 10 cm. longi, glabri; pedicelli 5-8 mm. longi. *Bracteolae* late obovato-rotundatae, 6-7 mm. longae, intra marginem minute puberulae. *Calyx* carnosus, disciformis. *Petalum* ovatum, apice rotundatum, basi late cuneatum, bracteolis leviter longior, striato-reticulatum. *Stamina* 3; antherae purpureae, 2.5 mm. longae. *Ovarium* breviter stipitatum, glabrum, stigmate suborbiculari. *Fructus* non visus.

Northern Rhodesia: 18 miles north-west of Abercorn, shrub 12 ft., flower-buds pink, *Hutchinson and Gillett* 3947 (see p. 238).

Pteronia Smutsii Hutch. sp. nov. [Compositae]; foliis anguste oblanceolatis glanduloso-punctatis triplinerviis distinctissima.

Frutex laxe divaricatus usque ad 2 m. altus; ramuli annotini longitudinaliter sulcati, glabrescentes, hornotini superne foliati, brevissime pubescentes, internodiis brevibus. *Folia* alterna, anguste oblanceolata, apice subacuta, basi acute attenuata, 2.5-4 cm. longa, usque ad 1 cm. lata, obscure triplinervia, utrinque glanduloso-punctata et scabridula. *Capitula* solitaria, alabastro anguste ovoidea demum ellipsoidea, 3 cm. longa, circiter 1.5 cm. diametro. *Involucri bracteae* 6-7-seriatae, paleaceae, glabrae, exteriores triangulares et minute ciliatae, intermediae ovato-ellipticae et mucronatae, interiores elongato-oblongae, circiter 2 cm. longae. *Flores* aurantiaci, numerosi. *Corollae* tubus anguste tubulosus, 1.4 cm. longus, glaber, lobis anguste triangulari-lanceolatis acutis circiter 3 mm. longis. *Achaenia* villosa, circiter 7 mm. longa. *Pappus* pallide stramineus, usque ad 1.5 cm. longus.

Northern Rhodesia: stony mountain top at the crest of escarpment a few miles south-west of Lake Tanganyika, 1600 m., 21 July 1930, collected by J. C. Smuts, Mrs. Gillett and J. B. Gillett—*Hutchinson and Gillett* No. 3979.

Comments on the discovery of this species and distribution of the genus appear on pages 239, 240, 241.

Aster brevipedunculatus Hutch. sp. nov. [Compositae]; affinis *A. fruticoso* Linn., sed pedunculis brevioribus conspicue bracteatis differt.

Frutex usque ad 1.3 m. altus; rami virgati, cortice brunneo glabro obtekti; ramuli laxe foliati. *Folia* plana, anguste oblanceolato-linearia, apice subacuta, basi angustata et conspicue decurrentia, circiter 2 cm. longa et 2.5 mm. lata, glabra, sicco subruguloso-reticulata. *Capitula* terminalia, solitaria, breviter pedunculata,

circiter 2.5 cm. diametro; pedunculi foliis vix longiores, parce bracteati; bracteae lineares, 2.5 mm. longae, extra glabrae, intra inferne breviter villosae. *Involucri bracteae* circiter 4-seriatae, ab exteriori gradatim longiores, usque ad 7 mm. longae, brevissime ciliolatae. *Flores radii* lilacini; corollae tubus 3 mm. longus, glaber; lamina anguste oblanceolata, 1 cm. longa, apice integra. *Flores disci* pallide flavi. *Achaenia* angustata, appresse pubescentia. *Pappus* duplex, setis exterioribus brevissimis, interioribus corollae tubo aequilongis albis.

Northern Transvaal: Western Zoutpansberg; Crewe Farm, 1400 m., among boulders, Aug., *Hutchinson and Gillett* 4419 (type); mountains 5 miles west of Wylie's Poort, at edge of evergreen scrub, 1550 m., *Hutchinson and Gillett* 4383 (see notes on p. 244).

Cineraria monticola Hutch. sp. nov. [Compositae]; affinis *C. deltoideae* Sond., sed foliis lobulatis et repando-denticulatis achaeniis dorso parce setulosis differt.

Herba usque ad 1 m. alta; caules simplices vel subsimplices, leviter costati, parce lanati, demum glabrescentes, internodiis plerumque circiter 5-7 cm. longis. *Folia* ambitu late ovato-orbicularia vel suborbicularia, basi truncata vel aperte cordata, apice triangularia, usque ad 8 cm. diametro, lobulata et repando-denticulata, supra glabra vel fere glabra, infra tenuiter albo-lanata demum glabrescentia; petioli basi auriculati, usque ad 4 cm. longi. *Corymbi* divaricati, multicapitulati; bracteae lineari-lanceolatae, acutissimae, basi auriculatae; pedunculi ultimi graciles, circiter 5 mm. longi, apicem versus parce bracteolati. *Capitula* flava, radiata, circiter 2 cm. diametro. *Involucri bracteae* 8-10, anguste oblongae, 6-7 mm. longae, apice triangulari-subacutae et breviter ciliolatae, margine membranaceae, extra sicco glabrae et distincte lineato-striatae. *Flores radii* 5-8; corollae tubus elongatus, 4 mm. longus, glaber; lamina anguste elliptica, 6-7 mm. longa, apice minute tridentata; ovarium laeve. *Achaenia* compressa, dorso parce setulosa. *Pappus* albus, 5-6 mm. longus.

Northern Transvaal: Zoutpansberg; ascent to Wylie's Poort from Louis Trichardt, herb 2-3 ft., ray-flowers deep yellow, June, *Hutchinson and Gillett* 3201.

Key to Rhodesian species of *Monotes*.

Leaves glabrous below, oblong, with a single gland at the base, with 8-10 pairs of lateral nerves; young branchlets glabrous...1. *glaber*.

Leaves more or less tomentellous or tomentose below:

*Leaves with a solitary gland at the base, the lower lateral nerves without glands at the base:

Leaves more or less rhomboid, the upper half somewhat triangular and pointed, narrowly rounded or broadly wedge-shaped at the base; lateral nerves very oblique, 10-12 pairs; reticulation very marked; fruiting sepals narrowly oblanceolate, much narrowed to the base.....2. *obliquinervis*.

Leaves more or less rounded at each end (rarely shortly pointed at the apex), not rhomboid :

Leaves roughly woolly-tomentose with loose hairs below, more or less cordate :

Leaves shortly and abruptly acuminate, with 12-14 pairs of lateral nerves; flowers densely glomerate in small sessile clusters..... 3. *dasyanthus*.

Leaves rounded or emarginate at the apex, with 16-18 pairs of lateral nerves; flower-clusters shortly pedunculate... 4. *discolor*.

Leaves shortly tomentose or tomentellous below :

Leaves deeply cordate at the base, elliptic, rather large, averaging about 15 cm. by 8 cm., closely reticulate below; lateral nerves 16-18 pairs; fruiting sepals slightly and shortly narrowed at the base..... 5. *cordatus*.

Leaves rounded or only shallowly cordate at the base; lateral nerves up to 14 pairs; fruiting sepals usually attenuated to the base :

Leaves very broadly elliptic or suborbicular-elliptic, less than twice as long as broad, strongly reticulate below :

Fruiting sepals narrowly oblanceolate, narrowed from above the middle to the base, about 5 cm. long; lateral nerves about 14 pairs; fruits depressed-globose..... 6. *lukuluensis*.

Fruiting sepals broadly oblong-oblanceolate, fairly broad nearly to the base, about 3 cm. long; lateral nerves 10-12 pairs; fruits ovoid-globose..... 7. *Homblei*.

Leaves oblong or oblong-elliptic, usually more than twice as long as broad :

Lateral nerves 12-14 pairs; reticulation very marked below : Fruiting sepals only slightly narrowed to the base, less than twice as long as broad; tertiary nerves very conspicuous and parallel..... 8. *caloneurus*.

Fruiting sepals much narrowed to the base and more than twice as long as broad; tertiary nerves not very conspicuous..... 9. *Engleri*.

Lateral nerves up to about 10 pairs; reticulation usually not very marked below :

Leaves over twice as long as broad, the lateral nerves rather fading towards the margin : Northern Rhodesia..... 10. *oblongifolius*.

Leaves usually less than twice as long as broad :

Leaves broadly rounded or subcordate at the base; lateral nerves rather distinct and not markedly oblique; South-eastern Rhodesia 11. *tomentellus*.

Leaves often slightly narrowed and not subcordate at the base; lateral nerves rather close and markedly oblique; North-west Rhodesia and Angola..... 12. *angolensis*.

*Leaves with a gland in the axils of the lower nerves as well as at the base, elliptic, cordate at the base, softly tomentose below..... 13. *glandulosissimus*.

Enumeration of Rhodesian species of Monotes.

1. **Monotes glaber** *Sprague* in Kew Bull. 1909 : 305; Eyles in Trans. Roy. Soc. S. Afr. 5 : 421 (1916).

Northern Rhodesia : Solwezi Distr., Mutanda Bridge, fr. June, *Milne-Redhead* 576; Mwinilunga Distr., 40 miles south of Mwinilunga, fr. Aug., *Milne-Redhead* 938; Batoka Highlands, shrub, fr. July, Kirk; Himyani Falls, tree 40-60 ft., *Allen* 734; Zimba, July-Aug. 1919, *Burt Davy* 17865; 34 miles west of Livingstone, small tree, Aug., *Burt Davy* 587; Great North Road, 66 miles north of Livingstone, Aug., *Burt Davy* 685.

Southern Rhodesia : Beatrice, 4000 ft., medium-sized tree, fl. Dec., *Eyles* 4441; Selukwe, fr. Sept., *Walters* 2349; Darwin, *Swynnerton* 4022; Salisbury 1550 m., fl. Nov., *Eyles* 4549, 2814; Rand 557; Mazoe, *Hale* in Herb. *Eyles* 5268.

2. **M. obliquinervis** *Hutch.* sp. nov. (see p. 247).

3. **M. dasyanthus** *Gilg* in Baum, Kunene-Samb. Exped. 307 (1903). Northern Rhodesia : Mwinilunga Distr., 40 miles south of Mwinilunga, fr. Aug., *Milne-Redhead* 941. Also in S. Angola.

4. **M. discolor** *R. E. Fries* in Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1 : 153, t. 12, fig. 13-14.

Northern Rhodesia : Mporokoso, *R. E. Fries* 1175 (not seen).

5. **M. cordatus** *Hutch.* sp. nov. (see pp. 234, 246).

6. **M. lukuluensis** *Hutch.* sp. nov. (see pp. 234, 247).

7. **M. Homblei** *De Wild.* in Bull. Jard. Bot. Brux. 5 : 56 (1915).

Northern Rhodesia : Solwezi Distr., Mutanda Bridge, fr. July, *Milne-Redhead* 677.

Also in the Katanga region of the Belgian Congo.

8. **M. caloneurus** *Gilg* in Engl. Bot. Jahrb. 28 : 136 (1899); *R. E. Fries* in Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1 : 154 (1914).

Northern Rhodesia : Mwinilunga Distr., 40 miles from Mwinilunga, fr. Aug., *Milne-Redhead* 942; Bwana Mkubwa, fr. Aug., *Fries* 326 and 368 (not seen). Also in Angola.

9. **M. Engleri** *Gilg* in Engl. Bot. Jahrb. 41 : 291, text fig. K. (1908).

Northern Rhodesia : Batoka Highlands, *Kirk*; Zimba, *Burt Davy* 19984; Kashitu R., 1300 m., fl. and young fr. July, *Rogers* 8304; near Mumbwa, *Macaulay* 743; between Choma and Mapanza, fl. May, *Rogers* 7665; between Choma and Pemba, fr. Aug., *Burt Davy* 703; Bolunga Camp, E. of Kafue, fr. Dec., *Shantz* 454; Kambole, S.W. of Lake Tanganyika, 1650 m., *Nutt*; Munali Pass, Nega Nega Hills, fl. Aug., *Burt Davy* 770; near Umtali, *Engler* 3159 (type). Also in the Katanga Region of the Belgian Congo.

10. **M. oblongifolius** *Hutch.* sp. nov. (see p. 248).

11. **M. tomentellus** *Hutch. & Milne-Redhead*, sp. nov. (see p. 248).

12. *M. angolensis* De Wild. ex Exell in Journ. Bot. 1928: Suppl. 1: 31.

Northern Rhodesia: Solwezi Distr., Mutanda Bridge, fr. July, Milne Redhead 673. Also in Angola.

13. *M. glandulosissimus* Hutch. sp. nov. (see p. 246).

Note.—I have not seen the specimens listed by Eyles (Trans. Roy. Soc. S. Afr. 5: 421) as *M. africanus* var. *denudans* Hiern.

XXXVI.—THE GENUS *KRAUSSIA*. A. A. BULLOCK.

In 1842 Harvey described a Rubiaceae plant collected by Krauss (No. 121) near Durban under the name *Kraussia floribunda*, thereby establishing a new monotypic genus. Later (1850), Sonder described two other species which he named *K. coriacea* and *K. lanceolata*, and in the Flora Capensis (iii. 22) Harvey himself added a fourth species, *K. pavettoides*. In 1876 a fifth species, *K. congesta*, was described by Oliver, and in this state the genus remained until Bentham and Hooker dealt with it in the second volume of their "Genera Plantarum". In this work they excluded Harvey's *K. pavettoides*, transferring it to *Webera* (now known as *Tarenna*), and from the remaining species they drew up a revised description which scarcely distinguished *Kraussia* from *Tricalysia*, the next genus in their classification. The only definite differential character was the degree of immersion of the ovules in the placenta.

In the Flora of Tropical Africa (iii. 117) Hiern (who in this work dealt only with Tropical African species) reduced *Kraussia* to *Tricalysia*, and this no doubt led Schumann to treat it as a synonym in his account of the Rubiaceae in the "Pflanzenfamilien." Schumann* retained the name *Kraussia* for his first section of *Tricalysia*, citing *T. ovalifolia* Hiern and *T. Sonderiana* Hiern (= *Kraussia coriacea* Sond.—vide infra) as typical members of the section.

It should be noted that none of the later authors, from Sonder (1850) onwards, regarded *Kraussia* as monotypic, or recognised that the species which had been added were not really congeneric with Harvey's *K. floribunda*.

Other writers, including Sim (For. Fl. Cape Col. 240), have been undecided as to the status of *Kraussia*, and in maintaining it have depended largely on the lobation of the calyx and corolla, a character so variable in *Tricalysia* as to be valueless.

The only extension of Harvey's generic description necessary in order to include the two new species described below, which so much resemble *K. floribunda* in general appearance as to leave no doubt that they are congeners, refers to the number of ovules in each of the two ovary-cells. In *K. floribunda* they are solitary, whereas in the other two species they are geminate; in all three they are almost

completely immersed in the fleshy placentas, which are attached to the middle of the septum.

Tricalysia and *Kraussia* are readily separable by means of the following diagnostic key:—

Style long-filiform or linear, much exceeding the spreading arms; flowers usually in modified cymes, usually congested, the cyme-branches very short; ovules geminate or more numerous

.....*Tricalysia* A. Rich. ex DC.

Style short, fleshy, somewhat bulbous, much shorter than the coherent style-arms, the latter lamellate outside; flowers in simple lax bracteolate cymes, the cyme-branches comparatively long; ovules solitary or geminate.....*Kraussia* Harv.

Kraussia Harv.

Harv. in Hook., Lond. Journ. Bot. i. 21 (1842); Sond. in Harv. et Sond., Fl. Cap. iii. 22 (1864-5) partim; Benth. et Hook f., Gen. Pl. ii. 95 (1873) partim.

Key to the species.

Leaves comparatively small, subsessile, lanceolate to narrowly ovate-lanceolate, up to 8 cm. long and 2.5 cm. broad:

Calyx-lobes rounded; leaf apex obtuse to subacute, the base rounded or abruptly decurrent (Natal).....1. *K. floribunda* Harv.

Calyx-lobes acute; leaf apex very acute or somewhat acuminate, the base cuneate (Transvaal).....2. *K. incerta* Bullock.

Leaves large, distinctly petiolate, oblong, up to 14 cm. long and 5.5 cm. broad, apex acute or abruptly acuminate, rounded at the base; calyx-lobes very acute3. *K. speciosa* Bullock.

1. *Kraussia floribunda* Harv. in Hook., Lond. Journ. Bot. i. 21 (Jan. 1842), et Thes. Cap. 13, t. 21 (1859); Sond. in Harv. et Sond., Fl. Cap. iii. 22 (1864-5); J. M. Wood, Fl. Natal 61 (1907), et in Trans. South African Phil. Soc. xviii. 164 (1908)*; Sim, For. Fl. Cape Col. 240 (1907) excl. descr. stigmat.

Coffea kraussiana Hochst. in Flora xxv. 237 (April, 1842).

Tricalysia floribunda (Harv.) Stuntz in U.S. Dept. Agric., Bur. Pl. Ind., Invent. Seeds and Pl. Import. No. 32, 39 (1914).

SOUTH AFRICA. Natal: Durban, Krauss 121 (type); Gueinzus s.n.; Williamson s.n.; Sanderson s.n.; Gerrard 21; Cooper 1239; Rudatis 1488. Inanda, Wood 418. Warner Beach, 20 miles south of Durban, Dyer 932.

The style and stigma of this plant are exactly similar to those of the following species. The style is somewhat swollen, and is considerably shorter than the lamellate arms, the latter being coherent by means of their interlacing marginal cilia. I believe that these interlocking cilia have not been previously noted.

*Revised List of the Flora of Natal.

*In Engl. et Prantl, Nat. Pflanzenf. iv. 4: 81 (1897).

2. *Kraussia incerta* Bullock, sp. nov.; valde affinis *K. floribundae* Harv., sed foliis pro rata angustioribus basi et apice acutis, lobis calycinis acutis differt.

Frutex vel arbor parva, glabra; ramuli subquadrangulares. *Folia* lanceolata, apice acuta vel subacuminata, basi cuneata, usque 8 cm. longa et 2.3 cm. lata, subsessilia vel breviter petiolata, nervis lateralibus utrinsecus 3-4 indistinctis; stipulae acuminato-triangularis, 3-5 mm. longae, intus dense villosa-pubescentes. *Cymae* axillares, bracteatae; pedunculi usque 1.5 cm. longi; pedicelli usque 5 mm. longi; bracteae lineari-lanceolatae, infimae circiter 3 mm. longae. *Calyx* fere usque ad basin 5-lobus, lobis ovatis acutis 1.5 mm. longis. *Corollae* tubus turbinatus, 4.5 mm. longus, intus ad medium annulo indumenti dense villosi instructus, lobis alabastro conspicue contortis sub anthesin patentibus oblongo-ovatis subacutis 7 mm. longis et 3 mm. latis. *Stamina* corollae tubo supra annulum villosum inserta, filamentis subobsoletis antheris exsertis linearibus apiculatis 6 mm. longis dorso puberulis basin versus dorsifixis. *Ovarium* 2-loculare, ovulis geminatis in placento crasso immersis; stylus carnosus, cylindricus vel leviter ellipsoideus, circiter 4 mm. longus, ramis circiter 6.5 mm. longis satis crassis aequilongis extra longitudinaliter lamellatis, marginibus ciliis brevibus cohaerentibus. *Discus* annularis cupuliformis, laevis. *Drupa* (? immatura) globosa, 7 mm. diametro.

SOUTH AFRICA. Transvaal: Komati Poort, Nov.-Dec., Kirk 67; Pole-Evans H. 16909 (type); Rogers 22217.

3. *Kraussia speciosa* Bullock, sp. nov.; affinis *K. floribundae* Harv., sed foliis oblongo-ellipticis majoribus, stipulis et calyce multo majoribus, corollae lobis acutis differt.

Arbor parva, glabra, usque ad 10 m. alta, caule debili; ramuli subquadrangulares. *Folia* oblongo-elliptica, late acuminata, basi rotundata, usque ad 14 cm. longa et 5.5 cm. lata, nervis lateralibus utrinsecus 7-8; petioli 0.8-1 cm. longi; stipulae ovato-triangularis, acutae, 1 cm. longae, intus villosa-pubescentes. *Cymae* leviter supra-axillares, longe pedunculatae, laxae multiflorae, bracteatae; pedunculi 5-7 cm. longi, pedicellis 1-1.5 cm. longis; bracteae lineari-lanceolatae, infimae usque ad 1 cm. longae. *Calyx* fere ad basin 5-lobus, lobis triangulari-lanceolatis acutissimis 4 mm. longis minute ciliolatis. *Corollae* tubus turbinato-campanulatus 7 mm. longus, intus ad medium annulo indumenti dense villosi instructus, lobis alabastro conspicue contortis sub anthesin patentibus ovato-lanceolatis acutis 1.3 cm. longis 6 mm. latis. *Stamina* corollae tubo supra annulum villosum inserta, filamentis filiformibus brevissimis, antheris exsertis linearibus vel lineari-lanceolatis apiculatis 9 mm. longis basin versus dorsifixis. *Ovarium* 2-loculare, ovulis geminatis in placento crasso immersis; stylus carnosus, cylindricus vel leviter extra longitudinaliter lamellatis marginibus ciliis longissimis cohaerentibus. *Discus* annularis, laevis. *Fructus* non visus.

* TROPICAL AFRICA. Tanganyika Territory: Kimboza Mikese-Kisaki Road, 1500 ft. alt., a small tree up to 30 ft. high, growing in Rain Swamp forest in black soil on a limestone formation, 4 Sept., 1930, Greenway 2516 (type).

Excluded species.

1. *Kraussia congesta* Oliv. in Journ. Linn. Soc. Bot. xv. 95 (1876), is *Tricalysia congesta* (Oliv.) Hiern in Oliv., Fl. Trop. Afr. iii. 120 (1877).

2. *Kraussia coriacea* Sond. in Linnaea xxiii. 53 (1850) was transferred to *Tricalysia* under the (then) illegitimate name *T. Sonderiana* Hiern in Oliv., Fl. Trop. Afr. iii. 119 (1877). In the same work (p. 120) Hiern also described another species under the name *T. coriacea* Hiern. The original *Kraussia coriacea* Sond. may therefore still be known as *Tricalysia Sonderiana*.

3. *Kraussia lanceolata* Sond. in Linnaea xxiii. 53 (1850) is *Tricalysia lanceolata* (Sond.) Burt Davy in Ann. Transv. Mus. iii. 122 (1912). This is figured by Wood on plate 231 of his "Natal Plants," and by Sim on plate 85 (fig. 1) of his Forest Flora of Cape Colony.

4. *Kraussia pavettoides* Harv. in Harv. et Sond., Fl. Cap. iii. 22 (1864-5), is *Tarenna pavettoides* (Harv.) Sim, For. Fl. Cape Col. 239 (1907).

XXXVII.—THE FLORA OF MADRAS: VII.*

The ninth part (pp. 1533-1687) *Commelinaceae* to *Cyperaceae* has now been published, and Mr. Fischer has drafted the following notes in continuation of those previously published.

NOTES ON THE FLORA OF MADRAS: PART IX.

C. E. C. FISCHER.

FORRESTIA.

F. mollis Hassk. In Fl. Br. Ind. vi. 383, the habitat of this species is given as "Malabar, J. Anderson," but C. B. Clarke (De Candolle Monogr. iii. 236) has quoted "Java; Montes Malabar," which refers to Mount Malabar in Java. The entry in the former work, therefore, is misleading. As I have seen no specimen of the species from peninsular India, nor any of the genus from S. India, it has been excluded.

ANEILEMA.

Page 1545. *A. esculentum* Wall. and *A. dimorphum* Dalz. I am not satisfied that these two species are really distinct. The details and dimensions given by C. B. Clarke (l.c. 206) are not constant. The one feature that may be decisive—the tuberous roots of the first named—is lacking in most herbarium specimens, thus precluding the possibility of judgment on its constancy. I have, however, retained both species.

*Continued from K.B. 1928, p. 285.

CYANOTIS.

Page 1549. *C. pilosa* Roem. & Sch. and *C. Wightii* C. B. Clarke. I cannot distinguish these two species. Specimens named by C. B. Clarke as one or the other species appear to me to be identical. The descriptions in DC. Monogr. iii. 250 and 251 do not offer clear distinctive characters. I am of opinion that the two are really the same, and have classed all the specimens under the former name.

Page 1551. *C. kewensis* C. B. Clarke and *C. vivipara* Dalz. For reasons for reviving the genus *Belosynapsis* see K.B. 1928, 254.

CALAMUS.

Page 1562. Of Palms generally, but especially of the genus *Calamus*, it may be said that herbaria are usually sadly deficient in satisfactory material. The several parts often vary greatly in different regions of the plant, particularly in the arrangements of the leaflets along the rhachis and of the spines. With dioecious species sometimes one sex only is represented; often the inflorescence is unsupported by vegetative parts, but more frequently it is the reverse. Consequently, the descriptions, even Beccari's, do not always present the full details required for the compilation of a satisfactory key; the one provided is the best I could draw up in these circumstances. With regard to several species careful descriptions from living specimens are much needed.

CRYPTOCORYNE.

Page 1575. *C. unilocularis* Wight is known only from a coloured drawing in Roxburgh's collection in Herb. Kew., which has been reproduced uncoloured as t. 774 of Wight's Icones. In Pflanzenr. iv. 23F, 237, Engler appears to refer to a specimen in Herb. Kew., but no such specimen is to be found; probably the above-mentioned drawing was intended.

Page 1576. *C. Meeboldii* Engl. l.c. 234. I have seen the type specimen and find that the ovaries are in several rows, as figured in Fig. 61c (l.c. 242). The plant, therefore, is a *Lagenandra* and has been transferred as *L. Meeboldii*.

THERIOPHORUM.

Page 1579. *T. infaustum* N. E. Brown. I am inclined to think this identical with *T. indicum* Engl., but I have seen only the two defective sheets of it. In the absence of further material I have thought it best to retain the species. As essential parts are unrepresented, I have had recourse to Engler's description under *T. Wightii* Engl. in DC. Monogr. ii. 608.

ARISAEMA.

Page 1585. *A. neglectum* Schott. I can find no character to distinguish this specifically from *A. tortuosum* Schott except that the leaflets are radiate and not pedate. In *A. tortuosum*, however, the leaflets are sometimes very nearly if not quite radiate. I consider, therefore, that *A. neglectum* is a doubtful variety of *A. tortuosum*.

A. pulchrum N. E. Br. was described in 1880 from a plant grown in an English garden (Mr. Bull's) introduced from "some part of India." On the type sheet in Herb. Kew. Mr. N. E. Brown has written: "Col. Beddome informed me (May 1882) that he sent this *Arisaema* to Mr. Bull. He discovered it in Sispara Ghat, 3000 ft. West Nilgerries." It seems probable that it may be an aberrant form of *A. Leschenaultii* Bl.

PLESMONIUM.

Page 1588. *P. margaritifera* Schott. It is somewhat doubtful whether this species occurs within the area of the Flora. I have, however, seen three sheets with leaves only which seem to me to be this species, consequently I have thought it best to include it. The three sheets referred to are: *C. A. Barber* 1805, collected in June 1900 at Lakshmipuram, Vizagapatam District (in Herb. Madras.); *M. S. Ramaswami* 1589, collected 9th Aug. 1914 in the Rampa Hills "towards the top" (in Herb. Calc.); and *V. Narayanaswami* 194, collected on 26th Sept. 1920 in the Rampa Hills at 1500 ft. (in Herb. Kew.).

RHAPHIDOPHORA.

R. decursiva Schott. In Pflanzenr. iv. 23B, Engler has included the Rampa Hills in the habitat of this species on the strength of sheet no. 15946 in the late Mr. Gamble's Herbarium, now at Kew. This sheet consists of two separate leaves and an inflorescence. The latter is *R. pertusa* Schott, with truncate ovaries and sessile stigmas. One leaf has one side entire; the other side is cut into 4 lobes but the divisions do not reach to within 0.4 in. of the midrib. The other leaf is pinnatisect with an orbicular outline. There is a terminal lobe with 7 lateral unequal ones—4 on one side and 3 on the other—not reaching the midrib. In my opinion the sheet is *R. pertusa* Schott.

ERIOCAULON.

A difficult genus to work out with dried material. Once dry the ♂ calyx is very apt to split; great care is required in opening out or a spathaceous calyx may be mistaken for one with free lobes. Probably insufficient attention has been paid to the seeds; I am inclined to believe that they may furnish good characters. Unfortunately many specimens are not in the stage to yield ripe seeds for comparison.

Page 1618. *E. setaceum* Linn. and *E. intermedium* Koern. The only distinctions between these two species appear to lie in the darker colour of the bracts of the latter and in the white-villous floral bracts of the former. I have found, however, sparsely but distinctly white-hairy bracts in dark-coloured heads. In view of the great variability of the indumentum in the genus I follow Hooker and unite the two under the first name.

Page 1619. *E. Geoffreyi* Fyson in K.B. 1914, 330. The only distinction that I can find between this species and *E. melaleucum* Mart. lies in the black anthers of the former; but the original

description of the latter states that the anthers are white at first and later black. In one capitulum of a plant collected by Mr. E. Barnes in the Nilgiris (B. 26), which I consider to be undoubtedly *E. melaleucum*, I found both white and black anthers. I also found one pale-brown anther together with black ones in the same flower on one of the sheets quoted in Fyson's description of *E. Geoffryi* (Fyson 2165). I consider, therefore, that they are the same species. *E. melaleucum* Mart. and *E. Ritchieanum* Ruhl. are very closely related and I am a little doubtful of their specific separation. Their extreme forms may be distinguished by the following characters:

E. melaleucum. Leaves short, stiff, not visibly fenestrate. Sheath-mouth truncate though often irregularly split, sulcate and not visibly fenestrate. Capitula up to 0.35 in. diam.; ♂ sepals more or less free.

E. Ritchieanum. Leaves long, lax, distinctly fenestrate. Sheath-mouth oblique, usually entire, distinctly fenestrate. Capitula up to 0.2 in. diam.; ♂ sepals spathaceous.

But these characters are not always found combined, the sheaths and leaves being sometimes fenestrate with the large capitula and truncate sheaths. Also the ♂ sepals are often easily separable in the spathiform type and this may be a question of age. The chief distinction used by Ruhland is that afforded by the mouth of the sheath. For the present it is preferable to treat them as separate species on the characters given.

E. Rhodae Fyson. No constant difference is apparent between this and *E. robusto-Brownianum* Ruhl., which species is very variable in the colour of the involucre bracts and the amount of indumentum of the several parts. In his key to the section *Hirsutae* (Journ. Ind. Bot. ii. 262) Fyson includes them both in the group characterised by involucre bracts black or brownish at the base, but Ruhland described those of *E. robusto-Brownianum* as "pallide-stramineae" (Pflanzenr. iv. 30, 77) and in one sheet identified by Mr. Fyson as that species they are straw-coloured in some heads and brown in others. The distinction in Fyson's key (l.c.) runs:—

"Floral bracts acuminate, hairy, giving the head an echinate appearance *robusto-Brownianum*.
Floral bracts dirty white, nearly glabrous *Rhodae*."

A review of a considerable number of specimens, however, shows that the heads vary from one extreme to the other and the hairiness associated with the first is noticeable in a sheet (Meebold 8273) identified by Fyson as the latter. Accordingly I have sunk *E. Rhodae* Fyson in *E. robusto-Brownianum* Ruhl.

E. Thomasi Fyson. I have examined the two sheets (Meebold 9106 and 9899) quoted in the original description of this species and find that the ♀ petals do not always bear a black apical gland. I have also seen the type specimen of *E. Vanheurckii* Muell.-Arg. in Herb. DC. at Geneva, which Mr. Fyson has not mentioned in his review, and I have no doubt that the two are identical. In the description of

E. Vanheurckii the ♀ petals are stated to be glandless and I find this feature absent in a specimen from Travancore (Calder & Ramaswami 218). On the other hand, in one head from Meebold 9104 the glands were present though absent in others and all the flowers of Meebold 9899 examined by me were glandless. It would appear, therefore, that this character is variable. Hence I must treat *E. Thomasi* as synonymous with *E. Vanheurckii*.

E. horsleykondae Fyson. In Journ. Ind. Bot. iii. 16, Mr. Fyson has suggested the possibility of this species being identical with *E. Ritchieanum* Ruhl., which he had not seen. I have compared the type sheets of the two and find them identical. Moreover, I cannot distinguish Fyson's variety *megacephala* of *E. horsleykondae* from *E. melaleucum* Mart.

Page 1620. *E. Dianae* Fyson and vars. This is very closely related to *E. collinum* Hook. f. in which the sepals are very variable. The typical form and var. *longibracteata* differ very decidedly from *E. collinum* by the long involucre bracts, and var. *Richardiana* has very different leaves; but I cannot separate Fyson's vars. e and f, and have, therefore, sunk them under *collinum*. Var. g. *conica*, on the other hand, in my view, is quite distinct from both *E. collinum* and *E. Dianae*, nor does it appear to be *E. Roxianum* Steud. It differs from *E. Dianae* by the short involucre bracts, the elongate-conical receptacle producing a conical capitulum, the linear or linear-spathulate sepals shorter than the ligulate or ligulate-spathulate petals and the distinctly transversely-reticulate seeds. Hence I have raised it to specific rank as *E. conicum* (Fyson) Fischer.

E. collinum Hook. f. In a sheet collected at Pykara in the Nilgiri Hills (Madras Herb. 15248a) all the ♂ flowers in one head had 4 sepals, 4 petals and 8 stamens; in 2 other heads on the same plant the ♂ flowers were normally trimerous.

E. Thwaitesii Koern. In the original description of this species (Linnaea, xxvi. 627) the ♂ sepals are given as 2 in number. In the Fl. Br. Ind. vi. 583 they are given as 3. Fyson (Journ. Ind. Bot. ii. 202) says 3 with 1 smaller or 2. My dissections of a considerable number of ♂ flowers show 2 as a rule, rarely 3 equal or with 1 smaller. The peculiar capillary ♀ petals with tufted apex are constant in this species as well as in *E. Gamblei* Fischer.

CYPERACEAE.

Page 1621. It is probably more correct to treat *Pycnus*, *Juncellus* and *Mariscus* as sections of the genus *Cyperus*, but to do so would have involved a study of the groups extending far beyond the limits of the present Flora and a considerable delay in its preparation. For this reason, and because C. B. Clarke retained the separate genera in Fl. Brit. India, I have thought it better to follow his lead.

PYCNEUS.

Page 1627. *P. ferrugineus* C. B. Clarke. I find it impossible to distinguish between this and *P. odoratus* Urb. (= *P. polystachyus* Beauv.), nor can I separate satisfactorily the type of *P. polystachyus*

from the var. *laxiflora* Benth. as there is a complete series of intermediate forms.

P. sulcinus C. B. Clarke. In the description in Fl. Br. Ind. vi. 593, the nut is stated to be "much flattened against the rhacheola." The sentence is ambiguous. In all specimens examined it is the edge of the nut furthest from the rhachis that is flattened, the other one being convex and fitting into a recess in the rhachis.

CYPERUS.

Page 1640. *Cyperus flavidus* Retz. Obs. v. 13 (1789). It appears that C. B. Clarke and other authors did not see the type specimen, which is in Herb. Lund. It is identical with *C. globosus* All. (= *Pycreus globosus* Reichb. = *P. capillaris* Nees) and is not, therefore, *Cyperus flavidus* of C. B. Clarke and other authors. *C. globosus* All. (1755) being an earlier name takes precedence, and another name must be found for *C. flavidus* C. B. Cl. non Retz. The oldest name is *C. tenuispica* Steud. (1855) and is now to be adopted.

Page 1641. *C. corymbosus* Rottb. and *C. tegetiformis* Roxb. After examining a number of specimens, many named by C. B. Clarke, I am unable to find any constant difference between these two species. Haines (Bot. Bihar and Or. v. 899-900) found a similar difficulty. I have decided, therefore, to treat them as identical.

C. tegetum Roxb. Dr. G. Kükenthal, who has seen the type of *C. Pangorei* Rottb., informs me that the two are identical. The latter is the earlier name.

C. rotundus L., *C. stenostachyus* Benth. var. *indica* C. B. Cl., *C. Fenzelianus* Steud., *C. subcapitatus* C. B. Cl., and *C. tuberosus* Rottb. I cannot find constant characters distinguishing these species. Several authors, including C. B. Clarke, have experienced the same difficulty and have remained in doubt. I consider them to be forms due rather to environmental conditions than to any inherent differences and I have, therefore, grouped all under the earliest name, *C. rotundus* L.

C. stoloniferus Retz. Trusting to a label of Mr. Foulkes on a sheet in Herb. Kew. which contains 6 plants and also labels of G. Thomson, C. B. Clarke (Fl. Br. Ind. vi. 615) has included "Nilghiri Mts" in the habitat. This is a most unlikely locality and I suspect that Foulkes' label has been wrongly placed on this sheet.

C. imbricatus Retz. Obs. v. 12 (1789) appears to have been entirely overlooked by C. B. Clarke, since no reference to it is to be found in Fl. Br. India or in his ms. monograph, though Willdenow mentions it in his edition of the Sp. Pl. i. 278. Vahl (Enum. ii. 367) 20) merges in *C. eminens* Klein ms. and this latter C. B. Clarke sinks the type specimen in Herb. Lund. By the kindness of Dr. C. Christensen I have been able to compare a spikelet of the type of *C. radiatus* Vahl (Enum. ii. 369-1805) with it and I find that there is no doubt that they are identical. *C. imbricatus* Retz. being the earlier name must now be adopted.

MARISCUS.

Page 1644. *M. Dregeanus* Kunth. Dr. Kükenthal, who has seen the type specimen of *Cyperus dubius* Rottb., informs me that it is identical with the above species which, therefore, must become *M. dubius* (Rottb.) Kük. I have seen the type specimen of *Schoenus Bobartiae* Retz. Obs. iv. 9, and find that it also is identical with *M. dubius*.

M. ischnos C. B. Clarke. This species is alleged, in Fl. Br. Ind. vi. 623, to have been collected by G. Thomson in "Nilghiri and Kurg Hills" and is there stated to be "the single Old World example," the habitat, otherwise, lying in Tropical America. In his ms. monograph p. 2343, in a marginal note, C. B. Clarke has written "in herb. Hook. f. et T. Thoms. 'In montibus Nilghiri et Kurg' inscriptum, est verosimiliter herbarii error."

ELEOCHARIS.

Page 1648. *E. subvivipara* Boeck. I have not seen the type specimen but, after examination of a number of specimens so named by C. B. Clarke and comparison with the description, I have come to the conclusion that the only difference between it and *E. Chaetaria* R. & S. lies in the rather longer stems and the viviparous spikelets. Accordingly, I treat it as a variety of the latter.

E. acicularis R. Br. is included in the Fl. Br. Ind. vi. 628 on the evidence of a sheet from Rottler's herbarium now in Herb. Kew. There is no indication of precise locality; the label attached reads "Herbarium Rottlerianum Penins. Indiae Orientalis. Presented by the Council of King's College, Feb. 1872." As the known distribution of the species is Europe, N. E. Asia and America, its occurrence in S. India is so improbable that, in the absence of corroboratory evidence, I have excluded it.

E. Gambleana Boeck. in Allg. Bot. Zeitschr. 1896, 54. The description omits any reference to hypogynous bristles and style-base, i.e., the critical characters for generic distinction. I have seen two sheets of specimens collected by Mr. Gamble at Pykara in the Nilgiri Hills at 6000 ft. (No. 20548). One of these bears the inscription in Mr. Gamble's hand "*Eleocharis Gamblei* Boeck." It agrees with the locality noted in the description and with the description itself as far as it goes, and if not the type specimen is very probably a duplicate of it. These specimens are defective, only the 2 or 3 glumes and bracts being left. From one, however, just sufficient material—a ripe nut with bristles and style complete—was obtained to show that it is not an *Eleocharis* but is without doubt *Scirpus subcapitatus* Thw. Failing evidence to the contrary I propose treating *E. Gambleana* Boeck. as identical with *Scirpus subcapitatus* Thw.

FIMBRISTYLIS.

Page 1658. *F. subbulbosa* Boeck. (Cyp. nov. ii. 29). C. B. Clarke considers this species as probably identical with his *F. subtrabeculata*. Boeckeler refers to specimens of Mr. Gamble from Madras without quoting a number. On Gamble's sheet No. 20801 from Adyar

(Madras) in Herb. Kew., in his own hand, is written "Boeckeler named this *F. sub-bulbosa*." This sheet, however, undoubtedly is *F. polytrichoides* R. Br.

F. Kingii C. B. Cl. ex Boeck. and *F. trabeculata* C. B. Cl. After examining a number of specimens I am unable to separate them. The only specimen identified by C. B. Clarke as *F. trabeculata*, and apparently the type specimen, is *Gamble* 17330, now in Herb. Kew. It is rather smaller in all respects than the typical *F. Kingii*, and the glumes and the nut are rather paler in colour. The superficial cells of the nut are more distinctly transversely oblong, but I have seen nuts of *F. Kingii* in which the cells near the base are transversely oblong while those near the apex are hexagonal or nearly circular. These characters are not very constant. I did not find the nuts of *F. Kingii* subpapillose but distinctly, though minutely, warted. The description of *F. subtrabeculata* is silent on that point, but I find its nuts precisely the same. Boeckeler (Cyp. nov. ii. 40) correctly described the leaves of *F. Kingii* as "rigidulis hirsutis" a feature I find also in *F. subtrabeculata*, though C. B. Clarke does not mention it. I consider, therefore, that the two species are identical. *F. Kingii* is the earlier name.

F. aestivalis Vahl. Haines separates this species from *F. dichotoma* Vahl because the former is "hairy or pubescent all over" and the latter nearly glabrous. But Vahl and C. B. Clarke state that *F. dichotoma* is variable in this respect being sometimes even villous. Clarke (Fl. Br. Ind. vi. 635 and 637) distinguishes the two by the nut being distinctly striate and trabeculate in the first, while in the second it is smooth with the outer cells in less prominent vertical rows. I have seen equally prominently striate and trabeculate nuts in specimens marked by C. B. Clarke as *F. aestivalis* as in those he identified as *F. dichotoma*. I can trace no reliable distinction between the two species and retain only *F. dichotoma* (*Scirpus dichotomus* Linn.), thus maintaining the earlier trivial.

Page 1660. *F. tenera* R. & S. and *F. monticola* Steud. I cannot find any satisfactory characters to distinguish these two species. There are glands on the glumes of at least one specimen determined by C. B. Clarke as *F. monticola*. The width of the leaves and the colour and markings of the nut are variable in both sets of specimens. I have decided, therefore, to unite them under the former and earlier name.

F. Gambleana Boeck. in Cyp. nov. ii. 40. The description is lacking in all reference to the critical floral characters, style, nut, stamens, etc. I have seen no specimen that can be identified with the description. In the circumstances I exclude the species.

BULBOSTYLIS.

Dr. Britton in "Sedges of Jamaica" has drawn attention to *Stenophyllus* Raf. as an earlier name for this genus, and this verdict has been accepted by T. Cooke in Fl. Pres. Bomb. ii. 886. It does not seem to me, however, that the very short description given by

Rafinesque agrees with *Bulbostylis*; therefore, I follow C. B. Clarke and others in retaining that name.

SCIRPUS.

Page 1666. *S. supinus* L. var. *uninodis* C. B. Cl. In Fl. Br. Ind. vi. 656, this variety is separated out because the spikelets are umbellate on 1-3 rays. As I have found both types of umbel on the same plant, I cannot maintain the variety.

S. Michelianus Linn. In Fl. Br. Ind. vi. 662 the distribution of this species is noted as "throughout British India." I have seen no specimens from S. India, nor are any cited by C. B. Clarke in his ms. monograph; I have, accordingly, excluded the species.

FUIRENA.

Page 1669. *F. umbellata* Rottb. The inner bristles are usually described as sessile or nearly so, but in every *mature* spikelet examined by me well-developed claws are exhibited. The claw, however, is invariably horizontally and closely sigmoidally curved so that it is hardly perceptible until expanded under the lens.

HYPOLYTRUM.

Page 1673. *H. Wightianum* Boeck. After a considerable study of the specimens so determined by C. B. Clarke and of the descriptions given by Boeckeler and by Clarke I have not been able to distinguish this species from *H. latifolium* L. C. Rich. Attempts have been made to differentiate them on the nuts, but these are very variable even in the same plant. The variations are probably due partly to the plants being polygamo-dioecious and partly to local conditions.

SCLERIA.

Page 1678. *S. poaeformis* Retz. Obs. iv. 13 (1786) has been altogether omitted from the Fl. Br. Ind. and from the Handbook of the Fl. Ceyl. (Trimen). In C. B. Clarke's ms. monograph of the Cyperaceae it is relegated to the insufficiently known "residue." Clearly neither C. B. Clarke nor Sir J. D. Hooker saw the type specimen collected by Koenig, now in the Herb. Lund. Having seen the type I consider that it is identical with *S. oryzoides* Presl (1828). The earlier name, *S. poaeformis* Retz., is to be maintained.

S. melanostoma Boeck. has been differentiated from *S. elata* Thw. on account of its unwinged midstem sheaths and dark nuts. I have, however, seen unwinged sheaths on stems bearing white nuts and winged sheaths correlated with nuts as dark as the typical ones of *melanostoma*. Moreover, white and dark nuts are found sometimes in the same panicle. Therefore, I unite the two under the name *S. cochinchinensis* Druce, which Druce has shown to be the correct name for *S. elata*.

CAREX.

Page 1685. *C. Christii* Boeck. The evidence for the occurrence of this species on the Nilgiri Hills is open to some doubt. Boeckeler states that Christ found it on the Rigi in Switzerland. Kükenthal, in Pflanzenr. iv. 20. p. 97, states that this is a printer's error and

that the correct locality is the Nilgiri Hills of India. He does not give any evidence for the conclusion and cannot now remember how he came by it. He had not seen the sheet at the time of writing. As far as I am aware, Dr. H. Christ was never in India. Nevertheless in view of Dr. Kükenthal's statement, I have retained the species in the flora.

C. gemella Hochst. I have seen Hohenacker's specimen No. 942a at the British Museum and find it identical with *C. brunnea* Thunb. The apical spikelets have lost all their lower flowers (presumably ♀) and nuts so that it might appear that they had been entirely ♂. Even were the two apical spikelets entirely ♂ in the type sheet, which is in Paris (the one in the British Museum being a duplicate), I would consider it to be an abnormal form of *C. brunnea*, but M. Gagnepain has kindly examined the type and informs me that it too has lost all the lower flowers and there is nothing to show that they were not ♀.

XXXVIII.—THE LOOFAH INDUSTRY. F. N. HOWES.

The loofah industry is one which, not unlike several other vegetable industries, is subject in a certain degree to the caprices of fashion. In the bath, loofahs have perhaps been supplanted to a some extent by the rubber article, but, nevertheless, they are still used in not inconsiderable quantities as bath-straps and flesh-gloves. In Great Britain the demand for the loofah sponge is said to be greatest in the mining and industrial areas, where its body cleansing powers are appreciated by the workers. Apart from the uses already outlined loofah fibre is at the present time employed in the manufacture of various other articles, one of the best known being the inner soles of footwear. For household cleaners and scrubbers of various types the fibre is eminently useful, possessing as it does certain properties which are rather unique among vegetable fibres. Other articles for which the loofah is or has been used are bath-mats, loofah cloth, loofah hats and spine-pads (Japan). Records exist of the fibre having been utilised for upholstery purposes, but for this use it does not appear to have been entirely suited or to have become generally adopted. A more recent application* for loofah fibre is in oil-filtration on steamships and in steam-mills, the fibre being used in place of coke.

The commercial supplies of loofah are obtained at the present time almost entirely from Japan, that country having always held a more or less unbroken monopoly for the product. Consignments from other countries, e.g. Florida and parts of Northern Africa, have appeared on European markets from time to time but never in large quantities. The superior or luxury grades of loofah, those of 16-18 ins. and upwards in length and of good colour and texture, are always of Japanese origin.

*Inlichtingen en Onderzoekingen van de Afdeeling Handelsmuseum, Koloniaal Instituut, Amsterdam, 1929, Med. xxvi. No. 8, p. 123.

* The loofah plant grows readily in most warm countries and attempts have been made to establish production on a commercial scale in various other parts of the world, including Java and India, but so far with no very great success. In Java it was found* that plants grown from seed of two Japanese varieties grew vigorously in the early stages but the subsequent flowering and setting of fruit were disappointing. The cultural treatment given the plants was exactly the same as that adopted in Japan, and out of an estimated yield of 80,000 loofahs from the plot planted only 3000 pieces were actually harvested. These were of inferior length and colour. The conclusion arrived at was that successful loofah production cannot be carried out in a damp tropical climate, such as that obtaining in the part of Java (Tijpemeuh) where the experiment was carried out; under these conditions the plant can merely be regarded as a useful quick-growing climber capable of supplying sufficient loofahs for local use. In India,† though careful attention was given to cultivation and preparation, the sponges produced were of poor quality, being small and brown, and the plants suffered from insect attack. The opinion held by a large firm of loofah importers in London is that the conditions prevailing in Japan are peculiarly favourable to loofah cultivation and that this may be connected with the volcanic nature of the soil on the island. It is possible, however, that the failure to produce a good marketable article in other countries where the plant appears outwardly to thrive may be due to one or more of the following causes:—

1. Neglect to limit the number of fruits allowed to ripen on each vine to a few only; unless this is done gourds of good length are not obtained.
2. Faulty methods of preparing the loofahs and separating the fibrous skeleton from the rind.
3. Unsuitable soil conditions or inadequate attention to the need for heavy manuring.

Luffa cylindrica M. Roem. is the species to which belong the varieties cultivated in Japan for loofah production. Other species of *Luffa* yield a fibrous net-work rather similar to that of *L. cylindrica*, but it is not of such length, neither is it regarded as being so suitable for commercial purposes. The fruit of this species in the fresh state, when properly grown, is frequently over two feet in length. A specimen grown in one of the houses at Kew (now in Museum I) measures 4 ft. 11 ins. in length in the dry state.

The treatment given to the "Hetchima" or *Luffa* crop in Japan is as follows. Seed is sown approximately at the end of March, the plant being grown as an annual. As soon as the first two leaves have developed the young plants are planted out in ridges 3-4 feet apart with the same distances between the plants in the rows. In some cases the young plants are transplanted several times in the nursery before being finally planted out. Adequate support has to be

*Teysmannia iii. p. 120. †Indian Trade Jour. iv. 19, pp. 313-315.

provided for the plants to prevent the fruits coming in contact with the ground, and the whole area is covered with horizontal palings of wood or bamboo about 6 feet from the ground supported by strong wooden posts. As the plant commences to grow the young flexible stems are tied to the uprights to assist them in climbing. When high enough they are arranged between the wide meshes of the framework, where they continue to develop of their own accord. As the plants are developing many of the side branches are cut off to encourage the growth of the main stem. The first-formed flower buds are nipped off, so also are those that appear late or after the setting of those fruits it is desired should mature. The ripening of the fruits and harvesting takes place in the autumn after a growing period of approximately six months. It is important that the fruits should be harvested at the right stage of maturity. This is indicated by the fruits commencing to turn yellow at the base and apex. Such fruits are also lighter to the touch than the unripe ones, which contain a much larger quantity of moisture. If the fruits are not cut at this stage they begin to turn brown as the outer layers commence to undergo decay, and this causes the fibrous material within to become discoloured. In cutting, about two inches of the fruit-stalk is left attached to the fruit for convenience in handling.

The sponge or fibrous portion may be separated from the fruit in various ways. The usual procedure in Japan is to place the freshly cut fruits in running water for a period varying from five days to a fortnight. This has the effect of softening the outer portion, which is then easily removed by hand. The abundance of small streams and rivulets in Japan in the areas where the loofah is cultivated facilitates this process. On being placed in the stream an object of some sort is generally placed over the loofahs to keep them well immersed, and some sort of simple enclosure is erected to prevent them being washed down the stream. On removal of the rind the fibrous portion is well washed and rinsed with fresh water: the more thoroughly this is done the whiter is the fibre likely to be. In the washing process the seeds come out of their own accord or are removed by hand. In some cases the seeds are removed from the loofah after it has dried by thrashing on a stone. After washing the loofahs are hung up in the sun to dry and bleach, after which they are ready for sale and export.

Another method of preparation is to hang the freshly cut fruits in an airy, draughty shed for two or three days, after which the outer skin becomes soft and pliable. This stage of the preparation is assisted by cutting off the tip of the gourd at the lower end, leaving a small hole through which moisture may drip. The loofahs are then extracted from the fleshy rind by running the finger down the skin of the fruit on one side and splitting it open. They are then thrown into a washing vat of lime-water (5 lbs. of slaked lime to 50 gals. of water) and after being well stirred and rinsed in the lime-water are transferred to the drying shed. The lime-water is well shaken

from each loofah before drying. Care has to be exercised in drying, for if dried too rapidly the fibre is liable to become brittle, while if drying is unduly prolonged the formation of mould accompanied by deterioration may occur, though the lime-water treatment militates against this.

In addition to field cultivation in Japan, which is largely in the province of Enshu with Hamamatsu as a commercial centre, loofahs are grown round the edges of fields and around dwellings and store-houses. The crop thrives in a light fairly moist soil and extensive manuring is practised. Various manures are used including dung, fish-manures, straw ashes, rice-dust, and mixtures of oil seeds and phosphatic fertilizers. When grown on a field scale the average yield is said to be in the neighbourhood of 24,000 pieces per acre.*

The Japanese loofahs vary in size from 8 to 18 inches and upwards in length, and are exported in press-packed bales of 8 to 9 cubic feet. Grading for size and quality is carried out before baling. The following figures indicate the nature of the grades and the number of loofahs per bale in the respective grades.

8-10 ins.	about	5,000	per bale.
10-12	"	4,500	"
12-14	"	3,500	"
14-16	"	2,500	"
16-18	"	1,800	"
18 in. and upwards	about	1,200	per bale.

On Western markets the popular grades at the present time are stated in trade circles to be those between 12 and 16 inches, there being very little demand for the smaller sizes. Length is the primary factor in determining the market value of a loofah and a very rapid rise in price takes place as the length increases. Pieces of 14 to 16 inches generally command twice or three times the price of those under 12 inches, while those of 18 inches and over may be valued at four or five times as much. A good white colour and good texture are also important considerations, but are of secondary importance to length according to present-day standards.

According to van de Polder† a custom sometimes practised in Japan is to cut the stems of the loofah vines about 5 feet from the ground after all the fruits have been harvested. The top of each stem is then bent round into a receptacle into which the sap flows and is collected. As much as half a litre of sap may be obtained from one plant in this way. This is used by Japanese women for rubbing on the face, hands, and body, and is regarded as an excellent substance for softening the skin and for giving it a fine fresh appearance.

Varieties and forms of *Luffa cylindrica* are cultivated as garden plants or occur naturalised in most tropical countries. The fruits are frequently used as a vegetable in the young stages before the fibre develops. In India two varieties are said to be commonly

*Der Tropenpflanzer v. p. 197.

†Teysmannia i, p. 509.

recognised; the fruits of one are edible and are used by the poorer classes either boiled or in curry, while those of the other are bitter and toxic. Except for its bitterness and slightly darker colour the toxic variety is claimed to be scarcely distinguishable from the edible. An investigation of the bitter variety by C. L. Bose,* as a result of cases of poisoning, led to the isolation of two toxic glucosides from the fruit. One of these was found to act as a severe emetic and the other as a brisk cathartic causing much irritation and giving rise to dysenteric symptoms. The edible varieties of loofah and varieties of allied genera are believed to owe their freedom from poisonous principles to cultivation.

The oil from the kernels of the seeds belongs to the semi-drying class, is liquid at the ordinary temperature, and has a mild agreeable taste with a brownish-green colour. It is stated that the oil-cake cannot be used as a feeding stuff on account of its bitterness and probable toxicity, but being rich in proteins and phosphates it would serve as a useful manure.†

XXXIX.—TROPICAL AFRICAN PLANTS: VIII.‡

Ricinodendron tomentellum Hutch. et Bruce, sp. nov. [Euphorbiaceae]; affinis *R. africano* Müll. Arg., sed foliis infra dense stellato-tomentellis, floribus majoribus, petalis liberis differt.

Arbor alta. Folia decidua, digitatim 5-foliolata; foliola subsessilia, obovato-oblongata, sensim acuminata, basi cuneata, juniora 6.5–13.5 cm. longa, 2–4.5 cm. lata, matura 20–23 cm. longa, glanduloso-denticulata, membranacea, infra dense stellato-tomentella, supra plus minusve glabrescentia; nervi laterales utrinsecus 15–21, infra prominuli. Inflorescentia non visa. Flores masculi breviter pedicellati. Sepala 5, ovata, 5 mm. longa, 2 mm. lata, extra ferrugineo-stellato-tomentella, intus glabra. Petala 5, libera, oblonga, basi sensim angustata, circiter 6 mm. longa, 2 mm. lata; disci glandulae erectae, breviter oblongae. Stamina 8–10, filamentis 3.5 mm. longis basi dense pilosis; antherae leviter exsertae. Flores feminei non visi.

Kenya Colony: Kwale, Mar., R. M. Graham 2346.

Dichapetalum kenienne Hutch. et Bruce, sp. nov. [Chailletiaceae]; affinis *D. fruticoso* Hiern, sed pedunculis 5 mm. longis vel minoribus, foliis minoribus differt.

Frutex scandens; ramuli annotini parce pubescentes, lenticellati, ramulis junioribus brunneo-pubescentibus. Folia obovato-oblongata, sensim et late acuminata, apice minute mucronata, basi late cuneata, 3–6.5 cm. longa, 1.5–2.6 cm. lata, integra, tenuiter coriacea, supra glabra, infra glabra costa media prominenti basi leviter

*Calcutta Med. Journ. Sept. 1906, pp. 65–74.

†Bull. Imp. Institute. No. 1, 1929, p. 109.

‡Continued from K.B., 1929, p. 28.

pubescenti excepta; nervi laterales utrinsecus 5–7; petioli pubescentes, circiter 5 mm. longi; stipulae caducae, lineares, pubescentes, 2 mm. longae. Inflorescentiae ad apices ramulorum, circiter 1.5 cm. longae; pedunculi usque ad 5 mm. longi; pedicelli circiter 5 mm. longi, griseo-pubescentes. Alabastra subglobosa. Flores albi, usque ad 5 mm. longi. Sepala 5, oblonga, extra griseo-tomentella, intus glabra, circiter 3 mm. longa, demum reflexa. Petala 5, ovata, glabra, profunde bifida, erecta vel leviter patentia. Stamina 5, leviter exserta, filamentis latis glabris; antherae parvae, basi rotundatae. Ovarium globosum, lanato-tomentosum, stylo glabro, stigmatibus breviter bilobatis.

Kenya Colony: Malindi District; Arabuko, in undergrowth of forest of *Brachylaena Hutchinsii* Hutch. or in bush, R. M. Graham 2132 (type), 2312.

Crotalaria (Simplicifoliae) unicaulis Bullock, sp. nov. [Papilionaceae]; nulli arcte affinis.

Herba annua erecta, 20–30 cm. alta; caulis simplex, solitarius. Folia simplicia, petiolata, anguste elliptica, apice acuta vel breviter acuminata, basi longe cuneata, 5–7 cm. longa, 2–2.5 cm. lata, superne primum pubescentia demum glabra, petiolis subalatis 1 cm. longis. Flores majusculi, lutei, in racemum terminalem pauciflorum laxum dispositi. Calyx in toto 12–13 mm. longus, lobis lanceolatis acutis 6 mm. longis. Vexillum elliptico-obovatum, apice acutum, 1.8–2.2 cm. longum, 1.2–1.4 cm. latum. Alae oblongae, 1.3–1.5 cm. longae, circiter 4 mm. latae. Carina circiter 2 cm. longa, dorso rotundata, apice acuta. Ovarium lineare, glabrum, marginibus pubescentibus, stylo elongato basi pubescente. Legumen non visum.

Northern Rhodesia: Mwinilunga District, 4000–5000 ft., in the bush, stem 8–12 in. high, growing "singly, not in clumps," flowers bright yellow, darker at the back of the petals, Nov. 1929, Miss J. M. Marks 10.

This striking plant is remarkable for its habit, large flowers and simple leaves. The lamina is decurrent to the base of the petiole, giving it the almost winged appearance noted in the description above.

Loranthus (Longicaliculati) acaciatorum Bullock, sp. nov. [Loranthaceae]; *L. Fischeri* Engl. affinis sed foliis majoribus, ramulis junioribus brevissime puberulis mox glabrescentibus, calyce sublongiore, corolla subbreuiore differt.

Rami annotini glabri, teretes, circiter 4 mm. diametro, cortice cinereo; ramuli hornotini subteretes, patentes, brevissime puberuli mox glabrescentes; internodia 1–2 cm. longa. Folia alterna, late oblongo-elliptica usque suborbicularia, apice rotundata, basi in petiolum brevissimum puberulum attenuata, usque 4 cm. longa et 2.5 cm. lata, subglabra, ut videtur subcarnosa. Flores axillares 2 vel plures fasciculati; pedicelli 1–2 mm. longi, bractea cupularis, subglabra vel glabra limbo subintegro. Calyx subtruncatus, cylindricus,

4-5 mm. longus, limbo ciliato. *Corolla* aurantiaca, usque 2-5 cm. longa, alabastro ad staminum insertionem ampliata, tubo 6 mm. longo usque ad medium vel ultra unilateraliter fisso; lobi lineares, usque 2 cm. longi, spiraliter torti. *Stamina* et *pistillum* ut in *L. Fischeri* Engl. *Fructus* ignotus.

Tanganyika Territory: S. W. Pares; Mwembe, alt. 900 m., an orange-flowered parasite on *Ximenia* and *Acacia* spp. in desert country, common in some places, Jan., Greenway 2065.

Aporrhiza nitida Gilg in Engl. Pflanzenw. Afr. iii. II. 280 (1921), in obs., nomen subnudum, hic ab E. Milne-Redhead descripta [Sapindaceae]; ab A. *paniculata* Radlk. foliolis magis coriaceis et indumento ferrugineo recedit.

Frutex vel *arbor* parvula 6 m. alta. *Rami* puberuli vel glabrescentes, teretes, cortice brunneo vel cinereo, juniores puberuli. *Folia* paripinnata, 2-4-jugata; petioli 4-6 cm. longi, puberuli vel tomentosi; rhachides 3-15 cm. longi, ultra foliola terminalia prolata, puberuli vel tomentosi, supra planiusculi; foliola subopposita, breviter petiolulata, petiolulis 3-8 mm. longis puberulis, plus minusve oblique oblongo-elliptica vel oblongo-obovata, apice late et obtuse acuminata, basi subcuneata in petiolulos decurrentia, 6-18 cm. longa, 2.5-7 cm. lata, coriacea, supra glabra vel nitida, subtus pilis setulosis praesertim ad nervos parce adspersa; costa supra inconspicua, basin versus canalem angustam efformans, subtus valde prominens; nervi laterales supra valde inconspicui, subtus valde prominentes, utrinque 10-12; foliola immatura pubescentiora. *Inflorescentia* paniculata, terminalis, 20-30 cm. longa, rhachi pedunculis pedicellisque ferrugineo-tomentosis; alabastra globosa, tomentosa. *Flores* alii masculi alii hermaphroditi. *Calyx* 7 mm. diametro, utrinque tomentosus, lobis deltoideis 2 mm. longis et latis. *Petala* alba, late spatulata, basin versus in tubum constricta, 3 mm. longa, 2 mm. lata, tubo 0.4 mm. lato 1.5 mm. longo, extra parce villosa, intus dense villosa; discus 5-lobatus, 4 mm. diametro, glaber. *Stamina* 7, intra discum inserta; filamenta filiformia, 3.5-4.5 mm. longa, parcissime villosa; antherae ovatae, 1 mm. longae, vix 1 mm. diametro, dorso affixae. *Ovarium* in floribus masculis abortivum, dense tomentosum, in floribus hermaphroditis conicum, compressum, 2 mm. latum, vix 2 mm. longum, dense tomentosum, biloculare; stylus linearis, 1.5 mm. longus, 0.3 mm. latus, glaber, stigmatibus simplicibus. *Capsulae* immaturae biscutellares, breviter stipitatae, tomentosae, lateraliter compressae; fructus maturus non visus.

Nyasaland: Blantyre, 1895, Buchanan in *Herb. Wood* 6992 (type of leaves and fruits).

Tanganyika Territory: Kyimbila District; Kibila Gorge, Risokolo, 7 Oct. 1912, tree 8 m. high, leaves green glossy, flowers cream with green sepals faintly scented, native name *Ntenga*, Stolz 1593; Kibila, Kimomo, 13 Feb. 1913, tree 8 m. high, leaves yellowish green, glossy, fruits green, native name *Itenga*, Stolz 1880.

^e Belgian Congo: Katanga; without precise locality, 30 Aug. 1916; native name *Mulundu*, Ringoet 84; Katanga, without precise locality, small tree, near water, 11 Oct. 1916, Ringoet 103.

Northern Rhodesia: Solwezi District; R. Jiundu, west of Solwezi Boma, in evergreen vegetation by the river, small evergreen tree 6 m. high, leaves glossy, flowers creamy white, 14 Sept. 1930, Milne-Redhead 1119 (type of flowers).

Cussonia jatrophioides Hutch. et Bruce, sp. nov. [Araliaceae]; affinis *C. hamatae* Harms, sed foliis minoribus glabris, spicis minoribus gracilibus differt.

Arbor parva; ramuli glabri. *Folia* alterna, ad medium digitatim 3-5-lobata; petioli 3.5-8 cm. longi, sulcati, graciles, apice leviter pubescentes; lamina 5-8 cm. longa, 8-13 cm. lata, membranacea, supra glabra, palmatim 3-5-nervis, nervis infra basin versus pubescentibus, lobis late ovatis apice acuminatis margine serratis; stipulae fere intrapetiolares, subulatae, pectinatae, circiter 3 mm. longae. *Inflorescentia* spicata; spicae ad apices ramorum fasciculatae, circiter 12 cm. longae. *Flores* non visi. *Fructus* ellipsoideus, circiter 7 mm. longus, 5 mm. latus, brunneus, apice disco prominente.

Tanganyika Territory: Dodoma District; Chenene Hills, 1450 m., common small spreading tree of lower *Berlinia* zone, Burt 996.

Lagynias pallidiflora Bullock, sp. nov. [Rubiaceae]; *L. lasianthae* (Sond.) Bullock affinis sed calyce minore corolla extra glabra tubo multo brevior, foliorum nervis lateralibus infra indistinctis differt.

Frutex vel *arbor* parva, glabra. *Folia* anguste elliptica usque anguste obovato-oblancoolata, apice late obtuse acuminata, basi cuneata, circiter 6 cm. longa et 2-2.3 cm. lata, petiolis 5-7 mm. longis, utrinque glabra, discoloria, nervis lateralibus inferne indistinctis. *Cymae* 3-6-florae, pedunculis 3-5 mm. longis, pedicellis usque 2 cm. longis. *Calyx* fere ad basin 5-lobus, lobis sub anthesin oblongo-spatulatis circiter 1 cm. longis et 2 mm. latis, statu fructifero latioribus. *Corolla* longe tubulosa; tubus 1 cm. longus, lobis lanceolatis apice filiformibus circiter 6.5 mm. longis.

Tanganyika Territory: Sigi, 25 Oct. 1910, Zimmermann 3219 (type): Kwantago R., Dec. 1907, Zimmermann 1021.

The generic name *Lagynias* was proposed by E. Meyer* in 1843 to accommodate a peculiar plant from near Durban which he named *L. discolor* E. Mey. He did not, however, publish a description and later authors included this plant in the genus *Vangueria* Juss. E. Meyer's name was resuscitated by Robyns† in his monograph of the *Vanguerieae* in 1928, when he transferred to it a second species, *L. dryadum* (S. Moore) Robyns from *Vangueria*. The latter is a native of South Tropical Africa. The large calyx

*E. Mey. in Drège Zwei Pflanzengeogr. Docum. 159, 197 (1843).

†Robyns in Bull. Jard. Bot. Brux. xi. 313 (1928).

lobes, which, with the corolla lobes, are abruptly reflexed when the flower is open, are very characteristic, and at once distinguish the genus from its close ally *Vangueria*.

It is likely that a fourth species exists in Kenya Colony. A specimen in the Kew Herbarium (*R. M. Graham* 1691) is allied to *L. pallidiflora*, but is described as a large climber, 4 in. in diameter at the base, and attaining 100 ft. or more in height.

Lagynias lasiantha (Sond.) Bullock, comb. nov.

Lagynias discolor E. Mey. in Drège Zwei Pflanzengeogr. Docum. 591 (1843), nomen; Robyns in Bull. Jard. Bot. Brux. xi. 313 (1928), descr.

Pachystigma lasianthum Sond. in Linnaea xxiii. 55 (1850).

Vangueria lasiantha (Sond.) Sond. in Harv. et Sond., Fl. Cap. iii. 14 (1864-5) l.c.

Vangueria venosa Sond. in Harv. et Sond. l.c., partim, quoad syn. *Lagynias discolor* E. Mey.

The necessity for making the above new combination arose when working out the affinity of *Lagynias pallidiflora* Bullock described above. In his monograph of the Vanguerieae, Dr. Robyns took up the "nomen nudum" *L. discolor* E. Mey., published in 1843, whereas the plant in question was described under the name *Pachystigma lasianthum* Sond. in 1850.

Tecomaria rupium Bullock, sp. nov. [Bignoniaceae]; affinis *T. shirensi* (Baker) K. Schum., a qua differt ramulis hornotinis tomentello-pubescentibus, foliis patentibus 7-9-foliolatis, foliolis lateralibus pro rata brevius acuminatis, foliolorum nervis subtus patule hispidulis, calycis tubo pro rata longiore, capsulis brevioribus, seminibus minoribus, eorum nucleis rhomboideo-obovatis, alis purpureo-striatis.

Frutex 2-3 m. altus, ramulis hornotinis tomentello-pubescentibus. *Folia* patentia, usque 15 cm. longa, plerumque 9-foliolata; petiolus 4-5 cm. longus, ut rhachis tomentello-puberulus; foliola lateralibus elliptica vel oblongo-elliptica, 2.5-5 cm. longa, 1.5-2.5 cm. lata, apice acuta vel breviter acuminata, basi rotundata, petiolulis 2-5 mm. longis; foliolum terminale ovato-oblongum, lateralibus paullo majus. *Racemi* longe pedunculati, 12-20 cm. longi; pedicelli 1.5 cm. longi, pubescentes, basin versus bracteolas duas oppositas lineares 2.5 mm. longas gerentes. *Calyx* tubuloso-campanulatus, 1.5 cm. longus, praesertim infra medium pubescens, vix accrescens, subaequaliter 5-lobatus; lobi oblongo-ovati, breviter cuspidati, circiter 4 mm. longi. *Corolla* rubra; tubus 2.5 cm. longus, ore circiter 7 mm. diametro; lobi late elliptici vel suborbiculares, circiter 1 cm. longi et 7-9 mm. lati. *Filamenta* 2.7 cm. longa; antherae lanceolato-sagittatae, circiter 4.5 mm. longae, loculis triente superiore connatis inferne divergentibus. *Ovarium* oblongo-ovatum, circiter 3 mm. longum; stylus 3.5 cm. longus, ramis spatulatis 2.5 mm. longis. *Capsula* lineari-oblonga, 5-7 cm. longa, valvis acute carinatis navicularibus. *Semina* oblonga, 1.5-1.7 cm. longa,

7-8 mm. lata, eorum nucleis rhomboideo-obovatis circiter 5 mm. diametro ad hilum late cuneatis, alis membranaceis irregulariter crenato-lobulatis purpureo-striatis.

Tanganyika Territory: Dodoma Province; N. Mpwapa, 5000 ft. alt., "a beautiful red-flowered shrub 6-8 ft. high growing on rocks and rocky places in mountain *Brachystegia* wood-grassland, common but scattered, 20 Aug. 1930, *Greenway* 2425 (type). Without exact locality, *Busse* 174.

Mimulopsis glandulosa (Lindau) Bullock, comb. nov. [Acanthaceae].

Epiclastopelma glandulosum Lindau in Engl., Bot. Jahrb. xxii. 114 (1895); et in Engl. et Prantl., Nat. Pflanzenfam. iv. 3B, 305 (1895).

Mimulopsis Thomsonii C. B. Clarke in Dyer, Fl. Trop. Afr. v. 55 (1899).

This new combination is rendered necessary on account of the necessity for retaining the oldest specific epithet on reducing the monotypic genus *Epiclastopelma* to *Mimulopsis*.

Leucas (Astrodon) pododiskos Bullock, sp. nov. [Labiatae]; *L. tomentosae* Gürke affinis sed floribus paucioribus calyce tomentoso nec villosa differt.

Frutex 1 m. altus; ramuli juniores molliter albo-tomentosi, apicem versus tantum foliosi. *Folia* oblonga usque oblongo-obovata, usque 1.3 cm. longa et 4-6 mm. lata, apice rotundata vel subtruncata, crenato-dentata, ceterum integra, basin versus angustata, subsessilia, utraque pagina sericeo-tomentosa, nervis supra impressis infra valde prominentibus. *Flores* in axillis subsolitarii, sessiles. *Calyx* sub anthesin 5 mm. longus, extra tomentosus, intus glaber; tubus infundibularis, 10-costatus, ore recto (nec obliquo); limbus aequaliter 10-dentatus. *Corolla* alba, 1 cm. longa, tubo limbum aequante. *Discus* obtuse subaequaliter 4-lobus, stipitatus, stipe 1.5 mm. longo. *Calyx fructifer* cum nuculis ignotus.

Tanganyika Territory: S. Pares; S. Same, 2700 ft. alt., in a brownish red soil, Feb. 1930, *Greenway* 2115.

A shrub 3 ft. high with white flowers and silvery foliage; with a Convolvulaceous plant it forms the dominant herbaceous vegetation unit of the *Acacia* desert. A somewhat anomalous species, having the habit of species of *Ballota*.

XL.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXXI.

Hedyotis impedita Craib [Rubiaceae-Hedyotideae]; ab affini *H. subdivaricata* Drake ex Pitard caule haud glabro, receptaculo breviter pubescente, calycis segmentis conspicue pubescentibus distinguenda.

*Continued from *K.B.*, 1931, p. 221.

Prachuap, Hua Hin, near sea-level, scrub, *Kerr* 13433.

Herba 45–70 cm. alta, annua; caulis erectus, simplex, pilosus, angulatus, sicco pallide viridis vel interdum parum lutescens. *Folia* opposita, nodis inferioribus approximatim, internodiis superioribus 5–8 cm. longis, lanceolata vel oblongo-lanceolata, vel suprema linearia, apice subacuta, basi cuneata, 0.7–3 cm. longa, usque ad 6 mm. lata, chartacea, sicco viridia vel parum lutescentia, subtus pallidiora, pagina utraque pilosa, costa supra impressa subtus prominente, nervis lateralibus utrinque 3–4 inferioribus fere e basi ortis subconspicuis vel fere obscuris, sessilia vel petiolo vix distincto brevi suffulta; stipulae variabiles, lineares vel deltoideo-lanceolatae, obtusae, acutae, vel longius attenuatae, saepe recurvae, 3–5 mm. longae. *Cymae* paniculam terminalem 6–8 cm. longam 3–9 cm. latam efficientes; flores albi (ex *Kerr*), pedicellis 0.25–1 mm. longis suffulti; bractae lanceolatae, pedicellis subaequilongae vel iis paulo breviores. *Receptaculum* circa 1 mm. longum, glabrum. *Calycis* tubus brevis, segmenta 4, lanceolata, subacuta, 2 mm. longa,

Kanchanadit, 5 m., common in savannah, *Kerr* 13066.

Ramuli volubiles, primo densius pilosi, mox pilosi, cortice brunneo-rubro obtecti, fistulosi. *Folia* opposita, lanceolata vel oblongo-lanceolata, 3-6.5 cm. longa, 0.8-2 cm. lata, rigide chartacea rotundato-cuneata, 3-6.5 cm. longa, 0.8-2 cm. lata, rigide chartacea sicco supra viridia, subtus pallide viridia, supra fulvo-pilosa, subtus densius pallide pilosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 3-5 obliquis supra parum impressis subtus subprominentibus, petiolo brevi densius piloso suffulta; stipulae 4-fidae, demum reflexae, ad 5 mm. longae. *Umbellae* terminales, per tres dispositae, pedunculo communi circa 7 mm. longo indumento ei ramulorum simili tecto suffultae; pedicelli saltem 2 mm. longi, pubescentes; flores luteo-albi (ex Kerr). *Receptaculum* 1 mm. longum, pubescens. *Calycis* dorso pubescentis tubus recurvi, 2 mm. longi, 1 mm. lati, intra pubescentes. *Corollae* tubus 2 mm. longus, utrinque glaber, lobi 4, lanceolato-lineares, 4.75 mm. longi, 1 mm. lati, dorso sparse hirsuti, intra inferne dense pilosi. *Stamina* 4, filamentis ad corollae tubi apicem affixis 1.5 mm. longis intra dense pilosis, antheris paulo ultra 1 mm. longis. *Discus* pilis brevibus erectis dense coronatus. *Stylus* fere 6 mm. longus, pilis albis oblique erectis hirsutus; stigmata duo, circa 1.25 mm. longa.

Kaw Chang, Klawng Mayom, near sea-level, scrub by stream, Kerr 6870.

Herba annua, caule erecto 8–23 cm. alto simplice vel apice tantum ramoso tetragulare glabro vel iuventute parcius breviter hirsuto sicco viridi. *Folia* opposita, oblique erecta, inferiora saepe ovata, superiora saepissime oblongo-oblancoolata vel spatulata, apice obtusa, basi cuneata vel rotundato-cuneata, 5–12 mm. longa, 2–4.5 mm. lata, rigide chartacea, sicco viridia vel parum lutescentia, glabra, costa supra parum impressa subtus prominente, nervis

lateralibus utrinque circa 3 obscuris inferioribus saepissime conspicue obliquis, sessilia; stipulae persistentes, foliis similes sed interdum pauci-lobulatae et multo minores, saepissime circa 2 mm. longae. *Cymae* caulem terminantes vel saepissime etiam ramulos breves ex axillis superioribus oreuntes terminantes, dichasia mox divaricata usque ad 2 cm. longa et 5 cm. diametro formantes; pedicelli sub anthesin 1-1.5 mm. longi; bracteae pedicellis subaequilongae vel iis paulo longiores. *Receptaculum* circa 0.5 mm. longum, conspicue longius puberulum vel brevius pubescens. *Calycis* segmenta 4, ovato-lanceolata, subacuta, 1 mm. longa, 0.5 mm. lata, dorso medio subcarinata, glabra. *Corolla* pallide punicea (ex Kerr), extra superne breviter pubescens; tubus 2.5 mm. longus, intra superne pilosus; lobi circa 2 mm. longi. *Antherae* 4, circa 0.5 mm. longae, subsessiles, inclusae, fere ad corollae tubi medium affixae. *Stylus* gracilis, 3.5 mm. longus, glaber, stigmatibus linearibus circa 0.5 mm. longis. *Fructus* mox plus minusve glabrescens, circa 2.25 mm. diametro, septicide dein loculicide dehiscens.

Nakawn Panom, Ta Uten, 200 m., open grassy ground, Kerr 8456.

Hedyotis Ridleyana Craib [Rubiaceae-Hedyotideae]; ab affini *H. capitellata* Wall. ex G. Don receptaculo cum calyce haud glabro recedit.

Ramuli volubiles (ex Kerr), primo prope nodos praecipue in sulcis pubescentes, mox glabri, sicco virides vel olivacei, ad 1.5 mm. diametro. *Folia* lanceolata, late lanceolata, vel oblongo-oblan-ceolata, apice acute attenuato-subacuminata, basi cuneata, 5-10 cm. longa, 1.3-2.8 cm. lata, chartacea, sicco supra viridia, subtus pallide viridia, pagina utraque breviter subsparsa setulosa, nervis lateralibus utrinque 4-5 obliquis cum costa supra impressis subtus prominentibus, nervulis subobscuris, petiolo usque ad 5 mm. longo suffulta; stipulae ad 4 mm. longae, pauci-fimbriatae et pinnatim lobulatae, fimbriis et lobulis glanduloso-terminatis. *Capitula* per 3 vel 5 disposita, axillaria vel terminalia, pedunculo ad 1.5 cm. longo subhirsuto suffulta, sub anthesin ad 1.4 cm. diametro, densiflora; flores sessiles vel pedicello ad 0.75 mm. longo suffulti, dimorphi. *Receptaculum* ad 1 mm. longum, parce pilosum. *Calycis* dorso parce pilosi tubus circa 0.5 mm. longus, lobi 4, sub anthesin recurvi, lanceolati, acuti, vix 2 mm. longi, 0.75 mm. lati. *Corollae* tubus ad 1.5 mm. longus, glaber, lobi 4, lineares, 4 mm. longi, circa 0.8 mm. lati, dorso glabri, intra medio inferne dense pilosi. *Stamina* 4, filamentis ad corollae tubi apicem affixis 2 mm. vel 3.5 mm. longis superne glabris intra basem versus dense pilosis, antheris paululo ultra 1 mm. longis. *Discus* glaber. *Stylus* 2 mm. vel 4.5 mm. longus, glaber; stigmata duo, mox recurva, papillosa.

Ranawng, La-un, 50 m., bamboo forest, Kerr 16458.

Hedyotis sarmentosa Craib [Rubiaceae-Hedyotideae]; ab affini *H. venosa* Korth. ramulis gracilibus, foliis angustis minoribus, floribus paucioribus inter alia recedit.

Fruticulus sarmentosus, ramulis fistulosis ad 2.5 mm. diametro cortice cinereo-brunneo obtectis, lenticellis haud conspicuis, novellis pilis albis nitidis brevibus dense tectis. *Folia* lanceolata, apice longius angustata, summo apice costa excurrente apiculata, basi attenuato-cuneata, 2.5-4 cm. longa, 0.5-0.8 cm. lata, sat rigida, sicco supra viridia, subtus pallide viridia, pagina superiore pilis brevibus crassis rigidis et inferiore ad costam nervosque laterales pilis similibus scabridula, nervis lateralibus utrinque 5-7 obliquis supra subobscuris vel parum impressis subtus prominulis, nervulis obscuris, margine recurva, petiolo circa 3-5 mm. longo indumento ei ramulorum simili instructo supra canaliculato suffulta; stipulae ad 4 mm. longae, in segmenta subulata 3-5 puberula divisae. *Glomeruli* axillares. *Receptaculum* breve, puberulum. *Calyx* in segmenta 4 linearia 1.75 mm. longa puberula ciliata fere ad basem divisus, dentibus parvis inter segmenta additis. *Fructus* indehiscens, subglobosus, puberulus, calyce persistente coronatus, seminibus loculo quoque 3-4 brunneis angulatis foveolatis.

Nan, Doi Pu Ka, 1500-1600 m., common in evergreen forest, Kerr 4941.

Chasalia chartacea Craib [Rubiaceae-Psychotrieae]; a *C. ophioxyloide* (Wall.) foliis pro longitudine angustioribus, inflorescentia brevior, filamentis longioribus recedit.

Frutex circa 1.5 m. altus (ex Kerr); ramuli primo parce puberuli, cito glabri, iuniores sicco fusci, mox substraminei, teretes, ad 3 mm. diametro. *Folia* oblonga, oblongo-lanceolata, vel oblongo-oblan-ceolata, obtuse acuminata, basi cuneata, interdum parum oblan-ceolata, obtuse acuminata, 9-17 cm. longa, 3-5.5 cm. lata, chartacea, sicco iuniora fusca, matura viridia, subtus pallidiora, glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8 intra marginem anastomosantibus supra conspicuis vel subprominulis subtus subprominulis, nervis transversis paucis supra conspicuis subtus subprominulis, integra, petiolo 0.5-2 cm. longo glabro supra canaliculato suffulta; stipulae circa 3 mm. longae, saepissime communi ad 1.8 cm. deciduae. *Inflorescentia* terminalis, pedunculo communi ad 1.8 cm. longo incluso 4 cm. longa, 4 cm. diametro, interdum etiam inflorescentia utrinque 2 inferioribus 8 mm. longis, pedunculis puberulis; flores multo minore ex axillis supremis orta, pedunculis puberulis; flores albi, luteo-oculati (ex Kerr), sessiles vel interdum pedicello brevi suffulti. *Receptaculum* circa 1 mm. longum. *Calyx* vix 0.5 mm. longus, truncatus vel irregulariter lobulatus. *Corollae* tubus circa 1.3 cm. longus, extra glaber, intra ad filamentorum insertionem pauci-pilosus, lobi 5, circa 2 mm. longi et 1.25 mm. lati. *Stamina* 5; filamenta 2.5 mm. longa, circa 1 cm. supra corollae tubi basem inserta; antherae lineares, 2 mm. longae, parum exsertae. *Discus* carnosus, calyce paululo longior. *Ovarium* biloculare, ovulis solitariis erectis. *Fructus* fuscus, glaber, 6 mm. diametro.

Yanyao, 50 m., evergreen forest, Kerr 18175.

Chasalia membranacea Craib [Rubiaceae-Psychotrieae]; a *C. ophioxylode* (Wall.) foliis membranaceis recedit.

Frutex circa 0.75 m. altus (ex Kerr), glaber; ramuli teretes, sicco fusco-virides, ad 2.5 mm. diametro. *Folia* lanceolata, oblongo-lanceolata, vel late oblanceolata, apice obtuse subacuminata, basi cuneata vel subacuminata, 10-18 cm. longa, 2.5-4.5 cm. lata, membranacea, sicco supra fusco-viridia, subtus pallide viridia, nervis lateralibus utrinque 8 supra conspicuis subtus subprominentibus intra marginem anastomosantibus, nervulis paucis inter se distantibus pagina utraque subconspicuis, margine integra, petiolo subgracili 7-15 mm. longo suffulta; stipulae oblatae, breves, parte basali diu persistente. *Inflorescentia* terminalis, pedunculo communi 1-2 cm. longo incluso 3-4 cm. longa, pedunculis partialibus circa 5 mm. longis pro genere paucifloris, floribus albis (ex Kerr) sessilibus. *Receptaculum* 1.5 mm. longum. *Calyx* circa 0.5 mm. longus, apice denticulatus. *Corollae* tubus 1.8 cm. longus, glaber, lobi 5, oblongi, apice rotundati vel obtusi, ad 5 mm. longi et 2.25 mm. lati, glabri. *Stamina* bene inclusa, filamentis 1.5 mm. longis 7 mm. supra corollae tubi basem affixis, antheris linearibus 3.25 mm. longis. *Discus* calyce conspicue longior, carnosus. *Ovarium* biloculare, ovulis solitariis erectis.

Nakawn Sritamarat, Kao Luang, 1100 m., evergreen forest, Kerr 15475.

Chasalia microphylla Craib [Rubiaceae-Psychotrieae]; a speciebus aliis foliis parvis distinguenda.

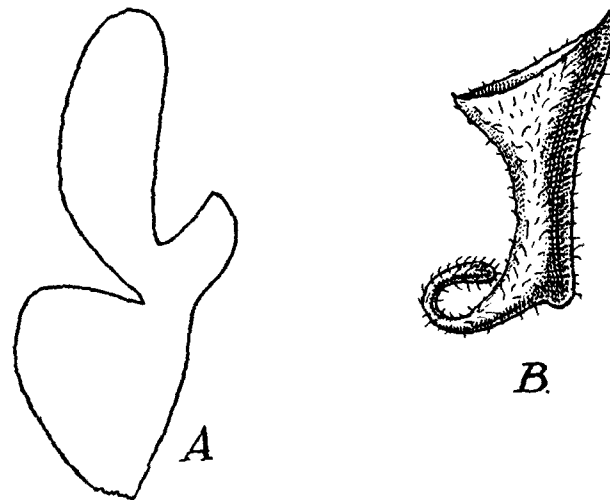
Frutex circa 1.5 m. altus; ramuli graciles, usque ad 2 mm. diametro, ob stipulas persistentes conspicue nodosi, glabri, iuventute sicco fusci, demum cinerei. *Folia* oblanceolata lanceolatave, apice acuminata, acuta, basi cuneata, usque ad 6 cm. longa et 1.6 cm. lata, sicca supra plus minusve fuscescentia, subtus pallide viridia, glabra, nervis lateralibus utrinque 5-7 intra marginem anastomosantibus pagina utraque subprominentibus, margine integra, petiolo 4-7 mm. longo supra canaliculato suffulta; stipulae circa 2 mm. longae, apice bifidae, cito stramineae, parte inferiore saltem diu persistente incrassata. *Inflorescentia* terminalis, pedunculo communi 5 mm. longo suffulta, foliis brevior, cymosim trifurcata, pedunculis partialibus circa 3 mm. longis glabris vel parce puberulis cymulam trifloram gerentibus, floribus albis (ex Kerr) sessilibus vel pedicello fere 2 mm. longo suffultis. *Receptaculum* 1.5 mm. longum, glabrum. *Calycis* tubus 0.5 mm. longus, lobi 5, deltoidei, acuti, fere 1 mm. longi, glabri. *Corollae* tubus inferne parum curvatus, 9 mm. longus, extra glaber, intra supra staminum insertionem pauci-pilosus, lobi 5, suboblongi vel lanceolato-oblongi, obtusi, ad 3.5 mm. longi et 1.75 mm. lati. *Antherae* parum exsertae, lineares, 2.5 mm. longae, filamentis 3 mm. longis 6 mm. supra corollae tubi basem insertis. *Discus* carnosus, calycis tubo paululo longior. *Stylus* 8 mm. longus, lobis duobus 2.5 mm. longis; ovarii loculi 2, ovulis solitariis erectis.

Nakawn Sritamarat, Kao Luang, 1600 m., evergreen forest, Kerr 15520.

XLI.—PLANTS NEW TO ASSAM: III.*

Impatiens cothurnoides C. E. C. Fischer sp. nov. [Balsaminaceae]; ab *I. Wattii* Hook. f. foliis oppositis, sepalis 2, pedunculis pedicellis floribusque hirsutis differt.

A herb about 2 ft. high. *Stem* stout, almost woody, branched, brown, sulcate, glabrous below, brown-furfuraceous at the ends of the branchlets, as are the peduncles, pedicels and bracts. *Leaves* opposite and ternate, membranous, linear-elliptic, tapering to a subacute apex, base decurrent on the petiole, sparsely hairy on the midrib and nerves on both faces, midrib prominent below, primary nerves 9-10 pairs ascending at a narrow angle, margins regularly denticulate; petioles very short. *Peduncles* axillary, solitary, slender, 0.2-1.4 cm. long, bearing an umbel of 2-4 primrose-yellow flowers at the apex; pedicels slender, 0.5-1 cm. long; bracts at the base of the pedicels lanceolate, acute, 3 mm. long. *Buds* excluding the spur sub-globose, hairy. *Sepals* 2, falcate-lanceolate, acute, 5 mm. long, green, sparsely furfuraceous-puberulous. *Standard* suborbicular, concave, 8 mm. in diameter, dorsally shortly hairy. *Wings* about 2 cm. long, 2-lobed; distal lobe oblong, rounded, 1.2 cm. long, 4.5 mm. wide, with a well-developed, cuneate, rounded auricle 3-4 mm. long; basal lobe rounded, 8-9 mm. long. *Lip* 1.2 cm. long excluding the spur, shaped like a cavalier riding-boot with mediaeval toe, mouth oblique, acute, shortly saccate at the posterior base, the anterior extremity produced into an upwardly recurved blunt spur nearly 1 cm. long, shortly furfuraceous-hairy, the hairs longer near the apex of the spur. *Capsule* linear-fusiform or slightly clavate, acute, about 1 cm. long, glabrous. *Seeds* pyriform, strongly curved, 1 mm. long, rugulose, papillose.



Impatiens cothurnoides C. E. C. Fischer. A, wing $\times 3\frac{1}{2}$. B, lip $\times 3\frac{1}{2}$.

*Continued from K.B. 1930, p. 241.

Garó Hills, Gauchi, 1000 ft.; flowers and fruit Nov., Mrs. N. E. Parry 873, "Growing on river banks." Garó name, *Mirimbok*; Lushai name, *Hmehzial*; Lakher name, *Radong*.

***Sterculia euosma* W. W. Smith** [Sterculiaceae].

Known from Yunnan.

Mishmi, Delei Valley, 2000 ft., flowers March, *Kingdon Ward* 7992. Agrees well with the typical plant, but the leaves are a little longer (up to 28 cm. long, 14 cm. wide, petiole 8 cm.) and the flowers are stated to be coral- or brick-red and inodorous.

***Scaphium Wallichii* Schott & Endl.** [Sterculiaceae].

Reported from Tenasserim and the Malay Peninsula.

S. Lushai Hills; a single fallen fruit found by Rev. W. J. L. Wenger. The Lushais say they know the tree, which occurs in the forest. The fruit is unmistakable, and it is highly improbable that it could be found otherwise than naturally in such a locality.

***Elaeocarpus dubius* A. DC.** [Elaeocarpaceae].

Described from Indo-China.

Mishmi, Delei Valley, 3000-4000 ft., flowers April, *Kingdon Ward* 8125, "Small tree growing on a precipitous well-wooded slope in a jungle-filled ravine. Glands of disc orange."

***Allophylus longipes* Radlk.** [Sapindaceae].

Hitherto known only from Yunnan.

Garó Hills; Tura mountain, 4000 ft., fruit Nov., Mrs. N. E. Parry 854. Garó name, *Masugingsep*. The thyrses are hardly compound, but otherwise precisely as in Yunnan specimens in Herb. Kew.—probably a reduced form or a variety.

***Buchanania acuminata* Turcz.** [Anacardiaceae].

Known from Burma, Siam and the Malay Peninsula.

S. Lushai Hills, 2500-2700 ft., flowers March, fruit July, W. J. L. Wenger 301, "In forest, a large spreading tree rather resembling the Mango tree; densely flowered."

***Swintonia floribunda* Griff.** [Anacardiaceae].

From Islands off Mergui.

Chittagong Hill Tracts, *King's Collector* 254; S. Lushai Hills, a single fallen fruit picked up by Rev. W. J. L. Wenger.

***Chasalia lushaiensis* C. E. C. Fischer** comb. nov. [Rubiaceae].

This species was published in *K.B.* 1928, p. 141. It was, however, wrongly attributed to the genus *Gaertnera* and is actually in close affinity with *Chasalia curviflora* Thw.

In the *Flora of British India*, iii. 176, the following nos. of the Wallich Catalogue are quoted under the last-named species: 6164, 8360, 8361, 8363, 8364, 8375, 8386, 8390 and 8461. These appear to comprise more than one species and a revision of the genus is desirable.

* The specimen now under consideration (*Parry* 180 from the Lushai Hills) differs from all these, more particularly in the shape and venation of the leaves, the narrowed cyme and the bracts. Nor is it *Psychotria lurida* Bl. The species should, therefore, be transferred to the genus *Chasalia* as *Chasalia lushaiensis*.

***Jasminum Wengeri* C. E. C. Fischer** sp. nov. [Oleaceae];

J. decussato Wall. affine, inflorescentia compacta, lobis calycinis haud revolutis, corolla multo longiore lobis tubo multo brevioribus differt.

Shrub (climbing?). *Branchlets* terete, patently brown-hairy. *Leaves* simple, ovate to ovate-lanceolate, apex attenuate, acute, base rounded or emarginate, 3.5-6.5 cm. long, 1.8-3.5 cm. wide (only those near the ends of the branchlets seen), brown-hairy on both surfaces, more densely so on the ribs and nerves, ribs 3-5 sub-palmate from the base, with 2-3 pairs of nerves from the midrib, arching and anastomosing, margins more or less undulate, brown-ciliate; petioles 4-7 mm. long, shaggy with brown hairs. *Cymes* terminal and from the upper axils, trichotomous, compact, shorter than the leaves; peduncle short, densely brown-hairy. *Calyx* 5-6 mm. long, longer than the shaggy pedicels, greenish-tawny-tomentose (when dry), lobes 5, linear, subacute, nearly as long as the tube, erect or nearly so, sinus narrow. *Corolla*-tube slender, 1.5-2.8 cm. long, slightly widening upwards, glabrous; lobes usually 6, narrowly elliptic, acute, 6-8 mm. long, glabrous. *Stamens* a little below the throat of the corolla, 1.7 mm. long; anthers apiculate. *Fruit* not seen.

S. Lushai Hills, 3500 ft., flowers August 1927, Rev. W. J. L. Wenger without number (Herb. Kew. and Herb. Calc.).

***Gelsemium elegans* Benth.** [Loganiaceae].

Known from China, Upper Burma, Indo-China and Malay Islands.

Manipur, Barak, 9000 ft., flowers Nov., C. B. Clarke 42252A; Assam, without precise locality, *King's Collector* without number; S. Lushai Hills, Tuizenhnar, 4000 ft., flowers Oct., Mrs. N. E. Parry 322. Lushai name, *Hnamtur*.

***Pedicularis corymbosa* Prain** [Scrophulariaceae].

Discovered in Upper Burma.

Lushai Hills, Champhai, 5000 ft., flowers Oct., Mrs. N. E. Parry 340, "Flowers pale-mauve turning to purple."

***Mantisia Wengeri* C. E. C. Fischer** sp. nov. [Zingiberaceae];

M. saltatoriae Sims affinis, scapo brevior, bracteis bracteolisque luteis suborbicularibus glanduloso-punctatis, rhacheos ramulis fere a basi flores dissitos omnino luteos ferentibus, calyce glanduloso-punctato differt.

Herb; rhizome short; roots numerous, sometimes somewhat tuberous, up to 10 cm. long; rootlets wiry, much branched. *Stem*

succulent, up to 1 m. high, completely enclosed in the overlapping leaf-sheaths. *Leaves* alternate, bifarious, the lowest 3 or 4 reduced to sheaths, the basal very short, the others lengthening upwards, the next 1 or 2 bearing short ovate or elliptic acute blades; blade narrowly lanceolate, finely caudate-acuminate, base narrow, sometimes unequal, sessile, 8–20 cm. long, 2–3.5 cm. wide, midrib slightly raised below, nerves parallel arising at a very acute angle from the midrib and meeting an intramarginal vein very close to the very narrowly cartilaginous, slightly undulate margin, primary nerves about 7 on either side in a cross section, face glabrous or with a few scattered, short, whitish hairs on the nerves above, both sides densely and minutely white-dotted (glands?); sheaths of normal leaves about as long as the blades, open down one side, the exposed portion ribbed and minutely sparsely puberulous, margins scarious; ligule 4–5 mm. long, bifid with a wide sinus, minutely ciliate. *Scapes* appearing before the leaves, radical, 1.5–3 cm. long, clothed in imbricating membranous, orbicular, gland-dotted, minutely ciliate scales 0.6–1.5 cm. long, increasing in size from the base upwards, lower strongly veined and densely puberulous, uppermost with indistinct veins and nearly glabrous, apex rounded or with a short triangular cusp. *Panicles* erect or decumbent with erect branches, 5–16 cm. long. *Rhachis* glabrous or minutely sparsely puberulous, branches bearing flowers from near the base. *Bracts* at the forks very thin, suborbicular, yellowish-green, more or less gland-dotted, 1–1.3 cm. long, glabrous or minutely puberulous. *Bracteoles* similar, 5–8 mm. long, sparsely and minutely brown gland-dotted. *Calyx* narrowly funnel-shaped, greenish-yellow, 7–8 mm. long, teeth 5, blunt, shallow, glabrous, minutely gland-dotted. *Corolla* yellow; tube very slender, straight or curved, slightly enlarged at the mouth, more than twice the length of the calyx, white-puberulous; limb 3-partite, upper segment erect, compressed boat-shaped, apex rounded, 5 mm. long, embracing the base of the filament, 2 lower divaricate, broadly triangular, rounded or acute, 4.5 mm. long. *Lip* narrowly cuneate, 1.3–1.5 cm. long, more or less deeply bifid, lobes rounded. *Stamen* narrowly linear, finely acuminate staminodes 0.8–1.3 cm. long just above the apex of the upper corolla segment; anther with a short oblong wing on either side. *Ovary* oblong, 4.5 mm. long. *Fruit* subglobose, pericarp papery; seeds numerous, oblong, slightly compressed, acute, glabrous, brown, 1.5 mm. long.

S. Lushai Hills, 3500–4000 ft., flowers April–May, fruit May, W. J. L. Wenger 306.

This species appears to be intermediate between *M. saltatoria* Sims and *M. spathulata* Schult. It differs from the latter in the smaller leaves with much shorter ligule, the much less pubescent rhachis of the panicle, the much longer linear instead of spatulate staminodes and the yellow suborbicular bracts and bracteoles. It would not be surprising to find that it is a hybrid between the two;

in general appearance it resembles *M. spathulata* more than the more elongate *M. saltatoria*. *M. spathulata* is sometimes very pale but the bracts and bracteoles are apparently always somewhat purple. The present species was found in association with *M. saltatoria* on rock-faces in the shade near streams.

XLII.—MISCELLANEOUS NOTES.

***Eucalyptus patellaris*.**—In a collection of plants made by Mr. C. E. F. Allen in North Australia specimens of a very unfamiliar Eucalypt were included which have been determined as *Eucalyptus patellaris* F. Muell. Mueller collected specimens of this species on the Upper Roper River in North Australia on 3rd July, 1856, when he was with Gregory's North-West Expedition. The species was described from these specimens, the original description being in the Journal of the Linnean Society, iii. 84 (1859). Commenting on the plant J. H. Maiden (Critical Revision Genus *Eucalyptus*, iv. 257, 1920) states: "The only specimen which appears to have been preserved and which is at Kew. . . .". It may be pointed out that the general collections made by Mueller in North Australia are better represented at Kew than in the Melbourne Herbarium, and Bentham in the introduction to the Flora Australiensis states that Mueller at that time preferred to send his rare specimens to Kew rather than to retain them in the Herbarium under his charge.

The specimens at Kew consist of two small sterile branchlets, a detached flower and a detached capsule. The flower, capsule and parts of the branchlets are figured by Maiden in Plate 163, vol. iv. of his Critical Revision.

Mr. Allen collected his specimens at Mataranka Station in August, 1922, and he remarks that it is "a bloodwood, a large tree." As the original specimens are so fragmentary, a few notes on Mr. Allen's specimens No. 683 are appended.

The fragments of the outer dead bark are hard, wavy-grained, dark brown internally and light grey externally. The leaves attain 22 cm. in length and 2 cm. in breadth. The inflorescences have evidently been in panicles 5–10 cm. long; the angular pedicels of the capsules are 6–8 mm. long; the almost bell-shaped capsules are 8–10 mm. long and about 8 mm. in diameter at the apex; the rim of the capsule attains 2 mm. in thickness and the 4 protruding valves are conspicuous.

W. D. FRANCIS.

The habitat of *Patersonia macrantha*.—The collection of a species of *Patersonia* in Arnhem Land, North Australia, by Dr. Herbert Basedow, raises some important questions concerning the distribution of this genus in Australia. *Patersonia*, which belongs to the family Iridaceae, is limited to Australia and the islands to the north of it. The species of the genus are conspicuous plants in the landscape of the regions where they grow on account of their large,

bibracteate inflorescences and delicate, evanescent corollas, which are often coloured blue.

Dr. Basedow's specimens, no. 140, so closely resemble *Patersonia macrantha* Benth. (Fl. Austral. vi. 407, 1873) that they are specifically scarcely separable from it. They differ from the type, however, in possessing a denser indumentum on parts of the leaves and some hairs on the style. In other respects the specimens in each instance are well matched.

Bentham gives the Darling Range as the habitat and Collie as the collector of the original material, and the type is the only specimen of the species in the Kew Herbarium. The Darling Range is in the south-western portion of Western Australia. The sheet bearing the type specimen is inscribed "Armstrong, Port Essington," in Sir W. J. Hooker's handwriting. This inscription is crossed out and Bentham has written a note: "probably Darling Range, Collie (the loose scape was with the Darling Range [*P. occidentalis*])."

Considering the close similarity of Basedow's specimens to the type and the correspondence in geographical distribution in each instance, it appears almost certain that the original inscription indicating Port Essington as the locality and Armstrong as the collector of *P. macrantha* is correct.

The explanation of Bentham's scepticism as to the locality is probably to be found in the fact that the other known species were confined to the south-western, southern and extreme eastern parts of the Continent. The definite record of a species in Arnhem Land is of considerable interest as this region is far distant from the known locations of the other Australian species.

Since the publication of *Flora Australiensis* three species of *Patersonia* have been found outside Australia. Two of these were described by Dr. Stapf from Borneo and one by Miss Gibbs from New Guinea. The Arnhem Land species is intermediate, in a geographical sense, between the large group of extra-tropical Australian species and the New Guinea and Bornean species.

W. D. FRANCIS.

International Horticultural Congress, 1930.*—The ninth International Horticultural Congress was held by invitation of the Royal Horticultural Society in London from the 7th to 15th of August, 1930. The Report and Proceedings now issued contains the official account of the speeches and resolutions, a list of members, and the papers read. The latter are printed sometimes *in extenso*, sometimes as abstracts. The papers and discussions were divided into three groups; those dealing with propagation, with pomology, and with tropical and subtropical horticulture. The Report is well produced and freely illustrated. It is impossible to refer in a short note to all

* Report and Proceedings of the IX International Horticultural Congress, 1930. Published by the Royal Horticultural Society, London, pp. 450. Price 15/-. It is understood that only a limited number of copies of the Report are available.

the papers presented. Many of them are of practical or specialist importance, but the following may be mentioned as of particular botanical interest: "Studies in Sterility," by Mr. M. B. Crane and Mr. W. J. C. Lawrence; "Anatomical Structure of Woody Plants in relation to Vegetative Propagation," by Dr. H. A. A. van der Lek; "Vegetative Propagation from the Standpoint of Plant Anatomy," by Prof. Priestley; "Somatic Mutations in Potatoes," by Dr. R. N. Salaman; "Graft Hybrids and the Induction of Polyploids in *Solanum*," by Dr. F. W. Sansome; "The Interrelations between Vegetative Propagation and Seed Reproduction," by Dr. A. B. Stout; "Ueber Xenien bei Leguminosen," by Prof. Tschermak-Seysenegg; and "The Wild Progenitors of Fruit Trees in Turkestan and in the Caucasus," by Dr. N. I. Vavilov.

W. B. T.

Trees of Northern Bengal.*—Dr. and Mrs. Cowan have accomplished a very useful work in bringing up to date the "List of Trees, etc., found in the Darjeeling District," first issued by the late Mr. J. S. Gamble in 1878, with a second edition in 1895. The original list was confined to the Darjeeling and Jalpaiguri Forest Divisions; the present volume comprises the Kurseong, Kalimpong, and Buxa Forest Divisions as well. With the lapse of time, bringing additional investigation, a considerable number of species has been added to the known flora of the tract. Mr. Gamble's second edition listed 950 species of flowering plants and 12 ferns, the volume under consideration lists 1310 phanerogams and 15 ferns.

The plan of the original work has been adhered to, but further information and an enlarged vernacular nomenclature have been added. The collections and notes made by the authors in the field, when Dr. Cowan was serving as a Forest Officer in the locality, have been drawn upon, but much of the taxonomic work was done at the Kew Herbarium and a graceful acknowledgment is made of the assistance given in person by Mr. Gamble.

C. E. C. F.

Icones Filicum Sinicarum.†—This volume, which is a Chinese production throughout, is the first of a series which will in time include illustrations and descriptions of every fern found in China. The species illustrated in the first part are fifty in number and are taken at random from twenty-seven genera. The illustrations, which are line drawings, are definitely in the first class, though one could wish that the block makers had taken a little more care in their preparation. The artist responsible, whose name is omitted, has

* "The trees of Northern Bengal, including shrubs, woody climbers, bamboos, palms and tree ferns," by A. M. Cowan and J. M. Cowan. Published by the Bengal Secretariat Book Depot, Calcutta, 1929, pp. 178. Price R. 1-12 or 3s.

† *Icones Filicum Sinicarum*. Fasc. 1, by Hsen Hsu Hu, and Ren Chang Ching. The Metropolitan Museum of Natural History, Academia Sinica, Nanking, and the Fan Memorial Institute of Biology, Peiping, 1930, pp. vi + 102, 50 plates.

produced drawings which would be hard to excel. As the book is a quarto the plants are illustrated natural size, whilst there are many excellent details drawn to a larger scale.

The text, for which Mr. Ching is largely responsible, is in English and Chinese, and we understand that every drawing has been prepared from the type or the type number of the respective species.

The most interesting fern illustrated is probably *Cheiropleuria bicuspis* (Bl.) Presl, which appears on Plate 50. This genus had been quite unknown in China prior to its discovery in 1928 by Mr. Ching, who found it in N. Kwangsi on a limestone cliff.

The volume is so bound that on the completion of the series it will be a simple matter to break up the parts and reassemble the species under genera.

F. B.

Flora of West Tropical Africa.*—The first part of volume ii of this Flora was published in March, 1931. It consists of 292 pages and text-figures 178-277, and deals with all the West African *Gamopetalae*, beginning with *Ericaceae* and ending with *Labiatae*. The family *Rubiaceae* is represented by 73 genera and over 400 species and occupies nearly a quarter of the part. *Compositae* has 72 genera but is represented by a much smaller number of species than *Rubiaceae*. Most of the remainder of the families were elaborated in the later volumes of the general Flora of Tropical Africa, and these do not show much increase in the number of species, the few novelties being mainly from the collections of Dr. A. Chevalier in French West Africa, and of Dr. J. Mildbraed in the British Cameroons. In addition to Mr. Trevithick's drawings, others have been prepared for this part by Miss Ross-Craig, and as usual they have been very well reproduced. Volume ii, part ii, now in preparation, will deal with the *Monocotyledons* and will complete the Flora.

Kew Bulletin, General Index.—A general Index to the *Kew Bulletin* for the years 1919-1928 has been published, price 2s. The work forms Appendix IV to the *Bulletin* for 1930, but it is separately paged and will not be bound up with the volume. The new publication and *K.B.* Additional Series XI form a complete Index covering the *Bulletin* from its commencement in 1887 up to the end of 1928.

**Flora of West Tropical Africa.*—By J. Hutchinson and J. M. Dalziel. To be completed in four parts. Vol. i, parts 1 and 2; vol. ii, part 1; 8s. 6d. each part. The Crown Agents for the Colonies, 4, Millbank, London, S.W.1.

BULLETIN OF MISCELLANEOUS INFORMATION No. 6 1931 ROYAL BOTANIC GARDENS, KEW

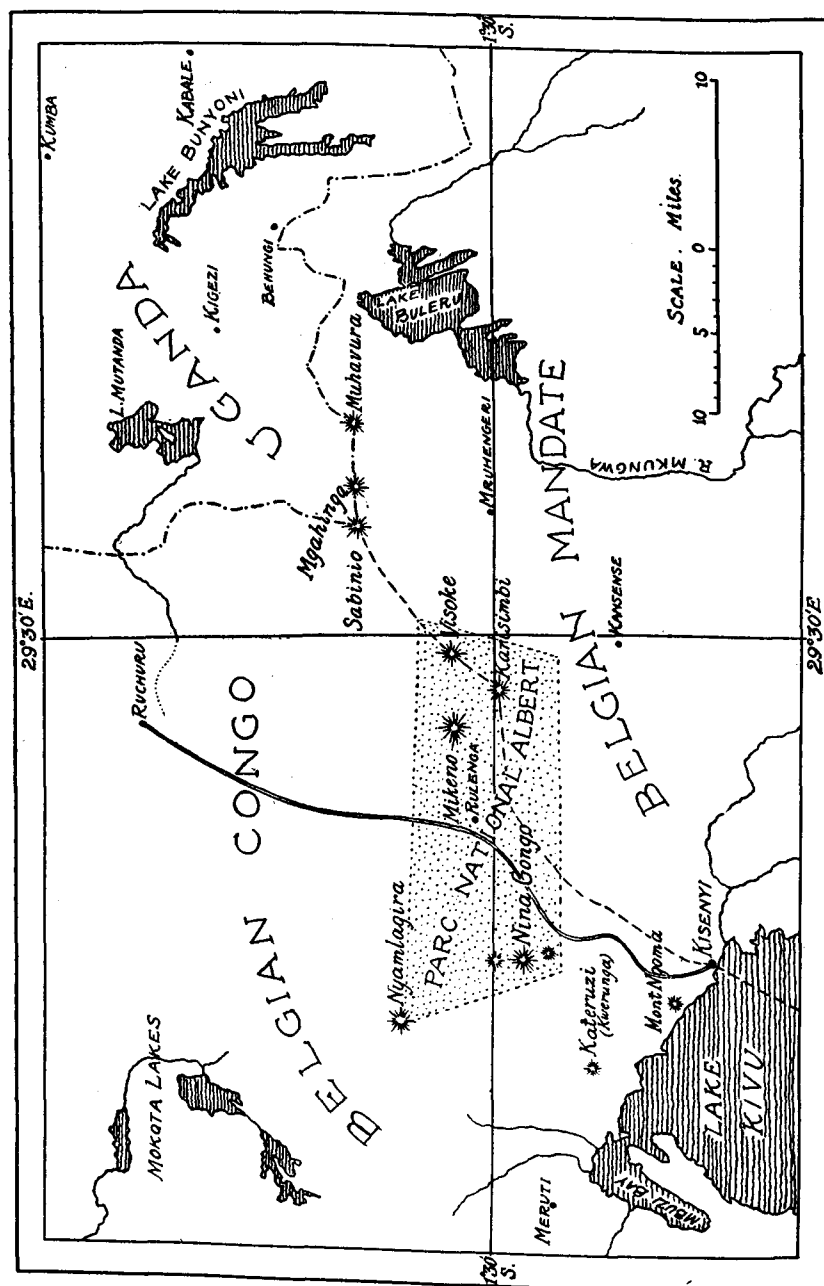
XLIII.—THE ARBORESCENT SENECIOS OF THE VIRUNGA MOUNTAINS. A. D. COTTON.

Since the original description by Oliver 47 years ago of a tree *Senecio*, discovered by Sir Harry Johnston on Kilimanjaro, not more than six gatherings of this remarkable group of plants, up to the end of 1929, had been received at Kew direct from collectors in the field. The publication of a new species in the *K.B.*, 1930, p. 97, appears to have aroused fresh interest, for during the last twelve months several important collections have been forwarded to Kew for identification.

Two of the gatherings in question were from Mt. Elgon, from Mr. H. M. Gardner and Mr. L. C. C. Liebenberg, and a third was from Mr. J. D. Snowden, who, during an expedition to the Kigezi District in the extreme south-west of Uganda, gathered a fine series of specimens on the mountain of Muhavura in the Virunga Range. Very valuable material has also been received from Mr. B. D. Burt from Kilimanjaro and from the Virunga Mountains. Mr. Gardner's plant is possibly a new species and further material is desired. Mr. Liebenberg's specimen proved to be *S. elgonensis*, a little known species which, though often seen by travellers, is apparently represented in European herbaria by two collections only, namely that of R. A. Dummer (the type gathering), and of J. D. Snowden, both from Mt. Elgon on which it is endemic as far as is known.

Mr. Snowden's recent specimen from Muhavura proves to belong to an even less known species, the flowers of which had not been previously collected, the name of the species indeed having been based on a single leaf brought back by Dr. J. Mildbraed from the same group of mountains in 1907, and preserved in the Berlin Herbarium. The plant proves to be a most distinct species, and now that ample and flowering material is available it is desirable to complete the description.

The mountain of Muhavura is situated at the eastern end of the group of volcanoes in the Kingdom of Ruanda, known as "Mufumbiro" or the Virunga (or Birunga) Volcanoes. This region, which previously was partly in German East Africa, is now in the Congo Mandated Territory and the Belgian Congo, Muhavura, the particular summit ascended by Mr. Snowden, being on the boundary between the former territory and Uganda.



The Virunga Mountains are of such exceptional interest that a statement as to their origin and importance will not be out of place. They form a range, including eight large volcanoes, which during tertiary times was thrown up across the floor of the western branch of the Great Rift Valley, namely the branch known as the Great Divide or the Tanganyika-Nile-Rift. The mountain-mass thus formed acts as a bridge across the deep fold which separates the grasslands of East Africa from the forests of Central Africa, and when the whole flora of Africa is more critically known a detailed study of this area should be worthy of special attention. These mighty eruptions are believed moreover to have formed a dam which separated the lakes of Albert Edward and Kivu, with the result that the waters of Lake Kivu now find their way to the Atlantic by way of Lake Tanganyika and the Congo River, instead of flowing through Lake Edward to the Nile and the Mediterranean.

The range consists of a western group of volcanoes, Nyamulagira,* 10,046 ft., and Nina Gongo, 11,386 ft.; a central group, Mikeno 14,540 ft., Karisimbi, 14,780 ft., and Visoke, 12,175 ft., and an eastern group, Sabinio, 11,960 ft., Mgahinga, 11,400 ft., and Muhavura, 13,547 ft. Nyamulagira and Nina Gongo are still active. The western part of the area was established by the Belgian Government in 1925 as the Parc National Albert, mainly for the preservation of the gorilla. The preserved area includes part of Nyamulagira, Nina Gongo, Karisimbi, Mikeno and Visoke (see map).

There is little scientific literature on the Virunga Mountains available and the following references include all those of botanical interest which have been traced. Graf von Götzen's volume on the German Expedition across the African Continent in 1903-4 provides the first accurate and scientific treatise on the Lake Kivu area (1). The Expedition was mainly concerned with matters other than botany, but this subject was not disregarded. An enumeration of 81 plants, preserved in the Berlin Herbarium, is included (p. 241). Although arborescent *Senecios* are not listed von Götzen refers (*l.c.* p. 241) to them as forming a belt below the summit of the active volcano Nina Gongo, which he was the first to ascend, and a specimen (No. 115) is to be found in the herbarium at Berlin.

The small volume by Wollaston on the Expedition to Ruwenzori in 1905-6 and his journey across the Congo Free State (2), although containing but few references to plants, is worthy of notice by reason of the chapter dealing with Lake Kivu and the volcano range.

In 1907, the Duke of Mecklenburg led his first great scientific expedition across Africa, the party including a botanist (Dr. J. Mildbraed), zoologist, geologist, ethnologist, and bacteriologist. The general results are summarized in the volume entitled *In the Heart of Africa* (3). A most interesting account devoted entirely to the volcano region and illustrated with a fine series of photographs of the wonderful craters is contained in chapter vi, and a

complete list of the plants collected is found in Mildbraed's treatise on the flora in the *Wissenschaftliche Ergebnisse der Expedition* (4). Two tree *Senecios* were recorded and were determined by Muschler, who dealt with the *Compositae*, as *S. Johnstonii* Oliver and *S. adnivalis* Stapf. In his later paper on the vegetation of the countries explored during the Expedition Mildbraed (5) devotes a section to the Virunga Volcanoes and summarizes and compares the vegetation of the four chief mountains Nina Gongo, Karisimbi, Sabinio and Muhavura (pp. 636-650), all of which he had ascended. He refers the species of *Senecio* on each mountain to the Ruwenzori plant, *S. adnivalis* Stapf. A similar account is found in the paper read before the Prussian Academy of Science (6).

The following extracts from the Duke of Mecklenburg's work are of interest as indicating the very extensive growth and development of these plants on the mountains in question. "The *Senecio Johnstonii* vegetation is extraordinarily developed on Karisimbi. It begins below the so-called south cone at an elevation of about 3400 metres as a candelabrum-branched tree about 10 metres in height, and extends up the cone for another 1000 metres, of which it is the sole inhabitant. . . . Below the summit it gives way to mosses, liverworts, and lichens, but we come across it again near the highest point in the shape of a few dwarfed specimens amongst snowflakes and the storm-tossed lava fragments which were studded with ice crystals at an elevation of 4500 metres" (3, p. 159; see fig., p. 162). With reference to Muhavura, on which Mr. Snowden collected, it is stated that in places which have been spared by recent lava floods the *Senecio* vegetation at the summit is developed quite typically. The plants "form a belt-like zone, a real primaeval forest of such density and amidst such a jumble of timber covered with dripping wet moss cushions that one can only work through it with considerable difficulty, often sinking up to the breast in over-grown clefts and hollows" (3, p. 163-4). Notes are also given in the same volume of the development of tree *Senecios* on two of the other volcanoes, namely Karisimbi and Mikenno. A summary of the vegetation and flora of these mountains as far as was known up to 1910 was provided by Engler (7).

Theo Kassner, the geologist, visited the Kivu area and ascended Nina Gongo during his journey from South Africa to Egypt. In his account (8) published in 1911, there are brief notes on the flora and there are at Kew some of the plants collected on the lava beds around Lake Kivu.

Another German expedition to East Africa was organised in 1911 and Hans Meyer's account of this journey (9), published in 1913, includes two chapters (iii and iv) on the Ruanda country. The plant collections were worked out by Mildbraed and a list of species is provided in chapter ix. No tree *Senecios* are included. A paper on the vegetation by the same botanist was published a year later (10).

The Swedish Rhodesia-Congo Expedition of 1911-12 also visited the Virunga Mountains. In his treatise (11) on the botanical results Professor R. E. Fries, who accompanied the expedition and ascended the mountain of Nina Gongo, records *S. Johnstonii* (p. 335). An account of the vegetation of this mountain with further notes on the *Senecios* was published later (12).

During the smaller Swedish Expedition which visited Kenya and Uganda in 1921-22, Professor R. E. Fries and Dr. Th. C. E. Fries explored particularly Mt. Kenya and the Aberdare Mountains. Up to this date the few Giant *Senecios* which had reached European herbaria were referred to *S. Johnstonii*, *S. adnivalis*, or *S. keniensis* (which proved to be a *nomen confusum*). On their return the brothers Fries published their well-known paper "über die Riesen *Senecionen*" (13) in which six new species were described, including one from the Virunga region, which Prof. R. E. Fries and Dr. Mildbraed had collected in 1911 and 1907 respectively, and had referred to *S. Johnstonii*. To this plant they gave the name *S. Erics-Rosenii*, after Count Eric von Rosen, who was the leader of the 1911 Rhodesia-Congo Swedish Expedition.

Later in the same year Mildbraed published a paper on the African Tree *Senecios* (14) in which he referred to a second plant which he had collected on the Virunga Mountains and had regarded as a large form of *S. adnivalis* Stapf. This he described as *S. Erics-Rosenii* var. *alticola* var. nov. (p. 230). The new variety was distinguished by the extremely felty under-surface of the foliage, and was represented by a single leaf preserved in the Berlin Herbarium. The following year Dr. Th. C. E. Fries, working over the same material, raised this variety to specific rank, naming it *S. alticola* (15). Dr. Mildbraed has kindly sent this specimen on loan to Kew and it is found to agree precisely with the plant newly received from Mr. Snowden from Muhavura.

The results of the Swedish and two German Expeditions which visited the Virunga mountains are summarized by Engler in his *Pflanzenwelt Afrikas* (16). He draws largely on Mildbraed's work but adopts the name *S. Erics-Rosenii* (pp. 303-310).

The expedition of the Harvard Institute of Tropical Biology and Medicine to Liberia and the Congo during 1926-27 visited the Kivu area, and Dr. D. H. Linder, botanist to the Expedition, collected on the Virunga Mountains. The specimens were forwarded to Berlin for determination. No report on these plants has been published but the duplicates have been distributed and amongst them a specimen of *S. Erics-Rosenii* from Nina Gongo.

No other information of consequence has been published on the botany of this region, though casual references to plants are to be found in the works of Alexander Barns and others. A well-written general account of considerable interest was, however, published in 1923 by Captain J. E. T. Philipps entitled "Mufumbiro: The Birunga Volcanoes of Kigezi-Ruanda-Kivu" (17).

Appended are full descriptions of the two species, the first being modified from that supplied by Prof. R. E. and Dr. Th. Fries, and the second being provided for the first time.*

Senecio Erici-Rosenii R. E. & Th. C. E. Fries in Svensk Bot. Tidskrift xvi. p. 390 (1922).—*S. Johnstonii* et *S. adnivalis* auctorum pro parte (non Oliver nec Stapf).

Stem repeatedly forked, 2–10 metres high, covered below with a rough furrowed bark and above with the remains of the old leaves bearing large terminal rosettes of leaves. *Leaves* thin, broadly elliptic to oblong-elliptic, petiolate, dentate, entire or subentire towards apex, lamina 30–60 cm. long and 12–20 cm. broad, upper surface glabrous when mature; midrib more or less arachnoid-tomentose towards the insertion; lateral nerves distinct, about 1–1.3 cm. apart; lower surface arachnoid-tomentose at first, almost glabrous with age, midrib barbate-tomentose; petiole short, gradually passing into the lamina, narrowly winged, 2–6 cm. long, 2 cm. wide. *Inflorescence* bracteate, paniculate, up to 1 metre high, with flower heads subcorymbosely arranged on slender ascending lateral branches; main axis and branches arachnoid-tomentose becoming glabrous with age. *Flower-heads* subcampanulate, about 18 mm. wide (excluding ligules) and 15 mm. long, pedunculate. *Involucre* 3-seriate, outer bracts (involucel) linear, 10 mm. long; inner bracts 2-seriate, 12–14, narrowly lanceolate or lanceolate, acute, margin entire, subglabrous (or very rarely slightly pilose), puberulous at apex, 11–12 mm. long, 2–4 mm. wide. *Ray-flowers* few, ligulate, yellow; tube 6 mm. long, ligule 10–14 mm. long, 3-fid. *Disk-flowers* 50–60, 8 mm. long, tube cylindrical, anthers exserted. *Pappus* barbed with rough hairs.

VIRUNGA MOUNTAINS. Nina Gongo, 12.6.94, von Götzen 115 (Herb. Berol.); *Mildbraed* 1421 (Herb. Berol.); R. E. Fries 1716 (Herb. Uppsal.); 16.2.27, *Linder* 2132; on upper zone of active cone, being killed by SO₂ fumes from crater, 11,000 ft., 7.1.31, B. D. Burtt 3180; in extinct southern crater especially on north side, 9000 ft., 8.1.31, B. D. Burtt 3187. Muhavura, 11,500 ft., 7.12.30, B. D. Burtt 2824. Mgahinga, on crater, 11,400 ft., 10.12.30, B. D. Burtt 2844. Sabinio, summit, 11,900 ft., 12.12.30, B. D. Burtt 2966. Visoke, in

*Since the above account was written a magnificent collection of *Senecios* from the mountains of the Virunga Range has been received from Mr. B. D. Burtt. He reports that these plants occur on seven out of the eight great mountain summits and are absent only on the very active volcano Nyam-lagira. The two species inhabit two distinct altitudinal zones, which slightly overlap. *S. Erici-Rosenii* occurs between levels of 9500 and 11,500 ft. and is found on all the volcanoes except Nyam-lagira. *S. alticola*, which occurs in a zone extending from 11,000–13,500 ft. was found only on Muhavura, Visoke, Miken and Karisimbi. It may be regarded as absent on the other four mountains. Mr. Burtt reports that he saw no evidence of the occurrence of "cabbage forms" such as occur on Mt. Kenya. His specimens are cited below under their respective names, but a general account of their occurrence and distribution on the individual mountains will be published later by Mr. Burtt.

Hypericum lanceolatum forest, 10,500 ft., 15.12.30, B. D. Burtt 3009. Karisimbi, in *Philippia* forest on southern slope, 9500–11,000 ft., 7.12.30, B. D. Burtt 3089.

This species is distinguished from *S. alticola* by its thin leaves, which except for the midrib are in the mature state almost or quite glabrous on the underside, and when in flower by the larger inflorescence and well developed ray florets. It forms a zone between 1000–11,500 ft., and thus usually is mainly below the cloud belt. It may occur in pure communities or at lower levels be associated with *Philippia Johnstonii*, *Hypericum lanceolatum*, and *Hagenia abyssinica*. Its occurrence either in the open or in the shelter of forest gives it much greater range of size than *S. alticola*. It is on the whole a much taller plant and more copiously branched. In the forest it is usually about 12–15 ft. high, but in very sheltered ravines old plants may assume the proportions of much-branched trees, some specimens of 30 ft. high having been noted (Burtt).

Though the two species are very distinct, occasional plants are met with which are intermediate with regard to certain characters, notably in the pubescence on the under side of the leaves. From the fact that the *S. Erici-Rosenii* zone overlaps the zone of *S. alticola* it would appear that the occasional presence of intermediate forms could not be used in support of the view that the latter species is a high altitudinal form of the former, but would rather suggest that the non-typical individuals found locally may represent hybrids or aggregates from hybrids.

S. Erici-Rosenii is the species which was previously referred to in the literature as *S. Johnstonii* Oliver and as *S. adnivalis* Stapf. It has been noted by all explorers as growing in profusion at about 10,000 ft. on Nina Gongo and on other summits in the Virunga Mountains. It is very distinct from *S. Johnstonii* but is undoubtedly allied to *S. adnivalis* from Ruwenzori. In the present state of our knowledge, however, it must be maintained as a distinct species on account of the longer ligules of the ray-flowers. The recently described species *S. longeligulata* De Wild., also from Ruwenzori, is obviously very nearly allied to *S. Erici-Rosenii* and possibly identical with it.

Senecio alticola Th. Fries in Svensk Bot. Tidskrift xvii. 229 (1923).—*S. Erici-Rosenii* var. *alticola* Mildbr. in Fedde Rep. xviii. 230 (1922); ab omnibus speciebus sectionis foliis subtus indumento albo-griseo longo villosis differt.

Stem simple or repeatedly forked, up to 2 metres in height, with terminal rosette of leaves. *Leaves* coriaceous, obovate-oblancoate, petiolate, irregularly dentate with triangular teeth 2–4 mm. long, lamina 30–50 cm. long, 15–20 cm. broad, upper surface glabrous when mature and faintly reticulate, lower surface covered with a persistent, dense, shaggy, white to grey-white indumentum; midrib very marked, continuing to apex, lateral nerves distinct, 1–1.4 cm. distant, forking and anastomosing towards the margin; petiole

winged, short, up to 6 cm. long, 2-3 cm. wide, clothed on both surfaces with abundant, long, silky, grey-white hairs. *Inflorescence* bracteate, paniculate, less than 1 metre high, densely crowded with flower heads subracemously arranged on short, spreading, lateral branches; main axis and branches clothed with very dense, long, woolly indumentum; lower bracts leaf-like, upper bracts slightly purple. *Flower heads* widely campanulate about 3 cm. wide, 1-5 cm. long, shortly pedunculate; flowers yellow. *Involucre* 3-seriate; outer bracts (involucel) linear, 15-16 mm. long, 1 mm. wide; the inner 2-seriate, oblong-lanceolate, acute, 16-17 mm. long, 4-5 mm. wide, glabrous, tips shortly ciliate, purplish when dry. *Ray-flowers* few, shortly ligulate, inconspicuous, yellow; tube about 7-8 mm. long, ligule linear-oblong, 5-6 mm. long, apex 2-3 fid. *Disk-flowers* very numerous, about 160, 10-12 mm. long, tube cylindrical below slightly inflated above, anthers slightly exerted; achenes about 3 mm. long, striate, glabrous. *Pappus* barbed, about 1 cm. long.

VIRUNGA MOUNTAINS. Karisimbi, "von oberen Grenze auf Hauptkegel," Nov. 1907, *Mildbraed* 1609; on upper slopes 1200-1300 ft., dominant shrub, 27.12.30, *B. D. Burtt* 3098. Muhavura summit, 13,500 ft., 19.11.29, *Snowden* 1555; summit, 13,500 ft., 6.12.30, *B. D. Burtt* 2797, 2811, 2812. Visoke, in crater on summit, 12,100 ft., 15.12.30, *B. D. Burtt* 3012, 3013. Mikenno, on southern slopes, dominant shrub, 11,500 ft., 25.12.30, *B. D. Burtt* 3067, 3068, 3069, 3070, 3071; on precipitous southern slopes near summit, 14,000 ft., 25.12.30, *B. D. Burtt* 3072, 3073, 3080.

Senecio alticola, which grows above the forest belt and in more exposed conditions, is a shorter, sturdier plant than *S. Erics-Rosenii* and more uniform in size. It is seldom more than 10 feet high, but even at the highest altitudes may branch four or five times. It is distinguished at a glance from *S. Erics-Rosenii* by the dense white woolly tomentum on the under-surface of the leaf. (See also notes under that species.)

Mr. Snowden pointed out that this species extended on Muhavura from about 11,500 ft. to the extreme limit of phanerogamic vegetation, namely at about 13,500 ft. This fact has been confirmed for other mountains by Mr. Burtt, who states that it usually appears suddenly in the vegetation, and shows up at once by the white underside of the leaves. He further observed that it occurs chiefly on the southern and more exposed slopes of the mountains and is associated with *Lobelia Wollastonii*.

The character of the tomentum in this species is different from that found in any other arborescent *Senecio*, and in this respect it stands in an isolated position in the genus.

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XLIV.—A NOTE ON MUSA ORNATA. E. E. CHEESMAN.

In standard works, including Hooker's Flora of British India, Species and Principal Varieties of Musa (*Kew Bulletin* 1894, 229), and Das Pflanzenreich, *M. ornata* Roxb. is given as a synonym of *M. rosacea* Jacq. I was recently able, by the courtesy of the Director of the Royal Botanic Gardens, Kew, to examine certain literature and coloured plates in the Herbarium, which show very clearly that this synonymy is erroneous, and as considerable confusion has already been caused by the mistake, it appears desirable to publish the facts.

M. rosacea Jacq. is illustrated in his Fragmenta Botanica t. 132, fig. 4, and Hort. Schoen. t. 445. The first figure shows a "hand" of four fruits, each about four inches long by one and a quarter inches broad, slightly angled, and of a pinkish or "old rose" tint. The second shows the male bud, with dark purple bracts, of which several are lifted at once, and the male flowers, which are also pink.

Figures in Loddiges' Cabinet t. 615 and Botanical Register t. 706, given as *M. rosacea* Jacq., are quite different from those cited above, but both agree with another plate in the Kew Herbarium marked "*M. ornata*, Icones Roxburghianae," which I take as an authentic figure of *M. ornata* Roxb.

It is therefore quite evident that two species are involved. The authentic figures of *M. rosacea* Jacq. agree exactly with no species known to me or described in the literature, but I incline to believe that they represent a form referable as a variety to *M. sapientum* L.

The figure of *M. ornata*, on the other hand, represents very accurately a species which is in the Imperial College of Tropical Agriculture collection under two numbers, one obtained from the Royal Botanic Gardens, Port of Spain, without a name, and the other from Java as "*M. rosacea*." Furthermore, it agrees with the description and coloured plates in the Journal of the New York Botanical Garden 27, 1926, Pl. 301 and 302, of a plant found by Bassier in Peru and doubtfully named by him "*Musa coccinea* Andr. (?)," and also with a photograph of a plant in Surinam, given by d'Angremond in Flora, 1914, Bd. 107, Taf. XI., as "*M. ornata chittagong*." Illustrations in the Kew collection from Mauritius and Principe equally clearly represent the same form, and I have seen the plant also in Jamaica under the name "*M. rosea*."

Thus, whilst *M. rosacea* Jacq. seems to be a doubtful species, *M. ornata* Roxb. has become widely disseminated, and it is the more important on this account that it should be correctly named.

The confusion appears to date from the Botanical Register, where accompanying t. 706 is text from which the following is extracted:—

"*Musa rosacea*. Mauritius Plantain Tree. There is some difference in the representation of this plant in Jacquin's work from the one before us, but we really believe the apparent difference arises principally from the upper portion of Jacquin's plant being withered before opening. An accident prevented our being able to examine the subject so accurately as we wished. The species has been called *rosacea* by Jacquin, not from the colour of the spathe, but from the form into which the valves of the spathe expand at the upper withered end in his sample . . . Introduced from the Mauritius by Sir Joseph Banks in 1805."

Comment may be made on this that I see no evidence of withered material in Jacquin's plate. The "form into which the valves of the spathe expand" may often be seen in the field on bananas of the *M. sapientum* affinity. Jacquin probably took the specific name from the pink flush on the male flowers, and/or the fruit. He certainly cannot have taken it from the bract colour, but on the other hand, the bract colour of *M. ornata* (pink) has probably assisted in the persistence of the mistaken synonymy.

D'Angremond (loc. cit. p. 63) detected the error in 1914, for he states of his plant—"Ich kann nur ausdrücklich betonen, dass sie *nicht* *Musa rosacea* Jacq. Fragm. ist." Also, it must be mentioned that several plates in the Kew collection marked *M. rosacea* have been altered to read *M. ornata* by some other person who must have noticed the discrepancy, but it still seems desirable to give the correction wider publicity.



Musa ornata.

Imperial College of Tropical Agriculture. Feb., 1931.

[To face page 298.]

PLATE VII



Musa ornata.

Imperial College of Tropical Agriculture.
Feb., 1931.

to face page 299.]

An interesting side issue of the matter is the fact that it affects the recorded parentage of the hybrid *Musa* described in the Gardeners' Chronicle (1895) as *Musa kewensis* $\times$. This hybrid is stated to be a cross between *M. Mannii* and *M. rosacea*. Inspection of the drawing there referred to leaves no doubt that "*M. rosacea*" is, in that case, again used incorrectly for *M. ornata*. *Musa kewensis* is itself, in the coloured drawing, extraordinarily like *M. ornata*, and the only clear evidence of the influence of *M. Mannii* is a splash of red pigment on the peduncle, which in *M. ornata*, so far as my observations go, is always green.

XLV.—SOME PERSIAN DRUGS. DAVID HOOPER.

The drugs described in the present article were nearly all collected in the bazaars of Teheran, Hamadan and Kirmandshah by Dr. J. M. Cowan and Dr. C. D. Darlington in the spring of 1929. An account of the tour is given in *Kew Bulletin* 1930, pp. 49-68, by Dr. Cowan in a paper "A Botanical Expedition to Persia." The drugs were all of a vegetable origin and have been identified at Kew with the assistance of the staff of the Herbarium and Museums. A few specimens included in the list are from collections made during the past five years by Mr. B. Gilliat-Smith, British Consul at Tabriz.

It is of great interest to have an opportunity of studying the origin of these drugs, and comparing them with the names of those found in ancient literature of Persia where materia medica has long been a special science. The most important of the Persian works on pharmacology is the *Kitabulabnyat an haqa 'iq-uladviyat*, or "Book of the Foundations of the True Properties of the Remedies," written about A.D. 970 by the physician Abu Mansur, who during one of his journeys visited India. B. Laufer (*Sino-Iranica*, 1919) says "This is not only the earliest Persian work on the subject but the oldest production in prose of the Neo-Persian literature. The text has been examined by R. Seligmann from a unique manuscript of Vienna dated 1055, the oldest extant Persian manuscript." There is a translation by Abdul-Chaliq Achundow from Baku. This has been rendered into German and published by Dr. R. Kobert in his "Historische: Die pharmacologischen Grundsätze des Abu Mansur Muwaffak, 1893." References to this work are noted under the name "Achundow."

In the year 1681 there was published in Paris the "Pharmacopoeia Persica, ex idiomate Persico in Latinum conversa, opus missionariis, mercatoribus, caeterisque Regionum Orientalium, Lustratoribus necessarium nec non Europaeis Nationibus perutile." This was written by a Carmelite monk, Frater Angelus. There is a short list of a few raw drugs, but the work contains chiefly prescriptions for pharmaceutical preparations, many of which are made up of 15 to 20 ingredients.

A valuable work of more recent date is one published in Teheran in 1874. It was compiled by Prof. J. L. Schlimmer, of the Polytechnic

College of Persia, Chief Medical Officer to the Persian Army, and Sanitary Officer, Teheran. It is written in French, and entitled "Terminologie Médico-Pharmaceutique et Anthropologique Française-Persane." This contains a very full list of medicinal plants of Persia with identifications made by Boissier, the De Candolles, Haussknecht and other eminent European botanists and pharmacologists.

Dr. J. E. T. Aitchison has botanically explored portions of Persia and the neighbouring regions, and his "Notes on the Products of Western Afghanistan and of North-Eastern Persia," published in Edinburgh in 1890, has been most useful for reference. Dr. William Dymock, for many years Medical Storekeeper for Bombay, had exceptional opportunities of studying the drugs coming into India from the Persian Gulf, and his great knowledge of oriental languages in addition to his medical and botanical training placed him in the front rank of Indian pharmacognosists. His "Vegetable Materia Medica of Western India" (1885), and later, his "Pharmacographia Indica," are storehouses of information on the trade, natural history and composition of oriental drugs. Use has also been made of the "Flora of Syria, Palestine and Sinai" by Rev. G. E. Post (1896), Boissier's "Flora Orientalis," and "A working list of the Flowering Plants of Baluchistan," by Mr. I. H. Burkill (1909). Notes made by Dr. Cowan on the medicinal properties of the drugs are indicated by (C).

Many useful notes on drugs and Persian and Turki names of North Persian plants occur in a series of Articles by B. Gilliat-Smith and W. B. Turrill in *K.B.* 1930, Nos. 7-10, entitled "On the Flora of the Nearer East: A contribution to our knowledge of the Flora of Azerbaidjan, North Persia."

As a practical result of these determinations the Empire Marketing Board desire to know if any of these products could provide new therapeutic agents for employment in western medical science. From a consideration of the list of 150 drugs it will be seen that most of them were mentioned by Abu Mansur one thousand years ago; several of them were prescribed by Avicenna and Dioscorides centuries before. It would seem that the drug supplies of this country, like the laws of the Medes and Persians, are unchangeable. The few products not mentioned by previous writers do not appear to have important properties; they include the thistle-down of a *Cirsium*, the fruits of a *Gaillardia*, the flowers of a *Stachys*, the stems of a *Linum*, and the seeds of a *Chenopodium*. "The Iranians were the great mediators between the West and the East, conveying the heritage of Hellenistic ideas to Central and Eastern Asia, and transmitting valuable plants and goods of China to the Mediterranean area" (B. Laufer). The standard drugs of Persia, such as tragacanth and the fragrant umbelliferous gum-resins, are in constant demand, and the trade in others may be increased as their virtues become more widely known. It should

be remarked that the specimens examined in the present enquiry were in a fresh condition and free from any fraudulent admixture. If further quantities should be required for chemical or physiological examination it would be easy to obtain them from the markets of Teheran and Hamadan.

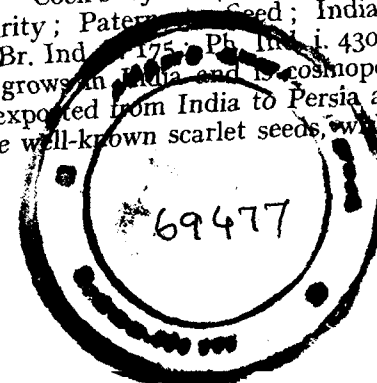
Literature cited.

- | | | |
|-------------------|---|--|
| Achundow | = | See Introduction. |
| Ait. | = | Notes on the products of W. Afghanistan and of N. E. Persia, by J. E. T. Aitchison (1890). |
| Boiss. | = | Boissier, <i>Flora Orientalis</i> . |
| B.P. | = | British Pharmacopoeia (1914). |
| Colloquios | = | by Garcia da Orta, Markham (1913). |
| Fl. Br. Ind. | = | Flora of British India. |
| Gild. & Hoff. | = | Volatile Oils, by Gildmeister and Hoffmann (1922). |
| I.H.B. | = | Baluchistan Plants, by I. H. Burkill (1909). |
| Laufer | = | Sino-Iranica (1919). |
| Makhzan-el-Adwiya | = | 1769, reprinted 1824. |
| Ph. Ind. | = | Pharmacographia Indica (1891). |
| Ph. Pers. | = | Pharmacopoeia Persica (1681). |
| Pharm. Journ. | = | Pharmaceutical Journal. |
| Pharmacog. | = | Pharmacographia, by Flückiger & Hanbury (1874). |
| Post | = | Flora of Syria, Palestine & Sinai (1896). |
| Schl. | = | Schlimmer's Terminologie (1874). |
| Sci. Pa. | = | Science Papers, by D. Hanbury (1876). |
| Tschirch | = | Handbuch der Pharmakognosie (1912). |
| Wehmer | = | Pflanzenstoffe (1919). |
| Wiesner | = | Die Rohstoffe des Pflanzenreichs, ed. 4 (1927). |
| Y. B. Pharm. | = | Year Book of Pharmacy. |

Abbreviations of Languages cited.

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|-------|---|--------------|-------|---|-------------|
| Arab. | = | Arabic. | Hind. | = | Hindustani. |
| Bal. | = | Baluchistan. | Lat. | = | Latin. |
| Beng. | = | Bengal. | Pers. | = | Persian. |
| Bom. | = | Bombay. | Port. | = | Portuguese. |
| Fr. | = | French. | Sans. | = | Sanskrit. |
| Gr. | = | Greek. | Syr. | = | Syrian. |
| Guz. | = | Guzerati. | Turki | = | Turki. |

Abrus precatorius Linn. (Leguminosae). The seeds. Ain-el-dik, "Cock's eye" (Hamadan); Echechme khorouce (Schl.); Jequirity; Patern... Seed; Indian wild liquorice. Schl.; Fl. Br. Ind. 175; Ph. Ind. i. 430. The plant grows in India and is cosmopolitan in the tropics; the seeds are exported from India to Persia and other countries in the west. The well-known scarlet seeds, with a black spot at one



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end, are made into necklaces and rosaries. They were formerly used as a standard weight by goldsmiths, the average weight of the seeds being 1.7 grains. The leaves and root contain a sugar (D. Hooper, Pharm. Journ. 1894, 937).

In medicine the seeds are said to have hilarant properties, and in Persia they are classified among the poisons. In India toxicological enquiries have shown that the seeds are ground into a paste, the paste is made into suis or needles, and these are inserted hypodermically in the bodies of cattle and bring about their death. Drs. Warden and Waddell in 1884 separated a protein body, called abrin, which is the active principle. Spica in 1888 called it a glucoside. Sidney Martin in 1889 found it to be a globulin or albumose. In 1891 Kobert described it as a toxalbumin.

Achillea Santolina Linn. (Compositae). Flowering tops.

Būmādrān (Teheran); Boi mazandran; Bui madaran (Pers.); Boe madran (Bal.); Birinjasaf (Ind. bazaars).

Ait. mss.; I.H.B.; Schl.; Boiss. ii. 266; Ph. Ind. ii. 272.

The dried herb with flower-heads sold in Teheran is collected about Senneh and the surrounding hills (C). The plant is widely distributed in the East and in Northern Africa. The flowers are arranged in corymbs. The heads are 5 mm. high and 3 mm. in diameter, the tubular flowers are yellow, and the involucre is covered with grey tomentose scales. They have a pleasant aroma. The flowering heads are used as a tonic and carminative in Persia and Sind. The strong odour of the herb drives away fleas and other noxious insects. In Baluchistan the drug is given to children for colic. Dymock says the Common Yarrow (*A. Millefolium* L.), growing in India, goes by the same name and has similar properties.

Adiantum Capillus-Veneris Linn. (Filices). The fern.

Kashburat (Teheran); Kashburat-el-bir, "Coriander of the wall" (Pers.); Pousia wechame (Schl.); Parsia washan (Pers.); Barr-i-sija waschan (Achundow 163); Kansburaj, Moohar-khas (Ind. bazaars).

Ait.; Post; Schl.; Ph. Ind. iii. 624.

The maiden-hair fern is found in Persia, Afghanistan, the North-Western Himalayas and Western China, but other species of fern are used medicinally and are called by similar names. The drug is said to be collected from walls around Teheran. The rhizome is the part used in medicine; it is credited with expectorant properties and is given for relieving difficult respiration.

Allium sativum Linn. (Liliaceae). The seeds.

Tukhm-i-tarra (Teheran, tarra—Persian for pot-herb). Garlic. Boiss. v. 229.

Under this name the small black, angular, corrugated seeds of an *Allium* are sold in Teheran. They are probably the seeds of the Garlic, which is *par excellence* the pot-herb of the East. Three kinds

of the plant are grown in Persia; Bustani (garden), Bari (wild), and Kirathi (leek-like).

Althaea lavateraefolia DC. (Malvaceae). The root.

Risha-i-khatmi (Hamadan); Rishah-i-khitmi (Ind.); Tibetche khetme (Schl.); Khutmi (Post).

Achundow; Schl.; Boiss. i. 828; Post; Ait.; I.H.B.

This plant grows in Egypt, Persia and Afghanistan. Aitchison says it is cultivated in North-Eastern Persia, not only for the showiness of its flowers, but for its petals, which are collected as they fall off the plant and are called gul-i-khatmi, and the seeds tukhm-i-khaira. In Baluchistan the flowers of *A. pallida* Wall. are called gul-i-khaira. The root, seeds, and flowers of these malvaceous plants are all used in medicine and are occasionally exported. The root from Hamadan agrees with that of *L. lavateraefolia*, but Achundow refers the drug to *A. ficifolia* Cav. and Schlimmer to *A. officinalis* Linn. The root is fibrous, light-coloured, and becomes mucilaginous when soaked in water. It is considered strengthening. It is probably a Persian substitute for the root of the Marshmallow of Europe (*Althaea officinalis*).

Alyssum campestre Linn. (Cruciferae). The seeds.

Hodame (Teheran); Qodumah (Pers.); Ghodaoumehe chirazi, Touderi, Djensidge (Schl.); Hedge Garlic; *Erysimum officinale* = *Sisymbrium officinale* in Schlimmer's Terminologie.

The seeds are light-brown, lens-shaped, 2 by 1.5 mm., with yellowish-grey border; they become coated with semi-opaque mucilage when placed in water. Preparations of the seeds are given in chest complaints (C).

Anethum graveolens Linn. (Umbelliferae). The fruits.

Shua, shuvit (Pers.); Sowa (Hind.); Suva, shepu (Bom.); Shibbit (Arab.); Anitum (Yunani); Dill seed.

Dill is a pot-herb in Persia, and the fruits are sold in the bazaars and used as a carminative.

Anthemis Wiedemanniana F. & M. (Compositae). Flowerheads.

Gul-i-banoi (Hamadan); Banoi, probably a contraction of Bābūna or Babunij, a name for the chamomile and other fragrant medicinal composites used in the East. Babunah is a village in Arabia, where *Matricaria Chamomilla* was once abundant.

Achundow; Ait.; Post; Schl.; Boiss. ii. 286; Pharmacographia 346; Ph. Ind. ii. 275; I.H.B.

Schlimmer refers Babuneh shirazi to the Roman Chamomile (*A. nobilis*), and says it is cultivated on a large scale in gardens, and is administered, as in Europe, for its tonic qualities. Post attributes Babunij to *Achillea fragrantissima* Forsk. and *Matricaria aurea* Linn.; the latter is a fragrant plant, an infusion of which is used as a febrifuge and carminative.

The chamomiles of the Indian Bazaars, which are brought from Persia and known as Babunah, are the flowers of *M. suaveolens* L., a slender form of *M. Chamomilla* growing in South Russia, Persia, and Siberia. In Baluchistan *A. Gayana* Boiss. and *A. odonto-stephanus* Boiss. are used medicinally. Out of 93 species of *Anthemis* enumerated in Flora Orientalis Wiedemann's Chamomile of Syria, Asia Minor, and Persia, affords the drug in the Hamadan bazaar. The flower-heads are recognised by their small size (1 cm. across), the conical receptacle, and carinate palea; they are bitter and have an agreeable fragrance.

Arctium Lappa Linn. (Compositae). The root.

Bardane (Teheran); Semen Bardanae (English Herbal 1730).

The Burdock plant is found in Syria, Persia, and Khorasan, as well as in Europe. The root under the name of Risha Baba Adam or "Root of Father-Adam" is quoted in Schlimmer's 'Terminologie.' It is regarded throughout India as depurative and antiphlogistic. In Teheran the root, with that of sarsaparilla, is used as a remedy for syphilis. The drug has had a considerable reputation in ancient times, but from a chemical examination by Zellner (1924) there is no indication of any substance in the root being physiologically active.

Aristolochia longa Linn. (Aristolochiaceae). The root.

Zarawand (Hamadan); Zarawand-i-tawil (Pers.); Zirawande thewile (Schl.).

Achundow; Schl.; Ph. Pers.; Post; Ph. Ind. iii. 165.

The roots of this and other species of Birthwort are highly valued medicines in the East. The drug from Hamadan is the cylindrical root, 13 mm. in diameter, showing in section the peculiar wedge-shaped bundles of the wood. It has a somewhat bitter taste. The Aristolochias are stimulating tonics and are often given for snake bites. Locally the root is used for amenorrhoea and as a pectoral and stomachic.

Artemisia maritima Linn. (Compositae). Flower-heads.

Dharmane (Teheran); Darmanah (Pers.); Afsatin el bahr (Arab.). Ph. Ind. ii. 288; Greenish and Maplethorpe, Y.B. Pharm. 1923, 646.

Aitchison states that *A. maritima* and *A. campestris* exist everywhere in N.E. Persia over the dry and stony country, forming the chief fodder for cattle. Camels and donkeys thrive on them. The root-stocks and dry stems are the mainstay of the traveller for fuel. The flower-heads are collected from the villages around Teheran and sold as a vermifuge. The Indian supplies come from Afghanistan and Persia. The local product was used by Dr. Sayed during the war, when santonin could not be procured in Teheran, and both seeds and leaves were found effective. A mixture of Dharmane and Absinthe is said to be much more active than flowers of *Artemisia* alone. L. Simonsen examined the leaves and flowering tops of *A. maritima* (*A. brevifolia* Wall.) growing in Chitral, Afghanistan, and Baluchistan, and found from 0 to 1 per cent. of santonin.

There is more in the herb when the flowers are just appearing (Pharm. Journ. 1923: 4, 57-63). Levant wormseed of European commerce comes from Persia and Asia Minor. It is also collected from a variable plant in the Himalayas, Kashmir, and Western Tibet.

Artemisia vulgaris Linn. (Compositae). Flower heads and leaves.

Absint (Teheran); Absentin (Pers.); Afsantin or Absanthin (Ait.); Afsintin roumi (Schl.).

Ph. Ind. ii. 284.

The origin of this ancient drug, described by Mohammedan physicians, is probably *A. Absinthium* Linn., but no doubt other species are used, including *A. vulgaris* and its varieties. *A. ponticum* Linn. is quoted by Schlimmer as the source of the drug sold in his day in Teheran; this is a plant growing in Europe, the Caucasian region, and Songaria. Achundow states that the Persian drug is obtained from Roman, Indian, and Nabatean sources. *A. Sieversiana* Willd. is one of the Indian kinds of afsantin said to be imported from Persia. The sample of afsantin from Teheran is a mixture of flower-heads, stalks, leaves, and mineral impurities. It is used as a tonic and is regarded as a very efficient vermifuge. The Persian name of these plants has been given to absinthe, a well-known liqueur used on the Continent.

Asparagus adscendens Roxb., and other species. (Liliaceae). The root.

Khushak (Hamadan); Kushak, merchubeh (Pers.); Isferaj (Ar.); Satavar, Satar mul, Shakakula micari (Hind.); Sufed musli of commerce (Bom.).

Ait.; Schl.; Post; Boiss. v. 339; Ph. Ind. iii. 482.

The roots of several species of *Asparagus* are used in the East in medicine. Besides the above species, found in Afghanistan and Persia, *A. sarmentosus* Willd., *A. officinalis* Linn. and *A. racemosus* Willd. have been identified as the origin of some of these drugs from India. The fruits are also medicinal and are sold in the bazaars under the Arabic name Haliyun. The root from Hamadan is in long thin pieces, 2-3 mm. in diameter, ivory-white, hard, horny, wrinkled longitudinally, and somewhat twisted. It swells in water and becomes mucilaginous; it has a mawkish, sweet taste, and hardly any odour. The root is considered to have stimulant and diaphoretic properties.

Asperugo procumbens Linn. (Boraginaceae). The flowers.

Badranj-boia (Teheran); Badrandj buya (Pers.).

Schl.; Boiss. iv. 275; Post, 540; I.H.B.

This is a prostrate herb in Arabia, Persia, Afghanistan, Baluchistan, Europe, and North Africa. It is common in cultivated fields and gardens. The fruiting calyx is reticulate-veined with acute, ciliate lobes; the pedicels are bent, the nutlets are oval, flat and warty.

The substitution of this plant for the well-known fragrant drug Badrandj-boia still persists in Persia. Schlimmer, writing under *Asperugo*, says "This plant, dried, is sold by the druggists of Teheran under the false name of Badrendj-bou-yeh, which is the true name of *Melissa cedronella*. I have never been able to understand the reason of this sophistication, to which Dr. Haussknecht was the first to call attention, because the true *Melissa* is largely cultivated in the gardens around Teheran." See *Dracocephalum Moldavica* (p. 315).

Astragalus fasciculaefolius Boiss. (Leguminosae). The gum. Kundjida (Teheran); Kunjad, Gujar (Bomb.); Khunjada, "resin for bleeding," (Ait.); Anzarut (Arab.); Sarcocolla, "flesh glue" (Greek); Kohl Farsi=Persian Collyrium, Kohl Kirmani=Kirman Collyrium.

Ait. 18; Ph. Ind. i. 476; D. Hooper, Journ. As. Soc. Bengal, Vol. ix. No. 4, April 1913, pp. 177-181; Achundow; Schl.; Boiss. ii. 396.

This is a sweet exudation secreted by the above plant obtained from Kurdistan and exported to India and elsewhere. It occurs in pale yellowish-brown fragments, brittle in consistency, soluble in water and alcohol, with a sweetish taste and odourless. It contains a sweetish principle similar to glycyrrhizin.

Sarcocolla forms a plaster long used by Parsi bone-setters, and is applied locally to the ears and face to allay neuralgic pains. Aitchison says the gum is used by ladies of the harem to improve their appearance and to give the skin a gloss.

Berberis vulgaris Linn., and other species. (Berberidaceae). The fruits.

Zirishk (Hamadan); Zarishk (Pers., Hind., Bom.); Zerechke (Schl.); Karoskai (Bal.).

Achundow; Ait.; Schl.; Boiss. i. 103; Ph. Ind. i. 65.

The Barberry is a common shrub growing at altitudes of 2000 ft. and upwards. The fruit is largely collected and consumed locally. It is also exported in quantity to India, where it is highly appreciated as a condiment. Dr. Cowan noticed *B. densiflora* Boiss. occurring in the North West of Persia, with broader berries than those of *B. vulgaris*; the fruits of both species are made into jam. In the Punjab the fruit and preserve is called Zirishk-tursh, to distinguish it in the trade from the small, dried, black grapes, known in Europe as currants or corinths (Aitchison).

The fruits (berries) are oblong, with an acid pulp and oblong seed. They contain dextrose, laevulose, and gum, and the unripe fruits contain berberine. Their consumption is said to remove itch and other skin complaints.

Calamintha graveolens Benth. (Labiatae). The seeds.

Ferenghi meak (Teheran); Frendje meehke (= *Melissa Calamintha*, Schl.); Faranj mishk or Biranj mishk (Arabic form of the Persian name); Palang mishk, which Dr. Dymock refers to *Ocimum*

sanctum Linn. (Ph. Ind. iii. 90). Pelenquemecke is referred by Schlimmer to another labiate, *Dracocephalum Kotschyi*.

Boiss. iv. 583; Post, 624.

This species of Calamint frequents the Mediterranean region, Syria, Asia Minor, Iraq, and the Transcaucasus. The seeds from Teheran are said to be brought from Shiraz; they were grown at Kew and identified as above. The drug is known in India, where supplies come from Persia.

The seeds are dark-brown and oblong in shape; 2 by 1 mm., three-angled, tapering towards the umbilicus, where there is a white V-shaped mark; they are feebly pungent, and become coated with transparent mucilage when soaked in water. The seeds are stimulating and aphrodisiac.

Capparis spinosa Linn. (Capparidaceae). The root and root-bark.

Risha Kavar (Teheran); Risha Kabar (Hamadan); Keber (Schl.); Capparis Cortex Radicis (Ph. Pers.).

Ph. Ind. i. 131; Boiss. i. 420.

The thorny Caper plant is found in Western Asia, Europe, North Africa, and Australia. According to Dr. Aitchison it is a common shrub from Quetta to Meshad, in the open country forming great bushes fully five feet high. In Persia, Dr. Cowan observed it as a low straggling bush often with stems trailing along the ground. *C. aphylla* Roth is very abundant in Baluchistan, where it is called by the same vernacular name (I.H.B.).

The flower-buds all through Persia are collected for household use to be made into pickles. The light-coloured root and the thick root-bark, in half quills, are used in medicine. These drugs have been introduced into India by Mohammedans, and are exported via the Persian Gulf. The root and root-bark are pungent and bitter, and are given for intermittent fever and rheumatism.

Carthamus tinctorius Linn. (Compositae). Achenes.

Kaufsha, Qushon (Hamadan); Tukhm-i-kaphah, Tukhm-i-kaphek (Pers.); Tokhme-kaficheh, idiom in Guilan (Schl.); Karophi (Bom.); Qurtum (Arab.); Kusum (Hind.); Atractus (Gr.), Safflower or Parrot seed.

Ait.; Post; Schl.; Sino-Iranica, 324; Ph. Ind. ii. 308.

The Safflower is cultivated in Syria, Persia, and Afghanistan, as a field crop, for its red anthers, which are used as a dyestuff and cosmetic.

The fruits or achenes, of the size of barley grains, are kept in all druggists' shops. They yield an oil by expression which is good for rheumatism.

Carum copticum Benth. & Hook. (*Sison Ammi* Linn., *Trachyspermum Ammi* Sprague ex Turrill; *Ptychotis Ajowan* DC.; *Ammi copticum* Linn.). (Umbelliferae). The fruits.

Zinian (Teheran & Hamadan); Ajowan, Ajwain (Hind.); Omum (Tam.); Ammeos (Ph. Pers.); Komoune molouki (Schl.); Basilikon Kuminon (Gr.); Sium Ammi; Bishop's weed.

Boiss. ii. 898; Fl. Br. Ind. ii. 682; Ph. Ind. ii. 116.

This is an African plant cultivated in Egypt, Persia, Afghanistan, and throughout India. The aromatic fruits were a well-known medicine among the ancient Greeks and Arabs, and still enjoy a great reputation in the East. The Persian drug is produced largely in the province of Shiraz. The fruits are brownish-grey and smaller and more curved than caraway seed. The fragrance and active principle of the drug reside in the 3 to 4 per cent. of essential oil which they contain. The oil holds a stearopten called thymol which crystallizes out at ordinary temperatures. Of the remaining portion half is thymene, a mixture of cumene and several terpenes. Thymol is known in India as Ajwain-ka-phul or Flowers of Ajwain. The distillate obtained when the fruits are boiled with water is called "Omum water," and is used as a carminative for children and as a cholera remedy.

Cassia Absus Linn. (Leguminosae). The seeds.

Cheshum (Hamadan); Chashum, cheshmak, chashmizak (Pers.); Hebbel soudane, Hab-us-sudan (Arab.); Chaksu seed of India; Egyptian Cassia seed.

Ph. Ind. i. 524; Fl. Br. Ind. ii. 265.

This is a plant widely distributed in the tropics of the old world. The small, black, lens-shaped seeds have long been known in the East in the treatment of eye diseases. In some books a plaster made of the seeds is recommended as an application to wounds and sores. In Hamadan the seeds are classed among the poisons (C).

Centaurea Behen Linn. (Compositae). The root.

Rishe bahman (Hamadan); Bahman, behmen, barham (India); the name is supposed to be derived from Brahma as a drug given to convey superior intelligence.

Ait.; Post; Boiss. iii. 682; Ph. Ind. ii. 303.

The plant grows in Persia, Syria, and Armenia. Boissier speaks of Bahman coming from the hills of Khorasan. Aitchison says it is a medicine from Kabul exported into India.

There are two kinds of this drug, Sufed (white) and Surkh (red) Bahman. The root from Hamadan appears to be the latter. The root is in short pieces, cylindrical, about 2.5 cm. in diameter, with a scaly crown, reddish-brown, scabrous, marked by numerous circular wrinkles externally; within, the wood is dull red and with yellowish, horny layers, and no starch. This drug does not appear to be the same as Red Rhapontic, which has been referred to the root of a peony.

Chenopodium capitatum Aschers. (Chenopodiaceae). The seeds.
Tukhm-isfanj (Pers.).

The seeds of this species of goosefoot are sold as a food-grain and medicine, and the plant is used as a pot-herb. The seeds are black, rounded and disc-shaped, 1 mm. in diameter. In mountain areas in South America the seed of *C. Quinoa* Willd. has long been known as a cereal, and supplies food where other food crops cannot easily be grown.

Cichorium Intybus Linn. (Compositae). The root and achenes.
Risha-kashni (Hamadan); Tukhm-kashni (Ham. & Teheran); Kashi (Hind., Bom. & Beng.); Intubus (Rom.); Sem. Cichorii (Pharm. Pers.).

Ph. Ind. ii. 311; Boiss. ii. 716; I.H.B.

The Chicory plant is indigenous to Persia, and is cultivated in Europe and India. It is a common weed over all well-cultivated land in the vicinity of water-courses and wherever there is damp, clay soil. It goes under the same name as the Endive, and the natives of East Persia do not distinguish between them (Aitchison).

The root is fleshy and tapering, wrinkled longitudinally, light-brown externally, and whitish within. The dried and torrefied root is well known as an article for mixing with commercial brands of coffee. In Persia, Baluchistan, and India it is a resolvent and cooling medicine for bilious attacks. The achenes are angled, of a pale, mottled-grey colour, and with a bitter and mucilaginous taste. They also are considered a cooling medicine.

Cirsium lanceolatum Linn. (Compositae). Thistle-down.

Foveh (Hamadan).

Achundow; Boiss. ii. 538; Post.

This species of Thistle is frequent in Syria, Persia, Afghanistan, and Kurdistan.

The drug consists of the white feathery pappus, 3 cm. long, of the dense capitula of this plant. With it are mixed a few tubular florets and a few linear-oblong, compressed, smooth achenes. They are said to be used locally for gonorrhoea.

Schlimmer refers to a medicine called "Badawerde" (=carried by the wind), consisting of the pappus of the Holy Thistle (*Carduus benedictus*). In India the downy heads of *Volutarella divaricata* Benth. are used as a drug (Ph. Ind. ii. 306). Badaward has also been referred to *Echinops candidus* (now *E. Cephelotes* DC.), a true Persian plant. It is unusual for a drug consisting of cellulose to be used internally. Probably it is for external application. In India the soft, woolly inflorescence of the male spadix of a bullrush (*Typha angustifolia* Linn.) is applied, like cotton, to wounds and ulcers (Ph. Ind. iii. 538).

Citrus Aurantium Linn. (Rutaceae). The flowers.

Bahār-i-narendj, 'Spice of orange' (Teheran); Behare narundj, Naphae flores (Schl.); orange flowers.

Ph. Ind. i. 270.

The dried flowers of the cultivated orange growing in Persia are sold in the bazaars and are recommended as a stomachic. Neroli oil and orange-flower water, obtained by distillation, are used in perfume and for medicine. Schlimmer in his *Terminologie* refers to *Aqua florum aurantii* or *Aqua naphae* as a favourite flavouring agent. The oil contains a nitrogenous substance of exceeding fragrance called anthranilic acid methyl-ester.

Colchicum luteum Baker, and **C. speciosum** Stev. (Liliaceae).
The corms.

Sulenjan (Teheran); Surinjan-i-talkh (Pers.); Schanbelid; Hermodactyl, the finger of Hermes (Gr.).

Achundow; Ph. Pers.; Boiss. v. 155; Schl.; Ait.; Ph. Ind. iii. 496.

The yellow-flowered *Colchicum* is found on grassy slopes in the temperate Himalaya and Kasknir, Afghanistan, and Turkestan.

C. speciosum is met with throughout the Badghis, Harirud, and Khorasan. The corms or bulbous roots are mixed with those of *Merendera persica* and constitute the Hermodactyls of the later Greeks (Aitchison). The roots of both plants are used in Persia. The Indian drug appears to be the corms of *C. luteum* imported from Kashmir. The corms are ovate, 3.5 to 5 cm. long, white, hard, and horny. The starch is muller-shaped with a hilum. Both species afford the alkaloid colchicine, and are used, as *C. autumnale* in Europe, for rheumatism.

Commiphora Molmol Engl. (Burseraceae). Oleo-gum-resin.

Murr-e-makki (Teheran); Mur, bol (Hind. & Bom.); Myrrha mechensis (Ph. Pers.).

Abu Mansur; Schl.; Pharmacog., 125; Ait.; Ph. Ind. i. 304.

This fragrant oleo-gum-resin, known as Myrrh, is one of the most ancient drugs in the orient. It is obtained from plants growing in North-east Africa and South Arabia and is brought to India, where Bombay is the centre of the trade. Aitchison says it is imported into Meshed through Persia for further transit to Afghanistan and Turkistan. Myrrh is an important drug among Mahommedans, who suppose that it originally came from Mecca. It is used as a stomachic.

Commiphora Mukul Engl. and other species. (Burseraceae).
Gum-resin.

Mukul-agrak (Teheran); Moghl-ezregh (Schl.); Bdellium (Pers.); Indian Bdellium.

Ph. Pers.; Tschirch; Pharmacographia; Ph. Ind. i. 311.

The Mohammedans describe the different kinds of Bdellium under the name of Mukul, and say that it is the produce of a tree common in Arabia and also in India. Several kinds are distinguished, all of them bitter. That with a reddish tinge is termed Mukul-i-azrak; with a yellowish-tinge, Mukul-i-yahud; brown, Sakulali; and with a rich red-brown colour, Mukul-i-Arabi. Gum-resins from trees in the arid

zones of Sind, Kathiawar, and Rajputana are used as substitutes for the African and Arabian Bdelliums. Aitchison says the Bdellium in the bazaars of Afghanistan is imported, but adds that fragrant gum-resins obtained from spurious shrubs in dry desert regions are indistinguishable from the imported product. The Persian sample is sticky and bitter, and forms a milky emulsion with water. The medicinal properties of Bdellium are regarded as the same as those of myrrh, and the drug is given in muscular rheumatism and is applied to painful parts in the form of "lep."

Conium maculatum Linn. (Umbelliferae). The fruits.

Karedemonah (Hamadan); Kirdamana (Bom.); Choquerane, Bikhe sifti (Schl.); Hemlock fruits.

Boiss. ii. 922; Ph. Ind. ii. 110.

The Hemlock is a poisonous British plant distributed in Europe and Northern Asia, but not in India.

Aitchison met with the plant, fully seven feet in height, in Karobagh in North-eastern Persia.

Arabian and Persian physicians repeat in their writings the opinion of the Greeks in regard to Hemlock.

The fruits and leaves contain a poisonous alkaloid—conine—which paralyses the motor nerves. The fruits are one of the poisons of Persia and are used locally as a lotion to allay pain.

Cordia Myxa Linn. (Boraginaceae). The fruits.

Sepestan (Teheran); Sebestan or Sapistan, from Sagpistan, "Dog's dugs" (Pers.); Sebestan plums.

Achundow; Ph. Pers.; Schl.; Post 532; Boiss. iv. 124; Ait.; I.H.B.; Ph. Ind. ii. 518; Cordia Myxa and allied species, J. Hutchinson, Kew Bull., 1918, 217.

Cordia Myxa, the Arbor glutinosa of Rumphius, is a common shrub or small tree frequently cultivated, and found in regions extending from Egypt to Cochin-China and Tropical Africa. The Sapistan is a well-known drug in the orient, introduced by the Arabians. It is a drupe of the size of a cherry with mucilaginous properties, and is sometimes used in making birdlime. Aitchison says the fruits are chiefly imported from Southern Persia to be employed in medicine, and are forwarded in quantity to Turkestan. On account of their demulcent properties they are useful for coughs and chest complaints.

Coriandrum sativum Linn. (Umbelliferae). The fruits.

Tukhm-i-kashniz (Teheran); Kuzbura, kozbara (Arab.); Kishniz, Kosniz (Pers.); Gashniz (Turki); Kostumburi (Sans.); Dhanya (Hind.); Koriyan (Gr.); Coriander seed.

Achundow; Schl.; Laufer; Fl. Br. Ind. ii. 177; Ph. Ind. ii. 129.

The Coriander plant is cultivated as a pot-herb and for its fruits in gardens throughout Persia, Afghanistan, and India. The globular

fruits are a well-known spice and flavouring agent. The plant is used in salads.

The principal constituent of the essential oil of the fruit is coriandrol, the dextro-gyrate modification of linalol.

Crataegus orientalis Bieb. (Rosaceae). The fruits.

Gwich (Hamadan); Kewiche (Ispahan); Kocha, gohja, kohela, alaf-kharez (Afg.); Naguncha, ghunza (Bal.).

Schl.; Boiss. ii. 660; Post; Aitchison; I.H.B.

The Oriental Hawthorn is a shrub or small tree of Asia Minor and the Caucasus. This and other species grow at an elevation of 3000 ft. and upwards, and are common at the heads of springs in the lower hills; they provide an excellent fodder for goats, sheep, and camels. The wood is valuable for the manufacture of spinning wheels. The fruits of most species are used in medicine. The fruit of *C. Azarolus* Linn., a tree of Persia and Asia Minor, is the Lu'rur of Achundow: Schlimmer notices the fruits of *C. oxyacantha* Linn. and *C. melancarpa* in his list of Persian drugs. The fruits from Hamadan are pome-like, rounded, 12 mm. across, with a reddish-brown, wrinkled pericarp, surmounted by an umbilicate disc, and minute lobes of the calyx; within are three oval, light-brown, hard pyrenes. The fruits contain sugar, and are supposed to act as an opiate (C), whilst the seeds are given for spermatorrhoea.

Croton Tiglium Linn. (Euphorbiaceae). The seeds.

Habb-el-salatin, "Sultan's seeds" (Hamadan); Habb-el-khatai, "Cathay (China) seeds"; Bidend jireh khatai, "Castor-oil seeds from China," Habb-dilmaluk (Ait.); Jamalgotia (Punj.).

Ait.; Schl.; Ph. Ind. iii. 281.

This is a small tree indigenous to China and N.E. India, now under cultivation throughout the greater part of India and the East.

Croton seeds were known to the Persians at a very early date and were doubtless introduced from China by the caravan route through Central Asia. They were described by Acosta in 1578, and called Pinones de Malaca. They are now imported from India.

They are oblong, 12 mm. long by 9 mm. broad, with dorsal and ventral surface arched. The testa is black, covered with a brown membrane; the oily albumen is enclosed in a delicate white membrane, and has two foliar cotyledons. The seeds contain a violently purgative oil, and are classified by the Persians among the poisons.

Cucurbita Pepo DC. (Cucurbitaceae). The flowers.

Gul-i-Kadu (Hamadan and Teheran); Kadu (Hind.).

Ait.; Schl.; Fl. Br. Ind. ii. 622.

The Pumpkin is largely cultivated as a vegetable in Persia and Afghanistan. The seeds provide the usual medicinal product of this plant, but the flowers, chiefly corollas, are sold in the bazaars of Teheran and Hamadan; they are yellow in colour and about 3.5 cm. long. The flowers are made into a decoction and applied to

the face to improve the complexion. They are also administered for chest troubles (C).

Cuminum Cyminum Linn. (Umbelliferae). The fruits.

Goi-Zira, "Green-Weed" (Turki, in Tabriz); Zira (Hind.); Jira (Beng. & Bom.); Cammun (Syr.).

Post 373; Gilliat-Smith & Turrill, Kew Bull. 1930, 390; Ph. Ind. ii. 113.

The Cummin plant is grown in gardens as a pot-herb, and the seeds, or properly fruits, are sold in the Persian bazaars as a condiment and medicine (Gilliat-Smith). There are three kinds of cummin recorded by Persian and Arabian writers; Kamun Farsi or Persian, Kamun Nabli or Nabatean (N.W. Arabia), and Kamun Kirmani or Black Cummin. The latter is probably the product of *Carum nigrum* Royle.

Cummin is a favourite condiment in India and other Eastern countries. From the cradle of civilisation in Egypt its use has spread to Arabia, Persia, India and China.

Cuscuta hyalina Roth. (Convolvulaceae). The herb, flowers, and seeds.

Gul-i-geshush (Hamadan), Flowers; Geshush, Kasus (Hamadan), Herb; Aftimun (Teheran), Flowers and seeds; Kochouze (Pers. lit.); Kushooth is the Arabic name for dodder. Kassutha (Gr.), Cuscuta (Lat.), hence Keshus (Pers.); "Kill weed."

Boiss. iv. 117; Ph. Ind. i. 548; Sci. pa. 240.

Of the above three samples of Persian drugs those from Hamadan appear to belong to *C. hyalina*. Gul-i-kasus (the flowers) and Tukhm-i-kasus (the fruits) are exported from Persia to India mixed with the leaves and spines of the plants on which they grow. The seeds are light-brown and have a bitter taste. The flowers are given for asthma and the thin filamentous stems for obesity. The drug Aftimun (Epitymon, Gr.), growing on a malvaceous plant, has larger flowers, and is probably derived from *C. europaea*, a native of Europe and Western and Central Asia. It is given as a digestive and purifier of the blood, just as in Europe dodder is an ancient remedy for intestinal disorders as constipation and flatulence.

Cymbopogon Schoenanthus Spreng. (Gramineae). Stems and leaves.

Azkar (Teheran); Izkhair (Arab.); Khavi (Hind.); Juncus odoratus; Herba Schoenanthi; Camel grass.

Ph. Pers.; Schl.; Ph. Ind. iii. 557; Oil-grasses of India and Ceylon, by O. Stapf, Kew Bull., 1906, 297.

The drug sent under this name is intended to represent the Persian and Indian drug Ishkar or Izkhair-i-jami, the stem and root of a fragrant grass introduced originally from Arabia. But the drug, although fragrant, consisting of the lower part of a leafy stem with a few wiry rootlets, could not be botanically recognised as a

grass. Kaempfer in his Travels in Persia in 1683-1688 speaks of the distillation of the oil from the grass Izkhir (Amoen. Exot. 1712). Preparations of the fragrant oil-grasses are used locally for debility.

Cynara Scolymus Linn. (Compositae). The fruits.

Kangar (Teheran); Kinguere (Schl.); Ardi-shauki (Arab.); Enghinar (Turki); Artichoke seeds.

Achundow; Boiss. iii. 557.

The Artichoke is a cultivated plant in Persia. The hard, white, polished fruits or achenes are used in medicine. They are called in some books kunghir, but according to Gilliat-Smith kangar is a name in Persia applied to almost any thistle. Aitchison believes that this name must have originated from the Persian name of the allied plant, the Prickly Artichoke (*Gundulea Tournefortii* Linn.). This plant, according to Schlimmer, exudes an emetic resin (Kangar-zad), which is used medicinally. Another plant, *Cirsium yamense* Turill, is called Kangar in Tabriz, where the underground shoots are eaten in the spring and called "artichoke" by the European Colony (Gilliat-Smith). The fruits in this collection, however, are those of the ordinary artichoke.

Cyperus rotundus Linn. (Cyperaceae). The tubers.

So-ad (Hamadan); Suad, Su'd (Pers.); Seid (Sudan); Motha (Hind.); Mustaka (Sans.); Muschk-i-zemin, earth musk; Rad. junci odorati (Ph. Pers.); Hsiang fu (Chin.).

Achundow; Ph. Pers.; Ph. Ind. iii. 552.

This sedge grows plentifully in moist or boggy ground. The small, dark, hairy tubercles are ovate-oblong, pointed at both ends, about 2.5 cm. or less in length, brown, hard, and horny. They have a somewhat lemon-like fragrance.

These tubers, known throughout Asia for their perfume and medicinal properties, are used for cleaning the teeth, and are placed among clothes to keep away insects. Their general action is tonic, stimulating, and stomachic.

Datura Stramonium Linn. (Solanaceae). Seeds and leaves.

Tukhm-tatulah (Pers.); Dhatura (Hind.); Jouj macel (Arab.); Shinah azghi (Bal.); Stramonium.

Ait.; Ph. Ind. ii. 586; Y.B. Pharm. 1927, 49; Synopsis of Genus Datura, W. E. Safford, Journ. Wash. Acad. Sci., 19 Apr. 1921.

The Thorn-Apple inhabits North, Central, and South America, and was introduced at a very early date into the warm regions of Europe, Asia and Africa. This species is a weed in Persia, and the name has been borrowed from other countries. Specimens of the seeds came from the bazaars of Teheran and Hamadan, and leaves from Hamadan, where they are sold among other drugs. Both seeds and leaves are used as poultices to allay pain. The natives recognise the poisonous properties of the seeds, and sometimes called them Kachola, the name for the seeds of *Nux vomica*, as both are used for

killing dogs. They contain the alkaloid hyoscyamine with small quantities of atropine.

Doronicum Pardalianches Linn. (Compositae). The root.

Daruneh (Hamadan); Darunej-i-akrabi (Pers.); Darounedge eghrebi (Schl.); Doronic (Gr.); Doronicum Graeci (Ph. Pers.); Doronicum root.

Achundow; Boiss. iii. 379; Makhjan-el-Adwiya; Ph. Ind. ii. 292; Kew Museum.

This ancient drug is said to have come originally from Greece and Syria. *D. scorpioides* Lam. affords some supplies of the drug, while *D. Falconeri* C. B. Cl., of the Himalayan region, has been identified as the origin of samples of the drug in India. It is a peculiar knotted root, like the tail of a scorpion, and white, like alabaster. It contains inulin instead of starch, and is acrid and bitter. In Persia it is regarded as poisonous. It is useful in nervous depression, and is prescribed, according to the law of signatures, for persons bitten by scorpions and insects.

Dracocephalum Moldavica Linn. (Labiatae). Herb and seeds.

Badranj-buya (Teheran); Badirash-bu (Tabriz); Badrendj-bouyih (Schl.); Baklat-el-utrujuya (Arab.). The Persian name means "the scented remedy for flatulent colic."

Achundow; Boiss. iv. 672; Ait.; Schl.; Ph. Ind. iii. 117.

Badrandj-buya is an important drug in Persia, and has been variously referred to species of *Nepeta*, *Calamintha* and *Melissa*, plants having the odour of balm. Achundow determined the source as *Melissa officinalis*. Aitchinson says the drug consists of the seeds of a labiate, while Dymock describes it as the flowers and seeds of a hyssop. The drug from Teheran is a mixture of broken stalks and seeds with some gland-dotted leaves. From Tabriz Mr. Gilliat-Smith sent seeds of the above-mentioned species of *Dracocephalum* under the same vernacular name, thus confirming the identification of Schlimmer in 1874. The seeds are black, somewhat torpedo-shaped, 2 mm. long, with a white V-shaped mark at the pointed end. They afford an opaque mucilage when soaked in water. The drug is esteemed locally, and is exported to India and elsewhere as a carminative and tonic. For another source of this drug see *Asperugo procumbens*.

Echinops persicus Stev., and other spp. (Compositae). Cocoon cases of a beetle.

Schakar tigar, "Sugar of nests" (Pers.); Chek kere tighal (Schl.); Gol tighol of Royle; Tréhala manna.

Ph. Pers. 1681, p. 361; D. Hanbury, Journ. Linn. Soc. 16 Dec. 1858; Science Papers, 158-164; Schl.; Apping, 1885; Ebert, 1909; Tschirch, 1912.

Tréhala is a sweet substance found in cocoons of a beetle occurring on the leaves and stalks of *Echinops persicus* and other species of *Echinops* found in Persia, Turkey, and Caucasus. The beetle is

Larinus maculatus Fald (Guldigul, Pers.), one of the Curculionidae. This insect forms a rough, chalky-looking nidus or cocoon, rounded-oval, 18-20 mm. long, yellowish-white, rough on the outside and smooth within. The cocoon contains from 15 to 23 per cent. of a special sugar, called by Berthelot trehalose, identical with mycose, the sugar of certain Fungi. Besides sugar there is present mucilage, amyloextrin and cellulose. This peculiar secretion, known since the time of Avicenna, is given in Hamadan for coughs and to relieve the respiratory organs.

Echium plantagineum Linn. (Boraginaceae). The corollas.

Gul-i-gao-zaban (Teheran); the Persian name means "Flowers of cow's tongue"; Flowers of Bugloss.

Boiss. iv. 208.

According to Dr. Aitchison the drug, under this Persian name, has been supplied by *Caccinia glauca* Savi and *Onosma macrocephala* DC. Schlimmer refers the origin of the drug to *Anchusa italica*, but remarks that druggists mix it with the flowers of *A. hybrida*. Dymock says the leaves and flowers of *Trichodesma molle* DC. come to Bombay under this name (Ph. Ind. ii. 521 and Appendix). In Baluchistan the drug is referred to *T. indicum* R. Br. (I.H.B.). In Sind it has been obtained from *T. zeylanicum* Br. It thus seems that Gul-i-gao-zaban is a generic name for the blue flowers of the Borage family. The above species of *Echium* occurs in Asia Minor, Transcaucasia, and North Africa. The blue corollas from Teheran belong to this species; they are 3 cm. long, 12 mm. wide at the throat, funnel-shaped, almost bilabiate, and slightly hairy. The flowers are considered a very good cardiac, tonic, demulcent, and laxative (C).

Embelia Ribes Burm. f. (Myrsinaceae). The berries.

Biranj-i-Kabuli (Teheran); Barhang-i-Kabuli (Pers.); Berengue Kaboli (Schl.); Baberang (Hind.); Embely currants.

Fl. Br. Ind. iii. 513; Schl.; Ph. Ind. ii. 349.

This shrub grows throughout India. The fruits are an ancient medicine in the East. Susruta described the anthelmintic properties of the fruits, which were given the Sanskrit name Vrisha-nasana, "destroyer of enemy" (worm). The drug is referred to in all Mohammedan works of medicine, and Rheede, Ainslie, Roxburgh, and Royle have added confirmatory evidence of the value of the berries for removing tape-worm (taenia) in children and adults. The fruits were given a place in the Indian and Colonial Addendum of the British Pharmacopoeia. The fruits are globular, dull-red, smaller than pepper corns, with a 5-partite calyx, and stalked. The outer shell is striated from base to apex, with a small beak. Inside it is reddish-brown marked by dark spots; the seed is horny with a reddish-brown crystalline efflorescence.

Dr. Warden in 1888 separated from the drug a crystalline active principle in golden spangles which he named embelic acid. Brissemoret in 1907 showed this substance to be an oxyquinone.

Erysimum repandum Linn. (Cruciferae). The seeds.

Tukhm-i-Khakshir (Hamadan); Khakechi (Schl.); Khubah (Arab.); Kashir (Bal.).

Achundow; Ait.; Schl.; Boiss. i. 189; Fl. Br. Ind. i. 153; I.H.B.

This is a small annual herb, hoary with close appressed hairs. It is frequent in Kashmir, Persia and westwards to Europe and West Africa. The seeds, with those of *Sisymbrium Sophia*, *S. Irio*, and other cruciferous plants, are exported into India from Persia under the name of Khakshir. The seeds from Hamadan are small, oblong, 1 mm. long, reddish or yellowish-brown, smooth, shining (not dull like those of *S. Sophia*), one surface convex and the other grooved, ending in a depression. When placed in water they become coated with transparent mucilage. The kernel is yellowish and oily, and has the flavour of mustard. The seeds are given in fever, and externally, in the form of a poultice, they relieve pain in the stomach (C).

Ferula galbaniflua Boiss. (Umbelliferae). The oleo-gum-resin. Biriz (Teheran); Barije, barzad (Pers.); Jao-shir (Arab.); Gum Galbanum.

Boiss. ii. 988; Schl. 295; Sino-Iranica, 363; Ait.; Ph. Ind. ii. 152.

Dr. Aitchison describes the Galbanum plant as being found in moist localities, as in the Badghis near Gulvan, where it grows in sandy soil. When in full blossom the flower is of a brilliant orange-yellow; as the fruit forms and ripens the colour changes, showing various autumnal tints. The stem is thick at the base, tapering suddenly and reaching a height of about four feet. The stem, on injury, yields an orange-yellow juice which slowly consolidates and has a strong odour resembling celery. This gum-resin is an article of export through Persia via the Gulf to Arabia and India. The sample from Teheran is said to have come from Kurdistan and Mazanderan. Galbanum is used internally for colic and is a useful stomachic. Externally it is applied as a plaster to sores and wounds. The drug contains resin 65, gum 20, essential oil 10-22 per cent., chiefly a terpene, d-pinene.

Ferula sp. (Umbelliferae). Oleo-gum-resin.

Sek-benedge (Teheran); Sagbinaj (Arab.); Iskabinah (Pers.); Sek biniedge (Schl.); Sagapenum.

Achundow; Ait.; Schl.; Sino-Iranica, 366; Ph. Ind. ii. 161.

Sagapenum is a fragrant gum-resin obtained from an undetermined plant in Laristan. Previous writers have suggested *Ferula persica* Schl. and *F. Szovitsiana* DC. as its botanical sources, but these have not been confirmed. The Makhzan-el-Adwiya states that the drug is brought from Shiraz and Kerman. As found in the market, the tears adhere into brownish-yellow cakes, translucent, with a persistent alliaceous odour and acrid taste. It yields by distillation a volatile oil containing sulphur. In the form of a plaster the drug has a local reputation for rheumatism.

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Foeniculum vulgare Mill. (Umbelliferae). The fruits.

Razione (Teheran and Hamadan); Razianah (Pers.); Dadli boyana (Tabriz); Razianaj (Arab.); Shum razionj (Syr.); Fennel. Post, 356; Schl.; Ph. Ind. ii. 124; On the commercial varieties of Fennel, J. C. Umney, Pharm. Journ. 58 (1897) 225; I.H.B.

Fennel is a stately umbelliferous plant cultivated for its fruits in several parts of Europe and Asia. The fruits are frequently in the bazaars confounded with aniseed (*Pimpinella Anisum* Linn.) the Persian name for which is Badian. A sample of fruit from Teheran labelled Badian, for instance, was that of Fennel. The fruits, commonly called seeds, are greyish-brown, slightly curved, beaked, with 5 prominent ridges on each mericarp, about 6-7 mm. long. The taste is sweet and aromatic. They yield from 3 to 5 per cent. of essential oil containing, as the principal ingredient, anethol, which constitutes 50 to 60 per cent., with a small amount of a compound with a bitter taste called fenchone. J. C. Umney found the odour of Persian fennel nearer to anise than any other variety of fruit examined, the percentage of anethol being higher and fenchone comparatively low. Fennel is a valuable condiment, and enters into mixtures given for dysentery and colds.

Fritillaria imperialis Linn. (Liliaceae). The corms.

Gul-i-samigun (Teheran); Gole-samagune, "The bulbs of the topsy-turvy"; "The tubers of a plant, the flowers of which, according to the natives, hang upside down, considered rare in Afghanistan and highly valued as a medicine" (Aitchison). Schlimmer refers the drug to *F. acmopetala*. Another Persian name for this plant is Gul-i-shirper, "flowers of six feathers" (L. J. Jefferies, mountains of Dasht Arjin, Farsistan. 1888).

Boiss. v. 189; Ph. Ind. iii. 498.

The Crown Imperial. The drug consists of broken pieces of thick corms. They are of a whitish colour, without odour or taste. The starch is oval and regular. An alkaloid has been separated from them by Fragner. The corms of species of *Fritillaria* are a valuable medicine in the Far East, chiefly for chest complaints. Regarding the Persian drug it is said, "When a woman has a child, a paste is made from it and is put on her stomach to reduce pain." (C).

Fumaria parviflora Lam. (Fumariaceae). The herb and fruits.

Shah tara (Teheran); Tukhm-i-Shahtara (Hamadan); Shah-tarra, "royal herb"; Tarra, "pot herb" (Pers.).

Achundow; Schl.; Boiss. i. 135; Fl. Br. Ind. i. 128; I.H.B.; Ph. Ind. i. 114.

The Fumitories are medicinal herbs employed throughout India, Afghanistan, and Baluchistan. The above species is found as a weed of cultivation, and the fruits are collected and exported.

The herb and fruits are both used in medicine. The herb occurs as broken fragments of stem and leaves with a slightly acid and

head, apiculate, rugulose on the surface, and one-seeded. They have hardly any odour, and the taste is slightly acrid and astringent. The plant contains fumaric acid and the alkaloid fumarine. Shah-tara is highly esteemed by Mohammedans in India; it is said to purify the blood and act as a laxative and diuretic. In Persia it is often mixed with chicory for medicinal purposes.

Gaillardia aristata Pursh. (Compositae). The fruits.

Ra'ana ziba (Teheran); Ra'ana (Arab.), Ziba (Pers.), both words meaning "beautiful."

This drug consists of the achenes of a North American plant grown in Persia for its handsome yellow and red flowers. The small villous achenes are surmounted by a ring of 6 to 10 hyaline pales, each 1-nerved, ending in a bristle. The plant is noticed by Mr. Gilliat-Smith as being cultivated in gardens near Tabriz, where the local name is Zilf-afshan.

Gul angrezi ("English-flowers") and Gul ashrafi are the names of the dried flowers of *G. pulchella* Fouger, a plant introduced into Baluchistan (I.H.B.). The medicinal properties of these drugs are not stated.

Glycyrrhiza glabra Linn. (Leguminosae). The root.

Risha asra sus (Teheran); Sus, asus (Pers.), the plant; Bekh-sus, the root-stock; Rob-asus, asal alsus, the extract.

Achundow; Ait.; Boiss. ii. 202; Post, 277; Schl.; Ph. Ind. i. 491.

Aitchison says the liquorice plant is a characteristic and extremely common shrub in the Badghis and Khorasan, at an altitude of above 2000 ft., and most luxuriant in loamy soil where there is moisture. In the latter localities the annual shoots grow to four feet with enormous underground rootstocks, which are sometimes used as fuel. The nomads collect these rootstocks from which they prepare the extract of liquorice. Post remarked that in Syria liquorice is a variable species in waste fields and on dry hill-sides, crowding out other vegetation. Schlimmer refers to three species, *G. glabra*, *G. echinata*, and *G. violacea*, while Boissier makes several varieties of the plant. It occurs also in Baluchistan. India obtains market supplies from Persia and Sind, and Aitchison suggested its cultivation in Quetta, Kohat, Peshawar, and other localities on the North-western Frontier. Throughout Asia liquorice root and its extract from time immemorial has been used for cough and chest complaints. In northern Persia the fibre of the root left after the preparation of the extract has been known to be made into paper.

Gypsophila paniculata Linn. (Caryophyllaceae). The root.

Zuleh (Hamadan); El-sabuniyeh, of the Arabs; Saosafed, Bekh (Ait.); Kundur, Kundusch (Achundow); Soap root.

Aitchison; Post; Boiss. i. 542; Ph. Ind. i. 155.

A shrubby plant of North Persia, Afghanistan, the Caucasus and Turkestan, 3 to 4 feet high with numerous stems springing from a perennial root-stock. The plants are characteristic of sandy soil; in Khorasan they are wild in cultivated ground. The underground root-stocks are collected and used as soap for washing the hair and clothes. In Persia the roots are regarded as poisonous. They contain the glucoside saponin; Kobert in 1904 separated from 6 to 16 per cent. of this principle from various samples of soap root. The Persian drug is no doubt a substitute for the older Roman and Egyptian Struthium, the root of *G. Struthium* Linn. of S. Europe. According to Achundow some of the vernacular names may refer to other saponin-yielding plants. *G. Arrostii* Guss. is the origin of the Levantic soap root.

Helicteres Isora Linn. (Sterculiaceae). The fruits.

Pachman-i-puh (Teheran); Kisht bar Kisht (Pers.); Pechak (Hind.); Avartin (Sans.); the Persian and Sanskrit names signify the furrows on a ploughed field.

Ibn Baitar; Achundow; Fl. Br. Ind. i. 365; Ph. Ind. i. 231.

The East-Indian Screw tree occurs in the dry forests throughout Central and Western India, and in Ceylon, and is found also in Java and northern Australia.

The spirally curved fruits are sold in all Indian bazaars, and their medicinal reputation is evidently known in more northern countries. The fruit is composed of fine slender, angular carpels twisted like corkscrews, and together forming a cone 3.5 to 5 cm. long. The carpels are pubescent and greenish-brown, and each one contains a single row of dark-brown, angular seeds. The drug has demulcent and slightly astringent properties, and is employed as a medicine for dysentery, for griping of the bowels, for flatulence in children, and for improving the appetite.

Heracleum persicum Desf. (Umbelliferae). The fruits.

Goleper (Kermanshah); Giafari (Schl.).

Schl.; Post; Boiss. ii. 1044.

This species of cow parsnip is indigenous in the moist valleys of the Elburz mountains, and is related to *H. pubescens* M.B., of a wider range. Boissier refers the plant Goulpere to *H. lasiopetalum*. The fruits, which are sold as a spice, are ovate-oblong, villous on the back, margin aculeate, the dorsal vittae thick and clavate, extending to two-thirds the length of the mericarp. While some of these plants are used medicinally and for food, other species in America and Europe are poisonous and produce erysipelatous inflammation (Cormerin, Des Plantes Vénéneuses, 1887).

Holarrhena antidysenterica Wall. (*Wrightia antidysenterica* Grah.). (Apocynaceae). The seeds.

Tukhm-zaban-i-gungishk-i-talk, "seeds of the bitter sparrow's tongue" (Pers.); Lizan ul asafir (Achundow); Indrajau (Hind.); Estrefanthus.

Ph. Ind. ii. 392; Pyman, Journ. Chem. Soc. 1919; Fl. Br. Ind. iii. 645.

A small deciduous tree in the tropical Himalaya, ascending to 3500 ft., from the Chenab westwards; throughout the drier forests of India, to Travancore and Malacca.

Samples of the seeds came from the bazaars of Hamadan and Teheran, showing that this Indian drug is well established in Persia. The seeds are narrowly linear-oblong, glabrous and brown, about 1.2 cm. long. They have a bitter taste due to the presence of an alkaloid, wrightine (conessine), which resides also in the bark of the tree, and may be separated in white crystals. Conessine acts like emetine. The seeds are reputed to have tonic and aphrodisiac properties.

Hyoscyamus reticulatus Linn. (Solanaceae). The seeds.

Bazr-el-banj (Hamadan); Bezor ol bendge (Schl.); Kohi bang (Bal.); Benj (Arab.); Bango (Port.); Henbane seeds.

Ait.; Boiss. iv. 295; Schl.; Post; Ph. Ind. ii. 626.

This species of *Hyoscyamus*, as well as *H. muticus* Linn. and *H. pusillus* Linn., is found wild in Persia and Syria. Aitchison observed that goats and sheep grazed on Henbane plants without apparent bad effects, and the shepherds did not look upon these herbs as poisonous. The seeds of these plants are, however, regarded by native physicians as being as poisonous as opium; they are exported from Persia to India. Henbane seeds are reniform, laterally compressed, greyish-brown in colour, with the testa finely reticulated. The taste is oily, bitter, and acrid.

The seeds and leaves contain the poisonous alkaloid hyoscyamine, the effect of which is to produce vertigo and insanity. The smoke of the seeds is inhaled for toothache.

Illicium verum Hook. f. (Magnoliaceae). Fruits.

Bādiān-i-khatai, "Anise of China" (Pers.); from Teheran.

Schl.; Ph. Ind. i. 41.

The Star Anise of commerce is obtained from trees growing in South China and Cochinchina. South-east Kwangsi and Tonkin possess the world's monopoly of this product, and Hong Kong is the chief distributing medium for foreign countries. Star Anise was a new medicine in Persia a hundred years ago, but the fruits and oils are now shipped regularly to India from China, and reach Persia via Bombay. The star-shaped fruits, composed of eight brown, radiating, boat-shaped carpels, vary from 3 to 3.5 cm. in diameter. They contain about 5 per cent. of essential oil, consisting of solid and liquid anethol; from 85 to 90 per cent. of anethol can be obtained from good oils by the freezing method. The fruits and oil are stomachic and are given to relieve cough and lung affections, and are used in confectionery and for seasoning food.

Inula Helenium Linn. (Compositae). The root.

Ghaza gouzanah (Teheran); Anduz (Hamadan); Gharsa; Pil gush, "Elephant's ear"; Rasan; Rasna of the Hindus; Andiz otu (Turki, *vide* Boissier ii. 186); Zendjebile chami, "ginger of Damos"; Zanjabil-i-shami, "Syrian Costus"; Aunée (Fr.); Helenion (Gr.); Enula campana (Med. Lat.); Elecampane.

Ph. Pers.; Schl.; Boiss.; Pharmacographia 340; Ph. Ind. ii. 259.

This plant is distributed in Central Asia and Central and Southern Europe. Schlimmer says the root sold in Persia comes from Baghdad and Damascus.

Elecampane root was an ancient medicine among the Greeks and its use spread to other parts of Europe and to Asia. It is not only an Asiatic drug but it is also recognised in the Pharmacopoeias of Germany, France, and the United States.

The root is hard and horny, brownish-grey in colour, paler within. The bark and wood are separated by a dark cambium layer; shining brown oil glands appear scattered over the surface of a transverse section, or are arranged in radiating groups. Crystals are seen in the interstices of old commercial samples. The root has an agreeable aromatic odour and a warm bitterish taste. In addition to inulin, which so frequently displaces starch in the Compositae, elecampane root contains from 1 to 3 per cent. of a solid crystalline mass permeated with a liquid oil containing alantic acid and alantolactone.

The root is given for bronchitis and tuberculosis and is a general aromatic tonic. It is used locally to reduce eruptions. From early times elecampane has been used as a substitute for or adulterant of the *Costus* of the East. Dymock mentions *I. Royleana* DC. and *I. racemosa* Hook. f. as plants affording roots for mixing with *Costus* in more recent times.

Ipomoea hederacea Jacq. (Convolvulaceae). The seeds.

Habb-el-nīl (Hamadan); Hab-un-nīl (Arab.); Hebbonile (Schl.); Tukhm-i-nīl (Pers.); Tukhm-i-nīlafar (Afgh.); Kaladanah (Hind.); Ipomoeae cyanosae semina (old Herbals); Pharbitis seeds.

Ait.; Schl.; Fl. Br. Ind. iv. 197; Ph. Ind. ii. 532; B. P. 1914.

The above plant grows all over India. The flowers are blue, hence the name nīlafar.

The seeds are blackish, forming the quadrant of a sphere, about 5 mm. long, with a minute protuberance at the upper end; they have a longitudinal dorsal groove, and dark-brown hairs on the hilar depression. These characters distinguish the seeds of this species from those of *I. muricata* Jacq. which are also used as a source of this drug. (Kassner, Pharm. Journ. 1924, [4] 58. 155, 203).

The action of these seeds is cathartic, due to the presence of an acrid resin. They are locally considered very poisonous.

Iris spuria var. **halophila** Pall., and other species. (Iridaceae). The rhizome.

Risha-i-irisa (Teheran); Bikh-i-banafshah, "Violet root" (Pers.); Susan mund (Kash.); Irisa (Ind. bazaars); the name is a corruption of the Greek; Orris root.

Schl.; Boiss. v. 126; Ph. Ind. iii. 451; I.H.B.

The violet odour of Orris root has long been recognised in the East, and the root is accordingly used for its perfume and as a medicine. The rhizomes of different species vary in their activity and aroma. Aitchison says the rhizome of an *Iris* is called Orisa or Orisia in Afghanistan and is brought from Bijnort to the Meshed market. Bombay is supplied with Orris root from Persia and Kashmir. Dymock identified one source as *I. germanica* Linn. Three samples are in the collection from Persia, and the one from Hamadan agrees with the root of botanical specimens of *I. spuria* found in Kurdistan. In Baluchistan the rhizomes of *I. songarica* Schrenk, called Gharwasha, powdered with curds, are used to stop diarrhoea. *I. Stocksii* Hemsl. & Lace is eaten in the Quetta Valley. The roots sold in the Persian bazaar retain their outer peel and differ from the trimmed root sold in Europe. Irises are plentiful in Persia, and their roots might be profitably exploited for the home markets. The roots yield a glucoside, iridin, and an ethereal oil containing irisol.

Juniperus communis Linn. (Taxaceae). The fruits.

Habb-el-harār (Teheran); Hab-el-a'ra'r (Ind. bazaars); Er'er, djerdjere (Schl.); Juniper berries.

Ph. Pers.; Abu Mansur; Ph. Ind. iii. 371; B.P. 1914.

The Juniper fruits sold in Teheran are said to be collected in the Elburz mountains. The fruit is a galbulus, grey-brown, 8 mm. in diameter, apex with a triradiate scar; it contains three hard, triangular seeds with large oil-glands and yellowish resin. The odour is like turpentine and the taste sweetish.

The fruits are a well-known drug in India, where they are imported from the west. The essential oil is official in the British Pharmacopoeia. The fruits and oil have a diuretic action and are administered for dysmenorrhoea.

Lallemantia Royleana Benth. (Labiatae). The seeds.

Balingan (Hamadan); Tukhm-i-balung (Ind.); Tukhme balengon; Dracocephali Royleani semina (Schl.).

Boiss. iv. 674; Ph. Ind. iii. 90.

This plant is found throughout Persia, Baluchistan, Afghanistan, Turkestan, and Northern India.

The seeds are black, narrowly oblong, 3 by 1 mm., smooth, angled on the inner side, arched on the other, a white spot at the narrow end or umbilicus. When soaked in water they become coated with an opaque, grey, tasteless mucilage.

The seeds are used for cough, and as a cordial stimulant and aphrodisiac.

A similar drug, the seeds of *L. iberica* F. & M., is sold in the bazaars at Tabriz, where the seeds are called Gara za'arak, meaning "little black seed." The plant is a pot herb (Gilliat-Smith).

Languas officinarum *Burkill* (*Alpinia officinarum* Hance). (Zingiberaceae). The rhizome.

Kulenjan (Teheran); Gūlindjān, Khulanjan (Pers.); Lesser Galangal.

Schl.; Ph. Ind. iii. 437; Hanb. Sci. Papers, 370.

This plant is indigenous to the Chinese island of Hainan, and is cultivated on the neighbouring coast of Kwangtung and in Siam. The rhizome is an ancient spice and medicine of the East and is occasionally brought to European countries. The drug is exported from Hong Kong and the Straits Settlements to Calcutta and Bombay, and re-exported to Arabia, Persia and Egypt.

The root is about 5 cm. long and less than 1.3 cm. in diameter, often branching, externally of a rusty-brown colour, longitudinally striated; and transversely marked with remains of leaf sheaths. Internally it is greyish-brown and breaks with a fibrous fracture; the odour is aromatic and the taste hot and spicy.

It yields from 0.5 to 1 per cent. of essential oil, containing cineol, to which the oil owes its camphor-like odour, eugenol, d-a-pinene, and probably cadinene (Gildmeister & Hoffmann ii. 278). Galangal root is used as a condiment, and in medicine it is given as a stomachic and for rheumatism.

Lavandula dentata *Linn.* (Labiatae). Flower-heads.

Astukudos (Teheran); Ustukhudos (Pers.); Osthokhodouce (Schl.); The Persian name is derived from the Greek.

See paper on this drug by Mr. I. H. Burkill in the Journ. As. Soc. Bengal, N.S., Vol. v. No. 3, March, 1909, 67-71; Ph. Ind. iii. 93; Boiss. iv. 540.

These are the flower-heads of a species of Lavender sold in Teheran and brought from Shiraz. They constitute an ancient drug used by the Greeks and referred to by Arabian and Persian physicians. The name ustukhudos has been applied to *L. Stoechas* L., the Staechus of old works on Materia Medica, the Lavender of the Isle of Hyères. *L. Stoechas* of the Mediterranean region has purple flowers on short, stalked spikes, with downy heart-shaped bracts. Upper bracts form an abortive purple tuft at the top, and the herb has a camphoraceous odour and hot bitter taste. *L. dentata* has the odour of rosemary and camphor. The essential oil contains dextro-camphor and dextro-fenchone, and probably fenchyl alcohol. (Giessler, 1915). Oil of *L. dentata* is similar to that of *L. Stoechas* (Gildmeister & Hoffmann iii. 450).

An infusion is given for catarrh. Locally the drug is outwardly applied in cases of neuralgia, to check bleeding, for the washing of wounds, and as a remedy against eruptions.

Lecanora esculenta *Eversm.* (Parmeliaceae). The lichen.

Shir zad (Teheran); Chir zadi, Agalactie (Schl.).

Holmes, Manna, Chem. & Drugg. xcii. 25 (1920).

The manna lichen is abundant in North Africa and Western Asia, on rocks or on soil, and locally in the desert of Seistan. It varies from the size of a pea to a small nut, clear brown or whitish, the interior is soft, white with interlacing hyphae and crystals of calcium oxalate. There is a tendency for the thallus to develop excrescences of a nodular form which easily become free and drift about by the wind in the desert. Under the article "Agalactie" Schlimmer records historic references to this lichen being used as food from the time of Alexander the Great. According to La Cour (1880) and Elekin (1901), the lichen contains lichenin, but its nutritive value is very low. The name of the drug means "milk begetting," and it is used in Teheran to increase the flow of human milk after childbirth.

Lepidium sativum *Linn.* (Cruciferae). The seeds.

Tukhm-shahi (Teheran); Tereh tizec (Schl.); Assalia (Bomb.); Tara tezak (Afg.); Cress seed.

Ait.; Schl.; Ph. Ind. i. 120; Boiss. i. 354.

The cress or garden cress is a native of Persia and is widely distributed as a cultivated plant eastwards to Tibet. The seeds are exported as a drug from Persia to India and westwards to Europe. The seeds are light brown or reddish-brown, oblong, 3 by 1.2 mm., with a depression on the inner margin and a white spot at one end, cotyledons incumbent. They have a pungent cress-like taste and become coated with transparent mucilage when soaked in water. The seeds contain 50 to 60 per cent. of fatty oil. Myrosin, an enzyme, with water, yields a volatile oil. Phenyl acetic acid, nitrile or benzyl cyanide is the principal constituent of the essential oil (A. W. Hoffmann). The seeds are tonic, aphrodisiac and diuretic.

Lepidium Draba *Linn.* (Cruciferae). The seeds.

The Hoary Cress, a weed of cultivation, distributed westwards to Europe, is the Montchih of Ispahan; Bajindak (Hind.); Buski seed of Baluchistan (I.H.B.). In Tabriz the young shoots are used as a salad under the name of "Khili-wili."

The seeds are smaller than those of the previous species, oval and dark brown. Seven or eight seeds are given as a dose for flatulence.

Linum album *Kotschy.* (Linaceae). Stems and flowers.

Sodabe (Hamadan); White Linseed.

Boiss. i. 858.

This is a glaucous shrub in Persia growing among crops. The lower parts of the stems are white and leafless. These stems and a few flowers form a drug which is used for syphilis, but the remedy is not recorded in other medicinal works of the East.

Linum usitatissimum Linn. (Linaceae). The seeds.

Basarak (Hamadan); Basarak katun, "Little seed of flax" (Pers.); Tukhm-i-katan (Ait.); Bazr ul kattān (Ach.); Bizre kattane (Schl.); the names for linseed in India are Alsī, Atasi and Alashi.

Ph. Ind. i. 239.

Aitchison informs us that in Afghanistan the Flax plant and seed are known as zagher; the oil of the seed as roghan-i-zagher; the fibre and linen cloth as katan or katun. The plant is cultivated in Turkestan for its seed for oil, but here, as in India, the fibre is not collected.

The seeds are largely eaten in sweetmeats, and the oil is employed both as a burning oil and in diet. In India the seeds are crushed and used as in Europe for poultices, and the oil is exported in large quantities from Calcutta.

Malva sylvestris Linn., var. **mauritiana** Boiss. (Malvaceae). Flowers.

Panirak (Teheran); the name in Persian means "little cheese," from the shape of the fruit; Penirek, Khib-bazi (Schl.); Nan-i-kulagh, "Crow's beard"; Khitmi-i-kuchak, "Small khitmi" (Pers.); Hamam komandji (Turki).

Boiss. i. 819; Ph. Ind. i. 204.

Aitchison says the flowers of the Mallow (*M. sylvestris*), called Gul-i-khatmi, are collected and exported and employed in medicine in North-eastern Persia. Dymock remarks that three varieties of the plant are grown in India: (1) cultivated, molochia; (2) large wild, khitmi; (3) small wild, khubazi. Khubazi is the Arabic and Bombay name of the drug imported into India from Persia. The drug from Teheran consists of the flowers with the small rotate carpels of the fruit ("little cheeses") in an immature state. Khatmi or khitmi is usually applied to the larger-flowered plants of species of *Althaea*. The Teheran drug is used locally for whooping cough (C).

Merendera persica Boiss. & Kotschy. (Liliaceae). The corms.

Surinja (Hamadan); Surinjan, shambalit (Pers.); Colchicum Persicum (Ph. Pers.); Sourenjane metri (Schl.).

Ph. Pers.; Boiss. v. 167; Schl.; Ait.; Ph. Ind. iii. 496.

This plant, allied to the *Colchicum*, occurs in North Persia, Afghanistan, the Juniper tracts of Baluchistan, and in the Punjab.

Aitchison found the plant common all over the Badghis and Khorasan. The corms are collected and exported from Meshed, as a medicine, through Persia to India via the Persian Gulf. The drug is one of the forms of the ancient Hermodactyl. It is probably the Surinjan-i-shirin or Sweet Surinjan, a medicine used by the Mohammedans in India.

The root from Hamadan is broken up into pieces showing a white, starchy fracture with no perceptible taste or smell. The starch granules are oval or rounded, occasionally truncate, with a hilum.

The drug is said to have the same action as the bitter Surinjan (*Colchicum* spp.) as a remedy for rheumatism.

Morus nigra Linn. (Moraceae). The root-bark.

Risha sha tut (Teheran); Chah touti (Schl.); Shah tut, "Royal Mulberry"; Tut shami (Syr.); Moron (Gr.); Sycamine.

The Black or Grafted Mulberry is cultivated in Persia and Baluchistan, principally for its fruit; the White Mulberry (*M. alba*) is grown for sericulture. They both yield fruit which in season is sold in the bazaars and met with in nearly every household (Aitchison).

The drug from Teheran consists of the bark of the root, reddish-coloured externally, with strong silky-white liber cells. It is used for dysmenorrhoea. In China the root-bark of the White Mulberry also has a great reputation as a medicine.

Nepeta ispanhanica Boiss. (Labiatae). Flowers.

Zūfā (Teheran); Zufah-i-yabis (Pers.).

Boiss. iv. 166; Achundow; Ph. Ind. iii. 116.

Zufah is a fragrant plant used for many years as a drug in the East. Schlimmer refers to Zoufa as a Hyssop and identifies the plant as *Nepeta officinalis*. Aitchison doubtfully refers the Zufa of Afghanistan to a species of *Hyssopus*. Dr. Dymock found the Zufah in Sind to be *N. ciliaris* Benth., while the plant of this name in Baluchistan is *N. bracteata* Benth. (I.H.B.).

The drug from Teheran consists of the fruiting calyx and seeds and stalks of *N. ispanhanica*, a species allied to *N. schiraziana* Boiss. The calyx is erect, 5 mm. long, 15-ribbed, green, with purplish, lanceolate, acute teeth, nearly as long as the tube. The seeds are oblong, 1 mm. in length, minutely punctate, with a white V-shaped scar at the narrow end. The seeds are mucilaginous when placed in water.

Nigella sativa Sibthorp (Ranunculaceae). The seeds.

Siyah danah, Shuniz (Pers.); Hab-es-souda (Arab.); Kala jira (Hind.); Siah daneh, Chounige (Schl.); False Cummin.

Boiss. i. 68; Ph. Ind. i. 28.

An annual herb, sometimes called the Nutmeg flower or Fennel flower, cultivated in Egypt, Syria, and Persia. According to Birdwood the seeds of the plant are the Black Cummin of the Bible, the Melanthion of Hippocrates and Dioscorides, and the Gith of Pliny.

The seeds are triangular, 2.5 to 3 mm. long, the umbilical end being the smaller, black; the testa is rough, with a white, oily kernel within. When crushed there is a pleasant odour of lemon. The seeds have been analysed by H. G. Greenish (Pharm. Journ. [3] x. 909), who found an essential oil, a fixed oil, and a saponin-like body. The seeds are used extensively as a spice and medicine. The ancient custom of sprinkling the seeds, like those of cummin, over the surface of bread baked by Mohammedans still prevails in Teheran and Tabriz. There is an Arab proverb: "In the black seed is the medicine for every disease except death." Around

Tabriz *N. arvensis* Linn. is cultivated as a pot-herb and for its seeds. It is called Gara tschorek oti, "Black bread weed" (Gilliat-Smith).

Nymphaea alba Linn. (Nymphaeaceae). The flowers.

Nilafar (Teheran); Nilufar (Pers.); Nenuphar (Ph. Pers.).

Ait.; Boiss. i. 104; Fl. Br. Ind. i. 114; Ph. Ind. i. 70.

These are the flowers of the White Water Lily found in ponds throughout Europe and Siberia. Nilufar is a name also applied to flowers of other water-lilies and sometimes to species of *Ipomoea*, which have blue flowers. Kamal, the flowers of a *Nymphaea*, is sold in drug-shops in India; and occasionally the flowers of the Sacred or Egyptian Lotus (*Nelumbium speciosum* Linn.) are used medicinally, especially in China.

The flowers have cooling and astringent properties and are administered locally for fevers and chest troubles (C).

Ochrocarpus longifolius Benth. & Hook. (Guttiferae). The buds.

Normush (Hamadan); Tambra, "red," Nagkeshur (Pers.).

Fl. Br. Ind. i. 270; Ph. Ind. i. 172.

This tree grows in the western part of the Peninsula of India from Canara to the Concan. The flower buds come principally from Rajapur and the Deccan.

The reddish-brown globose flower buds, like cloves, are used for dyeing silk and are astringent. In Persia, where they seem to have been recently introduced, they are used as a tonic (C).

Ocimum Basilicum Linn. (Labiatae). The seeds.

Tukhm-i-raihan (Hamadan); Reyhane sibze (Schl.); Takmeria (Bomb.); Semen Basilici (Old Herbals); Alfabaca (Port.).

Ait.; Boiss. iv. 534; Fl. Br. Ind. iv.; Ph. Ind. iii. 83.

The Sweet, Roman, or Garden Basil is a native of India and Persia and is distributed in Africa and Malaya. Raihan is Arabic for "the herb," and the plant is a pot-herb much used for its mint-like aroma. The seeds have long been known in medicine, and are said to be the Badranj of Ibn Sina. Large quantities are imported into India from Persia.

The nutlets or seeds are blackish, oblong, 2 to 2.5 mm. long by 1 to 1.2 mm. broad, punctulate, slightly arched on one side, with a white umbilicus at the end. They immediately become coated with a semi-opaque mucilage when placed in water.

Schlimmer remarks that the seeds are eaten with bread and cheese.

Ocimum canum Sims (*O. album* Roxb.). (Labiatae). The seeds.

Tukhm-i-sherbati (Hamadan); Tukhm-chirbati, reyhane kouhi, Badrudge ibieze (Schl.); White Basil.

Schlimmer remarks that Shiraz supplies Persia with these seeds, and adds that they are an indispensable ingredient in iced sherbert (sorbets à la glacé). It is said that when placed in water they give

off an agreeable odour, thus differing from the seeds of species of plantain (*Plantago*).

The seeds or nuts are black, punctulate, oblong or ellipsoid, by 1 mm., arched on one side with a sharp bifurcate line on the other. They are smaller than those of *O. Basilicum*, with a less prominent white umbilicus, but, like them, they become coated with opalescent mucilage when placed in water.

The seeds are given locally for lung and chest complaints.

Inosma echioides Linn. (Boraginaceae). The root.

Risha hava chuba (Hamadan); Haveh tchoubeh (Schl.); Jarjuya (Pers.); Ratanjot (Hind.); Yarleng (Bal.).

Achundow; Schl.; Boiss. iv. 181; Fl. Br. Ind. iv. 178; H.B.; Ph. Ind. ii. 54.

This plant, growing in Afghanistan and Siberia, affords a root which is a substitute for Alkanet (*Anchusa tinctoria*), from Al-kanna of the Arabs, employed as a dye and medicine in early times. The root of the allied species, *O. Hookeri* Clarke, is called Ranj-i-badshah, "King's dye." The tapering root has a purplish-red colour, and the cortical portion is easily separated in flakes. It imparts its colour to oils and spirits, and is used in colouring medicinal preparations. In Baluchistan the powdered leaves are given as a purgative to children. In Hamadan the root is powdered and given to horses for cough.

Papaver somniferum Linn. (Papaveraceae). The seeds.

Tukhm-i-khash-khash (Hamadan); Khish khash (Arab.); Cheche-kheche (Schl.); Poppy seeds.

Aitchison; Post; Ph. Ind. i. 73.

The seeds of the Opium Poppy are eaten in sweetmeats. They contain 50 per cent. of drying oil which is sometimes expressed and called Roghan-i-khash-khash. This oil is used for burning as well as for food. The seeds are sometimes said to be poisonous because they are contained in the opium-yielding capsule, but they are wholesome and nutritious.

Meganum Harmala Linn. (Rutaceae). The seeds.

Harmall (Arab.); Ispand, sipand (Pers.); Uzarih (Turki); Charjil, haremlan (Syr.); Espende, sodabe kouhi (Schl.); the Syrian Rue.

Achundow; Schl.; Post; Boiss. i. 917; Fl. Br. Ind. i. 486; Ph. Ind. i. 75; Wiesner, 44.

The Mountain Rue is a plant of Persia, Arabia, Syria, North Africa, and South Europe. The plant and seeds were used medicinally by the Greeks and Romans. Harmel or wild rue, a native of eastern countries, was noticed in European Herbals in the XVIIth century. The seeds are imported from Persia into India, where the plant has been introduced by the Mohammedans. The seeds are dull grey-brown, 2 mm. long, irregularly angular, testa spongy and tough, albumen fleshy, embryo curved; they have a bitter taste,

and when crushed have a heavy narcotic odour. They afford a fluorescent solution in water and a red-coloured tincture in spirit. The active principle probably resides in the alkaloids harmaline (Göbel, 1837) and harmine (Fritzsche, 1847). The custom still prevails in Persia of sprinkling the seeds on burning coals at marriages to avert the malignant influence of the evil eye. The seeds are an alterative and purifying medicine, and are supposed to stimulate the sexual system.

Physalis Alkekengi Linn. (Solanaceae). The fruits.

Gul-i-kakandj (Hamadan); Kakanah (Pers.); Kekenadge (Schl.); Alkikenji (Arab.); Clammy Wintercherry.

Achundow; Boiss. iv. 287; Post; Ait.; Schl.; Ph. Pers.; Ph. Ind. ii. 560.

A plant of Syria, Arabia, Persia, and Baluchistan.

The berries of this plant are in shape and size like dried cherries, but are full of pulp in which are embedded many reniform, yellowish seeds. As sold in the bazaars, broken fragments of the red accrescent calyces are mixed with the drug.

The fruits are said by Schlimmer to be hydragogue and vermifuge. Achundow indicates their use in certain female complaints. Locally they are regarded as a remedy for syphilis, and are supposed to be intoxicating when taken in quantity (C).

Pimpinella Anisum Linn. (Umbelliferae). The fruits.

Badian-i-rūmī (Teheran); Antchibun, a corruption of Anisum (Tabriz); Erva dos, from Portuguese Herba doce (Dymock); Aniseed.

Ait.; Boiss. ii. 866; Schl.; Ph. Ind. i. 131.

Anise is cultivated largely in Russia, as well as in Persia, for its seed, which is employed as a condiment and medicine. The fruit is often confounded with fennel. Boissier and Pomet give the Arabic Badyan as the vernacular name of *Foeniculum officinale* All. and the sample from Hamadan, labelled Badian, is the fruit of *Foeniculum vulgare*. Aniseed has been introduced into India from Persia, whence the supply for the Bombay market still comes. It is mainly a Mohammedan medicine, and is given in cough mixtures and to relieve pain. Arak-badiane or Anise water prepared by distillation is mentioned by Schlimmer. In Teheran the seeds are regarded as slightly poisonous. The active principle resides in an essential oil consisting of 80 to 90 per cent. of solid anethol which separates out slightly below ordinary temperatures, and anisic methyl charvicol.

Pistacia Khinjuk Stocks. (Anacardiaceae). The galls.

Buzghanj (Hamadan); Ushgai, bazgai (Bal.); Gul-i-pista (Bom.); Kakra-singh; Afs or Afs-el-batum (Tripoli).

Ait.; Boiss. ii. 6; I.H.B.; Ph. Ind. i. 377.

This is a frequent tree in Persia, Baluchistan, and Afghanistan, and has been described under different species. The tree yields a

resin-like material, and the nuts, which are eaten, afford a sweet oil; the leaves and galls are employed for tanning.

The galls are formed by an insect *Pemphigus utricularius* Pass. (figured in "Les Zoécécidies des Plantes d'Afrique, d'Asie et d'Océanie," by C. Houard, 1923, figs. 1010-1012, p. 471, under *P. atlantica* No. 1731). The galls, which contain about 40 per cent. of gallotannic acid, are ovoid, larger than peas, sometimes fig-shaped, at first pink in colour turning grey; the wall is thin, brittle, rugose on the outside, smooth within, translucent. The taste is astringent and slightly terebinthinate. In Persian and Arabic works on medicine these galls are described as cold, dry and astringent. Besides the galls of the Khinjuk tree the fruits of various species of *Pistacia* are used as food. Laufer in Sino-Iranica remarks that these indigenous trees from ancient times have occupied a prominent place in the life of the Iranians. The youth of Persia have been taught to subsist on terebinths, and "terebinth eaters" became a nick-name. The seeds of the Pistachio nut tree (*P. vera* Linn.) are probably the terebinths referred to, but other species and varieties also afford edible fruits.

In the present collection two samples of fruits are included.

Sample one: Habul-kazra (Teheran), Habb-el-khazra (Pers.). Schlimmer identifies Hebbil el Khezra as the seeds of the Persian Turpentine tree (*P. acuminata* Boiss. ex Buhse, now a synonym of *P. Khinjuk* Stocks). These small seed-like fruits are oval in shape, 6 mm. long, reddish-brown in colour, with an acid taste and terebinthinate odour. They resemble fruits on botanical specimens of *P. mutica* F. & M., a tree of Egypt, Asia Minor, Persia, and Afghanistan. The fruits are eaten, and are said to be good for debility.

The second specimen, from Hamadan, is called Chaltangach (Chatlanguch). These are small drupes, broader than long, 5 by 6 mm., rounder than the previous sample, glabrous, rugose, grey with bony stone. They resemble the fruits of *P. integerrima* Stew. (Fl. Br. Ind. ii. 13), the North-western Himalayan form of the Turpentine tree. They have a marked terebinthinate odour. They are used locally to impart flavour to milk.

In Baluchistan, the fruits, "Shahna," of the Khinjuk tree are dried and made into flour and eaten by the poor (I.H.B.).

Plantago major Linn. (Plantaginaceae). The seeds.

Bareng (Teheran); Tukhm-bārhang (Hamadan); Bartang, barhang (Afgh.); Bar-i-tang (Bal.).

Achundow; Ait.; Schl.; Boiss. iv. 878; Post 668; Ph. Ind. iii. 128; I.H.B.; Gilliat-Smith.

The Greater Plantain is very widely distributed in temperate countries. The seeds of this and other species are largely employed in medicine in the East. In Tabriz this plant is called in Turki Bizousha dishi, the female kind. *P. lanceolata* L. is distinguished as Bizousha erkek, the male kind.

The seeds are small, oval, 1 mm. long by 0.5 mm. broad, smooth and brown. They throw off a transparent mucilaginous coating when placed in water.

On account of their mucilaginous properties the seeds have a great reputation for affections of the bowels and as a remedy for dysentery. They are used locally as a chest medicine (C).

The seeds of *P. Loefflingii* Linn. are sold in the bazaars in Tabriz, where they are called in Turki Karni Yarikh, meaning "healing of the stomach" (Gilliat-Smith).

Plantago ovata Forsk. (*P. Ispaghula* Roxb.). (Plantaginaceae). The seeds.

Asbarg (Teheran); Asparse, asbaghul, ispaghul (Pers.); Lisan ul hamal (Arab.); Psyllii semina (Ph. Pers.); Khardanick (Bal.).

Achundow; Schl.; Boiss. iv. 855; I.H.B.; Ph. Ind. iii. 126; Brit. Phar. 1914.

This species of Plantain is a native of Persia, Baluchistan, and Northern India. Stocks observed that it was specially grown in Sind for its mucilaginous seeds, which from the time of Dioscorides have been a well-known medicine in the East. Large quantities are imported into Bombay from Persia. These seeds are light-coloured, boat-shaped, pointed at both ends, 2 mm. in length, translucent, with a pinkish tinge and brown streak on the convex side; the concavity is covered with a thin white membrane. They become coated with mucilage when soaked in water.

An infusion of the seeds is given to quench thirst and relieve cough. The crushed seeds, made into a poultice with vinegar and oil, are applied to gouty and rheumatic swellings.

In Baluchistan the seeds of *P. ciliata* Desf. are also called Isbaghol, and are used as a cure for dysentery (Hughes-Buller).

Plumbago sp. (?). (Plumbaginaceae). The root.

Risha tamesh (Teheran); Shitaraj, Chitrak (Hind.).

This root is not identified with certainty, but agrees outwardly with museum samples of plumbago root, of which two kinds are known in the East; Indian and Syrian. The root is $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, dark reddish-brown, longitudinally striated, and marked here and there by warty projections. The taste is acrid and biting. Its medicinal uses in Persia are not specified, but in India it is considered a powerful sudorific.

Poisons.

The following are regarded in Persia as poisonous drugs.

Aristolochia longa	Root	(Teheran).
Croton Tiglium	Seeds	(Hamadan).
Datura Stramonium	Seeds	(Hamadan & Teheran).
Datura Stramonium	Leaves	(Hamadan).
Doronicum Pardalianches	Root	(Hamadan).
Gypsophila paniculata	Root	(Hamadan).
Hyoscyamus reticulatus	Seeds	(Hamadan).

Ipomoea hederacea	Seeds	(Hamadan).
Iris spuria	Rhizome	(Hamadan).
Onosma echiioides	Root	(Hamadan).
Ricinus communis	Seeds	(Hamadan).
Strychnos Nux-vomica	Seeds	(Teheran).
Veratrum album L.	Rhizome	(Hamadan).
Withania somnifera	Root	(Hamadan).

Polygonum sp. (Polygonaceae). The rhizome.

Risha-anjubar (Teheran); Anjubar-i-rumi (Pers.); Endjebat (Schl.); Bistort is the Anjubar of the Western Arabs.

Ait.; Post; Schl.; Boiss. iv. 1027; Ph. Ind. iii. 150.

The rhizome sent under this name is nearly cylindrical, about 15 mm. thick, twisted, with rootlets below and scars above, reddish-brown and wrinkled on the outside, whitish within, with a ring of vascular bundles between the centre and circumference. The root contains tannin and grains of starch, elongate-oval in shape. The drug sold in Teheran came from Kermanshah and is probably intended to represent bistort, the rhizome of *P. Bistorta* Linn., but it differs from authentic museum samples of this drug. Schlimmer states that bistort root comes to Persia from Russia via Astrachan. Dymock informs us that the root of *P. vivipara* is a substitute for bistort in the Punjab, and the root Anjubar-i-rumi, not true bistort, and probably the root under notice, is imported into India from Persia. The root being very astringent is prescribed in cases of diarrhoea and dysentery.

Punica Granatum Linn. (Lythraceae). The flowers.

Gul a-nar (Teheran); Gul nare-farei (Schl.); Flores Punicae-granati (Ph. Pers.); Pomegranate flowers.

Achundow; Ait.; Post; I.H.B.; Fl. Br. Ind. ii. 581; Ph. Ind. ii. 45; Boiss. ii. 736.

The Pomegranate is a favourite tree in the East, where it is cultivated for its handsome flowers and edible and refreshing fruit, both of which are medicinal. It is indigenous in Anar-dara, Baluchistan, and eastward along the Suliman range to the Kuram Valley, into Kashmir and Kumaon. The fruit is the *Malus punica* of the ancients, Balusitan of Persia and Arabia, and Anar of Baluchistan. In the trade the small Pomegranates are anar-dana, whereas the cultivated fruit is anar. They are exported in immense quantities to Afghanistan and India. The rind of the fruit is used for dyeing and tanning leather. The ancient Persians were acquainted with the taenifuge qualities of the root-bark. The dried red flowers are given in pyorrhoea and whooping cough (C).

Pyrethrum sp. (?). (Compositae). Root.

Katek bah (Teheran).

This drug consists of a tapering root with a few undeveloped leaves arising from the crown. The root has the characters of that

of a composite, and the leaves resemble those of a *Pyrethrum*. The sample is marked "Poison—used as an eye medicine."

Quercus spp. (Cupuliferae). The galls.

Giash mashi (Hamadan); Kisa, kesa (galls); Maju, mazu, marjun (Pers.).

Pharmacographia; Galls figured in Connold's British Oak Galls; Houard 375; Ait.; Ph. Ind. iii. 360.

On the oaks growing in Asia Minor, Syria, and Turkey a quantity of galls are produced which reach India via the Persian Gulf. In North-eastern Persia, where oaks do not occur, the galls are imported from other districts of Persia for dyeing and tanning.

The galls in the collection are produced by the insect *Andricus lucidus* Hartig., var. *orientalis* Trotter. This Cynipid makes galls on *Quercus robur* Linn., *Q. lusitanica* Lam. and *Q. mongolica* Fisch. The galls are found in Britain in March and April, but are rare. The bazaar specimens are probably brought from Asia Minor. The galls have long spines, which, however, are broken off in the bazaar sample from Hamadan. The galls are usually used by tanners and are sold in drug shops as an astringent medicine. The local drug is given as a febrifuge (C).

Quercus spp. (Cupuliferae). The saccharine secretion.

Pune (Teheran).

Under this name is supplied a confection or cake of sugary substance, green with the presence of broken leaves. It is considered to be a form of Tar-anjabin "green honey," or Gaz-anjabin "Tamarisk-honey." Layard referred to this substance in his "Early Adventures in Persia, Vol. i. p. 349." "The mountainous country beyond Fellaut is thickly wooded with the 'beloot' or oak. These trees are chiefly valuable for the white substance called by the Bakhtyaris 'gaz' or 'gazu,' a kind of manna. It is an article of export to all parts of Persia, and is everywhere sold in the bazaars, and employed in the manufacture of a sweetmeat called 'Gaz-enjubeen,' which is much relished and considered very wholesome. When boiled with the leaves and allowed to harden it forms a kind of greenish cake, not disagreeable to the taste, but prepared for the use of the ladies of the enderun and to be offered to guests, it is carefully skimmed and separated when it becomes a white paste of very delicate flavour." Dr. Aitchison remarks that the name Tar-anjabin would apply correctly to Layard's "greenish cake." The names Tiringibyn and Terendschabin are quoted by Ibn Baitar, Garcia da Orta, and Schlimmer, and in the Pharmacopoeia Persica as those of an important purgative in Persia, and have been referred to the product of the Camel-thorn (*Alhagi camelorum* Fisch. and *A. maurorum* Desv.). But the name, in all probability, has been transferred in other districts to other sources. The broken leaves embedded in the green cake called Pune are not those of an *Alhagi* or *Cotoneaster*, but are more like those of an oak. Oak manna, manna

quercina, Gueza-elefi of Schlimmer, has been obtained from the leaves and fruits of *Q. mannifera* Lindl. of Kurdistan, *Q. persica* Jaub. & Spach, *Q. tauricola* Kotsch. and *Q. valonea* Kotsch. According to Tschirch (Pharmacologie) and Wehmer (Pflanzenstoffe) saccharose, glucose, fructose, and mucilage, in varying proportions, have been separated from these secretions. Ebert (1909) showed that a sample of Taranjabin contained saccharose and no glucose. Manna of the Oak from Smyrna (Hanbury, Sci. Papers 287), found on the leaves of the dwarf oaks, is collected by the peasants, who use it instead of butter in cooking their food, and ascribe to it no purgative effect while it is fresh.

Rheum Ribes Gronov. (Polygonaceae). The plant and fruits.

Riwas, ribas (Teheran); Tukhm-i-riwas (Hamadan); Ribas, the Persian and Arabic name of the plant; Rhubarb fruits.

Boiss. iv. 1003; Ph. Ind. iii. 153.

The edible rhubarb is indigenous all over the moister localities from 3000 feet and upwards, occurring in great expanses on a northern exposure, on the Pawpamissus range, and the higher hills of Khorasan, marking the country most characteristically in the autumn with the brilliancy of its almost scarlet foliage. The fruit and rootstock of wild rhubarb are both collected to be employed in medicine. A decoction of the fruit is considered a more powerful purgative than that of the root-stock (Aitchison).

The fruits of this plant, sold in Teheran, are used as a vermifuge for horses. Also in Hamadan the drug is applied as a poultice for pain in the head and ears (C).

Rhus coriaria Linn. (Anacardiaceae). The fruits.

Sumagh (Teheran); Summaq (Pers.); Tartak (Hind.).

Achundow; Schl.; Boiss. ii. 4; Post; Ait.; Ph. Ind. i. 373.

The Sumach is a tree cultivated in Khorasan, Western Afghanistan, and throughout Central Asia.

The leaves have long been used by the Arabs, Turks, and Persians, and in Europe, for dyeing and tanning leather and silk. They contain from 15 to 33 per cent. of tannin.

The fruit is exported from Persia and used by Mohammedans in India. The fruit is a small drupe, the size of a lentil, 5 mm. in diameter, red-coloured, acid and astringent to the taste, containing one lenticular, polished, brown, oily seed. These fruits are eaten and are reckoned as astringent in dysentery.

Ricinus communis Linn. (Euphorbiaceae). The seeds.

Kercheng (Hamadan); Karchak, garchak (Pers.); Tochme kercchec (Schl.); Khurwa (Arab.); Bed-anjir "Willow-fig"; Castor-oil seeds.

The Castor Oil plant is cultivated, round the margin of cotton, tobacco, or melon fields, throughout the country for its seed, from which the chief oil for burning is obtained. Aitchison noticed that

neither the seed nor the locally pressed oil is used in medicine, only the imported 'cold drawn' oil is so used.

The above name for the seeds is probably derived from Kirchek in the Deilami language because the fruit is like a basket with a cover made out of date leaves (Ph. Ind. iii. 301).

Roccella Montagnei Bél. (Graphidaceae). The lichen.

Dowalah (Hamadan); Davāla, Dāvila (Pers.).

Achundow refers this drug to *Muscus arboreus*, and gives the Persian names as Dawalak and Karbasu and the Arabic name as Aschna (*Usnea* sp.). The Persian name Dowalah is applied to more than one kind of lichen, since Dymock gives *Parmelia Kamtschadalis* Esch. as the source of Dowalah of the Indian bazaars (Ph. Ind. iii. 627). Some of the *Parmelias* are used as a dye, but the above drug from Hamadan gives no coloration with caustic potash. It is a whitish or grey coloured lichen in broken pieces. It has emollient and astringent properties, and is used in a bath or as a poultice. Locally it is given for stomach troubles (C).

Rosa foetida Herm. (*R. lutea* Mill.). (Rosaceae). The flowers.

Gul-i-zard, "yellow flower" (Teheran); Gole zarde (Schl.).

A. Olivier (Voyage dans l'Empire Ottoman, l'egypt et la Perse, Paris, 1807); Boiss. ii. 671.

The Persian Yellow Rose is a cultivated shrub in gardens. This is the yellow Austrian Briar in a wild state extending from the Crimea and Asia Minor through Persia to Turkestan, Afghanistan, Punjab, to Eastern Tibet. Aitchison calls it the Gul-i-raman-zeba, "lovely flower," of the Hari rud Valley.

The flowers are given in colic and for diarrhoea. Gulangabin is a confection of rose petals made with honey.

Rosa hemisphaerica Herm. (*R. sulphurea* Ait.). (Rosaceae). The fruits.

Damaverah (Hamadan).

Ph. Ind. i. 574; Boiss. ii. 672; Post.

This rose occurs in Persia and Afghanistan and, according to Post, is extensively cultivated in Syria.

The drug consists of the hips of this species. They are erect, nearly globular, broader than long, from 10 by 7 mm. to 13 by 8 mm., crowned with the remains of sepals, red, wrinkled, with short protuberances outside. Within are several light brown, hard, smooth seeds, 4 mm. long, mixed with silky hairs. The fruits are hot, dry, and astringent; they are given for stomach complaints.

Under the name of Ward, roses are found in Arabic and Persian works. In India the fruit of *R. canina*, as a medicine, is referred to as Dalik or Dog Rose (Dymock).

Rubia tinctorum Linn. (Rubiaceae). The root.

Runas (Pers.); Rounace (Schl.); Fuwwah (Arab.); Munjit (Hind.); Madder.

Ait.; Boiss. iii. 17; Post 224; Schl.; Ph. Ind.

The Madder plant grows from Persia to Spain. Aitchison says it is cultivated throughout the country in East Persia and takes three years for the proper size of the root to form. It is largely grown at Anar-dara, Koin, and Yezd, whence the root is exported in quantity to Herat. From Herat it is re-exported in all directions to Afghanistan proper and India, besides, in some bulk, to Turkestan. It affords a well known red dye for carpets. The root is used as a dye-stuff and a drug throughout the East.

Rumex obtusifolius Linn. and **R. conglomeratus** Linn. (Polygonaceae). The fruits.

Tukhm-i-hammāz (Teheran and Hamadan).

Boiss. iv. 1010; Ait.; Post; Ph. Ind. iii. 158.

The first of these widely-distributed species of dock yields a medicinal root known to the ancients as Radix Lapathi. But in Persia and India this and other species afford medicinal fruits. Those from Teheran belong to *R. obtusifolius*; they have three wings, are net-veined, irregularly toothed, and are red and green coloured. They are used locally as a stomachic.

The fruits from Hamadan are from *R. conglomeratus*, and have shorter wings, not distinctly toothed. They are given in pyorrhoea.

The drug under this name, however, is not confined to these two species of *Rumex*. According to Dymock Gul-i-hamaz or "Dock flowers," in India, are afforded by the fruits of *R. vesicarius* Linn., a plant found all over Asia.

Salvia Hydrangea DC. (Labiatae). The flowers.

Gula arbore (Teheran); Gul-i-arba (Pers.); Issikuttuz (Turki); Sarsand (Bal.).

Boiss. iv. 606; Ph. Ind. iii. 94; Kew Bull. 1930, 459.

A handsome flowering plant of Persia, Baluchistan, and Afghanistan. The drug consists of the mauve flowers with green-veined bracts, and small, rounded, brown seeds. Dymock says this drug is allied to Jadeh, probably a *Teucrium*. The flowering tops of a *Moluccella*, having enlarged purple calyces and a balm-like odour, and the rose-coloured mucilaginous calyces of *Hymenocrater elegans* Br. are used in medicine in Persia under the name of Gul-i-serwaj.

In Tabriz the inflorescence of *S. Hydrangea* is used in making medicinal tea (Gilliat-Smith). In Teheran the drug is said to stop excessive menstruation.

Salvia sp. (Labiatae). The seeds.

Tukhm-i-khardal (Hamadan).

Tukhm-i-khardal is the Persian name for mustard seed, but here the seeds of a *Salvia* have been supplied. The seeds are rounded, 1 mm. in diameter, greyish-brown, smooth, with a minute round umbilicus; a transparent mucilaginous coating is formed when the seeds are soaked in water. Aitchison, Schlimmer, and Dymock refer to species of *Salvia* being used in medicine under the name of

Kanocha. Dr. Stapf has shown that the Kanocha seeds of Ispahan, sold in the shops under the Persian name of Marv, are those of *S. macrosiphon* Boiss. (Ph. Ind. Appendix). The seeds are used locally, as mustard seeds, for making poultices. Those of *S. duplicifolia* Benth., called Maur in Baluchistan, are used for the cure of eye diseases.

Saussurea Lappa C. B. Clarke (Compositae). The root.

Butenak (Teheran); Patchak (Beng.); Kushta (Sans.); Kut (Hind.); Khost, Kust-i-talk, Bughenagh (Pers.); Costum amarum (Ph. Pers.); Indian Costus.

Ait.; Fl. Br. Ind. iii. 376; Schl.; Ph. Ind. ii. 296.

This soft, fragrant, whitish root comes from plants grown as a crown monopoly in Kashmir, and is exported to Persia, India, and China. This ancient drug was formerly called Arabian costus, as it was carried to Turkey and Europe by Arabs. It is greatly valued as a medicine throughout the East as far as China, and being costly is often adulterated. The root occurs in cylindrical pieces about 2.5 cm. or more in diameter, light-coloured, with an agreeable odour and a bitter and biting after-taste. It contains inulin but no starch. A second sample of Khost (Kust) from Hamadan was a smaller root, spirally twisted and lighter in colour. Various chemical principles have been separated from the root, some of which account for the violet-like odour:—Costu-lactone isomeric with alantolactone costus acid, dehydrocostus lactone and costol. Costus root is prescribed externally and internally for various complaints, and is taken locally to ward off the effects of snake and animal bites (C).

Sisymbrium Sophia Linn. (Cruciferae). The seeds.

Towdri (Teheran).

Ait.; Schl.; Boiss. i. 216; Ph. Ind. i. 118, 121.

These seeds resemble in size, shape and colour the drug Tukhm-i-khakshir (*Erysimum* sp.), except that they are dull and not shiny. They were grown at the Royal Botanic Gardens, Kew, in order that the correct species might be identified.

There are several kinds of cruciferous seeds known as "Towdri." The white varieties are somewhat pale and light red. A brown-coloured sort is sometimes met with under the name of "Black Towdri." The seed of *Lepidium Iberis* Linn. imported into India from Persia as Kasis, is one of the seeds called Towdri. Dr. Stewart, writing on the plants of the Punjab and Sind, states that the seeds of *Matthiola incana* R. Br., the Purple Gilly Flower, constitute one of the several kinds of "Todri." The drug is aphrodisiacal, fattening the body and purifying the blood.

Smilax China Linn. and **S. glabra** Roxb. (Liliaceae). The root.

Tchoube tchini (Schl.); Chub chini (Ind. bazaars); Tu fu ling (Chin.); Raiz da China (Port.); Tuber Chinae; China root; Chinese Sarsaparilla.

Schl.; Laufer 556; Colloquios; Ph. Ind. iii. 500.

The root is a famous remedy for the treatment of Morbus americanus (Syphilis) and was first introduced into Europe by the returning sailors of Columbus, and into India by the sailors of Vasco da Gama. It is mentioned by Indian writers of the 16th century; Garcia da Orta traced the source of the drug to China, and records a cure made in 1535. It was soon afterwards introduced into Persia by the Portuguese, and it is referred to by Mir Imad-ed-din, Mahmud of Shiraz, and Mir Muhammad Hashim, of Teheran.

Saponin has been found in the root (Kobert 1911 and 1916), but its therapeutic action is not considered very marked.

Solanum nigrum Linn. (Solanaceae). The fruits.

Taj-i-rizi, "the name may mean a crown of grapes or a crown of poison" (Aitchison); Anab etl thalib, "Fox's grapes"; Inab-ed-Dib (Arab.); Karezgi (Bal.); Wonderberry Plant.

Achundow; Boiss. iv. 284; Ph. Ind. ii. 550; I.H.B.

This species of *Solanum* is a common weed in Persia, where the plant is used as a vegetable, and the small black fruits with yellow seeds are medicinal. The ripe fruits are eaten in Baluchistan. The fruits of the Bittersweet (*S. Dulcamara* L.), under the name of Sag-anjar, "Dog's grapes," form a drug exported into India.

The fruits are considered laxative, and are employed in chronic enlargement of the liver.

Stachys germanica Linn. (Labiatae). The flowers.

Tuklejah (Hamadan).

This woolly species and its varieties are found in the Caucasus and in Europe. The drug consists chiefly of the sub-oblique calyces covered with tomentum, having five teeth, and with the remains of flowers and stalks. It is given to relieve stomach troubles.

Stachys lavandulaefolia Vahl. (Labiatae). The leaves.

Mardangush (Tabriz); Mardan-gusht, "Men's ears or fingers"; Marzangust, Zarangust (Pers.); Sansaq (Arab.).

Achundow; Ait.; Ph. Ind. iii.; Gilliat-Smith and Turrill, Kew Bull. 1930, 459.

This species of *Stachys* with purple flowers is found within Asia Minor, Armenia, Caucasus, Kurdistan, and Persia. The plant is one of the sources of an ancient Persian drug. Marzangust is mentioned by Abu Mansur, and is referred by Achundow to *Origanum Majorana* Linn. Dymock describes it under *Zataria multiflora* Boiss., a plant which, however, generally goes under the name of Zatar. Teheran and Hamadan bazaars afforded samples of Marzangust, one of which was a *Zataria*. Gilliat-Smith remarks that the inflorescence is sold in the bazaars of Tabriz and is made into an infusion and used locally as a remedy for spasms and stomach disorders.

Strychnos Nux-vomica Linn. (Loganiaceae). The seeds.

Kuchula (Teheran); Kachola (Pers.); Kotchouleh (Schl.).

Ait.; Schl.; Ph. Ind. ii. 459; Fl. Br. Ind. iv. 90.

Kuchula seeds are frequently referred to in ancient Persian works. In the Makhzan el adwiyā they are said to have been used from very early times for paralysis. They are called Azaraki by Indian Mohammedans and are given for debility. The seeds are imported from India, and in Teheran, as in other parts of Persia, they are classified as a poison.

Aitchison says, "The seed of the Nux-vomica is imported freely into these parts (N.E. of Persia) as a valuable tonic, but it is chiefly employed by the nomad tribes for poisoning wolves and dogs, these animals frequently proving destructive to their flocks."

Tamarix gallica var. **mannifera** Ehrenb. (Tamaricaceae). The manna.

Gaz-anjabin, 'Tamarisk honey' (Teheran); Gaz-i-shakar, 'Tamarisk sugar.'

Ph. Pers.; Ait.; Boiss. i. 778; Ph. Ind. i. 161.

Aitchison collected in the Badghis samples of manna from this variety of *Tamarix* which the natives distinguish from the ordinary species *T. gallica*. The saccharine exudation of this plant is said only to be collected in South-eastern Persia, in the district of Kerman, where it is obtained in large quantities and exported in all directions. In other parts of Persia Gazanjabin is obtained from other species of Tamarisk and a similar sugary substance from other plants (see under *T. pentandra*).

The sample from Teheran is a dried cake of sugar. Ehrenberg believes the sugar to be formed as a result of the punctures of *Coccus manniparus* which attacks this Tamarisk in Persia, Arabia, Afghanistan, and Egypt.

Tamarix pentandra Pall. (*T. Pallasii* Desv.). (Tamaricaceae). The manna.

Ghesa humase (Teheran); Guize khounkar, ghez mazedj, hebbel asle (Schl.).

Tamarisk manna, by D. Hooper, Journ. As. Soc. Bengal, New Series, Vol. v. 1909, 31-36; Boiss. i. 773.

The various species of Tamarisk are the commonest shrubs or small trees found from Quetta to Balamtghab, and from Herat to Meshed, up to 3000 ft. At least six species are widely distributed in Baluchistan, and two of them, *T. articulata* Vahl (Siahgaz) and *T. pentandra* (Shingir gaz), have been observed to yield a sweet gum. The latter is known to give a saccharine secretion in the Helmand. The samples are similar; they are sweet, sticky, transparent secretions, quite soluble in water, and become hard and opaque when kept owing to the crystallisation of the saccharose.

Terminalia Bellerica Roxb. (Combretaceae). The fruits.

Balila, balile (Teheran); Belādu (Pers.).

Ph. Pers.; Schl.; Ph. Ind. ii. 5; Fl. Br. Ind. ii. 446.

These are the Baleric myrobalans of commerce, the Balilaj of Mohammedan writers, imported into Persia from India. They are astringent, and are made into a lotion for sore eyes.

Terminalia Chebula Retz. (Combretaceae). The fruits.

Halila, halile (Teheran); Halileh kabuli (Schl.); Hirada, harra, har (Hind.).

Ph. Pers.; Schl.; Fl. Br. Ind. ii. 447; Ph. Ind. ii. 1.

The ripe fruits of this tree are the Chebulic myrobalans of Indian commerce. The drug from Teheran consists of the unripe fruits of the size of raisins, said to come from Kurdistan. There are two forms of this drug known as Halileh-i-zangi and Halileh-Hindi. Myrobalans are a well known astringent and tanning agent, but in medicine they have been found to have tonic and aperient properties.

Teucrium Polium Linn. (Labiatae). The flowers.

Mariam mohodi, "Peas of Mary" (Teheran); Mariam nukhudi (Tabriz); Meriam mekhodi is the Teheran name for *T. scordioides* Schreb., according to Schlimmer, who gives Gole khenon as the Yezd name, and Erfieh and Erpeh as literary equivalents. The Merian gole of the Terminologie is referred to *Salvia officinalis* Linn., but according to Gilliat-Smith this plant, although cultivated in gardens in Tabriz, has no local name, and is not used by the natives.

Boiss. iv. 821; I.H.B.; Ph. Ind. iii. 125.

The plant is the Poley Germander or Polion of the Greeks. The drug consists of the small woolly flowers mixed with some stalks and leaves. It has the fragrance of thyme, and is given as an infusion for internal disorders.

In Baluchistan *Teucrium Stocksianum* Boiss. is called Kalpora, and is a remedy for fever.

Thymus Serpyllum Linn. var. **Kotschyanus** Boiss. (Labiatae). Leaves.

Joshan Shirazi (Teheran); Zata (Post); Seetere (Schl.); Djūshā (Pers.).

Ait.; Boiss. iv. 556; Post; Schl.; Fl. Br. Ind. iv. 649; Ph. Ind. iii. 114.

The habitat of this variety is Persia and Kurdistan. The leaves are rounded, cuneate, ovate to lanceolate or elliptical, with prominent nerves below. The leaves are fragrant, and resemble those of *Zataria multiflora*, a plant which also receives the name Zatar. Seetere is the name given by Schlimmer to *T. Kotschyanus*, while Post applies the Arabic name Zatar to all plants of the genus *Thymus*. Boissier on the other hand refers Zatar to *Origanum Maru* Linn., Zatar farisi to *T. capitatus* Linn., and Zaeteran to *T. decussatus* Boiss. It would thus appear that Zatar and Joshan Shirazi are similar drugs, characterised by a thyme-like aroma. The leaves are carminative. In Teheran they are given for "too much water in the stomach," probably meaning the disease called ascitis.

Trachydium Lehmanni Benth. & Hook. (*Malabaila Sekakul* Boiss.). (Umbelliferae). The root.

Shekakul (Pers.); Segagoul (Arab.); Chakha-khoul (Turki); Chighaghole metri (Schl.); Parsnip of the desert.

Schl.; Post, 368; Boiss. ii. 891; Ait.; Ph. Ind. ii. 136.

The roots of this and other umbelliferous plants are collected in Persia and Afghanistan, and exported to India *via* Herat as a medicine. They have the thickness of an ordinary pencil at the top of the root, and are about two inches in length, tapering very rapidly to a point. It is called "The Root of Wisdom" and "Wild Carrot root," and is considered very valuable as a diet for improving the memory and increasing brain power. The name is applied to other stimulating and nourishing roots eaten by women for improving their *embonpoint*. The roots of *Caucalis*, *Pastinaca*, *Eryngium* and *Eremodaucus* are among the drugs of this class used as food for the sickly and convalescent.

Tribulus terrestris Linn. (Zygophyllaceae). The fruits.

Khasak (Teheran); Kharkhasak, khasak or hasak of the Arabs and Persians; Pakra (Hind.); Tribolia (Modern Greek).

Achundow; I.H.B.; Fl. Br. Ind. i. 423; Ph. Ind. i. 243.

This plant is found in the sandy districts of Guzerat and Kathiawar in North-western India, where the fruits are collected for the market. The drug is mentioned by Dioscorides and Pliny, and in the Bower mss., and by many Eastern writers. The fruit, of the size of a small bean, has 5 cells, dividing into 5 cocci, each of which is wedge-shaped, armed with 4 strong prickles. The seeds are oily and are enclosed in hard stony cells.

The fruits are used as a diuretic. Dr. Sayed Khan of Teheran says they act as a charm in bladder troubles. Duhn-ul-hasak and Rughan-i-char-i-chesak are names for an oil prepared from the fruits which is applied for rheumatism. In Baluchistan the plant is made into a paste with water and this is taken as a tonic and cooling medicine.

Trigonella cancellata Desv. var. *arcuata* C. A. Meyer (Leguminosae). The pods.

Iklil-il-malik (Teheran); Aketi, akentin (Hamadan); Usleib el malek (Post).

Abu Mansur; Boiss. ii. 71; Post; Ph. Ind. i. 404.

The origin of this drug has been referred to *Melilotus hamosa* Link, which has falcate pods, and *T. uncata* Boiss., whose pods are not so curved as those from Teheran and Hamadan.

The pods are horse-shoe shaped, about 2.5 cm. in length, greyish-white, curved outwards, grooved on both sides, and beaked; they are divided by a central partition and contain greyish-yellow, rhomboidal seeds, notched at one end, and with black spots.

The pods are used for various disorders, but chiefly as a suppurative and astringent. Sometimes they are made into a plaster for dispelling tumorous and painful swellings.

Trigonella Foenum-Graecum Linn. (Leguminosae). The herb and seeds.

Shambalila (Teheran); Tukhm-i-shambalila (Hamadan); Shamli, shamlid, shamlit (Pers.); Hilbah (Arab.); Hulbat (Ach.). Ait.; I.H.B.; Boiss. ii. 70; Post; Ph. Ind. i. 402.

The clover, Fenugreek, is cultivated universally in gardens as a pot-herb, and occasionally, especially at Herat, as fodder for cattle. The plant grows freely round Teheran. The leaves are commonly used for poultices. The seeds are among articles of export from Karachi to Bombay. They form an ingredient in cattle foods, and are regarded as stomachic and cordial.

T. polycerata Linn. in Baluchistan is called Shimsh and is considered a wild lucerne and used as a fodder for horses and sheep.

Veratrum album Linn. (Liliaceae). Rhizome.

Kondush (Hamadan); Kondocho, kondoco (Schl.); Hellebore root. Boiss. v. 171.

The White Hellebore is a plant of Europe, Central Asia, and Japan. The root is mentioned in the herbals of Hippocrates and Galen. The rhizome is dark brown, cylindrical or slightly tapering, 2.5 cm. in diameter, with numerous scars of broken rootlets; whitish within. It contains a poisonous alkaloid, jervine. The root is one of the Persian poisons.

Viola spp. (Violaceae). The flowers.

Gul-i-banafsha (Pers.).

Abu Mansur; Ph. Pers.; Ait.; Boiss. i. 450; Post, 118; Ph. Ind. i. 141.

Flowers of the Violet plant are exported from Persia to India, where they are regarded as a valuable medicine. It is not possible to identify the species of violet which constitute the dried broken flowers from Teheran. They have a diuretic and expectorant action. Dr. Sayed Khan of Teheran finds the drug to be useful in low fever where quinine is not available.

Withania somnifera Dunal. (Solanaceae). The root.

Busidan (Hamadan); Ashgand (Hind., Guz.); Sekran (Syr.); Hajarat el dib, "Wolf's tree" (Arab.).

Boiss. iv. 287; Fl. Br. Ind. iv. 239; I.H.B.; Post; Ph. Ind. ii. 566; Kew and Pharm. Soc. Museums.

An unarmed shrub with ovate, woolly leaves, inhabiting the South of Europe, Syria, Arabia, Baluchistan, India, and Africa. The roots are long, tapering, light brown, with knotty crowns 1.2 to 2.5 cm. in diameter, plump, smooth, white internally, with a short starchy fracture. The starch is rounded or oval with large hilum and a few granules truncated. The taste is mucilaginous and slightly bitter. From the observations made on the nature of this plant, and the specific names *somnifera* and *hypnotica* given to it by botanists, it would appear to be harmful to human beings when grown under certain conditions. In Hamadan the root is considered a poison,

and in parts of Arabia animals refuse to graze on the plant. In Baluchistan, however, it is said to be a vegetable and fodder for goats. Duthie says the shrub is alterative, and the root is given to horses. The leaves are used as a fomentation for sore eyes, and they are said to reduce boils and swellings, and to kill lice. F. B. Power and A. H. Salway (Proc. Chem. Soc. 1911, 27, 85) found evidence of an alkaloid and other crystalline principles in the root. But it contained no mydriatic alkaloid, and physiological tests failed to confirm the sedative and hypnotic properties attributed to it.

Zataria multiflora Boiss. (Labiatae). Leaves and stalks.

Zatar (Hamadan); Saatar (Indian bazaars); Izgun; isghand (Bal.).

Boiss. iv. 561; Post; I.H.B.; Ph. Ind. iii. 114.

This small plant is found in the hills of Muscat in Arabia, Persia, and Baluchistan. This species is allied to *Z. bracteata*, which sometimes bears the same vernacular names.

The small, thick, orbicular and glandular-dotted leaves have the odour of thymol, and are credited with the carminative properties of thyme and mint. In Baluchistan the plant is said to be good for stomach complaints.

A sample of broken stems and a few leaves labelled "marjan-just" from Teheran had the characters of this plant. (See *Stachys lavandulaefolia*).

Zizyphora tenuior Linn. (Labiatae). The herb.

Kakuti (Teheran); Kahkuti (Bal.).

Boiss. iv. 587; Ait.; I.H.B.; Ph. Ind. iii. 115.

A small labiate with spiked flowers found in Persia, Baluchistan, and Afghanistan. Aitchison says it is much used in medicine owing to its strong aroma of peppermint. In Baluchistan the plant is taken to allay fever, and the seeds, powdered and mixed with butter-milk, are used to cure dysentery. In Teheran the herb is employed as a cordial and stomachic.

Zizyphus vulgaris Linn. (Rhamnaceae). The fruits.

Annab (Teheran); Konar (Pers.); Connaros (Gr.).

Achundow; Boiss. ii. 12; Ph. Ind. i. 350; Post.

The indigenous form of the jujube is a shrub, rarely a tree, in the hills from the Badghis eastward to Kashmir. It is cultivated in all orchards for its fruit, which is largely eaten by the natives, especially on journeys, and this Dr. Aitchison thinks may account for the spread of the tree throughout the whole of Asia, wherever caravan journeys were made.

In Teheran it is said that the leaves are chewed as a drug, and the effects resemble the action of cocaine.

The fruits, which are sweet and wholesome, are the origin of the confection called the jujube. The fruits are imported into India; they are used as a demulcent and medicinally from the Persian Gulf to China.

XLVI. RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: VI.* E. M. MARSDEN-JONES AND W. B. TURRILL.

SELFINGS OF WILD PLANTS OF *S. VULGARIS*.

The following analyses of two generations, each obtained by selfing, under full control, one stock-plant (i.e. a plant imported directly from the wild), are of immediate interest by proving that heterozygosity within the species (i.e. varietal heterozygosity) accompanies and increases the polymorphism of the species. We are not here concerned with the possibility of hybridization giving rise to new characters, but we do show that character-combinations, similar to those met with in wild populations, can be obtained by the selfing of one wild heterozygote.

X 13. Stock Plant 10 (see *K.B.* 1931, p. 121) selfed.
139 plants.

The generation was fairly uniform with the parent for habit and leaf-shape, any exceptions being noted below. Only certain important characters are analyzed here. Since some plants did not flower and others did not set fruits and seeds it was impossible to score all of even these characters for every plant. In both this and the following generation, the first figure represents the number of the individual plant and the other symbols follow the scheme already outlined (*K.B.* 1931, pp. 136-137).

No.	1.	1.2.	K.2.5.	A.2.	G.1.3.		
No.	2.	1.1.	K.1.5.	A.2.	G.1.3.	F.1.	Se.3.
No.	3.	1.4.	K.1.5.	A.1.4.	G.2.3.		
No.	4.	1.4.					
No.	5.	1.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.3.
No.	6.	1.2.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.3.
No.	7.	1.4.					
No.	8.	1.4.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No.	9.	1.1.	K.1.5.	A.1.4.	G.2.		
No.	10.	1.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	
No.	11.	1.2.	K.3.5.	A.2.	G.1.3.	F.1-2.	
No.	12.	1.2.	K.1.5.	A.1-2.4.	G.2.	F.2.	Se.3.
No.	13.	1.1.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.2.
No.	14.	1.1.	K.1.5.	A.2.	G.1.3.	F.2.	Se.4.
No.	15.	1.4.	A.1.				
No.	16.	1.1.	K.2.5.	A.2.	G.2.3.		
No.	17.	1.4.	K.2.5.	A.2.	G.1.4.	F.1.	Se.3.
No.	18.	1.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.4.
No.	19.	1.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.3.
No.	20.	1.4.	K.1.5.	A.2.	G.1.3.		
No.	21.	1.2.	K.2.5.	A.2.	G.2.3.	F.1.	Se.3.
No.	22.	1.3.	K.1.5.	A.2.	G.1.3.		
No.	23.	1.1.	K.1.5.	A.1.3.	G.2.3.		
No.	24.	1.2.	K.1.5.	A.1.3.	G.2.4.		
No.	25.	1.2.	K.1.5.	A.1.3.	G.1.		
No.	26.	1.1.	K.1.5.	A.2.	G.2.3.		
No.	27.	1.1.	K.1.5.	A.2.	G.1.		

* Continued from *K.B.* 1931, p. 145.

No. 28.	I.1.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.3.
No. 29.	I.1.	F.1-2.	Se.2.			
No. 30.	I.4.	K.1.5.	A.1.			
No. 31.	I.1.	K.1.5.	A.1.4.	G.2.3.		
No. 32.	I.4.	K.1.5.	A.1.3.	G.1.3.	F.2.	
No. 33.	I.3.	K.1.5.	A.2.	G.1.3.		
No. 34.	I.1.	K.1.5.	A.2.	G.2.3.		
No. 35.	I.1.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.3.
No. 36.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.4.
No. 37.	I.1.	K.1.5.	A.2.	G.1.3.		
No. 38.	I.4.	K.1.5.	A.1.3.	G.1.3.		
No. 39.	I.1.	K.1.5.	A.1.4.	G.1.4.		
No. 40.	I.2.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.3.
No. 41.	I.1.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.4.
No. 42.	I.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.4.
No. 43.	I.1.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.3.
No. 44.	I.1.	K.1.5.	A.1.4.	G.1.4.		
No. 45.	I.4.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.3.
No. 46.	I.1.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.
No. 47.	I.4.	K.1.5.	A.1.3.	G.2.3.	F.2.	Se.3.
No. 48.	I.2.	K.1.5.	A.1-2.4.	G.1.		
No. 49.	I.2.	K.2.5.	A.1.4.	G.2.3.	F.1.	Se.4.
No. 50.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.2.
No. 51.	I.1.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.3.
No. 52.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 53.	I.4.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.4.
No. 54.	I.2.	K.1.5.	A.1.3.	G.2.3.	F.2.	Se.3.
No. 55.	I.2.	K.2.5.	A.1.3.	G.1.3.		
No. 56.	I.1.	K.1.5.	A.2.	G.1.3.		
No. 57.	I.2.	K.1.5.	A.2.	G.1.		
No. 58.	I.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.2.
No. 59.	I.4.					
No. 60.	I.1.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.4.
No. 61.	I.2.	K.2.5.	A.2.	G.2.		
No. 62.	I.4.	K.1.5.	A.1.4.	G.2.3.	F.1.	Se.2.
No. 63.	I.1.	K.1.5.	A.2.	G.2.4.	F.1.	Se.3.
No. 64.	I.2.	K.2.5.	A.2.	G.2.		
No. 65.	I.2.	K.1.5.	A.1.3.	G.1.3.		
No. 66.	I.2.	K.1.5.	A.1.4.	G.2.4.		
No. 67.	I.2.	K.1.5.	A.2.	G.1.3.	Se.2.	
No. 68.	I.4.	K.1.5.	A.2.	G.2.3.	F.1.	Se.4.
No. 69.	I.1.	K.2.5.	A.1-2.4.	G.2.4.		
No. 70.	I.2.	K.1.5.	A.1.3.	G.2.3.	F.1.	Se.3.
No. 71.	I.1.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.3.
No. 72.	I.2.	K.1.5.	A.1.3.	G.2.3.		
No. 73.	I.2.					
No. 74.	I.4.	K.1.5.	A.1-2.4.	G.1.4.		
No. 75.	I.4.	K.1.5.	A.1.3.	G.2.		
No. 76.	I.1.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.3.
No. 77.	I.4.	G.3.				
No. 78.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.3.
No. 79.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 80.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 81.	I.4.	F.1.				
No. 82.	I.4.	K.1.5.	A.1.4.	G.2.4.		
No. 83.	I.4.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.3.

No. 84.	I.1.	K.1.5.	A.1.4.	G.2.3.		
No. 85.	I.2.	K.1.5.	A.2.	G.2.3.		
No. 86.	I.4.	K.1.5.	A.1-2.4.	G.2.4.		
No. 87.	I.4.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.3.
No. 88.	I.2.	K.1.5.	A.1.4.	G.2.3.		
No. 89.	I.2.	K.2.5.	A.2.	G.1.		
No. 90.	I.2.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 91.	I.4.	K.1.5.	A.2.	G.2.3.		
No. 92.	I.4.	K.1.5.	A.1.4.	G.2.		
No. 93.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 94.	I.2.	K.2.5.	A.1-2.4.	G.2.3.	F.1-2.	Se.4.
No. 95.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.4.
No. 96.	I.4.	K.2.5.	A.2.	G.2.3.		
No. 97.	I.1.	K.1.5.	A.1.4.	G.2.	F.2.	Se.3.
No. 98.	I.4.	K.1.5.	A.1.4.	G.2.3.		
No. 99.	I.2.	K.2.5.	A.2.	G.2.3.		
No. 100.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 101.	I.4.	K.1.5.	A.1.4.	G.2.4.		
No. 102.	I.1.	K.1.5.	A.1.4.	G.2.4.	Se.3.	
No. 103.	I.1.	K.1.5.	A.2.	G.2.3.	F.2.	
No. 104.	I.3.	K.2.5.	A.2.	G.2.4.		
No. 105.	I.2.	K.2.5.	A.2.	G.1.		
No. 106.	I.4.	K.1.5.	A.1.4.	G.2.	F.2.	Se.4.
No. 107.	I.2.	K.2.5.	A.2.	G.2.3.	F.1.	Se.3.
No. 108.	I.4.	K.1.5.	A.2.	G.2.4.		
No. 109.	I.4.	K.1.5.	A.1.3.	G.1.3.		
No. 110.	I.4.	K.1.5.	A.1.4.	G.2.		
No. 111.	I.1.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 112.	I.2.	K.1.5.	A.1.4.	G.2.4.		
No. 113.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 114.	I.4.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.4.
No. 115.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.1.	Se.4.
No. 116.	I.4.	K.1.5.	A.2.	G.2.4.	F.2.	Se.3.
No. 117.	I.4.	K.2.5.	A.2.	G.1.4.		
No. 118.	I.1.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 119.	I.1.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.4.
No. 120.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.4.
No. 121.	I.1.	K.1.5.	A.1-2.4.	G.2.3.	F.1.	Se.3.
No. 122.	I.2.	K.1.5.	A.1.3.	G.2.3.		
No. 123.	I.1.	K.1.5.	A.1.4.	G.1.4.	F.1.	Se.3.
No. 124.	I.2.	K.1.5.	A.2.	G.1.3.	F.2.	Se.2.
No. 125.	I.2.	K.2.5.	A.2.	G.1.		
No. 126.	I.2.	K.1.5.	A.1.4.	G.1.		
No. 127.	I.4.					
No. 128.	I.2.	K.1.5.	A.1.4.	G.2.4.		
No. 129.	I.1.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 130.	I.2.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.3.
No. 131.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.3.
No. 132.	I.1.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 133.	I.4.	K.2.5.	A.1.3.	G.2.3.		
No. 134.	I.2.	K.1.5.	A.2.	G.2.3.		
No. 135.	I.2.	K.3.5.	A.1-2.4.	G.2.3.		
No. 136.	I.4.	K.1.6.	A.1.4.	G.2.3.	F.2.	Se.3.
No. 137.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	
No. 138.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.3.
No. 139.	I.1.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.3.

Nos. 3, 4, 15, 110, and 136 had the vegetative parts more yellow-green than those of the parent; the colour of the remainder was approximately as in the parent. Nos. 61, 65, and 99 had narrower leaves than the parent. No. 26 had very poor petals. Nos. 33 and 56 had decidedly small flowers.

SUMMARY OF ANALYSIS.

Indumentum. Parent with medium pubescence.

On selfing gave :

Densely pubescent 43, medium pubescence 49, few hairs 3, glabrous 44.

Calyx. Parent with inflated calyx and some anthocyanin.

On selfing gave :

Inflated 109, subinflated 19, narrow 2.

All plants scorable for the character of anthocyanin, except No. 136, had some present in the calyx. No. 136 was without anthocyanin.

Androecium. Parent was fully hermaphrodite and had a faint trace of purple in the filaments.

On selfing gave :

Hermaphrodite 76, female 56.

Purplish 22, colourless 51.

7 plants, here scored as hermaphrodite, produced also a few female flowers.

Gynaeceum. Parent had white stigmata and pink immature seeds.

On selfing gave :

Purplish stigmata 39, colourless 90.

Pink immature seeds 81, colourless 32.

Fruits. Parent had intermediate fruits.

On selfing gave :

Broadly ovoid-ellipsoid 17, intermediate 33, broadly ovoid to obloid 23.

Seeds. Parent had tubercled seeds.

On selfing gave :

Armadillo 0, weak armadillo 9, tubercled 44, strongly tubercled 16.

X 12. Stock Plant 5 (see *K.B.* 1931, p. 119) selfed.

117 plants.

The generation was fairly uniform with the parent for habit and leaf-shape, any exceptions being noted below.

No. 140.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.2.
No. 141.	I.3.	K.2.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 142.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.1.
No. 143.	I.3.	K.1.5.	A.1-2.4.	G.2.4.	F.1-2.	Se.1.
No. 144.	I.3.	K.1.5.	A.1.4.	G.2.	F.2.	Se.2.
No. 145.	I.3.	K.1.5.	A.1.4.	G.2.3.	F.1.	Se.2.
No. 146.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.2.
No. 147.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.2.

No. 148.	I.4.	K.1.5.	A.2.	G.2.3.	F.2.	Se.2.
No. 149.	I.3.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 150.	I.4.	K.1.5.	A.1-2.3.	G.1.4.	F.2.	Se.1.
No. 151.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.1.
No. 152.	I.3.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.2.
No. 153.	I.3.	K.2.5.	A.2.	G.2.3.	F.1.	Se.1.
No. 154.	I.3.	K.1.5.	A.1.4.	G.2.4.	F.1.	Se.1.
No. 155.	I.4.	K.1.5.	A.1-2.4.	G.2.3.	F.1.	Se.1.
No. 156.	I.4.					
No. 157.	I.2.	K.3.5.	A.1.3.	G.1.4.	F.1.	Se.2.
No. 158.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 159.	I.4.	K.1.5.	A.1-2.4.	G.1.4.	F.1-2.	Se.2.
No. 160.	I.4.	K.1.5.	A.2.	G.2.3.	F.2.	Se.1.
No. 161.	I.3.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.1.
No. 162.	I.4.					
No. 163.	I.4.					
No. 164.	I.3.	K.2.5.	A.1.3.	G.1.3.		
No. 165.	I.2.	K.2.5.	A.1-2.4.	G.2.3.	F.1.	Se.3.
No. 166.	I.4.	K.1.5.	A.1.			
No. 167.	I.4.	K.1.5.	A.1.4.	G.2.4.		
No. 168.	I.3.	K.1.5.	A.1-2.3.	G.2.3.	F.2.	Se.1.
No. 169.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.
No. 170.	I.4.	K.1.5.	A.2.	G.2.4.		
No. 171.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.1.
No. 172.	I.2.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.2.
No. 173.	I.4.					
No. 174.	I.4.	K.2.5.	A.2.	G.1.3.	F.1-2.	Se.1.
No. 175.	I.3.					
No. 176.	I.3.	K.1.5.	A.1-2.3.	G.1.	F.2.	Se.1.
No. 177.	I.4.	K.1.5.	A.1.4.	G.2.3.		
No. 178.	I.3.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.1.
No. 179.	I.4.	K.3.5.	A.1.4.	G.2.4.	F.1-2.	Se.1.
No. 180.	I.3.	K.2.5.	A.2.	G.2.4.		
No. 181.	I.4.	K.3.5.	A.1-2.4.	G.2.4.	F.1-2.	Se.2.
No. 182.	I.4.	K.1.5.	A.2.	G.2.4.	F.2.	Se.1.
No. 183.	I.3.					
No. 184.	I.3.	K.2.5.	A.1-2.4.	G.2.3.	F.1-2.	Se.1.
No. 185.	I.4.	K.1.5.	A.2.	G.2.		
No. 186.	I.3.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.2.
No. 187.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.3.
No. 188.	I.3.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 189.	I.2.	K.2.5.	A.2.	G.1.4.		
No. 190.	I.4.	K.2.5.	A.1-2.	G.1.3.		
No. 191.	I.4.					
No. 192.	I.3.					
No. 193.	I.4.	K.2.5.	A.2.	G.1.3.	F.1-2.	Se.2.
No. 194.	I.3.	K.2.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.
No. 195.	I.4.	K.2.5.	A.1.4.	G.2.3.		
No. 196.	I.4.					
No. 197.	I.4.					
No. 198.	I.4.	K.2.5.	A.1-2.4.	G.2.		
No. 199.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 200.	I.4.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.1.
No. 201.	I.3.					
No. 202.	I.3.	K.2.5.	A.1-2.4.	G.2.4.	F.2.	Se.1.
No. 203.	I.4.					
No. 204.	I.4.	K.1.5.	A.2.	G.1.4.	F.2.	Se.1.

No. 205.	I.4.	G.3.				
No. 206.	I.4.					
No. 207.	I.4.	K.1.5.	A.2.	G.1.		
No. 208.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.2.
No. 209.	I.4.	K.2.5.	A.1.4.	G.2.4.	F.1-2.	Se.2.
No. 210.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.2.
No. 211.	I.3.	K.3.5.	A.1.3.	G.1.3.	F.1-2.	Se.1.
No. 212.	I.3.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.1.
No. 213.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 214.	I.4.					
No. 215.	I.3.	K.1.5.	A.1.4.	G.2.4.		
No. 216.	I.4.					
No. 217.	I.2.	K.2.5.	A.1-2.3.	G.1.3.		
No. 218.	I.4.	K.1.5.	A.1-2.3.	G.1.3.	F.1-2.	Se.1.
No. 219.	I.3.	K.2.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 220.	I.3.	K.2.5.	A.2.	G.1.4.	F.1-2.	Se.1.
No. 221.	I.2.	K.2.5.	A.1.3.	G.1.3.	F.1-2.	Se.2.
No. 222.	I.3.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.1.
No. 223.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.2.	Se.1.
No. 224.	I.3.	K.1.5.	A.1-2.3.	G.2.3.	F.1-2.	Se.2.
No. 225.	I.4.	K.1.5.	A.2.	G.1.		
No. 226.	I.3.	K.1.5.	A.2.	G.1.3.		
No. 227.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.1.
No. 228.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.1.
No. 229.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.2.
No. 230.	I.4.	K.2.5.	A.2.	G.2.3.		
No. 231.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.1.
No. 232.	I.3.	K.1.5.	A.2.	G.2.3.		
No. 233.	I.4.	K.1.5.	A.2.	G.2.3.		
No. 235.	I.4.	K.1.5.	A.2.	G.1.	F.2.	
No. 236.	I.4.	K.1.5.	A.1.3.	G.1.		
No. 237.	I.4.	K.3.5.	A.1.3.	G.1.3.		
No. 238.	I.3.	K.2.5.	A.1.3.	G.1.4.		
No. 239.	I.4.	K.2.5.	A.1.3.	G.2.3.		
No. 240.	I.3.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 241.	I.4.					
No. 242.	I.3.	K.2.5.	A.2.	G.2.4.	F.2.	Se.1.
No. 243.	I.4.	K.1.5.	A.2.	G.2.4.		
No. 244.	I.3.	K.1.5.	A.1-2.3.	G.2.3.		
No. 245.	I.4.	K.2.5.	A.1.4.	G.2.4.	F.2.	Se.2.
No. 246.	I.3.					
No. 247.	I.3.	K.2.5.	A.1-2.3.	G.1.3.	F.1-2.	Se.1.
No. 248.	I.3.	K.2.5.	A.2.	G.1.		
No. 249.	I.3.					
No. 250.	I.3.	K.2.5.	A.2.	G.2.3.		
No. 251.	I.3.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.1.
No. 252.	I.3.	K.1.5.	A.1.3.	G.2.4.		
No. 253.	I.4.	K.1.5.	A.1.3.	G.2.4.	F.1-2.	Se.1.
No. 254.	I.4.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.2.
No. 255.	I.3.	K.1.5.	A.2.	G.1.4.		
No. 256.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.

Nos. 144, 166, 172, 177, 193, 194, 203, 213, 214, 215, 217, 226, 238, 241, 244, and 248 had the vegetative parts shining green; No. 164 had the vegetative parts darker green than in the parent;

the colour of the stems and leaves of the remainder was approximately as in the parent. Nos. 141 and 183 had narrower leaves than the parent. Nos. 199, 213, 226, 232, and 234 had small flowers. * No. 219 had exceptionally large petals. No. 251 had small scales (instead of bosses) on the petals.

SUMMARY OF ANALYSIS.

Indumentum. Parent with few hairs.

On selfing gave:

Medium pubescence 8, few hairs 48, glabrous 61.

Calyx. Parent with narrow calyx and with a trace of anthocyanin.

On selfing gave:

Inflated 65, subinflated 27, narrow 6.

All plants scorable for the character of anthocyanin had some present in the calyx.

Androecium. Parent produced both hermaphrodite and female flowers, the former predominating, and had a trace of purple in the filaments:

On selfing gave:

Hermaphrodite 56, female 41.

Purplish 28, colourless 27.

17 plants here scored as hermaphrodites also produced a few female flowers.

Gynaecium. Parent has very slightly tinged stigmata and pink immature seeds.

On selfing gave:

Purplish stigmata 39, colourless 57.

Pink immature seeds 54, colourless 33.

Fruits. Parent had intermediate fruits.

On selfing gave:

Broadly ovoid-ellipsoid 6, intermediate 40, broadly ovoid to obloid 19.

Seeds. Parent had weak armadillo seeds.

On selfing gave:

Armadillo 33, weak armadillo 24, tubercled 7, strong tubercled 0.

CONCLUSIONS.

The two generations obtained by selfing two stock-plants, of immediate wild origin, show how very heterozygous were the two parents for characters of *indumentum*, *calyx-shape*, *sex*, *fruit-shape*, and *testa*, and for the presence or absence of anthocyanin in filaments, stigmata, and immature seeds. This varietal heterozygosity conforms with the high polymorphism described for wild populations in our previous paper.

In view of the large amount of experimental work on *Silene vulgaris* and on *S. maritima*, to be published in later contributions, the full significance of the results obtained in the selfings X 13 and X 12 are not yet apparent and the following suggestions are in some degree tentative.

Indumentum. So far as our researches are complete all glabrous plants breed true to the glabrous character, and all densely hairy plants are homozygous for dense indumentum. In X 13 a plant with medium pubescence has, on selfing, given all four indumentum classes. A majority of plants show pubescence, and it is possible that the ratio represents a poor 1:2:1. In X 12 a plant with "few" hairs gave offspring a majority of which had few hairs and none which were densely pubescent, in this respect contrasting markedly with the results of X 13.

Calyx. Both "inflated" and "narrow" calyxed plants gave types and intermediates on selfing. We know that environmental factors (in the widest sense) modify calyx shape and at present we are doubtful what genes, if any, are involved in modifying calyx shape. In both generations anthocyanin appeared in the calyces of all plants except No. 136. If this plant lives and produces no anthocyanin in future seasons it will be tested on the hypothesis that it is a loss mutation.

Androecium. Both selfed plants had hermaphrodite flowers and both gave very close 9 hermaphrodite: 7 female ratios. Purple coloration occurred in the filaments of both selfed plants, and, in the offspring generations, plants with and plants without filament anthocyanin occurred, but in very peculiar ratios.

Gynaeceum. In X 13 a selfed parent with white stigmata gave offspring some with coloured some with uncoloured stigmata, while in X 12 a selfed parent with tinged stigmata gave similar results, and in both generations the plants with colourless stigmata largely exceeded those with coloured stigmata. Both parents had pink immature seeds and on selfing gave pink and colourless seeded plants, the latter in considerably greater numbers, and perhaps the figures are to be considered as forming poor 3:1 ratios.

Fruits. Both parents had intermediate types of fruits and on selfing gave ratios which may represent the 1:2:1 monohybrid ratio.

Seeds. In X 13 a plant with tubercled seeds gave no armadillo-seeded plants, but 9 whose seeds were scored as weak armadillo. In X 12 a plant with weak armadillo seeds on selfing gave armadillo and weak armadillo-seeded plants and only 7 whose seeds were scored as tubercled. It seems from our work up to the present that "armadillo" is a very clear-cut recessive character. Modifying factors probably act mainly on the tubercled type of testa, though "weak armadillo" may not always have the same genotypic constitution.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 7 1931 ROYAL BOTANIC GARDENS, KEW

XLVII.—THE GENUS *HAPLOCOELUM*. A. A. BULLOCK.

The Sapindaceous genus *Haplocoelum* was described by Radlkofer (1) in 1878, and was last reviewed by him (2) in 1921. Commencing in 1878 with one species, *H. inoploeum* Radlk., the genus now numbers eight, whilst a ninth species, *H. jubense* Chiov., has been described but should perhaps be referred to another genus on account of the presence of a corolla.

The genus, which is endemic in Tropical Africa, has been assigned to different families—to the Sapindaceae by Radlkofer, to the Simarubaceae by Engler (3). The latter eventually transferred his genus *Pistaciopsis* to the Sapindaceae, and gave a more complete description, but failed to recognise its identity with *Haplocoelum* Radlk. Meanwhile, in working out Welwitsch's Angolan plants, Hiern (4) in 1896 doubtfully referred a fruiting specimen of a plant to the family Burseraceae, where he described it as *Balsamea? foliolosa*. On examination this plant proves to be identical with Engler's *Pistaciopsis Dekindtiana*.

In 1921 Radlkofer reduced *Pistaciopsis* to *Haplocoelum*, making the necessary new combinations and reductions.

It appears that the Rev. T. Wakefield, who collected *Haplocoelum inoploeum* at Mombasa in November, 1894, confused two closely allied plants, which I believe to be distinct species. Both were incorporated in the Kew Herbarium, but only one was distributed. This was described by Engler as *Pistaciopsis Wakefieldii*, which is synonymous with *Haplocoelum inoploeum* Radlk. The remaining part of Wakefield's Mombasa gathering was identified, in 1889, by Radlkofer with his *Haplocoelum trigonocarpum*, a Zanzibar plant first collected by Sir John Kirk. Wakefield's plant is without fruit, but I regard it as distinct, and have described it below as *Haplocoelum mombasense*, sp. nov.

Excellent material is now available of the type-species, *H. inoploeum* Radlk., collected by Mr. R. M. Graham, of the Kenya Forestry Department. This shrub has very hard, strong, interlacing branches, and the small, yellow-scented flowers appear before the leaves. It is known to the Swahili natives as "Mfungu-Tanzu."

(1) Radlk. in Sitz. Math.-Phys. Akad. Muench. viii. 336 (1878).

(2) Radlk. in Engl. et Drude, Veg. der Erde, ix. Pflanzenw. Afr. III. ii. 278 (1921).

(3) *Pistaciopsis* Engl. in Engl., Bot. Jahrb. xxxii. 125 (1902), et l.c. xxxiv. 156 (1904).

(4) Hiern, Cat. Welw. Afr. Pl. i. 126 (1896).

In the closely allied species *H. trigonocarpum* Radlk., the flowers also seem to appear before the leaves. This is a Zanzibar plant represented in the Kew Herbarium by two sheets collected by Sir John Kirk. It is possible that the flowers also appear before the leaves, or when the leaves are very young, in *H. stronglylocarpum* Bullock, *H. foliolosum* (Hiern) Bullock, and *H. mombasense* Bullock, but no exact information is available, though the flowers forwarded of these species (none received of *H. foliolosum*), were old and withered while the leaves were apparently still young.

In the following enumeration, the specimens actually seen are indicated by a ! after the collector's number, and are deposited in the Kew Herbarium; the remaining specimens are cited from descriptions, and the collector's number is followed by the name of the herbarium in which the specimen is preserved.

Haplocoelum Radlk. in Sitz. Math.-Phys. Akad. Muench. viii. 336 (1878); et in Engl. et Prantl, Nat. Pflanzenf. III. v. 327 (1896); et in Engl., Pflanzenw. Ost-Afr. C. 251 (1895); et in Engl. et Drude, Veg. der Erde, ix., Pflanzenw. Afr. III. ii. 278 (1921); Chiov., Res. Sc. Miss. Stefan.-Paoli Somal. Ital. i. 207 (1916), *clavis specierum*.
Pistaciopsis Engl. in Engl., Bot. Jahrb. xxxii. 125 (1902); et l.c. xxxiv. 156 (1904).

Key to the species.

Corolla absent; leaflets subsessile or sessile:

Leaflets in 2-3 pairs:

Fruit globose or ellipsoid, smooth or faintly 3-ribbed:

Fruit densely tomentose.....1. *H. Scassellatii* Chiov.

Fruit glabrous or subglabrous:

Leaflets obtuse, emarginate.....2. *H. inoploeum* Radlk.

Leaflets acute or acuminate.....3. *H. acuminatum* Radlk.

Fruit markedly trigonous.....4. *H. trigonocarpum* Radlk.

Leaflets in 4-9 pairs:

Leaflets equal-sided, in four pairs, obovate-oblongate to elliptic.....5. *H. mombasense* Bullock.

Leaflets very unequal-sided, obliquely oblong:

Leaflets in 4-6 pairs, up to 3 cm. long:

Leaves up to 4.5 cm. long; young branches pilose.....

6. *H. gallaense* (Engl.) Radlk.

Leaves up to 7 cm. long; young branches pubescent.....

7. *H. stronglylocarpum* Bullock.

Leaflets in 7-9 pairs, up to 1.5 cm. long.....

8. *H. foliolosum* (Hiern) Bullock.

Corolla well developed, of 5 petals; leaflets long-petiolulate.....

9. *H. jubense* Chiov.

1. **Haplocoelum Scassellatii** Chiov. Res. Sc. Miss. Stefan.-Paoli Somal. Ital. i. 206 (1916).

SOMALILAND. Boscaglia di Arrar, Scassellati & Mazzocchi 2, 20 (Herb. Flor.). Cansuma, Scassellati & Mazzocchi 40 (Herb. Flor.). The type specimen is not indicated in Chiovenda's description.

2. **Haplocoelum inoploeum** Radlk. in Sitz. Math.-Phys. Akad. Muench. viii. 337 (1878); et in Engl., Pflanzenw. Ost-Afr. C. 251 (1895); et in Engl. et Drude, Veg. der Erde, ix., Pflanzenw. Afr. III. ii. 278 (1921).

Pistaciopsis Wakefieldii Engl. in Engl., Bot. Jahrb. xxxii. 125 (1902); et l.c. xxxiv. 157 (1904).

Haplocoelum Wakefieldii (Engl.) Chiov., Res. Sc. Miss. Stefan.-Paoli Somal. Ital. i. 207 (1916), *in clavi*.

KENYA COLONY. Mombasa, Nov., Wakefield s.n. (partim)!; Boivin 52 (Herb. Mus. Par.—type). Schimba Mts., Kässner 205 (Herb. Berol.). Duruma River, March, Kässner 287! Malindi District; Mida, on the edge of the forest or bush, a spreading shrub with very hard and strong interlacing branchlets, leafless at the time of flowering, flowers yellow, with a fairly strong scent, fruit oval and slightly ribbed, Graham 1560a (flowers)! 1560b (leaves)! 2350 (fruit)!

The native (Swahili) name, according to Mr. Graham, is Mfungatanzu.

3. **Haplocoelum acuminatum** Radlk. in Engl. et Drude, Veg. der Erde, ix., Pflanzenw. Afr. III. ii. 278 (1921), *nomen subnudum*.

ANGOLA. River Lobo.

Native name:—Mut ut' chine.

I have seen no specimens of this plant. The description is embodied in the key above. Presumably specimens are in existence in Germany, but Radlkofer gives no clue to their whereabouts, or to the collector.

4. **Haplocoelum trigonocarpum** Radlk. in Sitz. Math.-Phys. Akad. Muench. xx. 249 (1890), partim, quoad spec. zanzibar.; et in Engl., Pflanzenw. Ost-Afr. C. 251 (1895); et in Engl. et Drude, Veg. der Erde, ix., Pflanzenw. Afr. III. ii. 278 (1921).

ZANZIBAR ISLAND. Without exact locality, Kirk s.n. (type).

In the writer's opinion, the specimens cited by Radlkofer are referable to two species, *H. trigonocarpum* and *H. mombasense* (*vide infra*). Since the Zanzibar plant bears fruit, from which the name was taken, I have selected the Kirk specimen as the type of this species. This plant never has more than three pairs of leaflets, while the following species has four pairs.

5. **Haplocoelum mombasense** Bullock, sp. nov.; *H. trigonocarpum* Radlk. affinis, sed foliis 4-jugatis, foliolis superioribus minoribus differt.—*H. trigonocarpum* Radlk. in Sitz. Math.-Phys. Akad. Muench. xx. 249 (1890), partim, quoad spec. mombas.

Frutex vel *arbor*, ramulis novellis ferrugineo-tomentellis. *Folia* *matura* glabra, paripinnata vel raro imparipinnata, 4-jugata, usque

5 cm. longa, foliolis subsessilibus obovato-oblancheolatis vel ellipticis apice rotundatis emarginatis basi cuneatis, summis 3 cm. longis et usque 1.8 cm. latis, infimis 1-1.5 cm. longis et circiter 1 cm. latis, rhachi anguste alata, leviter puberula, petiolis 1.5 cm. longis. *Flores masculi*: sepala lineari-oblonga, 2 mm. longa, extra pubescentia; filamenta 2.5-3 mm. longa; antherae exappendiculatae, oblongae, 1.5 mm. longae. *Flores feminei* non visi. *Fructus* non visus.

KENYA COLONY. Mombasa, Nov., Wakefield s.n. (partim)!

6. *Haplocoelum gallaense* (Engl.) Radlk. in Engl. et Drude, Veg. der Erde, ix., Pflanzenw. Afr. III. ii. 278 (1921); Chiov., Res. Sc. Miss. Stefan.-Paoli Somal. Ital. i. 207 (1916), *in clavi*.

Pistaciopsis gallaensis Engl. in Engl., Bot. Jahrb. xxxii. 125 (1902).

SOMALILAND. Galla Highlands (Arussi-Galla-Land), near Ginea-Dumek, 5000-6600 ft., in rocky hollows, Ellenbeck 1963 (Herb. Berol.—type).

7. *Haplocoelum strongylocarpum* Bullock, sp. nov.; *H. folioloso* (Hiern) Bullock affinis, sed foliolis majoribus paucioribus superioribus quam inferioribus majoribus (nec ea subaequantibus) differt.

Arbor, ramulis junioribus satis dense tomentoso-pubescentibus demum fere glabris. *Folia* paripinnata, usque 7 cm. longa et 4 cm. lata, foliolis alternis utrinsecus 4-5 oblique oblongis apice emarginatis basi acutis, summis usque 3 cm. longis et 1.5 cm. latis reticulatis, infimis multo minoribus, rhachi anguste alata, petiolo circiter 1 cm. longo. *Inflorescentia* cymosa, axillaris, multiflora, congesta, foliis multo brevior, pedunculis abbreviatis, pedicellis gracilibus 8 mm. longis. *Flores masculi*: sepala ovato-lanceolata, acuminata, 1.5 mm. longa; filamenta gracilia, 5 mm. longa. *Flores feminei* non visi. *Fructus* laevis, ovoideus vel ellipticus, 1.5 cm. longus, haud trigonus. *Semina* oblongo-ellipsoidea, 1 cm. longa.

KENYA COLONY. Kisumu, a tree, Dobbs 2364!

8. *Haplocoelum foliolosum* (Hiern) Bullock, comb. nov.

Balsamea? *foliolosa* Hiern, Cat. Welw. Afr. Pl. i. 126 (1896).

Commiphora foliolosa (Hiern) K. Schum. in Just, Jahresb. 1899, xxvii. I. 480 (1901).

Pistaciopsis Dekindtiana Engl. in Engl., Bot. Jahrb. xxxii. 126 (1902).

Haplocoelum Dekindtianum (Engl.) Radlk. in Engl. et Drude, Veg. der Erde, ix., Pflanzenw. Afr. III. ii. 278 (1921).

TANGANYIKA TERRITORY. Mwanza, facing Lake Victoria, a shrub 10 ft. high, frequent on kopjes (no flowers or fruits), Nov., Burtt 2908!

ANGOLA. Huilla; in rocky places along the cataracts of the river of Lopollo and Monino, rather rare, Dec., fr., Welwitsch 4507! (type); Mucha Mts., 6000 ft., in rocky places, Dekindt 216 (Herb. Berol.—type of *Pistaciopsis Dekindtiana* Engl.).

9. *Haplocoelum jubense* Chiov., Res. Sc. Miss. Stefan.-Paoli Somal. Ital. i. 56 (1916); et l.c. 207, *in clavi*.

This plant is very completely described by Chioyenda. The presence of a corolla suggests that *H. jubense* should be referred to some other genus.

SOMALILAND. Duchia, July, Paoli 464, 465 (Herb. Flor.); Revai sul Giuba, July, Paoli 477 (Herb. Flor.); Uascianle, Scassellati & Mazzocchi 76 (Herb. Flor.).

XLVIII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: VII.* N. Y. SANDWITH.

NEW AND NOTEWORTHY LEGUMINOSAE AND ROSACEAE FROM BRITISH GUIANA.

LEGUMINOSAE.

Clitoria javitensis (H.B.K.) Benth. in Journ. Linn. Soc. ii. 42 (1858); in Mart. Fl. Bras. xv. pars i. 123 (1859).—*Neurocarpum javitense* H.B.K. Nov. Gen. et Sp. Pl. vi. 409 (1823).

An opportunity occurred recently of examining the type material of this species in the Herbarium of the Muséum d'Histoire Naturelle, Paris. The leaflets are ovate-lanceolate, 9-15 cm. long and 4.5-6.5 cm. wide; they have scattered adpressed hairs beneath, but these have fallen from some parts of the surface which are consequently glabrous. The bracteoles have fallen, but a single example in the capsule on the sheet is, as described, very short, 3 mm. (1½ lines) long. The calyx is, as described, 2.2 cm. (10 lines) long, and is 8-9 mm. wide. The shorter teeth are very short, triangular-acuminate, 3-4 mm. long, 4 mm. wide; while the longer subulate tooth is 6 mm. long in the best example. The whole calyx is adpressed whitish-pilose. The standard is densely adpressed-pilose over the whole of the outer surface, and this indumentum gives it a greyish-purple colour. The flattened lamina of the standard is about 4 cm. long and 3.5 cm. wide, while the claw is about 1.2 cm. long.

Of the specimens in Herb. Benth. and Herb. Hook. which have been compared with this plant, the one which agrees best with it and which may safely be identified with it is *Spruce* sine numero, from San Carlos, Venezuela, collected in August, 1853. The calyx, calyx-teeth and indumentum of the standard of this collection agree very well with those of the Humboldt and Bonpland type, and the pedicels and bracteoles agree with the description. The only discrepancy is in the leaflets, which are broader and glabrous beneath, but it is obvious from a comparison of numerous specimens that a considerable range of variation must be looked for in the shape, venation and clothing of the leaflets of the plants of this group. Another specimen which may be identified with the type is on the

*Continued from K.B. 1931, p. 188.

Kew sheet of *Spruce* 2320 from San Gabriel, Rio Negro, May 1852, but there is material from two different collections on this sheet, and one of them agrees with the large series of plants to be discussed later. *Spruce* 1877, from the Rio Negro, Oct. 1851, has the dense indumentum of the standard of the type, but the calyx, and above all its teeth, are much longer, and the bracteoles are rather longer (up to 5 mm.).

This sheet is of importance as it shows a transition towards a large quantity of material from Guiana and Amazonian Venezuela which differs remarkably from the type in the large much longer calyx-teeth, in the much more glabrescent outer surface of the standard which dries a pale colour, and in the long, glabrescent, conspicuously striate bracteoles. The leaflets of this series vary considerably and in one sheet (*Spruce* 3543) they are scattered-pilose beneath as in the type of *javitensis*. At first sight it seemed as if this set of plants represented a distinct species, but the evidence of *Spruce* 1877 is against any such supposition, and even within the series itself there is much variation in the length and position of the bracteoles, and in the size of the calyx and corolla; it is clear that the distribution of the two forms and their intermediates overlaps. *Ducke* 23406, from Manaos, Rio Negro, agrees well with *Spruce* 1877.

Fortunately, this large series of distinct-looking specimens already has the following valid name:—

var. **glabra** *Sagot* in Ann. Sci. Nat. sér. vi. 13. 299 (1882) emend.; a typo bracteolis longioribus, dentibus calycinis conspicue majoribus longioribus, vexillo extra glabrescente siccitate pallente differt.

FRENCH GUIANA. Karouany, 1857, *Sagot* 120 (type coll.).

BRITISH GUIANA. *Schomburgk* 1000; Rockstone, 1919-20, *Hitchcock* 17309; *ibid.*, 1921, *Gleason* 543; dense upland forest, Butukari, July 1921, *Gleason* 714; Demerara River, Nov. 1888, *Jenman* 4930; grant opposite Bartica Grove, Nov. 1886, *Jenman* 2498; Moraballi Creek, Essequibo River, Nov. 12th, 1929, *Sandwith* 599. The last-named collection was a low-growing rope, in wallaba forest; flowers on the old wood, very handsome; bracteoles green; calyx pale reddish-green; standard boat-shaped, very large, a lovely pale mauve, with violet stripes in the centre within; keel and wings much shorter, white; laminae of wings slightly cohering to keel.

BRAZIL. San Gabriel, Rio Negro, May 1852, *Spruce* 2320 (mixed gathering).

VENEZUELA. Tomo, Rio Guainia, San Carlos, Aug. 1854, *Spruce* 3543.

Dalbergia Riedeli (*Radlk.*) *Sandwith*, comb. nov.—*Hecastophyllum Riedeli* *Radlk.* in Koepff, Uber anat. char. *Dalberg.* 41 (1892). *H. Monetaria* Pers. var. *Riedeli* Benth. in Mart. Fl. Bras. xv. pars. i. 229 (1862) partim, quoad *Spruce* 1546.

BRAZIL. Barra, Rio Negro, May 1851, *Spruce* 1546 (type coll.); Rio Negro, Oct. 1851, *Spruce* 1879.

BRITISH GUIANA. Upper Demerara River, Sept. 1887, *Jenman* 4086; Moraballi Creek, Essequibo River, August 1929, *Sandwith* 53; lowland forest, Rockstone, July 1921, *Gleason* 527; bank of Essequibo River, Rockstone, July 1921, *Gleason* 893; Mazaruni River, June 1889, *Jenman* 5251.

Unfortunately, the Riedel specimen which is the type of Bentham's variety appears to be quite distinct from the above large and uniform series. *Radlkofer* did not see this specimen, and made *Spruce* 1546 the type of his species, conjecturing that Bentham had correctly identified the two as representing the same plant.

Machaerium Quinata (*Aubl.*) *Sandwith*, comb. nov.—*Nissolia Quinata* *Aubl.* Hist. Pl. Guiane, 743, t. 297 (1775). *N. ferruginea* Willd. Sp. Pl. iii. 900 (1803). *Machaerium ferrugineum* Pers. Syst. ii. 276 (1807); Benth. in Mart. Fl. Bras. xv. pars. i. 253 (1862), ubi synonyma cetera citantur.

Climber at mouth of the Moraballi Creek, Essequibo River, Oct. 18th, 1929, *Sandwith* 481.

Distr. Widely distributed over Guiana and Amazonian Venezuela and Brazil. Aublet's specimen at the British Museum has been verified and compared.

Clathrotropis brachypetala (*Tul.*) *Kleinh.* in Rec. Trav. Bot. Néerl. xxii. 398 (1925).—*Diplotropis brachypetala* *Tul.* in Arch. Mus. Par. iv. iii. (1844).

Moraballi Creek, Essequibo River, Aug. 28th, 1929, *Sandwith* 136. Tall tree on bank of small creek or gully, its favourite habitat. Leaflets green on both sides. Calyx brown. Fl. dirty white.

Vernacular name (Arawak), Arumatta.

Distr. St. Vincent (native?), Trinidad, Guiana.

Aldina insignis (*Benth.*) *Endl.* in Walp. Rep. i. 843 (1842).—*Allania insignis* Benth. in Hook. Journ. Bot. ii. 91 (1840).

Moraballi Creek, Essequibo River, Nov. 15th, 1929, *Sandwith* 618. Tall tree, 138 ft. high, 92 ft. to the first fork, 30 in. diam., in sandy mora forest by the right bank. Leaflets 5-7, glaucescent beneath.

Vernacular name (Arawak), Dakamaballi.

Distr. Endemic? All the sheets at Kew, with the exception of Robert Schomburgk's original collection from the Upper Essequibo and Rupununi Rivers, are from the Lower Essequibo and the creeks which flow into it near Bartica.

Swartzia xanthopetala *Sandwith*, sp. nov.; facie *S. tomentosae* (*Willd.*) DC., ab hac ac affinis stipulis minoribus, bracteolis sub flore conspicuis persistentibus, ovario longo angusto ut stipite styloque glaberrimo differt; a *S. grandifolia* Bong. ex Bth. atque *S. picta* *Spruce* ex Bth. rhachi foliorum nuda statim distinguenda.

Arbor mediocris, 22.5 m. alta, ramulis summis densissime tomentosis, annotinis pullis, novellis ferrugineis. *Folia* imparipinnata, 3-9-foliolata, vulgo 7-foliolata, 12-30 cm. longa; petiolus subteres vel supra anguste canaliculatus, densissime ferrugineo-tomentosus, 2-5 cm. longus; rhachis similis, omnino exalata, supra canaliculata, internodiis 1.2-4 cm. longis; petioluli 2-3 mm. longi; foliola lateralia oblonga vel obovato-oblonga, terminalia vulgo obovata, apice obtusa saepius rotundata brevissime mucronulata, raro subacuminata, basi obtusa saepius rotundata, 3-15 cm. longa, 2-7 cm. lata, chartacea, supra nervis impressis rugulosa nitidula, costa ferrugineo-tomentosa, ceterum pilis albis laxis deterrentibus plus minusve dense conspersa, subtus pallidiora costa nervisque reticulatis densissime ferrugineo-tomentosis ceterum etiam passim laxe pilosula, nervis primariis utroque costae latere vulgo 10-14 versus marginem arcuantibus ac anastomosantibus; stipulae satis parvae, ovatae, ad 4 mm. longae atque 3 mm. latae. *Inflorescentiae* infra folia in ramulis annotinis defoliatis surgentes, solitariae vel geminae, crebrae, racemosae, saepius flexuosae, 5-20 cm. longae, vulgo 4-12-florae, passim (pedunculus, pedicelli, bractae, bracteolae, alabastra) densissime ferrugineo-tomentosae; bractae ovatae, concavae, 2-4 mm. longae, circiter 3 mm. latae; pedicelli sub flore aperto 1.2-2.2 cm. longi; bracteolae sub calyce ipso positae atque saepe ei adpressae, angustae, oblongo-lineares, 2-3 mm. longae, 0.5-1 mm. latae, post petali lapsum persistentes. *Alabastra* matura ovoideo-subglobosa, 7-10 mm. diametro. *Calyx* in lobos 4 ad basim fissus; lobi elliptico-ovati, 1-1.2 cm. longi, 5-6 mm. lati, extra densissime ferrugineo-tomentosi, intus glabri statu vivente virides. *Petalum* aureum, valde venosum, orbiculato-cordatum, 3 cm. longum atque latum, margine integro vel obscure sinuato-lacerato, extra basi ac in ungue necnon secus venas pilosum, intus glabrum; unguis 3 mm. longus. *Stamina* filamentis aureis, glabris; majora circiter 15 quam minora numerosissima subduplo longiora. *Ovarium* longum, angustum, glaberrimum, statu vivente viride, siccitate nigrum, 2-2.5 cm. longum, 1-1.75 mm. latum, subrectum vel saepius curvatum, sensim in stylum glabrum colore eodem praeditum 6-8 mm. longum attenuatum; stipes glaber, circiter 7 mm. longus. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 7th, 1929, *Sandwith* 388 (type). Tall tree, 74 ft. high, 9 in. diam., in wallaba forest on ridge. Branchlets, veins of lower surface of leaflets, and inflorescence all ferrugineous-tomentose. Leaflets wrinkled and slightly shining above. Petal and filaments bright yellow. Sepals green inside, ferrugineous-tomentose outside. Ovary and style green and glabrous.

Demerara River, Aug. 1888, *Jenman* 4505.

The nearest affinity of this species is perhaps *S. picta* Spruce ex Benth., which differs in its winged leaf-rhachis, its larger more

acuminate leaflets, and above all in its much larger conspicuously sinuate-dentate petal, which Spruce noted as resembling an oak-leaf.

S. Benthamiana *Miq.* Stirp. Surinam. Sel. 15 (1850).

Moraballi Creek, Essequibo River, Oct. 19th, 1929, *Sandwith* 488. Tall tree, 92 ft. high, 13 in. diam. The species is scattered in wallaba forest on sandy ridges. Petal and filaments pure white. Blaze with purplish-red juice.

Vernacular name (Arawak), Itikiburaballi.

Distr. Guiana, Amazonian Brazil.

The leaflets of this species vary rather considerably in texture and venation, according to age and development. The present material agrees best with Spruce's collection (1843) from the Rio Negro which, as Bentham pointed out in the *Flora Brasiliensis*, exhibits certain points of difference from the typical plant of Surinam and Cayenne; but the longer filaments of *Sandwith* 488 are always sparsely pilose when carefully examined under a lens, whereas in Spruce's plant they are said by Bentham to be quite glabrous.

Sclerolobium guianense *Benth.* in Hook. Kew Journ. Bot. ii. 237 (1850).

Moraballi Creek, Essequibo River, Oct. 11th, 1929, *Sandwith* 423. Tall tree, 122 ft. high, 18 in. diam., in greenheart forest. Stipules remarkably pectinate. Panicles very conspicuous. Sepals creamy-white. Petals 0 or rudimentary. Filaments golden-yellow with golden-yellow hairs below. Young ovary ferrugineous-tomentose on the margins.

Vernacular name (Arawak), Yawarridan.

Distr. Guiana. Not recorded by Ducke from Pará. Schomburgk's original collection is the only other British Guiana sheet at Kew, but the tree is probably not uncommon.

Cassia pteridophylla *Sandwith* in Kew Bull. 1928, p. 375.

Moraballi Creek, Essequibo River, Sept. 23rd, 1929, *Sandwith* 323. Tall tree, 90-100 ft. high, 12 in. diam., in wallaba forest on sandy ridge. Fl. bright yellow.

Vernacular name (Arawak), Immirimiaballi; not Iriariadan, as was originally suggested.

This species is confined to the wallaba forest, where it is abundant. It is satisfactory to note that the emarginate character of the leaflets, which immediately distinguishes it from *C. adiantifolia*, was found to be absolutely constant in the leaves both of seedlings and of mature trees.

C. leiandra *Benth.*, var. **guianensis** *Sandwith* var. nov.; a planta typica foliolis angustis oblongis, facie saepius subrectangulari, lateribus insigne subparallelis, apice rotundatis vel emarginatis, 0.7-4.4 cm. longis, 0.6-1.6 cm. latis, indumento subtus praesertim costae multo minus conspicuo differt.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 25th, 1929, *Sandwith* 521 (type): tall tree, 100 ft. high, 13 in. diam., in mixed forest; young leaflets red; fl. bright yellow. Eberoabo River, Berbice River, May 1919, *Hohenkerk* in Forestry Department record no. 790: tree 77 ft. high; fl. golden-yellow with strong, sweet perfume. Ite Creek head, Kuruabaru River, Demerara River, *Hohenkerk* in ditto, no. 790A: tall tree, with light-yellowish sapwood and dark red-brown heartwood; flowers orange to vermilion.

Vernacular name (Arawak), Warua.

Bauhinia (§ *Tylotea*) **scala-simiae** *Sandwith* sp. nov.; *B. cupreonitenti* Ducke affinis, indumento faciei inferioris foliorum longiore atque laxiore, floribus majoribus multo longius pedicellatis, alabastris sine lobis apicalibus cernendis, calyce insigne alato alis spiraliter plicatis differt.

Frutex ingens alte scandens atque per summas arbores late pervagans; caulis vel truncus denique ad 1-2 pedes latus, insigne compressus atque transverse regulariter ita costatus ut gradus praebeat scalam simulet. *Folia plantarum incipientium* in terra repertarum late ovata vel suborbicularia, majora ad trientem vel ultra biloba, lobis erectis vel in foliis maximis subdivaricatis sinu triangulari latissimo breviter ad 5 mm. mucronato, insigne longe vulgo 2-3 cm. anguste cuspidatis, basi truncata vel profunde ad 2 cm. cordata, 6-25 cm. longa, 5-25 cm. lata, supra viridia glabra, subtus indumento sericeo adpresso pulcherrime pallide cupreonitenta, tenuiter papyracea, 9-11-nervia, rete venularum supra subtilissimo; petiolus ut caulis densissime ferrugineo-villosus, 3-18 cm. longus. *Ramuli summi fruticis maturi* sulcati, vulgo 3-5 mm. diametro, indumento rubro-ferrugineo villosio densissime vestiti; cirrhi oppositi, 2-6 cm. longi, juventute indumento simili praediti, tum indurati cinerascetes. *Folia matura* late ovata vel suborbicularia, juniora superiora semper simplicia integra apice siccitate plicato ad 5 mm. mucronata, seniora maxima integra vel nonnunquam ad 2 cm. biloba lobis late triangularibus vel brevissime acuminatis sinu latissime triangulari, omnia basi cordata vel cordato-truncata, 4-24 cm. longa, 3.5-23 cm. lata, coriacea, fortiter 9-nervia, supra glabra nitida siccitate olivaceo-purpurascencia vel nigricantia nervis impressis rete venularum subtilissimo inconspicuo, subtus indumento duplici, et minute adpresse pilosula, et dense praesertim nervis venulisque satis longe atque laxe ferrugineo-villosa, conspicue reticulata; petiolus indumento ramulorum densissimo indutus, vulgo satis brevis, 1-9 cm. longus, sed nonnunquam in foliis inferioribus ad 20 cm. longus. *Racemi* axillares, 5-20 cm. longi, satis pauciflori atque laxiflori, indumento ramulorum omnino simili; bracteae lanceolatae vel spathulato-lanceolatae, 3-5 mm. longae, circiter 1.5-1.8 mm. latae, extra indumento racemi indutus, intus glabrae, purpurascetes; bracteolae similes, in medio vel saepius supra medio pedicello positae, spathulatae vel oblongae, ad 6 mm.

longae, bracteis saepe paullo latiores ad 2 mm. latae; pedicelli indumento racemi praediti, maturi 1-1.6 cm. longi. *Alabastra* ovoideo-subglobosa, circiter 8 mm. longa atque lata, nitentia, densissime rufo-pilosa, lobis apicalibus carentia. *Calyx* 1-1.2 cm. longus, 1.2-1.7 cm. latus, ore truncato, lobis obscuris triangularibus, extra indumento racemi ramulorumque densissime vestitus, intus dimidio inferiore glaber, extra conspicue alatus, alis 10-11 spiraliter sinuato-plicatis 2-3 mm. latis. *Petala* albo-lutea, brunneo-nervosa; 4 inferiora subaequalia, obovato-spathulata, ungue incluso 1.8-1.9 cm. longa, lamina 0.8-1 cm. lata extra pilis ferrugineis dense lanata intus glabra, ungue utrinque villosio 5-6 mm. longo; petalum quintum summum spathulato-oblongum, plicatum, 1.6 cm. longum, circiter 5 mm. latum. *Stamina* glaberrima, inaequalia, 0.5-1 cm. longa. *Ovarium* sessile, sulcatum, pilosum, 4 mm. longum, 2 mm. diametro, sensim in stylum basi excepta glabrum 4 mm. longum attenuatum. *Legumen* maturum planum, densissime rufo-tomentosum indumento senectute deterili, obovato-oblongum, 12-16 cm. longum, 4.4-4.8 cm. latum.

BRITISH GUIANA. Moraballi Creek, Essequibo River, in mora and morabukea forest, August 17th, 1929, *Sandwith* 44 (type): giant bush-rope, frequent; branchlets and lower surface of leaves cupreous; leaves entire; calyx crinkled, cupreous; petals cream, veined with brown, with cupreous hairs on back; young pods cupreous-tomentose. *Ibid.*, Sept. 19th, 1929, *Sandwith* 300, a collection of seedling plants and seedling leaves, common on the forest floor. Weriwera-Kuru Creek, Essequibo River, Oct. 14th, 1922, *Hohenkerk* in Forestry Department record no. 197B. Opposite Bartica, April 1887, *Jenman* 3627. Koorie Creek, Nov. 1886, *Jenman* 2690, "base of stem as stout as one's body." Upper Waini Trail, North-west District, Nov. 1910, C. W. Anderson in Forestry Department record no. 197A (seedling leaf only). "Mazaruni, Cuyuni and Essequibo," *Appun* 380 (seedling leaves). "Demerara," *Parker* (seedling leaves).

Creole names, "Monkey Ladder" or "Turtle Step."

Frequent by the Moraballi Creek, where the "ladders" formed by the mature rope were one of the most conspicuous features of the forest, but not nearly so plentiful as *B. Kunthiana* Vog. The seedling leaves are remarkably different in shape from those of the mature tree, which are usually quite entire, and would hardly be identified with them in herbaria in the absence of field-notes; the same is true of the seedling leaves of *B. Kunthiana*, which are cleft to the base.

B. Siqueiraei Ducke in Arch. Jard. Bot. Rio de Janeiro iii. 108 (1922); iv. 54 (1925).

Moraballi Creek, Essequibo River, Nov. 13th, 1929, *Sandwith* 603. Bush-rope in mixed forest, not forming a "monkey-ladder." Flowers in magnificent racemes. Petals creamy-white. Pedicels, calyx, and back of petals pale cupreous-sericeous.

Distr. Brazil (Pará).

The material agrees perfectly with *Ducke* 11104 from the Rio Xingú. A remarkably interesting extension of the range of an extraordinarily handsome and distinct species. It was evidently local in this district, as it was only noticed in a very small area along one of the lines which were cut at random by members of the Oxford Expedition.

Eperua (Wallaba) in British Guiana. The Wallabas of the Colony are of such growing economic importance,* and of such interest to the ecologist studying the various types of forest, that it seems desirable to give a simple key to the species and an enumeration of the different collections of each. The best characters are furnished by the inflorescence, the leaflets of each species being extremely variable in shape, size and number. Four of the five species found in the Colony appear to occur more or less plentifully together in the Wallaba consociation or forest-type, and at least three of these are passing under two Arawak vernaculars, Soft Wallaba and Ituri Wallaba. Their presence side by side is proved by the results of the Wallaba plot which was worked by the botanists of the Oxford Expedition. In this area, besides the dominant *E. falcata* or Soft Wallaba, material was collected from two Ituri Wallabas, growing within a few yards of each other, which was not distinguished in the field, but has been found on return to Kew to represent two described species which are apparently separable in the herbarium. The fifth species, *E. Schomburgkiana*, is easily distinguished from the other four by its snow-white petal, and appears to be confined to the banks of rivers and creeks, where it is very plentiful.

Inflorescence very long (usually several feet) and pendulous :

Inflorescence covered with a dense, rust-coloured, scurfy wool.....

1. *rubiginosa*.

Inflorescence covered with finely adpressed ashy-sericeous or ashy-brown hairs.....2. *falcata*.

Inflorescence very short, not pendulous :

Inflorescence covered with a dense, conspicuous, pale brown, scurfy wool : petal white.....3. *Schomburgkiana*.

Inflorescence very finely hirtellous ; petal rhododendron-mauve (Ituri Wallabas) :

Stipules small and inconspicuous, 2-5 mm. long, up to 3 mm. broad ; bracteoles inserted close to the calyx, normally above the middle of the pedicel ; petal rather small, rarely up to 5 cm. long.....4. *grandiflora*.

Stipules large and conspicuous, usually 0.7-2 cm. long and up to 1.5 cm. broad ; bracteoles distant from the calyx, normally below the middle of the pedicel or at its base ; petal large, 4.5-8.5 cm. long (usually 6-8 cm.)...5. *Jenmani*.

*See a paper entitled "The Wallabas of British Guiana," by J. B. Aitken, in *Tropical Woods*, no. 23, 1-5 (1930).

1. *E. rubiginosa* *Miq.* *Stirp. Surinam. Sel.* 12 (1850).

Essequibo and Rupununi Rivers, 1838, *Robert Schomburgk* 515 ; ann. 1841, *Richard Schomburgk* 174 ; Essequibo River, 1881, *Jenman* 1147 ; Kurupukari, Essequibo River, July 1920, *Hohenkerk* in F.D. no. 122B ; Essequibo and Mazaruni Rivers, *Appun* 294 ; Mazaruni River, 1880, *Jenman* 768, 786.

Distr. Surinam and French Guiana.

Not collected on the Moraballi Creek by the Oxford Expedition.

2. *E. falcata* *Aubl.* *Hist. Pl. Guiane*, 369, t. 142 (1775).

Corentyne River, 1879, *Jenman* 234 and *im Thurn* ; ann. 1918, *Leechman* ; Demerara River, 1888, *Jenman* 4941 ; Upper Demerara River, 1887, *Jenman* 4095 ; Moraballi Creek, Essequibo River, 1929, *Sandwith* 137, 329 ; Morebo, Barima River, North-west District, 1908, *C. W. Anderson* 122.

Vernacular name (Arawak), Soft Wallaba.

Distr. Surinam and French Guiana (*Aublet* !) ; extreme north of the state of Pará, Brazil. Cultivated in Trinidad.

The flowers vary in colour from deep rose to greenish-white.

3. *E. Schomburgkiana* *Benth.* in *Mart. Fl. Bras.* xv. pars ii. 226 (1870) ; verosimiliter non *Pittier* in *Trab. Mus. Com. Venezuela*, iii. 172 (1928).

Orealla, Corentyne River, 1879, *Jenman* 459 ; Essequibo and Rupununi Rivers, 1838, *Robert Schomburgk* 317, 517 ; Essequibo River, *Appun* 384, *Jenman* 1336 ; Moraballi Creek, Essequibo River, 1929, *Sandwith* 142 ; above Arrawarri Mouth, Lower Essequibo River, 1909, *C. W. Anderson* 182 ; Potaro River, Tumatumari, 1921, *Gleason* 332 ; Mazaruni River, *Jenman* 627, 5257, *Appun* 359.

Distr. Rio Trombetas, Brazil.

From the evidence of field-notes, this very distinct species would appear to be absent from the "wallaba forest" of sandy ridges away from the banks of creeks and rivers. As with other species, individuals vary considerably in height.

4. *E. grandiflora* (*Aubl.*) *Benth. l.c.*—*Parivoa grandiflora* *Aubl. l.c.* 757, t. 303 (1775). ? *E. Schomburgkiana* *Pittier* in *Trab. Mus. Com. Venezuela*, iii. 172 (1928), non *Benth. E. Hohenkerkii* *Sprague* ms. ; *Aitken* in *Tropical Woods*, no. 23, 1 (1930), nomen.

Ann. 1844, *Richard Schomburgk* 988 (1722) ; Demerara River, *Jenman* 6269, 7304 ; Berbice River, May 1919, *Hohenkerk* in F.D. no. 788 ; opposite Bartica Grove, 1886, *Jenman* 2482 ; Moraballi Creek, Essequibo River, 1929, *Sandwith* 314 ; Upper Rupununi River near Dadanawa, 1922, *la Cruz* 1704.

Vernacular name (Arawak), Ituri Wallaba.

Distr. Surinam and French Guiana (*Aublet* !).

5. *E. Jenmani* *Oliv.* in *Hook. Ic. Pl.* 1955 (1891).

Bartica, 1888, *Jenman* 4770 ; Essequibo River, 1884, *Jenman* 2154 ; Moraballi Creek, Essequibo River, with *E. grandiflora*, 1929,

Sandwith 710; Rockstone, 1921, *Gleason* 837; Butukari, 1921, *Gleason* 718; Demerara River, *Jenman* 573, 3830, 4258; below the Kaieteur, Potaro River, 1881, *Jenman* 975; Kaburi River, Mazaruni River, 1926, *Wood* in F.D. no. 876; Kumaka, Kurupung River, Mazaruni River, 1925, *Altson* 313; *Appun* 756; ann. 1907, *F. C. Foote*.

Vernacular name (Arawak), Ituri Wallaba.

Distr. Surinam (no specimens seen) and French Guiana (*Martin* in *Herb. Mus. Brit.*). Cultivated in Trinidad and Jamaica, and at Singapore.

Careful study of the large series of specimens of *E. grandiflora* and *E. Jenmani* suggests that the validity of the characters separating them is still rather doubtful. It will be seen from the key that a definite overlapping has been discovered in the dimensions of certain parts. In addition to the characters given in the key, *E. Jenmani* normally differs from *E. grandiflora* in having longer pedicels and larger leaflets, but these characters cannot be used as invariable distinctions. The point of this note is, in fact, to suggest that forest officers should study these two Ituri Wallabas in the field with a view to determining their final taxonomic relationship.

Peltogyne pubescens Benth. in Hook. Journ. Bot. ii. 96 (1840).

Moraballi Creek, Essequibo River, Nov. 1st, 1929, *Sandwith* 546. Tall tree, 132 ft. high, 24 in. diam., on hill in wallaba forest. Bark reddish-brown; sapwood cream; heartwood dark brown, purple on exposure. Inflorescence very beautiful on the lax crown; buds pruinose; sepals 4 and petals 5, pink; filaments white; style pink, stigma purplish; ovary whitish-sericeous.

Vernacular names, Kuroburelli (Arawak); Purpleheart.

Distr. British Guiana; Brazil (Rio Branco, *Ule* 7728, 8151); Colombia.

Differs from *P. paniculata* Benth. of the Rio Negro and Casiquiare in the shape and size of the leaflets, and in the indumentum of the inflorescence.

Hymenaea Davisii *Sandwith*, sp. nov.; ovario tomentoso, *H. oblongifoliae* Huber affinis, foliolis angustioribus falcatis magis acuminatis, floribus longius pedicellatis, stipite calycis supra bracteolas multo longiore, tubo calycis longiore cupulari differt; ab *H. intermedia* Ducke ovario tomentoso statim distinguenda.

Arbor excelsa, 34.5 m. alta, 62.5 cm. diametro, in eperuetis crescens, cortice sublaevi rubro-brunneo. *Petiolus* glaber, teres, circiter 2 cm. longus; petioluli glabri, 3-4 mm. longi. *Foliola* bina, elliptico-lanceolata, longa ac angusta, semper distincte falcata, apice conspicue vulgo ad 1 cm. acuminata, basi inaequilaterali obliqua cuneata, 11-15 cm. longa, 3-4.2 cm. lata, coriacea, utrinque nitida, glaberrima, nervis omnibus supra impressis, subtus costa prominente nervis primariis elevatis sed haud valde conspicuis, ceteris utrinque vix cernendis. *Inflorescentia* paniculata, tota

indumento pallide brunneo dense adpresse puosa, ad 15 cm. longa; rami inferiores compositi, ceteri simpliciter racemosi post florum lapsum ad 3 cm. longi. *Bractee* bracteolaeque delapsae. *Pedicelli* 5-7 mm. longi, ad 2 mm. lati, mox disarticulati, dense adpresse pilosi. *Flores* nocturni, fragrant. *Calyx* extra indumento simili indutus; tubus discifer cupularis, 5-7 mm. longus, circiter 5 mm. latus, stipite insigni sub flore aperto 0.7-1 cm. longo; lobi 1-1.3 cm. longi, 6-9 mm. lati, elliptico-oblongi, intus pilis longioribus laxae adpressis flavescentibus nitenti-sericei. *Petala* alba, oblongo-lanceolata vel lanceolata, glabra, conspicue punctato-glandulosa, 1.3-1.5 cm. longa, 5-6 mm. lata. *Stamina* filamentis albis glabris, 2-2.3 cm. longis; antherae pallide citrinae, 4-5 mm. longae. *Ovarium* subquadratum, dense flavescenti-pilosum, 4-5 mm. longum, ad 3 mm. latum, stipite sub ovario ipso piloso 5-6 mm. longo (parte in calycis tubo immersa inclusa); stylus glaber, 2-2.5 cm. longus, stigmatibus circiter 1 mm. diametro; ovula in unico ovario dissecto 6. *Legumen* rotundato-ovatum, monospermum, granulosum, minutissime tomentellum, senectute glabrescens, 4-4.5 cm. longum, 3.5 cm. latum.

BRITISH GUIANA. Warimia Creek, Essequibo River, June 8th, 1929, *Forestry Department* record no. 943 (type). "Large tree, 115 ft. high, 25 in. diam., in wallaba forest on white sand on top of hill slope; not buttressed; bark fairly smooth, reddish-brown; gives locust gum when dead. Flowers nocturnal, dying next morning, very delicately fragrant. Calyx brownish. Petals and filaments white; anthers pale lemon. This is a variety of Simiri which produces a small one-seeded pod."—*T. A. W. Davis*.

Macouria River, Essequibo River, March 9th, 1909, *C. W. Anderson* 165 (leaflets and pod). "Sapwood hard, pinkish-white. Heartwood fair-sized, hard, rich-brown, darkening on exposure."

Vernacular names; Locust, Simiri or Courabarie.

This fine tree is named in honour of Mr. T. A. W. Davis, Assistant Conservator of Forests, British Guiana, whose observations on the forest flora of this Colony are of the highest importance. The other "Simiri" or "Locust" of British Guiana, *H. Courbaril* L., is immediately distinguished from this species by the shorter, relatively broader leaflets, the glabrous ovary and the longer pod.

Dimorphandra Gonggrijpii *Kleinh.* in *Rec. Trav. Bot. Néerl.* xxii. 410 (1925).

Moraballi Creek, Essequibo River, Nov. 8th, 1929, *Sandwith* 570 (foliage only).

Vernacular name (Arawak), Morabukea.

Distr. British Guiana, Surinam.

The identity of this well-known tree is at last fixed with certainty by comparison with the type material which was borrowed from Utrecht. It is one of the largest and commonest trees in the north of the colony, reaching a height of 150 feet, and forming a clearly distinguishable consociation or forest-type. The latter will be discussed at length in an ecological paper by Messrs. T. A. W.

Davis and P. W. Richards. At the moment it may be pointed out that *Morabukea* is abundantly distinct from *Mora* (*Mora excelsa* Benth.) in its thinner trunk with rich brown (not greyish) bark and smaller flange buttresses; and in the shape and venation of its bijugous leaflets. The measurements of the latter were unfortunately omitted by Kleinhoonte; they are 5-15 cm. in length, and 2.5-7.5 cm. in width. The flowers have not yet been collected or described, so that it is perhaps inadvisable at present to transfer the species to the genus *Mora* as recently defined by Ducke (Arch. Jard. Bot. Rio de Janeiro iv. 44), although it is highly probable that this transference will be required.

Pithecellobium pedicellare (DC.) Benth. in Hook. London Journ. Bot. iii. 219 (1844).—*Inga pedicellaris* DC. Prodr. ii. 2. 441 (1825).

Moraballi Creek, Essequibo River, Sept.-Oct. 1929, *Sandwith* 350, 469. A large tree with rich brown, lenticellate bark. Calyx greenish-brown. Corolla red; filaments pure white. No. 469 was a tree 131 ft. 9 in. high and 3 ft. 2 in. diam.

Vernacular name (Arawak), Red Manariballi.

Distr. Surinam, French Guiana and Brazil. Apparently the first record from British Guiana.

Inga (§ *Leptinga*) **Jenmani** *Sandwith*, sp. nov.; *I. sertuliferae* DC. affinis, foliolis multo minoribus tenuioribus chartaceis facie undulata, pedunculis semper multo (saepius duplo) brevioribus, calycibus minoribus differt.

Frutex vel *arbor*, 3-30 m. alta, ramulis summis fuscis pubescentibus dense lenticellatis. *Folia* petiolo 0.5-1.5 cm. longo, internodiis rhacheos 1-2.8 cm. longis; petiolus rhachisque pubescens sed vetustate glabrata, vix unquam lenticellata, angustissime alata marginibus erectis, vulgo 1 mm. lata sed sub jugo inferiore ad 2 mm. lata; glandulae nunc sessiles nunc distincte stipitatae; foliola 1-3-juga, vulgo 2-juga, elliptica vel ovato-elliptica, apice breviter obtuse acuminata, basi in petiolulum brevissimum 1-2 mm. longum abrupte cuneatim attenuata, inferiora 3.5-8 cm. longa, 1.5-3.5 cm. lata, foliola jugi terminalis 7-11.5 cm. longa, 2.5-5.7 cm. lata, glabra, nitida, chartacea, facie undulata, supra nervis omnibus impressis obscuris, subtus omnibus elevatis valde intricate reticulatis, nervis primariis utroque costae latere sursum arcuantibus vulgo 6-8; stipulae delapsae. *Umbella* pedunculo striato dense minute pubescente, 0.3-3.2 cm. (saepius 1-2 cm.) longo ad 1 mm. lato; bractae ovatae, ferrugineo-pubescentes, 1-1.5 mm. longae, circiter 0.75 mm. latae; pedicelli striati, glabri vel sparse pilosuli, adulti 0.7-1.3 cm. longi. *Flores* albi. *Calycis* tubus sparse ferrugineo-pubescentis, ad 2 mm. longus (saepe brevior), 1 mm. latus; dentes extra dense ferrugineo-pubescentes, 0.3-0.5 mm. longi, ad 0.7 mm. lati. *Corollae* tubus glaber, 6-8 mm. longus, apice ad 2 mm. latus; lobi extra praesertim dimidio superiore plus minusve ferrugineo-pubescentes, ad 1.75 mm. longi, circiter 1 mm. lati. *Tubus stamineus*

vix vel ad 3 mm. exsertus; filamenta libera ad 1.3 cm. longa. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 7th, 1929, *Sandwith* 187 (type); tree about 90 ft. high. *Ibid.*, Sept. 3rd, 1929, *Sandwith* 171. Supenaam Creek, Essequibo River, June 1893, *Jenman* 6587. Demerara River, May 1887, *Jenman* 3908. Without locality, 1844, *Schomburgk* 810, identified by Benth. as "*sertulifera* DC. var." Upper Mazaruni River, Sept.-Oct. 1922, *la Cruz* 2245, noted as 11 ft. high.

Closely allied to *I. sertulifera*, but the distinguishing characters are maintained in large series of both species, and are evidently not affected by the height of the tree, which varies considerably, nor by its habitat in dark forest or on the sunny banks of creeks and rivers.

I. Huberi *Ducke* in Arch. Jard. Bot. Rio de Janeiro iii. 49 (1922); v. 120 (1930).

Moraballi Creek, Essequibo River, Aug. 26th, 1929, *Sandwith* 119: middle-sized tree, about 70 ft. high, in "low bush"; bark reddish-brown, fluted; flowers white, capitate. *Ibid.*, Oct. 26th, 1929, *Sandwith* 526: tree about 50 ft. high, in mixed forest; leaflets shining-green and glabrous; calyx and corolla pale green; filaments white.

Vernacular name (Arawak), Warakusa; but this is indiscriminately applied to many species of *Inga*.

Distr. Brazil (Pará).

First record from British Guiana, and no other specimens from the Colony have been seen. Compared with *Ducke* 20120.

I. rubiginosa (Rich.) DC. Prodr. ii. 434 (1825); Benth. in Trans. Linn. Soc. xxx. 627 (1875).—*Mimosa rubiginosa* Rich. in Act. Soc. Hist. Nat. Par. 1792, 113.

Moraballi Creek, Essequibo River, Nov. 5th, 1929, *Sandwith* 556: tall tree, 94 ft. high, 12 in. diam., in mixed forest; inflorescence and lower surface of leaflets dark fulvous-tomentose; buds shining fulvous-sericeous; stamens and style pure white. *Ibid.*, Nov. 13th, 1929, *Sandwith* 605; middle-sized tree, about 60 ft. high, in mixed forest.

Vernacular name (Arawak), Karoto.

Distr. Guiana, Brazil (Pará). *Ducke* 10079, recently distributed as *I. Thibaudiana* var. *latifolia* Huber, agrees excellently with the Cayenne specimen (*Martin*) in Herb. Kew., which was cited as *I. rubiginosa* by Benth.

ROSACEAE.

All the species collected by the Oxford University Expedition in 1929 are included.

Licania buxifolia *Sandwith* sp. nov.; *L. canescenti* R. Benoist affinis, foliis maturis crassioribus, plerumque bullatis marginibus

valde revolutis, mucronatis tantum vel brevissime cuspidatis, ramis inflorescentiae magis glabris, floribus majoribus differt.

Arbor excelsa, in eperuetis crescens; ramuli summi glabri lenticellati. *Folia* elliptica vel elliptico-ovata, apice saepe facie rotundata obtusa sed semper acuta vel mucronata, mucrone revoluta, vel brevissime (2–4 mm.) cuspidata, basi cuneata, 2.5–13 cm. longa, 1.5–6.2 cm. lata, inter inflorescentias parva atque conferta, supra glabra, subtus ut in *L. canescente* nervis exceptis incana oculo nudo glabra sed tomento minutissimo arcte adpresso farinaceo oblecta, novella nonnunquam plana chartacea, adulta (praesertim prope inflorescentias) crasse coriacea bullata buxiformia marginibus valde insigne revolutis, nervis supra impressis reticulatione vix cernenda, subtus prominentibus rete venularum impresso vel in foliis majoribus prominente, nervis primariis utroque costae latere 6–10 arcuantibus; petiolus glaber, 2–6 mm. longus; stipulae subulatae, mox delapsae. *Inflorescentiae* numerosissimae, axillares atque pseudoterminales, 5–15 cm. longae; rami saepe bracteis foliaceis foliis summis bullatis revolutis simillimis suffulti, maturi purpurascens, glabri vel glabrescentes; cymae pauciflorae, breviter (0.5–2 mm.) pedunculatae, pedunculo tomentello; bractae basi pedunculorum glabrae vel glabrescentes, triangulares, circiter 0.5 mm. longae. *Flores* parvi, albo-lutescentes. *Calyx* subgloboso-campanulatus, extra ac intus subtiliter dense griseo-tomentellus, cum lobis ad 2 mm. longus, vix ad 1.5 mm. diametro; lobi triangulares, vix ad 1 mm. longi, 1 mm. lati. *Petala* nulla. *Ovarium* dense tomentosum, circiter ad 1.2 mm. altum atque diametro. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 23rd, 1929, *Sandwith* 327 (type): tall tree, 84 ft. high, in wallaba forest on sandy ridge, a characteristic member of this type of forest; crown very dense; fl. cream. Upper Demerara River, Sept. 1887, *Jenman* 4110.

Vernacular name (Arawak), Marishiballi.

Certainly closely allied to *L. canescens* R. Benoist, but easily distinguished on foliage characters from the numerous sheets of that species in the Paris Herbarium and in London.

***L. heteromorpha* Benth.** in Hook. Journ. Bot. ii. 221 (1840).

Moraballi Creek, Essequibo River, Nov. 13th, 1929, *Sandwith* 604. Tall tree in mixed forest. Fl. dirty cream. Very like Kairiballi, but leaves thicker, smaller and more emarginate. Fruit as in Kairiballi.

Vernacular name (Arawak), Kunoko.

Distr. Guiana, Amazonian Brazil.

As pointed out by Fritsch (Ann. Hofm. Wien, iv. 44), this is an extraordinarily variable species, particularly in the size, shape and apex of the leaves, which do not yield satisfactory characters for specific division. There is, however, one form which is so frequent and is so easily distinguished by the much less intricate and more open reticulation of the leaves, that it seems worthy of varietal rank. It

was sorted out as a distinct species by the younger Hooker, who gave it the manuscript name *L. Klotzschii* Hook. fil.; and Fritsch, in discussing and noting the characteristics of *Schomburgk* 824, remarks that at first he thought it represented a new species, but concludes that the distinctions are due to the specimen having been collected from a sterile branch. This conclusion is not borne out by subsequent collections of the same plant, but the only constant character appears to be that of the leaf-venation. The Arawaks who accompanied the Oxford Expedition distinguished this tree from Kunoko under the name Kairiballi, but this name was also given to *C. W. Anderson* 39, the herbarium material of which agrees with Kunoko. The variety may be described as follows:—

***Licania heteromorpha* Benth. var. perplexans Sandwith**, var. nov.; foliis utrinque satis laxae nec intricatissime reticulatis differt.

BRITISH GUIANA. Ann. 1844, *Schomburgk* 824 (1443B), type; Pomeroon River, Sept. 1843, *Schomburgk* 1443; Demerara River, May 1887, *Jenman* 3902; *ibid.*, March 1898, *Jenman* 7336; Kamwatta Creek, Koirimap River, Pomeroon River, June 1918, *Hohenkerk* in Forestry Department record no. 39 B; Moraballi Creek, Essequibo River, August 28th, 1929, *Sandwith* 140; *ibid.*, Oct. 12th, 1929, *Sandwith* 433.—No. 140 was a tall tree 111 ft. high, in morabukea-greenheart forest; and no. 433 was a tree 92 ft. high and 8 in. diam., in mixed forest.

FRENCH GUIANA. *Martin*.

Vernacular name (Arawak), Kairiballi.

***L. divaricata* Benth.** in Hook. Journ. Bot. ii. 221 (1840).—*L. heteromorpha* var. *divaricata* Fritsch in Ann. Hofm. Wien, iv. 45 (1889).

This species differs very widely from *L. heteromorpha* and its varieties, not merely in the venation of the leaves but especially in the colour, size and indumentum of the calyx, and the size and shape of the primary bracts, which give the inflorescence a totally different facies. Material exactly agreeing with the type (*Schomburgk* 463) was collected on the Mora-mora-bisi Creek, Mapenna River, Corentyne River, in April 1918, by *L. S. Hohenkerk* in Forestry Department record no. 705. The tree was noted as possessing deep blood-red bark with similar gummy sap, and very small, greenish-yellow flowers.

Vernacular name, Buruburuli.

***L. densiflora* Kleinh.** in Rec. Trav. Bot. Néerl. xxii. 383 (1925).

Moraballi Creek, Essequibo River, Sept. 24th, 1929, *Sandwith* 336: tall tree, 108 ft. high, in morabukea forest; leaves ashy-white below; fl. creamy-brown; fruiting, and with a few fresh inflorescences. *Ibid.*, Sept. 26th, 1929, *Sandwith* 341: tall tree, 113 ft. high, on slope in mora-morabukea forest; in good young flowering condition.

Vernacular name (Arawak), Marishiballi.

Distr. Surinam.

Compared with authentic material (*Pulle* 452 and *Gonggrijp* 5346) borrowed from Utrecht. Other British Guiana collections are *Jenman* 623, Mazaruni River, Sept. 1880; *Jenman* 3604, Bartica, April 1887; and *C. W. Anderson* 57, Yarikita River, Amakura River, North-west District, July 1908.

L. venosa *Rusby*, New Sp. S. Am. Pl. 26 (1920).

Moraballi Creek, Essequibo River, Sept. 14th, 1929, *Sandwith* 261; tall tree in morabukea forest. *Ibid.*, in mixed forest, Sept. 19th, 1929, *Sandwith* 299; tall tree with leaves ashy beneath, and creamy-yellow flowers.

Vernacular name (Arawak), Kautaballi.

Distr. Guiana, Eastern Venezuela.

One of the commonest and most easily recognised trees in the district, being especially plentiful in mixed forest. Its affinity is with *L. Hostmanni* Fritsch and *L. majuscula* Sagot. Other British Guiana specimens agreeing with *Rusby's* type collection are *Jenman* 3839, Demerara River, April 1887; *Jenman* 4112, Upper Demerara River, Sept. 1887; *Jenman* 2393, Macouria River, Essequibo River, Nov. 1886; *la Cruz* 4349, Assakatta, North-west District, Sept. 1923; *la Cruz* 4384, Kaieteur Falls, Potaro River, Oct.-Nov. 1923; and *Forestry Department* record no. 887, Mazaruni River, Aug. 1926.

L. laxiflora *Fritsch* in Ann. Hofm. Wien, iv. 46 (1889).—*L. macrophylla* Klotzsch in Schomb. Faun. et Fl. Gui. 1198 (1848), nomen.

Moraballi Creek, Essequibo River, Nov. 9th, 1929, *Sandwith* 586: middle-sized to tall tree, in mixed forest; leaves greyish-tomentose below; infl. with brownish hairs; fl. cream. *Ibid.*, Oct. 26th, 1929, in mixed forest, *Sandwith* 711 (leaves only).

Vernacular name (Arawak), Kauta.

This has been compared with *Robert Schomburgk* 1559 (from "savanne, Brit. Guiana, Dec. 1843") and 24 ("last small collection") in Herb. Kew., which agree with *Fritsch's* description and with specimens of the type collection (*Schomburgk* 976) in the Paris Herbarium, and seem to belong to the same gathering. The inflorescence of the Moraballi Creek collection is stiffer and more densely flowered than that of *Schomburgk's* specimens, which seem to have been untypical, and collected from an old branch with large, old leaves. This species seems to be far more closely related to *L. mollis* Benth. than to *L. leptostachya* Benth., with which it was compared by *Fritsch*; it is distinguished from *L. mollis* by the leaves, which are cuneate-attenuate at the base instead of cordate or rounded, by the longer petiole, and by the secondary veins which are regularly subhorizontal and parallel, whereas in *L. mollis* they are very irregular.

L. incana *Aubl.* Hist. Pl. Guiane, 119, t. 45 (1775).

This species was identified by *Bentham* with the plant which was distributed by *Sagot* as *L. microphylla* *Sagot*, and which was

named *L. Kunthiana* by Sir Joseph Hooker in his account in the Flora Brasiliensis. Hooker himself referred Aublet's species to *Bentham's* *L. leptostachya*. In 1889 *Fritsch* adopted *Bentham's* conclusion in his review of the genus in Ann. Hofm. Wien, iv. 48, but there is no evidence that either he, or *Bentham*, or *Hooker* had ever seen Aublet's specimen. A wiser course was followed by *R. Benoist* in his conspectus of the *Licaniae* of French Guiana in Bull. Mus. Par. xxv. 512 (1919). Having failed to find Aublet's specimen in Paris, and regarding the original description and figure as inadequate and partly erroneous, he refused to identify *L. incana* with any known species. Fortunately, the specimen exists in the Herbarium of the British Museum, and it agrees neither with *L. Kunthiana* nor with *L. leptostachya*, but with the very distinct thick-leaved plant which *Bentham* described as *L. crassifolia*, and which occurs on savannahs throughout Guiana. This was reduced by *Benoist* (l.c. 514-15) to varietal rank under *L. leptostachya* Bth., with the remark that the characters separating *L. leptostachya*, *L. crassifolia*, and *L. axilliflora* Hochr. were not of specific value. This supposition will have to be tested by careful observations in the field. Meanwhile it may be added that the life-size figure of the leaf given by Aublet is larger than any of the leaves on his dried specimen, which show none of the conspicuous minor venation of this figure, a character which would immediately suggest *L. leptostachya* as contrasted with *L. crassifolia*. At present, however, the evidence of the dried specimen in Herb. Mus. Brit. is the strongest available for fixing the identity of Aublet's plant.

Distr. Guiana.

The following species of *Licania* have been found to agree with authentic material of earlier described species:—

L. longifolia *R. Benoist* in Bull. Mus. Hist. Nat. Paris, xxviii. 252 (1922) is **L. venosa** *Rusby*, New Sp. S. Am. Pl. 26 (1920).

Material in Herb. Mus. Brit. collected by *Mélinon* and distributed from Paris as *L. longifolia* agrees with *Rusby's* type collection of *L. venosa* and with specimens from British Guiana.

L. galibica *R. Benoist* in Bull. Mus. Hist. Nat. Paris, xxv. 514 (1919) is **L. membranacea** *Sagot ex Laness.* Pl. util. Colon. Franç. 130 (1886).

Benoist omits to mention *L. membranacea* in his paper (loc. cit.) on the *Licaniae* of French Guiana. *Sagot's* no. 1081, which is one of the two collections cited by *Benoist* and distributed from Paris as *L. galibica*, was distributed to Kew long ago as *L. membranacea* *Sagot*, and no doubt represents the species which was later validly, although most inadequately, published by *Lanessan*.

L. pachystachya *Kleinh.* in Rec. Trav. Bot. Néerl. xxii. 384 (1925) is **L. robusta** *Sagot* in Ann. Sci. Nat. sér. 6, xv. 306 (1883).

Mélinon material recently distributed from Paris as *L. robusta* is probably syntypic and agrees with *Sagot's* rather short description.

Herb. Boschuizen no. 2729, a collection in the Utrecht Herbarium which was made from one of the authentic trees of *L. pachystachya*, cannot be distinguished from Mélinon's specimens.

L. crassifolia Benth. in Hook. Journ. Bot. ii. 220 (1840) is *L. incana* Aubl., vide supra.

Parinari parvifolia Sandwith sp. nov.; *P. montanae* Aubl. atque *P. Pajura* R. Benoist affinis, ab ambabus statim foliis parvis, praeterea ab illa indumento ramulorum petiolorum inflorescentiaeque, ab hac floribus minoribus differt.

Arbor excelsa, 30–45 m. alta, 75.5 cm. diametro, vertice lato densissime ramoso. *Ramuli* lenticellati, cortice brunneo vel pullo, seniores glabri vel glabrescentes, summi densissimi atque crebre foliati, novelli dense villosi atque tomentelli, pilis adscendentibus subadpressis vel patulis siccitate cinereis pullis vel fere fulvis necnon tomento subtus pilis induti, indumento toto saepe mox deciduo. *Folia* parva, ovata vel saepius lanceolato-elliptica, apice sensim in acumen conspicuum vulgo 1–1.3 cm. longum attenuata, basi attenuata cuneata raro obtusa subrotundata, 3–7.5 cm. longa, 1–3 cm. lata, rigide coriacea, supra glabra costa impressa nonnunquam pilosa excepta nitidula siccitate olivacea vel saepius brunnea nervis impressis, subtus cinerea vel siccitate cinereo-fulva lana densa brevissima arcte adpressa senectute e nervis venulisque evanescente induta, costa etiam juventute adpressa pilosa, valde crebre reticulata venulis parallelis, nervis primariis numerosissimis utroque costae latere vulgo circiter 30 a se 2–4 mm. distantibus parallelis patulis versus marginem valde arcuatis; petiolus brevis, 2–5 mm. longus, villosus vel senectute glaber; stipulae non visae. *Inflorescentiae* apice ramulorum in axillis foliorum summorum vel terminales 1–5 fasciculatae, thyrsoidae, 3–5.5 cm. longae, totae tomento cinereo atque pilis cinereis adscendentibus vel patulis indutae; bracteolae cymarum magnae, conspicuae, alabastra amplexantes, concavae, ovatae, acuminatae, 5–6 mm. longae, 3 mm. latae, extra indumento piloso atque tomentello supra descripto praeditae intus tomentellae; bracteolae florales ultimae 3.5 mm. longae, 2.5 mm. latae; pedicelli laterales brevissimi, floris intermedii circiter 2 mm. longi. *Flores* albo-virides. *Calyx* extra indumento simili indutus; tubus anguste obconico-campanulatus, 3–3.5 mm. longus, ad 3 mm. latus, intus densissime longe pallide fulvo-villosus; lobi ovato-lanceolati, acuminati, 2.5 mm. longi, 1.5 mm. lati. *Petala* 5, oblongo-spathulata, 2 mm. longa, ad 0.8 mm. lata, dimidio superiore sub lente forti minute pilosula. *Stamina* ut videtur 7, filamentis glabris 2 mm. longis. *Ovarium* densissime villosum, 1.2 mm. longum, vix 1 mm. latum; stylus inferne villosus, superne glaber, 2.5–3 mm. longus. *Fructus* ignotus.

BRITISH GUIANA. In mixed forest at the Moraballi-Wineperu Divide, Essequibo River, Aug. 28th, 1929, Sandwith 139 (type). Tall tree, 129 ft. high, 2½ ft. diam., with a very wide, dense,

floriferous crown. Leaves ashy beneath. Flowers whitish-green. Branchlets colonised by ants.

Upper Demerara River, Sept. 1887, Jenman 3992. "A large tree, 100 ft. or more high."

Vernacular name (Arawak), Hill Bahurada. Recognised by Jenman as a distinct species from the Broad-leaved Bahurada (*P. campestris* Aubl.) in a note forwarded to Kew in March, 1888.

This magnificent species, remarkable for its uniformly small leaves, lacks the long, dark brown, woolly indumentum which is characteristic of the branchlets, petioles, and inflorescence of *P. montana*. The leaves resemble more those of *P. Glazioviana* Warm. and *P. brachystachya* Benth., the former of which has longer petioles and much less acuminate leaves, while the latter is a small tree with thin papery leaves; both have fewer lateral nerves and much narrower, less conspicuous, bracteoles.

P. montana Aubl. Hist. Pl. Guiane, 514, tt. 204–5 (1775).—*P. Rodolphi* Huber in Bol. Mus. Pará, vi. 77 (1910); Ducke in Arch. Jard. Bot. Rio de Janeiro iii. 44 (1922).

Comparison with Aublet's specimen in the British Museum Herbarium shows that R. Benoist was correct in his identification of *P. Rodolphi* with *P. montana*, and in describing the species referred by Huber and Ducke to *P. montana* as *P. Pajura* R. Benoist: see Bull. Mus. Par. xxviii. 252–3 (1922). Herb. Jard. Bot. Rio no. 15025, distributed as *P. Rodolphi*, is *P. montana* Aubl., and nos. 15028 and 18225, distributed as *P. montana*, agree with the type no. (Huber 7045) of *P. Pajura* R. Benoist in Herb. Mus. Brit.

P. campestris Aubl. Hist. Pl. Guiane, 517, t. 206 (1775).

Moraballi Creek, Essequibo River, Sept. 7th, Sandwith 184. Tall tree, 119 ft. high, 2 ft. diam., 82 ft. to the first fork, in mixed forest. Buttressed up to 13 ft. Leaves ashy below. Petals white, erect.

Vernacular name (Arawak), Broad-leaved or Round-leaved Bahurada.

Distr. Trinidad, Guiana, Brazil.

Easily recognised by the large, persistent, striate stipules and the cordate base of the leaves.

P. guyanensis Fritsch in Ann. Hofm. Wien, v. 14 (1890); see below, under *Hirtella guyanensis*.

P. Hostmanni Fritsch, l.c. 13, is *Couepia cognata* (Steud.) Fritsch in Ann. Hofm. Wien, iv. 60 (1889); Pulle, Enum. Pl. Surinam 198 (1906).—*Hirtella cognata* Steud. in Flora, xxvi. 761 (1843). *Couepia Steudeliana* Miq. Sel. Stirp. Surinam. 28 (1850). *Moquilea Steudeliana* Walp. Ann. ii. 463 (1851–2).

Fritsch overlooked the fact that his species had already been twice named from the same material (*Hostmann* 795); but, a year before, he had inadvertently made the necessary new combination

for it in its correct genus. This was missed by the Index Kewensis, but was taken up by Pulle, who omitted to cite Fritsch's later name in synonymy. The following specimens from British Guiana are in Herb. Kew.: *Jenman* 6301, from the Demerara River, Dec. 1891; and *la Cruz* 2107, from the Upper Mazaruni River, Sept.-Oct. 1922.

***Couepia comosa* Benth.** in Hook. Journ. Bot. ii. 215 (1840).

Cuyuni River; on the rocky shore of islets near the right bank at the Akaio Falls, Nov. 25th, 1929, *Sandwith* 687. Low tree or shrub, up to about 15 ft. in height. Fl. white. Fr. greyish-black, spotted with brownish-white.

Distr. Apparently endemic on the larger rivers of British Guiana.

***C. pauciflora* Huber** in Bol. Mus. Pará, v. 372 (1909).

Moraballi Creek, Essequibo River, Sept. 20th, 1929, *Sandwith* 315; middle-sized tree, 50-60 ft. high, in wallaba forest on hill. Other collections from the Colony are *Jenman* 4184, Upper Demerara River, Sept. 1887; and *Gleason* 539, lowland forest, Rockstone, July 1921.

Vernacular name (Arawak), Aiamoradan.

Distr. Pará.

The material agrees well with the type no. (*Ducke* 8630) in Herb. Mus. Brit. An interesting extension of the range of a most distinct species.

***Hirtella americana* L.** Sp. Pl. ed. 1, 35 (1753), non Aubl., nec Jacq., nec Hook. fil. in Mart. Fl. Bras., nec Fritsch, nec *Ducke*, nec Standley in Contr. U.S. Nat. Herb. xxvii. 88 (1928), etc.

The specimen in Clifford's Herbarium in Herb. Mus. Brit., on which the description of this species in Hortus Cliffortianus p. 17 was based, proves to represent a plant from the Isle of Pines, Central America and the Spanish Main, which has for long been known either as *H. glandulosa* Spreng., or *H. mollicoma* H.B.K., or more recently as *H. guatemalensis* Standley. This of course bears no resemblance to Aublet's *H. americana*, which is *H. racemosa* Lam., and there is no reason either for the total elimination of the trivial *americana* (see Fritsch in Ann. Hofm. Wien, v. 10) or for its incorrect application. This discovery was first made by Mr. N. E. Brown in June, 1923. Mr. Brown considered that *Curtiss* 260, from near Nueva Gerona, Isla de Pinos, West Indies, Dec. 1903, was a very good match with Linnaeus' type; a comparison which was confirmed independently this year. An equally good match is *H. H. Smith* 850 from Santa Marta, Colombia. But there seems very little reason to doubt that all the specimens (*Triana*, *Linden*, *Lehmann*, etc.) distributed as *H. mollicoma* from Panamá and Colombia are referable to the same species, and that the British Honduras collections (e. g. *Schipp* 82) of *H. guatemalensis* Standley are equally inseparable from it. Kunth's description and figure of *H. mollicoma* agree well with these

plants; the Brazilian *H. glandulosa* Spreng. and its allies, on the other hand, differ widely from *H. americana*.

***H. racemosa* Lam.** Encycl. iii. 133 (1789).—*H. americana* Aubl. Hist. Pl. Guiane 247, t. 98 (1775), non L.

Moraballi Creek, Essequibo River, Sept. 14th, 1929, *Sandwith* 253. Low tree on bank of creek. Petals pale veronica blue. Filaments deeper, like those of *Echium vulgare*.

Distr. Tropical America.

***H. paniculata* Sw.** Prodr. Veg. Ind. Occ. 51 (1788).—*H. hirsuta* Lam. Illustr. ii. 114 (1793).

Moraballi Creek, Essequibo River, Sept. 18th, 1929, *Sandwith* 285. Low tree on bank of creek near its mouth. Petals pinkish-white. Filaments pinkish-purple in upper two thirds, whitish at base.

Distr. St. Vincent, Trinidad, Guiana and Rio Branco.

***H. manigera* Kleinh.** in Rec. Trav. Bot. Néerl. xxii. 387 (1925).

Moraballi Creek, Essequibo River, Aug. 22nd, 1929, *Sandwith* 92; low tree, about 20 ft. high, in "low bush"; sepals olive; petals white; filaments pinkish-purple, but whitish towards the base. Other collections from the Colony are *Jenman* 3980, Upper Demerara River, Sept. 1887, noted as a small tree; and *Jenman* 5028, Demerara River, June 1889. Compared with the type in the Utrecht Herbarium.

Distr. Surinam.

***H. guyanensis* (Fritsch) Sandwith**, comb. nov.—*Parinari guyanensis* Fritsch in Ann. Hofm. Wien, v. 14 (1890).

BRITISH GUIANA. Ann. 1841, *Schomburgk* 168 (type coll.). Bartica, Nov. 1888, *Jenman* 4734.

It is difficult to understand how Fritsch was induced to describe this and *Couepia cognata* in *Parinari*, since the facies of neither species suggests that genus. The present plant has a unilocular ovary, and its facies resembles that of some species of *Couepia*, to which genus it was referred by Sir Joseph Hooker under the manuscript name of *C. Schomburgkii*. The small number of its stamens (apparently 6-8), however, removes it from *Couepia* and requires its transference to *Hirtella*. Another manuscript note on Schomburgk's sheet records that this plant is *Waldeckia corymbosa* Klotzsch and Richard Schomburgk ms. in Herb. Mus. Berol.; this name is found on page 1249 in Klotzsch's alphabetical list of the Flora of British Guiana in the third (supplementary) volume of Richard Schomburgk's travels, but no reference is given to any page in the text, presumably owing to lack of information about the locality and habitat. The name is not found in the Index Kewensis.

XLIX.—AFRICAN ORCHIDS, II.* V. S. SUMMERHAYES.

The majority of the species here described are from a collection made in Central Africa, particularly in the volcanic region north of Lake Kivu, by Dr. D. H. Linder in 1927 on behalf of the Arnold Arboretum. The specimens were sent for determination to Kew by Dr. C. Schweinfurth, assistant to Prof. Oakes Ames. The collection, although not large, contains many interesting forms and the records considerably extend the distribution of some of the species. Others had only been collected once or twice previously.

The remainder of the new species in the paper are from various collections, mostly made in East Africa.

Diplacorchis ashantensis *Summerhayes*, sp. nov.; a ceteris speciebus statura majore, floribus majoribus, petalis columnae haud adnatis, labello ambitu elliptico-obovato trilobato lobo intermedio lateralibus paulo brevioribus facile distinguenda.

Herba terrestris, erecta, usque 90 cm. alta. *Caulis* robustus, subteres, usque ad apicem dense foliatus. *Folia* inferiora vaginantia, obtusa, superiora late lanceolata, acuminata, basi attenuata, usque 11 cm. longa et 3 cm. lata, glabra, subtus insigniter trinervia, suprema sensim in bracteas transeuntia. *Racemus* circiter 25 cm. longus, dense multiflorus; bracteae erecto-patentes, lineari-lanceolatae vel fere lineares, acutissimae, usque 5 cm. longae, flores multo superantes. *Flores* pro genere magni, erecto-patentes, pedicelli cum ovario usque 1.5 cm. longi, glabri. *Sepalum* intermedium lineari-oblongum, obtusum, 9–10 mm. longum, medio 2–2.5 mm. latum; sepala lateralalia oblongo-lanceolata, subfalcata, basi valde obliqua, 10–11 mm. longa, supra basin 3–4 mm. lata, apice paulo incrassata subcucullata. *Petala* oblongo-lanceolata, leviter curvata, 11–12 mm. longa, infra medium 3.5–4 mm. lata, libera. *Labellum* ambitu elliptico-obovatum, basi attenuatum, apice trilobatum, lobis lateralibus obtusissimis extra rotundatis 1.5–2 mm. longis, intermedio paulo brevioribus anguste triangulari subacuto, totum labellum ab ostio calcaris 9–11 mm. longum, medio 7–8 mm. latum, basi carinis duabus altis basi columnae adnatis instructum; calcar saccatum, obtusum, 3–4 mm. longum. *Columna* (anthera inclusa) 6.5 mm. longa; anthera erecta, 3 mm. longa, obtusa, loculis approximatis parallelis, canalibus subnullis; rostellum lobus intermedius erectus, valde compressus, cucullatus, lobi laterales brevissimi, horizontales, bursiculas semiglobosas viscidium includentes formantes; stigma medio excavatum vel concavum.

GOLD COAST. Ashanti, Northern Province, Amoma, amongst the grass in savannah country, July 7th, 1913, *Chipp* 531 (type in Herb. Kew.). "Lip white, purple spotted."

This plant is of especial interest since it seems in some respects to be a link between the genera *Diplacorchis* and *Brachycorythis*. In the presence of small pouches in which the viscidia rest, and in the

possession of two tall keel-like plates adnate to the sides of the base of the column and decurrent for a short distance on to the disc of the lip, the species falls into *Diplacorchis*. The habit, however, so much more robust than that of any *Diplacorchis* and resembling very strongly the section *Calocorythis* of *Brachycorythis*, and the lip, in which the side lobes are slightly longer than the triangular front lobe, seem to suggest an alliance with the latter genus. The bracts are, however, relatively longer in the present plant than in any species of *Brachycorythis*. In addition the spur is quite short and obtuse, another character intermediate between the two genera. The two high keels at the base of the lip in *Diplacorchis* can be seen on examination to be probably homologous with the prolonged decurrent margins of the hypophyll in *Brachycorythis* and *Schwartzkopffia*, especially as they seem to terminate either gradually or abruptly in different species.

The present species differs markedly from the other species of *Diplacorchis* in having the petals entirely free from the column, a character of *Brachycorythis*, and consequently it seems desirable to create a separate section of *Diplacorchis* to contain it; this section may suitably be called *Brachycorythoides*, the remainder of the genus being placed in a section *Eu-Diplacorchis*. These sections may be distinguished as follows:—

Petals united to column; lip simple or trilobed with front lobe much longer than side lobes.....*Eu-Diplacorchis*.
Petals free; lip trilobed, side lobes slightly longer than front lobe *Brachycorythoides*.

The discovery of this new species in the Gold Coast considerably extends the distribution of the genus, since the nearest record is that of *D. Engleriana* Schltr. from Katsina Allah in Nigeria. The genus otherwise occurs in South and Central Africa and in Madagascar, while there is a specimen in the Kew Herbarium from Uganda.

Habenaria (§ *Diphylla*) **helicoplectrum** *Summerhayes*, sp. nov.; ex affinitate *H. armatissimae* Rchb. f. et *H. Lugardii* Rolfe, sed ab omnibus speciebus hujus sectionis calcaris circinatim incurvo facile distinguenda.

Herba terrestris. *Folia* bina, humistrata, suborbicularia, 8–9 cm. longa, 10–12 cm. lata, glabra. *Scapus* cum floribus 40 cm. altus, superne cataphyllis sparsis lanceolatis tenuiter acuminatis usque 2.5 cm. longis praeditus; racemus 12 cm. longus, subdense 20–25-florus; bracteae lanceolatae, acuminatae, ovario pedicellato multo breviores. *Flores* suberecti, ovario graciliter pedicellato 2.5–3.5 cm. longo. *Sepalum* intermedium elliptico-ovatum, 2.5–3.5 cm. longo, subacutum, ± erectum, 10–12 mm. longum, concavum; sepala lateralalia falcatis semiovata, acuta vel acuminata, reflexa, 14 mm. longa. *Petala* bipartita; partitio postica linearis, acuta, 10–12 mm. longa, sepalo intermedio adhaerens; partitio antica erecta, filiformis, 2.8 cm. longa, superne papillosa. *Labellum* tripartitum;

*Continued from *K.B.* 1927, p. 419.

partitiones laterales lineari-filiformes, 2.5 cm. longae; partitio intermedia linearis, 1.5 cm. longa, lateralibus duplo latior; calcar cylindricum, superne paulo ampliatus, circinatim incurvum, 3.5 cm. longum. *Anthera* erecta, apiculata, 6 mm. longa, canalibus horizontalibus brevibus 3 mm. longis, staminodiis anguste oblongis curvatis 2 mm. longis. *Brachia* stigmatifera oblique clavata, inferne gracilia, 6 mm. longa.

TANGANYIKA TERRITORY. Pare District, Ngulu, 960 m., May 1928, *Haarer* 1435A (type in Herb. Kew.).

The nearest allies of *H. helicoplectrum* are evidently *H. armatissima* Rchb. f. and *H. Lugardii* Rolfe, which resemble it closely in flower structure and general habit, but possess much longer pendulous spurs, between 3 and 6 inches in length.

The alteration of the name of this section (*Diphylla*) to *Geophyllum* as made by Schlechter, is not permitted under the International Rules of Nomenclature, although Schlechter's name is admittedly more apt. Sectional names may be either substantival or adjectival and both types can be used in the same genus, e.g. *Combretum*.

Habenaria (§ *Diphylla*) *Snowdenii* Summerhayes, sp. nov.; affinis *H. villosae* Rolfe et *H. aberranti* Schltr. a quibus floribus minoribus petalis usque ad basin bipartitis differt.

Herba terrestris, perennis. *Folium* radicale, singulum, humistratum, suborbiculare, acutum, 1.3 cm. longum et latum, carnosum, minute papillato-puberulum, ciliatum. *Scapus* erectus, gracilis, cum floribus 22 cm. longus, basi vaginis duabus latis membranaceis, supra medium cataphylla lanceolata acuta instructus, villosulus; racemus breviter cylindraceus, 5 cm. longus, 1.5 cm. latus, subdense circiter 10-florus; bracteae lanceolatae, acuminatae, ovario pedicellato satis breviores, villosulae. *Flores* erecto-patentes, inversi. *Sepalum* intermedium late ovatum, obtusum, 4 mm. longum, valde concavum; sepala lateralia oblique ovata, acuta, 5 mm. longa; omnia sepala extra sparse pilosa. *Petala* bipartita, glabra; partitio postica elliptico-ovata, acuta, 3.5 mm. longa, 1.8 mm. lata; partitio antica ligulato-linearis, e basi sensim angustata, acuta, 3.5 mm. longa. *Labellum* ex ungue lata trilobatum, in toto 7 mm. longum; lobus intermedius oblongus, obtusus, 5 mm. longus, 1.75 mm. latus, basi vena incrassata superne furcata instructus; lobi laterales late lineares, acuti, 5 mm. longi, 1 mm. lati; calcar erectum, leviter incurvum, 8 mm. longum, apicem versus paulo dilatatum, subacutum. *Anthera* erecta, 2.5 mm. alta, canalibus brevibus. *Rostelli* lobus intermedius linguiformi-triangularis, obtusus, antheram vix aequans; processus stigmatiferi breves, truncati, canales antherae aequantes; ovarium breviter pedicellatum, circiter 7 mm. longum, villosulum.

UGANDA. West Nile District, Arua, in short grass savannah, 1260 m., May 1930, *Snowden* 1707 (type in Herb. Kew.). "Flowers yellowish green."

This species is very similar to *H. villosa* Rolfe and *H. aberrans* Schltr., both of which have inverted flowers with the same general construction, and hairy sepals, inflorescence and leaf. When Schlechter described *H. aberrans* as an aberrant species with no near relative he obviously overlooked Rolfe's species, since the two are very closely allied.

The three species may be separated as follows:—

Sepals 4–5 mm. long; petals divided to the base...*H. Snowdenii*.

Sepals 6–8 mm. long; petals bilobed in upper part only:

Spur 14–16 mm. long, pendulous.....*H. villosa*.

Spur 9 mm. long, erect, incurved.....*H. aberrans*.

Habenaria *Linderi* Summerhayes, sp. nov.; ab *H. Thomsoni* Rchb. f. foliis angustioribus, forma sepalorum lateralium, labelli partitionibus subaequalibus; calcar cylindrico nec clavato differt.

Herba perennis, erecta, gracilis, 50–55 cm. alta. *Caulis* foliatus, teres, glaber. *Folia* erecto-patentia, circiter 6, linearia, inferiora usque 25 cm. longa et 11 mm. lata, superiora mox decrescentia et in bracteis transeuntia. *Racemus* subdense 18-florus, 15 cm. longus; bracteae lanceolatae, acuminatae, usque 2.2 cm. longae. *Flores* erecto-patentes vel fere erecti. *Sepalum* intermedium ellipticum, utroque angustatum, obtusum, recurvum, 8 mm. longum, 3 mm. latum, glabrum; sepala lateralia deflexa, oblique obovata, obtusa, 9.5 mm. longa, 5 mm. lata. *Petala* erecta, bipartita, minute papillosa; partitio postica anguste linearis, 8 mm. longa; partitio antica linearis, obtusa, nervosa, posticae aequilonga, 1 mm. lata. *Labellum* tripartitum, glabrum, partitionibus anguste linearibus subacutis, lateralibus leviter divergentibus 9 mm. longis, intermedia paulo latiore 10 mm. longa; calcar pendulum, fere strictum, anguste cylindricum, obtusum, 10–11 mm. longum. *Anthera* resupinata, 3 mm. longa, canalibus gracilibus 5 mm. longis, staminodiis distincte bilobis lobis divergentibus ovatis acutis. *Brachia* stigmatifera subgracilia, oblique capitata, 7 mm. longa; rostellum lobus intermedius subulatus, subfalcatus, 3.5 mm. longus; ovarium 9 mm. longum, pedicello 7 mm. longo.

UGANDA. Bufundi, April, *Linder* 2586 (type in Herb. Oakes Ames).

Up to the present I have been unable to segregate satisfactorily the species of Schlechter's section *Bilabrella* (Engl. Jahrb. liii. 512: 1915) from the older section *Ceratopetalum*. Schlechter unfortunately gives a very incomplete idea as to what species he included in his section, while the sectional characters given do not seem to be very clear cut, there being quite a number of species intermediate between the two sections. For the present, therefore, I leave open the question of the section to which *H. Linderi* belongs, since it appears to be one of these intermediate types.

Habenaria *limnophila* Summerhayes, sp. nov.; affinis *H. Weberianae* Schltr. a qua labelli lobo intermedio lateralibus dimidio

longiore, calcari leviter falcato apice breviter obtusissime ampliato nec subclavato, brachiis stigmatiferis gracilibus antherae canales excedentibus differt.

Herba terrestris, perennis, 45–75 cm. alta. *Caulis* erectus, foliatus, teres, glaber. *Folia* 6–10, erecto-patentia, inferiora 3–4 linearia, acuta, basi vaginantia, usque 33 cm. longa et 1.6 cm. lata, superiora mox in bracteas transeuntia. *Racemus* cylindraceus, subdense multiflorus, 10–20 cm. longus, 4–6 cm. diametro. *Flores* erecto-patentes; bracteae lanceolatae, acuminatae, ovario pedicellato multo breviores; pedicelli gracillimi, 1.3–2 cm. longi. *Sepalum* intermedium reflexum, ellipticum vel anguste ovatum, obtusum, 4.5–6 mm. longum, 1.5–2 mm. latum; sepala lateraliter deflexa, valde obliqua, obovata, lateraliter apiculata, 6–8 mm. longa, 3.5–4.5 mm. lata. *Petala* bipartita; partitio postica linearis, acuta, 4.5–5 mm. longa, papillosa; partitio antica lanceolato-linearis, acuta, 7–8.5 mm. longa, circiter 0.75 mm. lata, omnino vel basi tantum papillosa. *Labellum* tripartitum, glabrum; partitiones lineares, subacutae, laterales 8 mm. longae, intermedia paulo latior, 12–13 mm. longa; calcar leviter incurvatim falcatum, cylindricum, apice obtusissime ampliatum, 1.8–1.9 cm. longum. *Anthera* 3 mm. alta, canalibus gracilibus apice adscendentibus 4.5–5 mm. longis; staminodia elliptica, breviter stipitata, bifida, 1.5–2 mm. longa. *Brachia* stigmatifera gracilia, oblique capitata, 5–6 mm. longa; rostellum lobus intermedium subulatus, acutus, 2 mm. longus; ovarium 5–6 mm. longum.

TANGANYIKA TERRITORY. Mpololo, Moshi District, 1050 m., August 1928, Haarer 1477 (type in Herb. Kew.).

KENYA COLONY. Nairobi, in plains among long grass, 1770 m., May 1930, Napier 136; Aug. 1903, A. Whyte; in plains, 1650 m., 1916, Dowson 376.

UGANDA. Serire District, Rapai, in swamp, 1110 m., July 1926, Maitland 1308 B; locality doubtful, 1921, C. H. Lankester; no precise locality, in swampy land, R. Fyffe 256.

Flowers greenish, greenish-white or white.

This species, which, judging from the number of specimens seen, must be fairly common in the highlands between Mts. Elgon, Kenya and Kilimanjaro, is characterised chiefly by the slightly falcate spur which ends abruptly in a very slight swelling but is not at all clavate as in so many other allied species. *H. limnophila* is apparently an inhabitant of swampy land, occurring especially in the plains in the neighbourhood of Nairobi. For the section to which this species belongs see the remarks under *H. Linderi*.

Peristylus brachylobos Summerhayes, sp. nov.; *P. ugandensi* Rolfe proxima, sed foliis acutioribus tenuioribus, racemis laxioribus, labello breviori lobo intermedio lateralibus duplo latiore differt.

Herba terrestris, radicibus flexuosis subtomentosis. *Caulis* erectus, vix 60 cm. altus, foliatus, glaber, basi vaginis duabus acutis. *Folia* in specimine unico solum viso 11, elliptica, elliptico-ovata vel

elliptico-obovata, breviter acuminata, basi angustata, 4.5–10 cm. longa, 2.2–4 cm. lata, tenuiter chartacea, glaberrima, superiora minora. *Racemus* sublaxiflorus, in specimine apice defractus, 5 cm. longus; bracteae lanceolatae, acuminatae, usque 1.2 cm. longae. *Flores* erecti, parvi; de colore nil constat. *Sepalum* intermedium elliptico-ovatum, obtusum, 2.5 mm. longum, 1.5 mm. latum, trinervium; sepala lateraliter intermedio similia sed angustiora. *Petala* anguste et falcatim oblonga, rotundata, 2 mm. longa, uninervia. *Labellum* transverse oblongum, antice tridentatum, 1.5 mm. longum et 2 mm. latum, lobis lateralibus acutis, intermedio late triangulari acuto basi 1 mm. lato lateralibus duplo latiore disco carina humili instructo, omnibus 0.5 mm. longis; calcar obtusum, apice paulo dilatatum, 1.25 mm. longum. *Anthera* brevis, 1 mm. longa, loculis parallelis. *Brachia* stigmatifera crassa, vix 1 mm. longa, apice paulo dilatata; rostellum lobus intermedium minutus, dentiformis.

BELGIAN CONGO. Mt. Miken, S.W. slope, at lower margin of bamboo forest, 2265 m., March, Linder 2413 (type in Herb. Oakes Ames).

Bonatea ugandae Rolfe in Orch. Rev. xiv. 365, 368 (1906), nomen; affinis *B. Kayseri* Kraenzl. a qua sepalis lateralibus ungui labelli per 2 cm. adnatis, labelli partitionibus lateralibus 3.5–4 cm. longis, intermedia 2–2.5 cm. longa, canalibus antherae longioribus differt.

Herba terrestris, subrobusta, usque 75 cm. alta. *Caulis* teres, glaber, basi usque 1 cm. diametro. *Folia* infima ad cataphyllas obtusas vel acutas vaginantes redacta, media circiter 10, elliptica vel elliptico-lanceolata, rotundata usque acuta, basi vaginantia, usque 18 cm. longa, 2.5–5 cm. lata, suprema bracteis similia, lanceolata, acuminata. *Racemus* usque 25 cm. longa, laxiuscule 4–25-florus; bracteae lanceolatae, acuminatae, 2.5–5 cm. longae. *Flores* albi, suberecti vel patentes, glabri, ovario pedicellato 5–8 cm. longo. *Sepalum* intermedium ellipticum, acutum, valde concavum, 2.5 cm. longum, 1.4–1.6 cm. latum; sepala lateraliter oblique quadrata, apice acuta abrupte acuminata, margine antico dilatato angulo rotundato, margine postico circiter 2.5 cm. longo, margine antico per 2 cm. ungui labelli adnato, quo latissima 1.3–1.5 cm. lata. *Petala* bipartita; partitio postica anguste linearis, erecta, margini sepalis lateralibus agglutinata et ei aequilonga; partitio antica linearis, superne leviter incrassata, 4 cm. longa, ungui labelli per 1.7 cm. adnata. *Labellum* tripartitum, ungue 2.7–3 cm. longa, partitionibus lateralibus anguste linearibus antice attenuatis acutis 3.5–4 cm. longis, intermedia angustiore 2–2.5 cm. longa, cornu erecto obtuso in basi labelli ante ostium calcaris; calcar cylindricum, dependens, 12–15 cm. longum. *Anthera* 1.7 cm. alta, rostrata, canalibus suberectis tenuibus 2.2–2.5 cm. longis, staminodiis obovatis subcarnosis 1.5 mm. longis. *Rostellum* lobus intermedium

cucullatus, abrupte acuminatus, 8-9 mm. longus; brachia stigmatifera anguste clavata, apice complanata, 2.6-3.2 cm. longa, dimidio inferiore ungui labelli agglutinata.

UGANDA. Busoga, Jinja, 1170 m., May 1904, *E. Brown* 50 (type in Herb. Kew.).

KENYA COLONY. Ayam River, Rumuruti, N.E. slope of Aberdare Mts., 2100 m., *Dowson* 634.

BELGIAN CONGO. Nurungi, Jan. 30th, 1927, *Linder* 1968.

This species is one of the largest flowered of the genus and is very similar to *B. Kayseri*, from which it differs chiefly in the lip. Brown's specimen was named in manuscript by Rolfe many years ago but no description has previously been published. A specimen was exhibited at a meeting of the Royal Horticultural Society on November 6th, 1906, where it was awarded a Botanical Certificate.

Satyrium (§ *Leptocentrum*) **acutirostrum** *Summerhayes*, sp. nov.; affinis *S. sceptrum* Schltr. a quo floribus paulo majoribus, calcaribus ovario dimidio longioribus, rostellum lobo intermedio longiore linearisubulato nec ovato differt.

Herba robusta usque 85 cm. alta, caule cataphyllis anguste ellipticis vel lanceolatis obtusis usque acuminatis laxè vaginantibus omnino oblecto. *Folia* vera desunt. *Spica* 15 cm. longa, 2.5 cm. diametro, densiflora; bracteae late lanceolatae, acuminatae, flores excedentes, demum reflexae, usque 2.5 cm. longae. *Flores* erectopatentes, illis *S. robusti* Schltr. paulo minores. *Sepalum* intermedium anguste ellipticum, obtusum, 7 mm. longum, 2 mm. latum; sepala lateralalia paulo longiora et latiora, leviter curvata, basi labello connata. *Petala* elliptica, rotundata, 6.5 mm. longa, 2.5 mm. lata, parte quarta infima sepalis connata. *Labellum* cucullatum, semi-globosum, apice angustum obtusum, 8 mm. longum, ostio pro sectione lato; calcaria cylindrica, ovario parallela, 1.6 cm. longa, 1 mm. diametro. *Columna* 6.5 mm. longa, curvula; stigma transverse oblongum; rostellum 3 mm. longum, lobis lateralibus brevissimis dentiformibus, intermedio e basi 1 mm. lata linearisubulato. *Ovarium* sessile, 1 cm. longum, glabrum.

BELGIAN CONGO. Kibati, at foot of Mount Ninagongo, Feb. 16th, 1927, *Linder* 2107 (type in Herb. Oakes Ames).

A species belonging apparently to the group within § *Leptocentrum* possessing leaves developed on sterile shoots, although there are no leaves in the present specimen. Of the species of this group *S. sceptrum* Schltr. is the most nearly related, but differs in the possession of smaller flowers, the spurs equalling the ovary, and the middle lobe of the rostellum being shorter and broadened.

Disperis katangensis *Summerhayes*, sp. nov.; affinis *D. zeylanicae* Trimen et *D. neilgherrensi* Wight, ab utraque floribus majoribus, appendicis labelli lobis brevibus strictis rotundatis nec divaricatis cornutis differt.

Caulis strictus, bifolius, teres, glaber, 8-13 cm. altus, uni- vel biflorus. *Folia* patentia, sessilia, late ovata, basi cordata, apiculata vel breviter acuminata, 8-12 mm. (lobis basalibus inclusis 9-15 mm.) longa, 8-14 mm. lata. *Bractea* foliis bene similis, subpatens, ovario circiter dimidio brevior, 5-10 mm. longa. *Flos* pro genere magnus, erectus. *Sepalum* intermedium lineare, superne sensim attenuatum, 1.6 cm. longum; sepala lateralalia libera, longitudinaliter semi-orbicularia, latere antico stricto, apice apiculata, 1.2-1.5 cm. longa, 7-8 mm. lata, medio in saccum humilem obtusissimum producta. *Petala* elliptico- vel lanceolato-ovata, 1.6 cm. longa, cum sepalo intermedio galeam hemisphaeroideam 1.2-1.3 cm. longam formantia. *Labellum* lineare, basi faciei columnae adnatum, superne refractum, apice obovato-spathulatum, cuspidatum, supra crista integra instructum, papillato-pubescent, parte integra labelli in toto 5 mm. longa; appendix labelli erecta, e basi cuneata truncato-triangularis, hastata, antice biloba, lobis strictis rotundatis, in toto 3.5 mm. longa, quo latissima 4 mm. lata, superne dense pubescens. *Columna* brevis; rostellum brachia circinatim incurva, apice erecta, brevia, obtusissima. *Ovarium* glabrum, leviter 6-alatum.

BELGIAN CONGO. Katanga, Kisinga Valley, in shady moist places, May 5th, 1924, *C. W. von Hirschberg* 168. "The hood is pale pink veined with pink, the lip darker pink. The leaves are white-veined and are magenta beneath."

The species, whose nearest African relative is *D. mossambicensis* Schltr., is, however, most closely allied to the two Southern Indian species. The four species belong to a group within the genus occurring otherwise in the Indo-Malayan region, the two African species being the most westerly members of the group and being less closely related to the remaining African species of the genus.

Polystachya (§ *Caulescentes*) **retusiloba** *Summerhayes*, sp. nov.; affinis *P. Rivae* Schweinf., a qua statura minore, foliis multo brevioribus, inflorescentiis racemosis, labelli lobis lateralibus rotundatis emarginatisve, callo linguiformi differt.

Epiphytica; radices copiosae, flexuosae, glabrae. *Caules* cylindrici, erecti, cum floribus usque 13 cm. alti, duabus tertiis superioribus foliati, basi vaginis arctis obtusis instructi. *Folia* linearisubulata, apice obtusa brevissime bilobulata, basi vaginantia, laminis usque 5.5 cm. longis et 1.1 cm. latis tenuiter chartaceis. *Inflorescentiae* racemosae, usque 4.5 cm. longae, apice dense pluriflorae; flores erecti; bracteae lanceolatae, acutae, subimbricatae, ovario pedicellato breviores. *Sepalum* intermedium lanceolatum, acutum, 9 mm. longum, 4 mm. latum, concavum; sepala lateralalia oblique triangularia, acuta, 9 mm. longa, basi mentum obtusum 8.5 mm. longum formantia, marginibus leviter incurvis. *Petala* linearispathulata, subacuta, 8 mm. longa, infra apicem 1.75 mm. lata. *Labellum* breviter unguiculatum, trilobum, 9 mm. longum et latum; lobi laterales semi-orbiculares, antice rotundati, emarginati; lobus intermedius anguste ovatus, subacutus, marginibus inflexis,

4 mm. longus, 3 mm. latus, in disco puberulus; callus linguiformis, apice truncatus vel leviter retusus, e basi labelli usque medium decurrens. *Columna* 5 mm. longa, antice leviter excavata.

BELGIAN CONGO. Mt. Miken, camp Ruero on south-west slope, 2850 m., Mar. 10th, 1927, *Linder* 2096a (type in Herb. Oakes Ames).

This is the first species of § *Caulescentes* recorded from the volcanic area north of Lake Kivu, but *P. imbricata* Rolfe occurs on Ruwenzori and two other species occur near Lake Victoria to the east. The present species bears a strong resemblance to several others, e.g. *P. Rivae* Schweinf., *P. oligophylla* Schltr. (which, although a much larger plant with longer leaves, has considerably smaller flowers) and *P. imbricata* Rolfe. The last-named has less prominent lateral lobes to the lip, definitely falcate and acuminate sepals, smaller flowers and rather different leaves. Although it is very doubtful if all the plants referred by Kraenzlin to *P. imbricata* can be considered conspecific they all differ from *P. retusiloba* in the above characters. The characters distinguishing the new species from *P. Rivae* are given in the diagnosis.

Polystachya (§ *Calluniflorae*) **erythrocephala** *Summerhayes*, sp. nov.; a *P. Stuhlmannii* Kraenzl. foliis apice acutis, inflorescentiis foliis multo brevioribus, floribus duplo majoribus differt.

Caules basi incrassati, e rhizomate brevi, approximati, usque 3 cm. longi, apice 2-3-foliati, vaginis fere omnino obtekti. *Folia* linearia, acuta, 4-10 cm. longa, 3-6 mm. lata, subcoriacea. *Inflorescentiae* racemosae, circiter 2 cm. longae, subdense 3-6-florae; pedunculus vaginis lanceolatis membranaceis acutis flores infimos attingentibus tunicatus; bracteae lineari-subulatae, 3-6 mm. longae, ovarium pedicellatum superantes; rhachis dense setulosa. *Flores* erecto-patentes, pro sectione mediocres. *Sepalum* intermedium ovatum, acuminatum, 3.5-4 mm. longum, concavum; sepala lateralalia ovato-triangularia, leviter falcata, longiuscule acuminata, margine dorsali 5 mm. longa, basi 3.75 mm. lata, mentum amplum rotundatum formantia. *Petala* linearia, acuta, leviter falcata, 2.75 mm. longa. *Labellum* ex ungue brevissima cuneatim dilatatum, trilobum, medio inter bases loborum lateralium carnosum, in toto fere 4.5 mm. longum, supra ubique setulosum; lobi laterales erecto-patentes, quadrato-rotundati, 0.7 mm. longi, 1.3 mm. lati; lobus intermedius anguste triangularis, acuminatus, valde reflexus, 1.5 mm. longus, basi 0.8 mm. latus. *Columna* 1.5 mm. alta et lata; anthera lata, rotundata. *Pollinii* stipes linearis, superne dilatata, 0.6 mm. longa; glandula oblonga, antice apiculata, postice breviter hastata.

NORTHERN RHODESIA. In gorge two miles south of Solwezi, among rocks near river, in full sun, June, 1930, *Milne-Redhead* 504. Flowered at Royal Botanic Gardens, Kew, Dec. 30th, 1930 (type in Herb. Kew.).

Flowers greenish-yellow. Column with purplish rim to stigma; anther cap deep reddish-purple.

A striking little species of an epiphytic type but collected, in resting condition, on a rock in full sun. It differs from all the species of § *Calluniflorae* in the possession of acute leaves, but quite clearly belongs to this section in all other respects. The species is apparently closely allied to *P. Stuhlmannii* Kraenzl. of which, however, I have not seen an authentic specimen. The recurved middle lobe of the lip is common to both, as well as other floral features, but the two differ in several respects as shown in the diagnosis.

Polystachya (§ *Superpositae*) **kermesina** *Kraenzl.* in Engl. Jahrb. xliii. 333 (1909), et in Wiss. Ergebn. Deutsch. Zentr.-Af. Exped. ii. 74, t. vii. fig. D-E (1910).

This species is placed by Kraenzlin in § *Grandiflorae* in his monograph of the genus.* Examination of the type specimen shows, however, that the pseudobulbs are superposed in the same manner as in other species of § *Superpositae*. This feature is not mentioned in the original description, nor is it shown in the figure cited above. This was due to the way in which the specimen had been mounted so that the pseudobulbs were almost hidden under a mass of roots.

P. kermesina differs in certain respects from other members of § *Superpositae*, showing in the inflorescence, especially the hairy rhachis, a strong resemblance to certain species in § *Grandiflorae*. The structure of the flowers, and particularly the peculiar lip, differentiates the species from all others examined by me. The lip is fused to the foot of the column at the base, the lower half being parallel and adpressed to the column and apparently held in position by the projecting rostellum, while the upper half is then recurved so sharply and completely that it also lies parallel to both the lower portion of the lip and the column foot. When more is known of the genus it may be found necessary to create a separate section for this remarkable little species.

For the present it seems advisable to transfer the species to § *Superpositae* since the current classification of the genus on vegetative characters seems on the whole satisfactory, and the group with superposed pseudobulbs is sharply defined from all others in that respect.

In order to complete the description given by Kraenzlin the following description of the pseudobulbs is added:—

Pseudobulbi superpositi, seriati, teretes, graciles, 1-3 cm. longi, 1-2 mm. diametro, inferne cataphyllis superne vaginis foliorum tunicati; totum sympodium usque 6 cm. longum.

BELGIAN CONGO. Mt. Ninagongo, N. of Lake Kivu, 2800-2900 m., Feb. 1909, *Mildbraed* 1348 (type); Feb. 1927, *Linder* 2093.

Polystachya (§ *Superpositae*) **spatella** *Kraenzl.* in Engl. Jahrb. xix. 251 (1894).—*P. Elliotii* Rendle in Journ. Bot. xxxiii. 198 (1895).

In his monograph† Kraenzlin separates these species from one another on the length of the claw of the lip, *P. Elliotii* being said to

*Fedde, Repert. Beih. xxxix. 92 (1926).

†l.c. p. 101.

possess a short claw and *P. spatella* a long one. It is difficult to see, however, how this concept of *P. Elliotii* originated, since the original description reads "labello longe unguiculato" and the examination of a duplicate type specimen confirms this statement.

On examination of the type specimen of *P. spatella* Kraenzl., and comparison with *P. Elliotii*, I can see no differences warranting specific segregation. The distinctions mentioned by Rendle, who did not see the type specimen of *P. spatella*, are only apparent, being dependent on the different methods of describing the lip adopted by the two authors. Actually the specimens of the two species agree extremely well.

Polystachya (§ *Cultriformes*) *angustifolia* Summerhayes, sp. nov.; affinis *P. gracilentae* Kraenzl., a qua foliis angustioribus, inflorescentiis racemosis nec paniculatis, floribus minoribus, mento multo brevior, labello brevior forma divergente differt.

Epiphytica. Caules caespitosi, gracillimi, usque 15 cm. alti, basi 2 mm. diametro, siccitate valde sulcati, apice monophylli, basi radicibus copiosis flexuosis glabris instructi. Folia linearia, apice subacuta, basi leviter vaginantia, 9-12 cm. longa, 3-6 mm. lata, tenuiter coriacea. Inflorescentiae racemosae, foliis paulo breviores, subaxe 7-11-florae, basi spatha vaginante 2-2.5 mm. longa instructae; bractae anguste triangulares, acuminatae, subrigidae, usque 4 mm. longae. Flores suberecti, pro sectione parvi. Sepalum intermedium lanceolatum, acutum, 4.5-5 mm. longum; sepala lateralia subfalcatis triangularia, subacuta, 5-6 mm. longa, basi 3 mm. lata, antice obtusangula, mentum brevem fere 3 mm. longum formantia. Petala oblanceolata-spathulata, subacuta, 4.5-5 mm. longa, superne 1 mm. lata. Labellum ex ungue brevi sensim dilatatum, ambitu oblongum, apice rotundatum, infra medium utrinque lobulo brevissimo rotundato instructum, 4.5-5 mm. longum, infra medium 1.8-2 mm. latum, disco omnino nudo, venis vix incrassatis. Columna brevis, leviter complanata, fere 2 mm. longa.

BELGIAN CONGO. South-west slope of Mt. Mikenno, epiphytic on bamboo, 2430 m., March, Linder 2395 (type in Herb. Kew.).

This rather striking member of § *Cultriformes* is characterised by the relatively narrow leaves and loose racemose inflorescence. Unfortunately no information is available as to the colour of the flowers. Kraenzlin in his monograph* uses the shape of the lip, whether simple, obscurely trilobed, or distinctly trilobed, for separating the species of this section. In my opinion this is not a satisfactory character and much more distinct groups can be recognised from the leaf characters, some species possessing narrow obtuse leaves as in the species here described, others broad cordate and often acute leaves, while in others the leaves are terete or nearly so.

P. angustifolia is yet another example of the section from the volcanic region in the neighbourhood of Lake Kivu, the number of

species recorded from this area being now seven. From the area between Lakes Kivu and Albert (including Ruwenzori) 11 of the 27 described species of the section have been recorded, the Cameroons district coming next with 8 species.

Bulbophyllum *miniatum* Hort. in Orch. Rev. xii. 118 (1904), nomen; F. W. Moore in Journ. Roy. Hort. Soc. xxxiii. 381, t. 53 (1908).

This species, of which the origin is obscure, but which is said to come from the Congo region, is first recorded in cultivation at Glasnevin Botanic Gardens, where it flowered in August, 1903. It was exhibited by Messrs. Sander and Sons at a meeting of the Royal Horticultural Society in March, 1904. In April of the same year an inflorescence was sent to Kew from Mr. O'Brien of Harrow from what was apparently the plant exhibited by Sander. Later (1906) a specimen was received at Kew from the Jardin des Plantes, Paris, under the name *B. saltatorium* var. *affine*, while in 1920 a specimen was cultivated at Kew as *B. Kindtiano* De Wild. In January of this year a plant of unknown origin labelled *B. saltatorium* flowered at Kew and was found to be *B. miniatum*.

The species was very shortly described by F. W. Moore in 1908 in an article entitled "Lesser Known Orchids" and a photograph of the inflorescence accompanied this description. This photograph shows plainly the character by which the species may be distinguished from all its allies except *B. inopinatum* W. W. Sm., namely, the very short narrow bracts. *B. inopinatum* is a much larger plant with orbicular petals, whereas in *B. miniatum* these are subulate-filiform.

In the original accounts the hairs on the lip are described as white, but those on Mr. O'Brien's specimen are faintly tinged with pink at the base, and it is probable that greater stress was laid on the whitish colour as contrasting with the red hairs of *B. barbigerum* Lindl. and other allied species. In the other specimens in the Kew Herbarium as well as in the living plant which flowered recently the hairs are pale pink.

As the descriptions so far given are insufficient clearly to define the species from others I subjoin a complete description of it based on all the material available. Unfortunately the specimen which was figured and which represents the type does not seem to have been preserved.

B. miniatum Hort. ex F. W. Moore; affinis *B. Kindtiano* De Wild., a qua floribus minoribus, bracteis dimidio brevioribus angustioribus differt.

Epiphytica. Pseudobulbi 1-2 cm. distantes, ovoidei, biconvexi vel majores 3-4-angulati, usque 2 cm. longi et 1.7 cm. lati, inclinati, apice obtusi, unifoliati. Folia elliptica, vel oblongo-elliptica, brevissime petiolata, apice levissime obtuseque bifida, usque 7 cm. longa et 1.8 cm. lata. Scapus gracilis, teres, usque 36 cm. longus, cataloga et 1.8 cm. lata. Phyllis paucis vaginantibus obsitus; racemus 6-15 cm. longus, subaxe

*l.c. pp. 106-107.

7-15-florus; bractae lanceolatae, acutae, circiter 3 mm. longae. Flores erecto-patentes. Sepala lanceolata, acuta, subreflexa, 6 mm. longa, supra basin 2 mm. lata, ciliata. Petala sepalis multo minora, subulato-filiformia, 3 mm. longa. Labellum lanceolato-ligulatum, acutum, basi medio callis humilis duobus parallelis instructum, dimidio superiore pilis 3-5 mm. longis barbatum. Columna brevis, apice in aristas subulatas erectas 1 mm. longas producta; anthera acuminata.

Said to come from the Congo. At Kew are specimens cultivated at Harrow by Mr. O'Brien in 1904; and at the Royal Botanic Gardens, Kew, in 1906, 1920 and 1931.

Sepals wine-coloured, greenish near tips; petals deep wine-coloured. Lip as petals, hairs pale pink. Column greenish-wine-coloured; anther greenish.

Aërangis ugandensis Summerhayes, sp. nov.; affinis *A. hologlotti* Schltr. et *A. hyaloidi* (Rchb. f.) Schltr., ab illa floribus minoribus petalis quam sepalo intermedio haud latioribus, labello obtuse apiculato, calcar dimidio longiore, ab hac foliis anguste cuneato-oblancheolatis bilobis, inflorescentia laxa differt.

Epiphytica; caulis brevis, erectus, usque 8 cm. longus, radicibus glabris albido-viridibus 3-4 mm. diametro instructus. Folia disticha, cuneata vel cuneato-oblancheolata, apice inaequaliter obtuse biloba, basi breviter vaginantia, 5-15 cm. longa, supra medium 1.5-2 cm. lata, coriacea, siccitate multinervia. Scapi pauci (circiter 2), subdependentes, circiter 7 mm. longi, subaxe 7-10-flori; bractae latissimae, truncatae, 2 mm. longae. Flores patentes vel subreflexi, albi. Sepala oblongo-lanceolata, apiculata vel subacuminata, 6-8 mm. longa, 3 mm. lata. Petala oblongo-lanceolata, acuta, 6-7 mm. longa, sepalis aequilata. Labellum oblongum, subito breviterque acutatum, 6-7 mm. longum, medio 3-4 mm. latum; calcar anguste tubulosum, rectum, 1-1.2 cm. longum, obtusum. Columna brevis, interne teres, superne paulo dilatata, 2 mm. longa; pollinia ellipsoideo-sphaeroidea, aurea, stipiti communi lineari 1 mm. longa affixa, glandula unica disciformi; rostellum 0.5 mm. longum, lineare, indivisum. Ovarium cum pedicello 1-1.2 mm. longum, viride, glabrum.

UGANDA. Mt. Elgon, on trees in forest, 1500 m., May 17th, 1925, Snowden 879 (type in Herb. Kew.). Cult. Royal Botanic Gardens, Kew, received from J. D. Snowden, 1925.

The plant belongs to a small group of species in the genus possessing a short spur and small flowers, the other two members being found in Madagascar and Ceylon respectively.

L.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: VII.* E. M. MARSDEN-JONES AND W. B. TURRILL.

NATURAL OFFSPRING OF A WILD HYBRID.

In the second paper of this series (*Kew Bull.* 1929, p. 34) we described and figured a wild hybrid (No. 22) between *Silene maritima* and *S. vulgaris*, which we found on 19th July, 1928, at the Abbotsbury end of the Chesil Beach, Dorset. This plant was producing plenty of seeds, some of which were collected. There was no sign of an unusual amount of infertility among the seeds, indeed the seeds collected would be described as a good sample for wild seed as compared with either parent species. The seeds were sown at Kew in the spring of 1929 as K. 703, and 66 plants were raised to maturity in 1930. More than half flowered the first year (July to Sept.), but the scoring for vegetative and floral characters was made on 24th June, 1930, and fruits and seeds were collected in early September, 1930.

It should be recalled that only one plant of *S. vulgaris* was found in the immediate neighbourhood of the hybrids (No. 22 and several others), and this was female. It is, of course, possible that other individuals of *S. vulgaris* formerly existed within pollinating distance. Very large numbers of *S. maritima* plants grew on the shingle all around and showed a large range of intra-specific variation. Since the collected seeds resulted from natural open pollination the chances strongly favoured back-crossing with different individuals of *S. maritima*, and the analyses of characters in the offspring, given below, support this view.

The interest of the population here scored is that it indicates how the products of hybridization can be absorbed into that parent species which dominates in numbers of individuals in the immediate neighbourhood. Had the original *S. vulgaris* parent been hairy the results would have been still more interesting. There can be no doubt that intra-specific polymorphism is increased, within what is normally regarded as a species population, by chance and infrequent crossings.

The following symbols are used in this paper:—

M, i.e. of the *maritima* type.

V, i.e. of the *vulgaris* type.

H, i.e. of the F₁ hybrid type (*maritima* x *vulgaris*).

When used in combinations the scored character has an intermediate expression, the second symbol indicating the direction of bias.

The following table is arranged to show from which parent the characters scored were derived.

<i>maritima</i> .	<i>vulgaris</i> .
Stems prostrate.	Stems erect.
Barren shoots present.	No (or very few) barren shoots.
Flowers 1 to 7.	Flowers numerous.

* Continued from *Kew Bull.* 1931, p. 352.

Flowers regular.	Flowers zygomorphic.
Calyx M.	Calyx V.
Petals and segments overlap (probably here <i>maritima</i> characters).	Petals and segments diverge (probably here <i>vulgaris</i> characters).
Scale.	Boss.
Immature seeds pink (probably here a <i>maritima</i> character).	Immature seeds white (probably here a <i>vulgaris</i> character).
Capsules M.	Capsules V.
Seeds armadillo (probably here a <i>maritima</i> character).	Seeds tubercled (probably here a <i>vulgaris</i> character).

In addition it should be noted :—

1. Barren shoots were present in small numbers in all plants, unless otherwise stated.
2. The stem lengths were maxima at the time of scoring.
3. The foliage and general appearance of the plants were of the H type, with mostly a verge towards M, except in Nos. 10 (V-H), 13 (M), 17 (M), 24 (H-V), 25 (H-V), 26 (M), 27 (V-H), 29 (V-H), 30 (M), 31 (H-V), 32 (H-V), 33 (H-V), 34 (M), 36 (H-V), 39 (H-V), 47 (H-V), 53 (V-H), 54 (H-V), 57 (V-H), 61 (V-H), and 65 (V-H).
4. The number of flowers as given indicates number per inflorescence, not number per plant.
5. The flowers were slightly zygomorphic, except where otherwise stated.
6. The petals were bilobed, except where otherwise stated.
7. No anthocyanin blotch occurred on any of the petals.
8. The anthers in all the hermaphrodite plants had some purple in them.

Characters of individual plants from wild hybrid.

1. Stems very prostrate, 5.7 dm., with medium amount of anthocyanin. Flowers 5 to 7, regular, Calyx H-M, veined with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.
2. Stems semi-prostrate, 3.7 dm., with little anthocyanin. Flowers 1 to 6, regular. Calyx H, veined with little anthocyanin. Petals and segments overlapping, H scale. Filaments, stigmata, and immature seeds pink. Capsules H-M. Seeds tubercled.
3. Stems prostrate but ends ascending, 5.7 dm., with little anthocyanin. Flowers 7 to 10. Calyx H-V, with medium amount of anthocyanin. Petals and segments overlap, small H scale. Stigmata white. Filaments and immature seeds pink. Capsules H. Seeds tubercled.
4. Stems prostrate, 5.7 dm., with medium amount of anthocyanin. Flowers 4 to 9, regular. Calyx H-V, with medium amount of anthocyanin. Petals and segments overlap, boss to H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled.
5. Stems prostrate but ends ascending, 3.7 dm., with much anthocyanin. Flowers 7 to 9, female. Calyx H, veined with medium amount of anthocyanin. Petals and segments overlap, small H scale. Stigmata white. Immature seeds pink. Capsules V (?). Seeds strongly tubercled.

6. Stems erect, 4.5 dm., with small amount of anthocyanin. Flowers 7 to 14, hermaphrodite and female. Calyx V, veined with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds tubercled.
7. Stems prostrate, 3.5 dm., with medium amount of anthocyanin. Flowers 6 to 7, hermaphrodite and female. Calyx V-H, with medium amount of anthocyanin. Petals and segments diverge, H scale. Filaments, stigmata, and immature seeds white. Capsules V. Seeds weak armadillo (?).
8. Stems prostrate, 5.5 dm., with medium amount of anthocyanin. Flowers 3 to 5, female. Calyx M-H, with medium amount of anthocyanin. Petals and segments overlap, very small H scale. Stigmata white. Immature seeds pink. Capsule H. Seeds tubercled.
9. Stems prostrate, 3.7 dm., with much anthocyanin. Plant poor and not in flower.
10. Stems prostrate, with few barren shoots, 4.0 dm., with small amount of anthocyanin. Flowers 4 to 7. Calyx V, with little anthocyanin. Petals diverge, segments overlap, H scale. Filaments, stigmata, and immature seeds white. Capsules V. Seeds strongly tubercled.
11. Stems prostrate, with few barren shoots, 3.5 dm., with little anthocyanin. Flowers 3 to 7. Calyx M-H, with little anthocyanin. Petals diverge, segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Seeds weak armadillo.
12. Stems prostrate, 3.2 dm., with little anthocyanin. Flowers 5 to 7, female and hermaphrodite. Calyx H, with little anthocyanin. Petals and segments overlap, small H scale. Filaments pink. Stigmata white. Immature seeds pink.
13. Stems prostrate, compact, with numerous barren stems and general habit of *S. maritima*, 4.0 dm., with medium amount of anthocyanin. Flowers 2 to 5, regular. Calyx M, with medium amount of anthocyanin. Petals and segments overlap, good scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds strongly tubercled.
14. Stems prostrate, 3.5 dm., with medium amount of anthocyanin. Flowers 3 to 6. Calyx V-H, with little anthocyanin. Petals and segments overlap, boss. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds strongly tubercled.
15. Stems sub-erect, 3.7 dm., with medium amount of anthocyanin. Flowers 2 to 3. Calyx H-M, with little anthocyanin. Petals and segments overlap, H scale. Stigmata white. Filaments and immature seeds pink. Capsules H-M. Seeds strongly tubercled.
16. Stems very prostrate, 5.5 dm., with medium amount of anthocyanin. Flowers 3 to 7. Calyx H, with little anthocyanin. Petals and segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.
17. Stems sub-erect, 3.7 dm., with little anthocyanin. Flowers 2 to 4. Calyx H-M, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled.
18. Stems prostrate, 5.0 dm., with medium amount of anthocyanin. Flowers 4 to 6. Calyx H-V, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds weak armadillo.
19. Stems prostrate, 3.7 dm., with much anthocyanin. Flowers 7 to 10. Calyx V-H, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds tubercled.

20. Stems prostrate, 5.2 dm., with much anthocyanin. Flowers 5 to 11, regular. Calyx H-V, with little anthocyanin. Petals and segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds strongly tubercled.
21. Stems prostrate, 4.2 dm., with much anthocyanin. Flowers 6 to 7, female. Calyx H-V, with little anthocyanin. Petals overlap, segments diverge, H scale. Stigmata and immature seeds white. Capsules V. Seeds weak armadillo.
22. Stems sub-erect, 4.0 dm., with little anthocyanin. Flowers 3 to 5. Calyx V-H, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M-H. Seeds tubercled.
23. Stems sub-erect, 5.2 dm., with little anthocyanin. Flowers 4 to 7, regular. Calyx M, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.
24. Stems very prostrate, with very few barren shoots, 5.0 dm., with much anthocyanin. Flowers 6 to 13. Calyx V, with little anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds tubercled.
25. Stems very prostrate, with very few barren stems, 6.0 dm., with medium amount of anthocyanin. Flowers 5 to 11. Calyx H-M, with little anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds weak armadillo.
26. Stems prostrate, 5.5 dm., with little anthocyanin. Flowers 3 to 6, regular. Calyx V, with little anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white, immature seeds pink. Capsules M. Seeds armadillo.
27. Stems very prostrate, with few barren shoots, 6.5 dm., with much anthocyanin. Flowers 3 to 8, regular. Calyx M, with little anthocyanin. Petals and segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds weak armadillo.
28. Stems prostrate, 3.5 dm., with little anthocyanin. Flowers 3 to 7. Calyx H-V, with little anthocyanin. Petals and segments diverge, boss. Filaments and stigmata white. Immature seeds pink. Capsules M-H. Seeds tubercled.
29. Stems prostrate, with very few barren shoots, 4.5 dm., with much anthocyanin. Flowers 7 to 20. Calyx V, with little anthocyanin. Petals diverge, segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled (weak).
30. Stems sub-erect, compact, with numerous barren shoots, 5.2 dm., with little anthocyanin. Flowers 3 to 7, very slightly zygomorphic. Calyx M, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled.
31. Stems prostrate, with few barren shoots, 6.0 dm., with medium amount of anthocyanin. Flowers 6 to 7. Calyx H-M, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M-H. Seeds armadillo.
32. Stems prostrate, with few barren shoots, 5.7 dm., with much anthocyanin. Flowers 7 to 12. Calyx H-M, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M-H. Seeds tubercled (weak).
33. Stems prostrate, 4.5 dm., with much anthocyanin. Flowers 10 to 11. Calyx H, with medium amount of anthocyanin. Petals and segments diverge,

H scale. Filaments, stigmata, and immature seeds white. Capsules H-V. Seeds tubercled.

34. Stems prostrate, with numerous barren shoots, 4.5 dm., with little anthocyanin. Flowers 7 to 13, regular. Calyx H, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds strongly tubercled.

35. Stems prostrate, with many barren shoots, 3.5 dm., with little anthocyanin. Flowers 3 to 6. Calyx H, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled.

36. Stems prostrate, with few barren shoots, 5.0 dm., with much anthocyanin. Flowers 10 to 13. Calyx H-V, with medium amount of anthocyanin. Petals and segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds weak armadillo.

37. Stems prostrate, 4.2 dm., with medium amount of anthocyanin. Flowers 3 to 5. Calyx H, with little anthocyanin. Petals and segments diverge, H scale. Filaments, stigmata, and immature seeds pink. Capsules M. Seeds tubercled.

38. Stems sub-erect, 5.0 dm., with medium amount of anthocyanin. Flowers 7 to 13. Calyx H-V, with medium amount of anthocyanin. Petals and segments diverge, some petals multilobed, boss. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds tubercled.

39. Stems very prostrate, 4.7 dm., with much anthocyanin. Flowers 7 to 14. Calyx M-H, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Seeds weak armadillo.

40. Stems sub-erect, 5.0 dm., with a medium amount of anthocyanin. Flowers 3 to 7, regular to very slightly zygomorphic. Calyx H-M, with a medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments, stigmata, and immature seeds pink. Capsules M. Seeds armadillo.

41. Stems sub-erect, 5.5 dm., with a medium amount of anthocyanin. Flowers 6 to 7, regular. Calyx M, with a medium amount of anthocyanin. Petals and segments overlap. Stigmata white. Filaments and immature seeds pink. Capsules M. Seeds weak armadillo.

42. Stems sub-erect, 3.5 dm., with much anthocyanin. Flowers 5 to 7. Calyx H-V, with little anthocyanin. Petals and segments overlap, H scale. Stigmata and filaments white. Immature seeds pink. Capsules H. Seeds armadillo.

43. Stems very prostrate, 5.0 dm., with much anthocyanin. Flowers 3 to 9. Calyx H, with little anthocyanin. Petals and segments overlap, some petals multilobed, boss. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds tubercled.

44. Stems prostrate, 5.2 dm., with little anthocyanin. Flowers 6 to 9. Calyx H-M, with little anthocyanin. Petals and segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds tubercled.

45. Stems sub-erect, 4.2 dm., with little anthocyanin. Flowers 3 to 7. Calyx H, with little anthocyanin. Petals and segments overlap, H scale. Filaments white. Stigmata and immature seeds pink. Capsules M. Seeds tubercled.

46. Stems prostrate, 5.2 dm. with little anthocyanin. Flowers 6 to 15. Calyx H, with little anthocyanin. Petals and segments overlap, H scale. Filaments white. Stigmata and immature seeds pink. Capsules M. Seeds armadillo.

47. Stems very prostrate, with no barren shoots, 5.0 dm., with medium amount of anthocyanin. Flowers 9 to 15. Calyx H-V, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds weak armadillo.
48. Stems prostrate, 4.5 dm., with medium amount of anthocyanin. Flowers 5 to 7. Calyx H, with medium amount of anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.
49. Stems 3 to 7. Calyx H-V, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled.
50. Stems very prostrate, with few barren stems, 5.2 dm., with medium amount of anthocyanin. Flowers 6 to 10. Calyx H-M, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.
51. Stems very prostrate, 4.7 dm., with medium amount of anthocyanin. Flowers 4 to 7. Calyx H, with little anthocyanin. Petals and segments overlap, H scale. Filaments, stigmata, and immature seeds white. Capsules H. Seeds armadillo.
52. Stems prostrate, 5.0 dm., with medium amount of anthocyanin. Flowers 7 to 12. Calyx H, with medium amount of anthocyanin. Petals and segments overlap, H scale. Stigmata white. Filaments and immature seeds pink. Capsules H. Seeds tubercled.
53. Stems prostrate, 5.0 dm., with little anthocyanin. Flowers 5 to 7. Calyx H-M, with medium amount of anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M-H. Seeds weak armadillo.
54. Stems prostrate, with few barren shoots, 4.5 dm., with much anthocyanin. Flowers 7 to 9. Calyx H, with medium amount of anthocyanin. Petals and segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds tubercled.
55. Stems very prostrate, 4.5 dm., with medium amount of anthocyanin. Flowers 3 to 7. Calyx V-H, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H. Seeds tubercled.
56. Stems prostrate, 5.0 dm., with much anthocyanin. Flowers 4 to 7. Calyx H-M, with medium amount of anthocyanin. Petals diverge, segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules V-H. Seeds strongly tubercled.
57. Stems prostrate, 3.5 dm., with a medium amount of anthocyanin. Flowers 2 to 5. Calyx V, with medium amount of anthocyanin. Petals diverge, segments overlap, H scale. Stigmata white. Filaments and immature seeds pink. Capsules V-H. Seeds strongly tubercled.
58. Stems prostrate, 4.5 dm., with medium amount of anthocyanin. Flowers 3 to 6. Calyx H-M, with medium amount of anthocyanin. Petals and segments overlap, a few petals multilobed, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.
59. Stems prostrate, 3.7 dm. with little anthocyanin. Flowers 3 to 7, regular. Calyx H-M, with little anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds weak armadillo.
60. Stems very prostrate, 4.5 dm., with medium amount of anthocyanin. Flowers 3 to 7, regular. Calyx M, with little anthocyanin. Petals and segments overlap, good scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds armadillo.

61. Stems very prostrate, with few barren shoots, 5.5 dm., with little anthocyanin. Flowers 15 to 17. Calyx V, with medium amount of anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules H-M. Seeds tubercled.
62. Stems sub-erect, with few barren shoots, 4.0 dm., with little anthocyanin. Flowers 2 to 5. Calyx H-M, with medium amount of anthocyanin. Petals overlap, segments diverge, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds weak armadillo.
63. Stems prostrate, 3.0 dm., with much anthocyanin. Flowers 3 to 7. Calyx H-V, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules, H. Seeds tubercled.
64. Stems very prostrate, 4.5 dm., with medium amount of anthocyanin. Flowers 3 to 5. Calyx H, with little anthocyanin. Petals overlap, segments diverge, H scale. Filaments white. Stigmata and immature seeds pink. Capsules M. Seeds armadillo.
65. Stems prostrate, with few barren shoots, 4.2 dm., with medium amount of anthocyanin. Flowers 4 to 7, regular. Calyx M-H, with little anthocyanin. Petals and segments overlap, H scale. Stigmata white. Filaments and immature seeds pink. Capsules M. Seeds armadillo.
66. Stems sub-erect, with very few barren shoots, 3.5 dm., with little anthocyanin. Flowers 2 to 5. Calyx M-H, with medium amount of anthocyanin. Petals and segments overlap, H scale. Filaments and stigmata white. Immature seeds pink. Capsules M. Seeds tubercled.

Summary and conclusions.

The offspring obtained from seeds of unprotected flowers of a wild hybrid between *Silene vulgaris* and *S. maritima* have been analysed for certain characters. The immediate seed parent was growing on the edge of a large population of *S. maritima* and the offspring no doubt had a considerable number of different pollen parents. The various combinations and modifications of characters, derived from the two species, show clearly how chance and infrequent crossings can increase polymorphism and heterozygosity within a cross-pollinated population of what would normally be regarded as a species. As would be expected from the history of the plants scored the influence of *S. maritima* is on the whole greater than that of *S. vulgaris*.

The research on which this paper is based has been aided by a Royal Society Government Grant.

LI.—MISCELLANEOUS NOTES.

THOMAS FORD CHIPP, M.C., Ph.D., D.Sc.—We record with deepest regret the sudden death of Major T. F. Chipp, the Assistant Director, at his house on Sunday evening, June 28th.

Born in 1886 at Gloucester, where his father was Chief Constable, he was educated at the Royal Masonic School, Bushey, and was Secretary of the School Natural History Society. His taste for natural science led him to take up horticulture, and after a period of service in the gardens of Syon House he entered Kew in 1906 as a Student Gardener. After a few months in this capacity, he was selected, owing to his marked ability, for one of the Temporary Technical Assistant posts in the Herbarium, where he remained until

1908. During this period he prepared himself, in his spare time, for the B.Sc. examination, London University, which he passed in 1909 with Honours in Botany. He then received an appointment as Demonstrator in Botany at Birkbeck College and in 1910 was appointed an Assistant Conservator of Forests in the Gold Coast. Before proceeding to West Africa he spent a year studying Forestry in Germany and the Federated Malay States.

In 1914 Chipp was appointed Assistant Director of the Botanic Gardens at Singapore, but the war starting while he was in England en route for the Straits Settlements, he at once sought permission to rejoin his territorial regiment, the 8th Middlesex, in which he had held the rank of Captain. With his regiment he proceeded to Gibraltar and subsequently to France, where he served continuously until 1919, being ultimately attached to the Staff with the rank of Major, and was awarded the Military Cross.

In 1919 he proceeded to Singapore to take up the post of Assistant Director to which he had been appointed five years earlier.

Chipp's good work while Assistant Conservator of Forests in the Gold Coast had been duly noted and in 1921 he was invited to return to be Deputy Conservator of Forests in that Colony.

His career both at home and in the Colonial service had naturally also been closely followed at Kew with interest and appreciation, and on the retirement of Sir David Prain in 1922 and the promotion of the present Director, Major Chipp was invited to occupy the vacant post of Assistant Director of the Royal Botanic Gardens, Kew, and assumed office on August 1st, 1922.

A fuller account of his many activities and of his contributions to science will be published later, but it should be recorded here that Chipp was a most loyal colleague, always bright, happy and filled with unbounded energy and enthusiasm for his work. He placed his work and his duties as Assistant Director of Kew in the foremost place at all times and carried them out with commendable precision, accuracy and devotion.

Having started his career at Kew as a Student Gardener, he found time to look after the welfare and interests of the Student Gardeners and entered fully into their activities and spared no pains to help their advancement.

By sheer hard work, late and early, he prepared himself for his University courses, and as the result of his research work, carried out mainly in his own time, he was awarded the Ph.D. degree and later the D.Sc. by his University.

Chipp was an organiser of high ability, tactful and reliant; doubtless his experiences on the Staff during the war greatly developed his organising ability and his sense of the value of law and order in arrangement.

His untimely death, at a time when men of his calibre and powers are all too rare, is a greater loss than Kew has ever before been called upon to bear.

Botanical Magazine.—Part iii. of vol. cliv (1928) has now been published and contains the following plant portraits:—*Inula magnifica cyclophylla* Stapf (t. 9227), a new subspecies described by Dr. Stapf from the Orient; *Gaultheria caudata* Stapf (t. 9228), a new species from China raised from seed collected by Forrest, probably in S. W. Yunnan; *Rhododendron parvifolium* Adams (t. 9229), from Siberia; *Scilla bithynica* Boiss. (t. 9230), a native of S. W. Asia Minor and E. Bulgaria; *Lycaste suaveolens* Summerhayes (t. 9231), a new species, closely allied to the well-known *L. aromatica*, probably from Central America, and grown in England under the name *L. aromatica* var. *maius*; *Osmanthus armatus* Diels (t. 9232), a rare shrub from the woods of W. Hupeh and S. E. Szechuan; *Chamaelaucium uncinatum* Schauer (t. 9233), the Geraldton Wax-flower of Western Australia; *Piptanthus concolor yunnanensis* Stapf (t. 9234), a new subspecies raised from Forrest's seed, a native of N. W. Yunnan to the Tibetan frontier; *Plectranthus chiradzulensis* Baker (t. 9235), figured from a plant raised by Sir John Ramsden, the species being native in Tropical E. Africa; *Berberis mitifolia* Stapf (t. 9236), a new species allied to *B. brachypoda* C. K. Schneider from N. W. and W. Hupeh; and *Codonopsis meleagris* Diels (t. 9237), collected by Forrest in Yunnan.

Dissotis mirabilis Bullock (K.B. 1931, 99).—When describing this species it was unfortunately overlooked that Scott Elliott's no. 7480, a very incomplete specimen referred to it, had been cited by Gilg in Engl. Monogr. Afr. Pflanz. ii. 18 (1898) as the type of a new species, *Dissotis macrocarpa*. Owing to insufficiency of material, Gilg's account of that species was not quite satisfactory, the bracts for example being described as without nerves, and the receptacle as subglobose or subpyriform, whereas it is cupular or (at most) suburceolate. These discrepancies led to *D. mirabilis* being described as a distinct species. It now becomes a synonym of *D. macrocarpa* Gilg, which name should be associated with the more adequate description supplied under *D. mirabilis*.
A. A. B.

Serdang Experimental Plantation, F.M.S.—The remarkable progress that has been made at Serdang in experimental work in tropical agriculture and in establishing a most comprehensive collection of tropical economic plants during the short period of ten years is an achievement on which the Department of Agriculture is to be highly congratulated. The recent appearance of a detailed guide book,* replete with numerous illustrations and a plan of the station, should be of assistance to those not

*"Guide to the Government Experimental Plantation, Serdang, F.M.S.," by the Staff of the Agricultural Division, Department of Agriculture, S.S. and F.M.S. Kyle, Palmer and Co. Ltd., Kuala Lumpur, F.M.S., 1931, pp. 141, plates 12, diagrams 6. Price \$2.

familiar with this experiment station in realizing the magnitude of the plantation work and the extent of the progress made. In the first few chapters an account is given of the history and development of the station and of the prevailing soil and climatic conditions. This is followed by an account of the numerous crops and economic plants that are in cultivation, a chapter being devoted to each economic group. Separate accounts are given of the arboretum, factories and machinery, and stock farm.

In view of the increasing interest in the Oil Palm (*Elaeis guineensis* Jacq.) as a plantation crop in Malaya, experimental work on this crop has received special attention at Serdang. A most informative summary—occupying twelve pages—of the work done up to the present is given in the guide.

Among the more important plant introductions, the success that has attended the cultivation of those species yielding Chaulmoogra oil—*Hydnocarpus* spp. and *Taraktogenos Kurzii* King—is of special interest. Other tropical medicinal plants that are grown with success are Ipecacuanha and Chenopodium.

In the section devoted to fibre plants an account is given of the behaviour at Serdang of most of the more common tropical fibre plants. The remarks on Sisal are of special interest in view of increasing importance of this fibre on the markets of the world.

F. N. H.

Florae Siamensis Enumeratio.*—Part 4, completing vol. i., has appeared and comprises the families Rosaceae to Cornaceae. This part contains records of 647 species. Of these 127 are new species first described for this work by Prof. Craib or Miss Geddes, mostly in the *Kew Bull.* for 1928, 1929 and 1930. A few were described in the *Gardeners' Chronicle*. Fifty-one new varieties are also noted and 12 new combinations. An index to families and genera in the volume is supplied and also a statement of the actual day of publication of each of the 4 parts.

Those familiar with the previous parts will remember that the work is not descriptive. It gives the synonymy and distribution with collectors' numbers and localities, together with local names and distribution, of each species known to occur in Siam. For new varieties not previously described a few lines of diagnosis are given. It is to be hoped that eventually a comprehensive map will be furnished, for many of the localities are not to be found in atlases.

C. E. C. F.

*A list of the Plants known from Siam with records of their occurrence, by W. G. Craib. Vol. i, Part 4. Published under the auspices of the Siam Society by The Bangkok Times Press, Ltd., Bangkok; Luzac & Co., London, 1931, pages viii + 247. Price 12s. 10d., or Tcs. 7.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1931 ROYAL BOTANIC GARDENS, KEW

LII.—NORTH-EASTERN BRITISH SOMALILAND. C. L. COLLENETTE.

In June, 1929, the Secretary of State for the Colonies informed me that arrangements were being made for the demarcation of the boundary between British Somaliland and Italian Somaliland. Mr. Amery very kindly sent me this information, as it had been suggested to him that I might wish to consider the possibility of sending a qualified botanist from Kew to accompany the Commission.

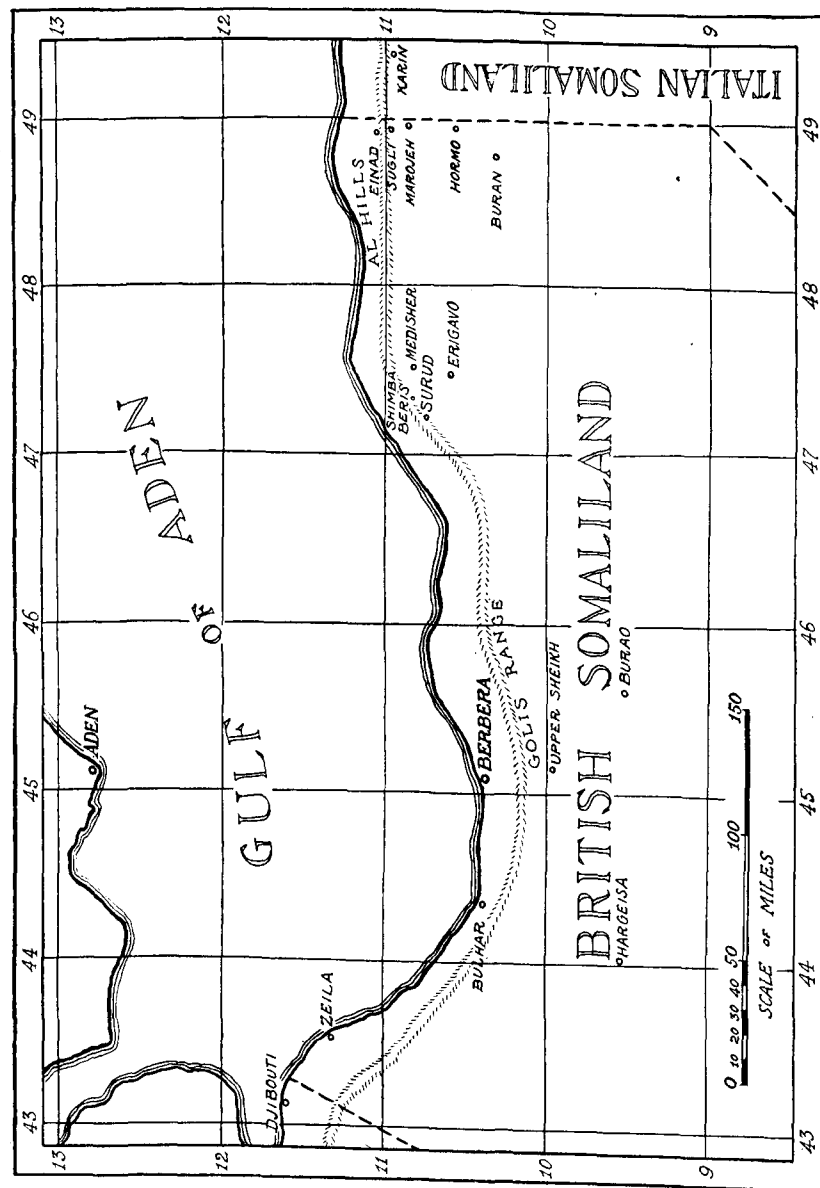
I was very glad to avail myself of this interesting opportunity and was fortunate in being able to secure the services of Mr. C. L. Colletette for the purpose. Mr. Colletette accompanied the Commission during part of their stay in Somaliland, making extensive botanical collections. Unfortunately, he was prevented by an attack of blackwater-fever from staying in the country for the whole of the period with the Commission, but it was very fortunate that he was not taken ill until after the most interesting portion of the Boundary, from the botanical point of view, had been thoroughly investigated.

The expenses incurred in attaching Mr. Colletette to the Commission were met from the funds placed at my disposal by the Empire Marketing Board for the purpose of making botanical collections, and the following paper by Mr. Colletette gives an account of his botanical observations of the region visited, from various points of view. A detailed account of the plants collected will, it is hoped, be published in an early number of the *Kew Bulletin*.

A. W. H.

The Commission assembled at Berbera in the second week of August, 1929, and a fortnight was spent in landing and repacking stores, which were despatched by camel train for the boundary. On the 29th August a start was made by motor lorry for Buran (lat. 10° 13' N., long. 48° 47' E.), 3000 ft., 15 miles from the boundary, chosen as the advanced base on account of its accessibility and excellent water supply.

It was now the end of the dry summer season, and locusts in very large numbers were encountered throughout the journey. Vegetation was in consequence practically without flower or leaf, but *Euryops Hildebrandtii* Mattf. and the very common *Justicia Phillipseae* Rendle were untouched by the insects.



The route from Berbera led southwards over the coastal plain, known as the Guban, to the Golis Range, where the Sheikh Pass winds steeply into the hills to Upper Sheikh, the hill station of the Government, at 5500 ft.; thence south-eastwards to Burao (lat. $9^{\circ} 32' N.$, long. $45^{\circ} 33' E.$), a station of the Somaliland Camel Corps, and north-eastwards to Erigavo (lat. $10^{\circ} 37' N.$, long. $47^{\circ} 23' E.$), where at 5700 ft. is a small station with a Commissioner. The vegetable garden of this station, situated at Medisher, in a rocky valley with permanent water, some 27 miles by road from Erigavo, had been completely laid bare by locusts, even the stalks of vegetables having been eaten down. Of wild plants, the leaves of *Salvia somalensis* Vatke and *Lasiocorys argyrophylla* Vatke were left untouched, but the flowers were eaten.

From Erigavo the route lay eastwards for 105 miles over level stony country to Buran.

I remained with the Commission from 5th September, 1929, to the 10th February, 1930, during which time the surveyors completed the work on the boundary from Buran (lat. $10^{\circ} 13' N.$, long. $48^{\circ} 47' E.$) northwards to the sea. After this the Commission worked southwards, but the level and monotonous nature of the country, and the fact that no rain could be expected for some weeks, did not justify a continuance of the botanical work.

At the time of the arrival at Buran, locusts were most luckily on the decrease, and shortly afterwards were seen no more, with the exception of one large swarm, which passed over without settling, on 23rd September. Rains had also commenced, and during the month of September totalled between half an inch and one inch, which quickly brought the vegetation into flower.

During the first six weeks of the period, the district round Buran was thoroughly explored for plants, about 140 species being found in flower. The Commission then moved 23 miles to the northward, where at Hormo, 2250 ft., in a different type of country, a further 30 species were collected. From Hormo, a trip was made to the north-east into Italian Somaliland, with a short stay at Karin (lat. $10^{\circ} 57' N.$, long. $49^{\circ} 24' E.$), in the foothills of the coastal range at 900 ft. Here the rainfall had been poor, but permanent water, both in the form of springs and beneath the surface, encouraged local vegetation, and the trip yielded 36 additional species.

From 4th to 30th November I was able to pay a visit to the Al Hills near the coast, collecting at various altitudes, and camping near the summit of the range for 17 days at Sugli, 4750 ft. (lat. $10^{\circ} 58' N.$, long. $48^{\circ} 53' E.$). This country was most interesting, and 134 species not previously seen in flower were collected.

From 12th to 28th December a further camping trip was made to the Surud, in the coastal range about 120 miles to the west of Buran, where the elevation reaches 7250 ft., the highest ground in Eastern Somaliland. Here camp was made for a fortnight at

Shimba Beris, 6750 ft., and 58 further species were added to the collection.

During the month of January, 1930, the flowering season by this time being practically over, seeds and roots of a number of species were collected in the Buran district, and additional notes obtained from the natives.

Eastern Somaliland may be divided into three units :—

(1) A flat and narrow coastal plain, backed by hilly and broken country which extends to the precipitous northern slopes of

(2) The Al Hills, running roughly parallel to the coast, which attain a height of from 4000 to 7250 ft. and stretch across northern Somaliland, under various names.

(3) The inland plateau, mainly at an elevation of 2000 to 3500 ft.

The climate is governed by the North-east monsoon, which blows from November to March, and the South-west monsoon, which blows from May to August or September. The strongly desiccating nature of the latter causes all vegetation to dry up.

Rainfall varies considerably from year to year and in different parts of the country. On the coastal plain it is very slight, ranging from 1 to 5 inches in the year. On the higher northern slopes of the Al Hills there is much mist and cloud, and precipitations probably amount to as much as 30 inches. At Erigavo, on the southern slope of the range at 5700 ft., the recorded rainfall has totalled $10\frac{1}{2}$ to $15\frac{1}{4}$ inches in the year, mainly in the months of April-June and August-September. On the inland plateau precipitation usually takes the form of local storms, and some districts may be completely missed. An estimate based on the few available data gives a figure for this region of from 5 to 10 inches annually.

Immediately after a few showers an ephemeral vegetation springs up, while trees and bushes come into flower. The flowering seasons are short and irregular, but on the inland plateau are principally confined to the months May-June and September-October.

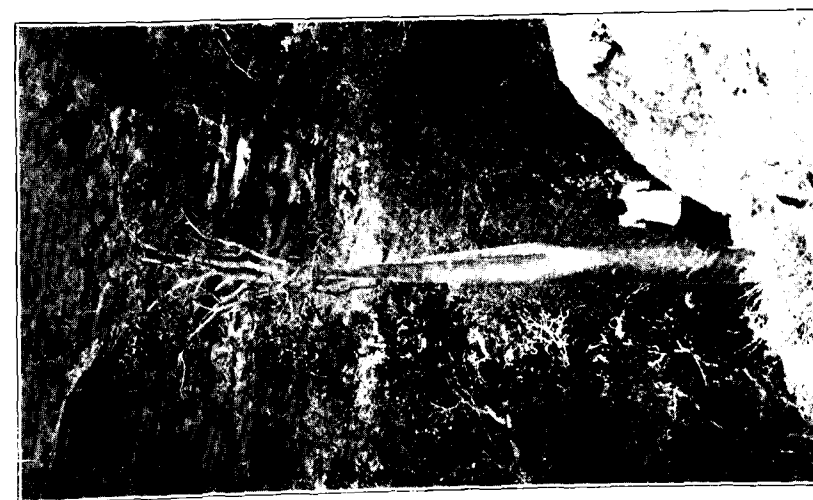
Temperatures are high: published figures for the coastal belt (Berbera) show a mean maximum for the year of 93.1° F. and a mean minimum of 74.3° F. The highest figures occur during June to August and the lowest from November to February. At 7000 ft. on the coastal range (Shimba Beris) for eleven days in December 1929, the mean maximum was $76\frac{1}{2}^{\circ}$ F. and the mean minimum 37° F. On the night of December 26th-27th, $31\frac{1}{2}^{\circ}$ F. was recorded. At Erigavo (5700 ft.), the recorded temperatures for 1928 and 1929 give a mean maximum of $78-79^{\circ}$ F. and a mean minimum of $49-51^{\circ}$ F.; temperatures below freezing point occurred in the month of January.

On the inland plateau, temperatures are lower than on the coast, and show a greater range; at Buran (3000 ft.), the mean maxima during September, October, December 1929 and January 1930 were 94° , 93° , 85° and 81° F., and the mean minima 70° , 69° , 64° and 59° F.

PLATE VIII.



Boswellia Carteri Birdwood, the Mohor or Frankincense tree yielding the Dakar gum, at Einad. The scars on the trunk show the old incisions for gum.



Euphorbia noxia Pax, at Einad.

PLATE IX.



Succulent area, southern side Al Hills, above 3750 ft. In foreground, right, *Euphorbia* sp.; centre, with large spherical rootstock, *Trematosperma cordata*, the Adahi; left, *Euphorbia nigripina*.



Shimba Beris, 6750 ft. *Juniperus procera* covered with *Usnea articulata* f. *trichodioides*. Lawn of *Cynodon Dactylon* and *Eleusine Robecchii*.

The soil of the inland plateau is mainly a reddish sandy clay, giving a slightly alkaline reaction. Limestone outcrops are frequent, and rocky areas occur with little soil. The Al Hills are of limestone, steeply precipitous on their northern face and sloping more gently to the south, this side being much split up into valleys.

Biotic factors. The inhabitants are divided into tribes, which lead an entirely pastoral existence, and move in the wake of the rainfall. On the inland plateau, domestic animals (camels, sheep, and goats) undoubtedly affect the composition of the vegetation in the principal grazing areas, where edible species lead a much more precarious existence than those which are protected or poisonous. Moreover, in time of drought, natives have a practice of cutting and bending over the stem of *Acacia* and other bushes to allow the animals to graze on the upper branches. This is an offence under the laws of the Protectorate, but it has been recently and extensively practised in some districts.

The effect of domestic animals on the vegetation has been varied in the past by the fluctuation in their numbers, owing to the unsettled condition of the country. Although periodic drought is a controlling factor, under present conditions there would seem to be room for a considerable increase in flocks and herds, with a correspondingly augmented influence on the vegetation.

The wild fauna of the country is insufficient in numbers and size materially to affect the vegetation.

Somaliland is subject to periodic visits of the locust *Schistocerca gregaria*, one such period, lasting for over a year, having occurred just prior to the visit of the Commission. Although no dead vegetation was noticed as a result of their attacks, it was estimated that after the autumn rains of 1929, in the Buran district, only some 25 per cent. of individual woody plants came into flower, due largely to defoliation in the previous season and the eating out of dormant buds. A breeding area of the locusts occurs in the foothills between the Al Hills and the sea, where several swarms of "hoppers" were seen in the autumn of 1929.

The extensive forests of *Juniperus procera* Hochst., between 6000 and 7250 ft. on the coastal range, are subject to damage by fire, as the trees grow thickly together and there is much dead timber. Large open areas at this elevation, covered with low-growing vegetation and without junipers, may have been cleared in this manner in the past, but no traces of recent fire could be found. A fire started by natives during the fighting against the Mullah is said to have covered a considerable area, but this district was not visited.

The two frankincense trees, *Boswellia Frereana* Birdwood and *Boswellia Carteri* Birdwood, are extensively exploited for their gum by the natives who live in the hills. The trees are protected from harm and are never cut as firewood, and are left untapped until they attain considerable size. No attempt, however, is made to increase the number of trees.

In the area of North-eastern Somaliland under review *Acacia* gums are collected to some slight extent, but not on a commercial scale.

CLIMATIC VEGETATION.

The coastal plain, a narrow strip a few miles wide between the sea and the hills, with very low rainfall, and subject to continual sand-storms during the south-west monsoon, has a very sparse vegetation. No specimens were collected from this area, which contains, sometimes half-buried in drifted sand, isolated and stunted *Acacia* bushes, such as *Acacia misera* Vatke and *Acacia spirocarpa* Hochst. On the sea shore are extensive beds of *Suaeda fruticosa* Forsk., with frequent bushes of *Tamarix nilotica* Ehrenb.

The inland plateau, elevation mainly from 2000 to 3500 ft., includes the whole of the north-eastern side of the country south of the coastal range, and consists of level tracts, the surface often covered with loose stones, and occasional low limestone hills, with small outcrops of gypsum. Stream beds or "tugs" occur, trending west to east, which contain water for only a few hours after storms. The vegetation of the plateau may be divided into two types:—

(1) That of the limestone rocky soil, of which the Buran district (lat. $10^{\circ} 13' N.$, long. $48^{\circ} 47' E.$), 3000 ft., may be taken as an example. This locality has a rocky or stony surface, rather sparsely covered with bushes and small trees, and presenting even after rain a grey-green and rather lifeless appearance. Permanent water occurs infrequently, in rocky pools. The plants typical of this association are:—

Chenopodiaceae, not determined. Very abundant, but avoiding the "tug" beds, native name "Waloh."

Balanites orbicularis Spr. }
Acacia misera Vatke. } Thorn bushes and trees, forming the
Acacia spirocarpa Hochst. } most conspicuous part of the
Acacia Bussei Harms. } vegetation.
Acacia mellifera Benth. }

Zygophyllum Hildebrandtii Engelm. Abundant. Leaves bright green.

Sarcostemma viminale R. Br. }
Aloe percrassa Tod. } The commonest succulents.

Schizachyrium Kellerei Stapf. Large conspicuous grass clumps, not really abundant.

Eleusine Robecchii Chiov. A very common grass, avoiding "tug" beds.

Tamarix nilotica Ehrenb. Confined to the "tug" beds.

(2) That of the sandy soil, of which the Hormo district (lat. $10^{\circ} 33' N.$, long. $48^{\circ} 59' E.$), 2250 ft., is an example. Bare rock seldom appears. Water occurs as shallow pools in the "tug" beds, and is rarely permanent on the surface.

Vegetation is fairly heavy along the lines of the "tugs" but more sparse on the level ground. Grass appears extensively, and often affords good grazing.

The dominant plants are:—

Acacia spirocarpa Hochst. The only common tree, largely confined to the neighbourhood of the "tugs."

Zizyphus Hamur Engl. Abundant, usually near the "tugs."

Tamarix nilotica Ehrenb. Rather numerous in the "tugs," often dwarfed.

Amphilophis radicans Stapf. } Often covering the ground over
Pennisetum orientale Rich. } considerable areas, not dependent
on the "tugs."

Cadaba mirabilis Gilg. Over the whole area, not especially numerous, but green and conspicuous.

Calotropis procera R. Br. Locally common in the "tugs," absent in some localities.

The sandy soil vegetation occupies a far larger area on the inland plateau than that of the rocky areas, but the two often intermingle, and it is perhaps better to take a combination of the two as representing the whole of the country near the boundary from lat. $10^{\circ} 10' N.$ to $10^{\circ} 50' N.$ This may be compared with the trans-African belt of "thorn scrub."

Valleys and lower slopes of the Al Hills (coastal range). The north-east monsoon coming in from the sea impinges on the northern slopes of the range, resulting in considerable rainfall and cloud. On the more gently sloping southern side, heated by the sun, the rainfall very rapidly diminishes, and the lower slopes are reached only by occasional storms, although clouds are more frequent than on the level plateau southward.

The southern foothills of the range are intersected by valleys with rocky and stony floors, sheltered somewhat by the surrounding slopes. These valleys support a considerable vegetation, and that at Marojeh (lat. $10^{\circ} 54' N.$, long. $48^{\circ} 59' E.$), 2250 ft., may be taken as typical. The dominant plants are:—

Croton confertus Baker; *Bridelia somalensis* Hutch., sp. nov. (see page 413); *Maerua sessiliflora* Gilg; *Grewia villosa* Willd.; *Balanites aegyptiaca* Del.; *Acacia spirocarpa* Hochst.; *Zizyphus Hamur* Engl.; *Zygophyllum Hildebrandtii* Engl.; *Aerva persica* Merrill (*A. tomentosa* Forsk.).

On the steep slopes which fringe many of the southern valleys up to 3500 ft., the sparse flora is largely composed of the frankincense tree, *Boswellia Frereana* Birdwood, which yields the "Maidi" gum. This tree grows from cracks or pockets in the rock, and prefers a steeply sloping surface. It is not as a rule to be found on more level ground, although it is certainly not crowded out by competition; it is not often seen above 3750 ft.

From the plains and upwards to about 3750 ft., the more gentle and rounded slopes, not occupied by the *Boswellia*, have a sparse flora composed largely of:—

Balanites aegyptiaca Del. ; *Acacia spirocarpa* Hochst. ; *Eleusine Robecchii* Chiov.

The lower slopes on the northern side of the range are subject to a much greater rainfall than the southern side, and at 1000 to 1500 ft. the plants of the maritime plain give place to a more prolific vegetation, which again merges at about 3000 ft. into a mountain zone, to be referred to later. The dominants in this intermediate area, noted at Einad (lat. 11° 02' N., long. 48° 55' E.), 2000 ft., are :—

Commiphora sp. (not in flower or fruit), native name *Gadon* ; *Dracaena schizantha* Baker ; *Commiphora erythraea* Engl. ; *Boswellia Carteri* Birdwood ; *Euphorbia noxia* Pax.

Herbaceous plants are not numerous and there is little grass.

The mountain zones. On the southern side of the range, the zone from 3750 ft. to the top of the slope at 5000 to 6250 ft. is characterized by a growth largely composed of succulents. The soil is sparse, and the radiation of the sun's rays from the surface intense, but night temperatures are cool. The dominant plants are :—

Euphorbia sp. (not in flower or fruit), native name *Angir*.

Trematosperma cordatum Urban.

Euphorbia nigrispina N. E. Br.

Euphorbia sp. (not in flower or fruit), native name *Dibu*.

Buxus Hildebrandtii Baill.

The highest zone on the Al Hills is marked by an abrupt division from the last mentioned, commencing at the top of the southern slope. It stretches across the broad summit of the range at heights varying from 4000 to 6250 ft., and down the northern slope to about 3000 ft. It occupies the site of greatest rainfall, and throughout much of the year is sheltered by clouds. Other factors are the more oblique rays of the sun on the northern slopes, and the lower temperature due to elevation.

Buxus Hildebrandtii Baill. clothes this area in almost unbroken cover, and makes up perhaps 90 per cent. of the larger vegetation. In its shade, and growing in the deep humus derived from its fallen leaves, is a carpet of small and delicate herbaceous plants and ferns of numerous species. The dominants in this area, noted at Sugli (lat. 10° 58' N., long. 48° 53' E.), 4750 ft., are :—

Buxus Hildebrandtii Baill.

Acokanthera Schimperii Schweinf.

Cadia purpurea Ait. (*C. varia* l'Hérit.).

Euphorbia sp. (not in flower or fruit), native name *Dibu*.

Acacia sp. (not in flower or fruit), native name *Sug-sug*.

Euphorbia sp. (not in flower or fruit), native name *Angir*.

Trematosperma cordatum Urban.

The numerous herbaceous plants show no noticeable dominant.

On the level floors of the valleys which intersect the summit are green lawns of *Cynodon Dactylon* Pers., with a few large trees of *Ficus gnaphalocarpa* A. Rich., under whose shade in the grass are numerous

plants of the crocus-like *Merendera longifolia* Hutch. sp. nov. (see page 414).

In the higher and more exposed parts of the area, *Dracaena schizantha* Baker is conspicuous and fairly numerous among the *Buxus*.

On the Surud mountain (lat. 10° 45' N., long. 47° 12' E.), 120 miles to the west of the frontier and of the area just discussed, somewhat different conditions prevail. The southern and south-eastern slopes are gradual and less subject to wash. *Buxus Hildebrandtii* appears to be entirely absent. The succulent zone does not appear on the upper part of the southern slopes, its place being taken, from 5800 to 6500 ft., by a rather sparse growth of :—

Dodonaea viscosa L. ; *Aloe percrassa* Tod. ; *Euryops Hildebrandtii* Mattf. ; *Cadia purpurea* Ait.

The top of the Surud extends for several miles at an elevation of 6500 to 7520 ft. This area is covered with an almost continuous forest of *Juniperus procera* Hochst., which continues down the steep northern slope to below 6000 ft., covering the area of greatest rainfall. The dominants in this area are :—

Juniperus procera Hochst. Perhaps 65 or 70 per cent. of the trees present.

Sideroxylon buxifolium Hutch. sp. nov. (see page 413). Perhaps 10 per cent.

Cadia purpurea Ait. Perhaps 5 per cent.

Dodonaea viscosa L. Perhaps 2 or 3 per cent. No other tree is abundant.

Euryops Hildebrandtii Mattf. } Forming a fairly thick under-
Salvia somalensis Vatke. } growth over much of the
Stachys Hildebrandtii Vatke. } ground.

Justicia Phillipseae Rendle. Present everywhere, and often forming a carpet.

Usnea articulata Hoffm. Thickly on the branches of trees.

The floors of the upper valleys, in the broader and more level spots, are grassy lawn-like areas of *Cynodon Dactylon* Pers., mixed with a fair quantity of *Eleusine Robecchii* Chiov.

The herbaceous flora of the Al Hills is found to some extent on the Surud, but the junipers provide less humus and less shade than the *Buxus*. The number of species is far less than that of the Al Hills.

The juniper is found only in small numbers on the Al Hills, and the trees are undersized. I am unable to suggest any material difference in soil, rainfall, wind, or aspect between the summits of the Al Hills and the Surud. The dominance of the juniper on the Surud would appear to be due to the greater elevation and lower temperature, although the two species are said to grow together on mountains further to the west.

EDAPHIC VEGETATION.

A somewhat uncommon phenomenon in North-east Somaliland is the occurrence of seepage cliffs, where water permanently oozes from the rock, usually forming a pool below. A good example is found at Buran. When sufficiently protected from the sun, a plentiful growth of the maidenhair fern, *Adiantum Capillus-Veneris* L., is found on the rocks, with *Erigeron Bovei* Boiss. where there is any soil. A considerable variety of rushes, sedges, and grasses may exist in the moist ground of the immediate vicinity.

In the southern foothills of the Al Hills at 2000-3000 ft. occur ravines, narrow and shaded, with a floor of loose rocks. The chief plants in these ravines are :—

Croton confertus Baker.

Bridelia somalensis Hutch. sp. nov. (see page 413).

Moringa peregrina Fiori (*M. aptera* Gaertn.).

Aristolochia rigida Duchartre. Common where it occurs, but not in all ravines.

At a lower elevation, as for instance at Karin (lat. $10^{\circ} 57' N.$, long. $49^{\circ} 24' E.$), 900 ft., in Italian Somaliland, where there is a pass through the hills, there occur "tug" beds covered with loose boulders and confined to somewhat narrow limits between the hills, with a considerable subterranean flow. These are occupied almost exclusively by two species of tree :—

Conocarpus lancifolius Engl. Growing to 70 ft.

Mimusops Angel Chiov. Perhaps one to every ten of the preceding species, and growing to 40 ft.

At Karin, in a broad valley where in the past there has been a considerable settlement and a European vegetable garden, are two areas of two to three acres, permanently damp with surface water. These areas contain :—

A tall palm, unidentified, native name *Madah*.

Phoenix reclinata Jacq. var. *somalensis* Becc. Growing thickly beneath the *Madah*.

Pluchea sp. (not in flower or fruit). Abundant in slightly drier ground than the *Phoenix*.

Erigeron Bovei Boiss. Abundant near open water.

A similar area at Marojeh (lat. $10^{\circ} 54' N.$, long. $48^{\circ} 59' E.$), 2250 ft., of three to four acres, also exhibits a growth of the *Madah* palm, and almost impenetrable thickets of the tall plume grass *Erianthus Ravennae* P. Beauv.

ECONOMIC NOTES.

With the exception of a few isolated areas of very small extent, no cultivation of crops is possible in North-eastern Somaliland, and none is attempted by the natives.

The juniper forests on the higher slopes of the coastal range are sufficiently extensive to furnish timber in commercial quantity, but its removal would be expensive and difficult, as several miles of

rough and steeply sloping surfaces would have to be negotiated before arrival at ground suitable for wheeled traffic.

The two species of frankincense, already referred to (page 405), are of common occurrence in suitable localities of the Al Hills. Gum was not being collected at the time of my visit, but it is said that the natives usually receive advances from Arab middlemen on the coast, to whom the gum is afterwards delivered at prices which are too low to encourage an increase of production. The collecting grounds are at the present time too remote from existing stations for effective control, but there would appear to be room for considerable development of this product when the country is further opened up.

SOMALI PLANT NAMES.

Native names were obtained for the great majority of the larger plants met with, and will be included in the account of the species collected, which is to appear at a later date. These names were gathered from reliable natives, and in most cases the plants were shown to more than one individual. It was found that dried or withered specimens were rarely recognised, and that information was only satisfactory when obtained with the aid of large fresh specimens or from the actual plant in the field.

It was also found that whereas all the Somali tribes speak the same language, their plant names vary very considerably. The name of a common plant in one part of the country may be transferred to another species in some other locality.

This question was carefully enquired into, and, while there was some diversity of opinion, it seemed to be well established that the names separate into two classes, those of the :—

(1) Darod tribes—Warsangeli, Mijertain, Dolbahanta, etc., which inhabit, roughly speaking, the eastern and less known side of the country, and the adjacent part of Italian Somaliland.

(2) Ishaak tribes—Habr Yunis, Habr Awal, Habr Toljalla, etc., which inhabit the rest of the country.

Some of the Dolbahanta (Darod) names, however, appear to agree with the Ishaak rather than the Darod, and two men of the Dolbahanta, from different districts, may use dissimilar names or a combination of Nos. 1 and 2.

The native Somali names which have hitherto been obtained by botanists are probably almost entirely Ishaak.

The spelling of the names has in nearly every case been checked with the aid of Europeans who speak the language, and occasionally a different spelling has been adopted from that appearing in previous lists.

In the case of a number of plants it was possible to arrive at the meaning of the native name, throwing light on the uses and attributes of the species. However, considerable caution had to be exercised in this enquiry, as it was most difficult for the native to distinguish between the actual meaning of the name and the

idea which the sound of the word brought to his mind. This may be paralleled in English by the word "oak," which does not mean "the sturdy one," nor "violet"—"the retiring one." Some of the alleged meanings had to be rejected for this reason and included in general notes on the plants.

Notes on certain species.

Short field notes will be included in the account of the species collected, but the two which follow are perhaps more suitable for the present report.

Aristolochia rigida Duchartre. This plant was found in flower somewhat uncommonly at Karin (Italian Somaliland) and in abundance at Marojeh (Al Hills). The flowers possess a fairly strong, carrion-like smell. The perianth-tube narrows at its base to a small circular opening, which leads to a roomy chamber containing stamens and pistil. The inner walls of the tube are covered with a thick growth of downwardly pointing hairs, while the circular opening is provided with a ring of hairs meeting in the centre and directed slightly towards the chamber. The chamber itself is free of hairs. Insects enter the perianth-tube, and once inside have difficulty in returning against the hairs. When past the circular opening they cannot return. After a short period, which was estimated from the appearance of the flowers at two or three days, the hairs wither and allow the insect to escape.

All the available flowers, to the number of two or three hundred, were opened, and those in which the hairs had not withered were usually found to contain captives. A collection of these was made, and consists of:—

- 40 diptera of about 11 species.
- 3 Lycaenid butterflies of 2 species.
- 6 moths of 4 species.
- 3 grasshoppers of 2 species.
- 1 cricket.
- 1 beetle.

Several grasshoppers and other insects which were far too large to enter the flowers were noticed endeavouring to do so. Over half the diptera exhibit bright yellow pollen adhering to the head and thorax, but the other insects do not show this, and were probably uninvited guests. No dead flies were found inside the flowers, but the lepidoptera were usually battered with struggling, and either dead or very exhausted.

Flying about and settling freely on the plants were a number of flies having pollen on the head and thorax, and it is evident that a proportion of these would eventually enter other flowers and effect fertilization.

Dorstenia crispa Engl. Native (Warsangeli) name *Bogoh-u-jed*, meaning "south-facing." Living rootstocks of the plant were brought home in addition to the usual dried specimens. The species was found in some quantity on the south and south-west sides of

boulders and rocks, growing in cracks and crannies at the place where the boulder touched the ground, and often under the protection and shade of a projecting ledge. No specimens were found on the north or shady side of the boulders. The boulders chosen were on level ground, usually on rock platforms, and no plants were found on cliffs or on an irregular surface.

Most of the rootstocks produce one or two rounded nodules on their upper surface, joined by a narrow neck to the main stem, and easily broken off.

It was strongly suggested by the position of the plants that, during the hot months of July to September, when the South-west monsoon is blowing, these nodules become detached and are blown before the wind until stopped by a rock.

Descriptions of the new species in this paper, by J. Hutchinson.

Sideroxylon buxifolium Hutch. sp. nov. [Sapotaceae]; affinis *S. oxyacanthae* Engl., sed inermis, foliis spatulato-obovatis longe petiolatis, floribus brevissime pedicellatis differt.

Arbor usque ad 6.5 m. alta, interdum frutescens; ramuli annotini pallide purpurei, leviter flexuosi, lenticellis transverse porosis notati, hornotini elongati, subdense foliati, minute stellato-puberuli, cinerei. *Folia* spatulato-obovata, apice rotundata, basi acute cuneata, 2–4 cm. longa, 1–1.5 cm. lata, supra glabra et nitida, infra cinereo-tomentella, coriacea; petioli circiter 3 mm. longi, stellato-tomentelli. *Flores* axillares, glomerati, breviter pedicellati, pallide viridi-flavi; pedicelli crassi, ferrugineo-tomentelli. *Sepala* libera, suborbicularia, 2 mm. diametro, coriacea, extra ferrugineo-tomentella, marginibus interdum hyalinis. *Corollae* tubus late campanulatus, intra tenuiter pilosus, 1.5 mm. longus, lobis late ellipticis 2 mm. longis apice bilobatis. *Stamina* corollae lobis longiora; staminodia petaloidea, triangularia, acutissime acuminata. *Ovarium* tomentosum, sulcatum; stylus 2 mm. longus, glaber.

Somaliland: Surud Range; Shimba Beris, lat. 10° 45' N., long. 47° 12' E., 6750 ft., abundant in rocky ground, Nov., *Collenette* 371. Vernacular name *Sheh* (Ishaak tribes).

A very distinct species with leaves like those of *Buxus Hildebrandtii* Baill.; the filaments are very long for the genus *Sideroxylon*. The allied species *S. oxyacantha* Engl. occurs in Eritrea and Abyssinia.

Bridelia somalensis Hutch. sp. nov. [Euphorbiaceae]; affinis *B. scleroneuræ* Muell. Arg., sed foliis infra glabris minus reticulatis distincta.

Arbor 5 m. alta; ramuli annotini purpurascens, glabri, hornotini graciles. *Folia* oblonga vel oblongo-lanceolata, apice obtusa vel rotundata, basi rotundata, 5–9 cm. longa, 2.5–3.5 cm. lata, chartacea, glabra, supra pallide viridia, infra pallidiora, inconspicue reticulata, nervis lateralibus utrinsecus circiter 12 marginem versus obscure arcuatis, tertiariis subparallelis; petioli sicco nigrescentes, 5 mm.

longi, glabri; stipulae subulato-lanceolatae, 4 mm. longae, marginibus minute ciliolatis. Flores ♂ virides, axillares, glomerati, subsessiles. Sepala ovato-triangularia, glabra, 2.5 mm. longa. Petala cuneato-obovata, sepalis dimidio breviora. Discus patelliformis, margine leviter undulatus. Antherae subobtusae. Ovarii rudimentum bilobatum. Flores ♀ non visi. Fructus 2-locularis, late ellipsoideus, 8–10 mm. longus, siccitate verrucosus.

Somaliland: Marojeh, 2250 ft., lat. 10° 54' N., long. 48° 59' E., among boulders in dry stream bed, common tree 14 ft. high, flowers not common, green, Nov., Colletette 224.

Vernacular name *Hambah Jujh* (Warsangeleh).

Merendera longifolia Hutch. sp. nov. [Liliaceae]; affinis *M. abyssinicae* A. Rich., foliis multo longioribus et latioribus marginibus scabrido-serrulatis, floribus majoribus, antheris brevioribus distinctissima.

Cormus late ellipsoideus, circiter 3 cm. longus; scapus intra vaginas usque ad 10 cm. longus, biflorus. *Folia* coaetanea, plerumque 3 vel 4, linearia, acuta, usque ad 10 cm. longa et 1.5 cm. lata, glabra, circiter 7-nervia, marginibus angustissime translucetibus et scabrido-serrulatis. *Perianthii segmenta* rosea, a basi distincta, lanceolata, longe unguiculata, circiter 5 cm. longa. *Filamenta* robusta, 5 mm. longa, sulcata; antherae 4 mm. longae, oblongae, basi breviter 2-lobae. *Ovarium* lineari-lanceolatum, laxe syncarpum, glabrum; styli a basi distincti, 2.3 cm. longi.

Somaliland: Sugli, Al Hills, 4750 ft., lat. 10° 58' N., long. 48° 53' E., flowers mauve, in short grass under shade of large trees, sandy soil, Nov., Colletette 254.

Hitherto only one species of *Merendera* has been known from Tropical Africa, *M. abyssinica* A. Rich. being found on the lower slopes of mountains in Abyssinia. This new species discovered by Mr. Colletette in Somaliland is very distinct on account of its long leaves, which lie flat on the ground, and by the large handsome flowers. It would probably prove to be a desirable plant for cultivation.

LIII.—SESSE CANOES. C. M. HARRIS.

During my stay at Government House, Entebbe, His Excellency the Governor took me to see a fine Sesse Canoe which was in use as a ferry boat across a narrow arm of the Victoria Nyanza. As I noticed that the canoe was made of various kinds of wood and learnt that specific timbers were always used for the different parts—sides, thwarts, prow, etc.—I asked Mr. C. M. Harris, of the Uganda Forestry Department, to be so kind as to find out what the various timbers and lianes might be and to send me an account of the construction of these remarkable canoes, which appear to be somewhat unique in their methods of construction.

PLATE X.



Sesse canoe with "peace prow" and tokens of pieces of cloth. Jinja, Uganda.
[Photo. by Mr. C. M. Harris]

This he has most kindly done and has also supplied the photograph and sketches illustrating the article which follows. A. W. H.

Before the peaceful conditions of the present day the tribes—the Baganda and BaSaga, and the island tribes, the BaSesse and BaVuma—inhabiting the northern shores of Lake Victoria were continuously engaged in warfare. Their battles chiefly took place on the water, and the chief objective was to ram and sink the canoes of the enemy.

In addition to these set battles, in which there were often as many as 100 canoes a side, piracy was rife, the catch from the fishing canoes commonly being seized and the canoes sunk. Sides were always changing, however, and the allies of one day might be the enemies of the next. It was necessary, therefore, to show some token when canoes went on a peaceful errand, and on these occasions a "peace prow" was carried which prevented ramming. This false prow is shown in the sketch and in the photograph,

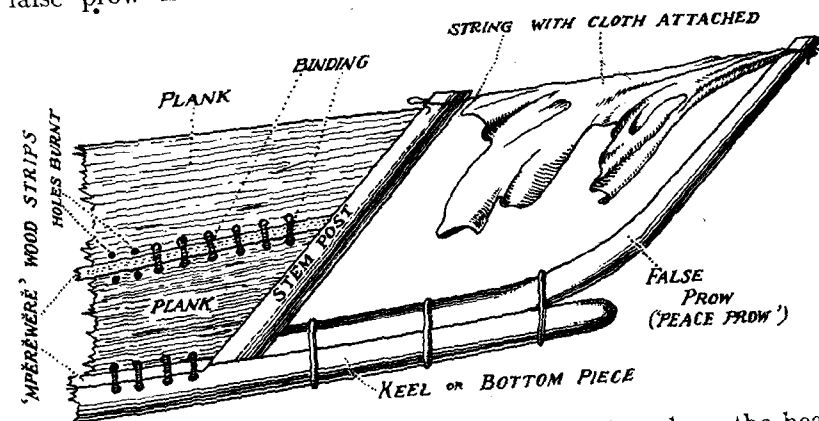


Plate X. On its top a totem is generally placed, such as the head of a cormorant or of a swamp antelope. Along a string which joined the top of this false prow to the nose of the canoe tokens were hung to emphasise the peaceful errand of the canoe. These tokens consisted of feathers, papyrus heads, bunches of leaves, or, as shown in the photograph, pieces of cloth.

The Sesse is a "sewn" canoe and a considerable improvement on the ordinary dugout which is still commonly used on the Lake. The origin of the name is a little doubtful. It may be that they were originally made by the Sesse Islanders, or the name may have been given to them as they are more seaworthy than a dugout and capable of crossing in safety to the islands, a distance of 20 miles.

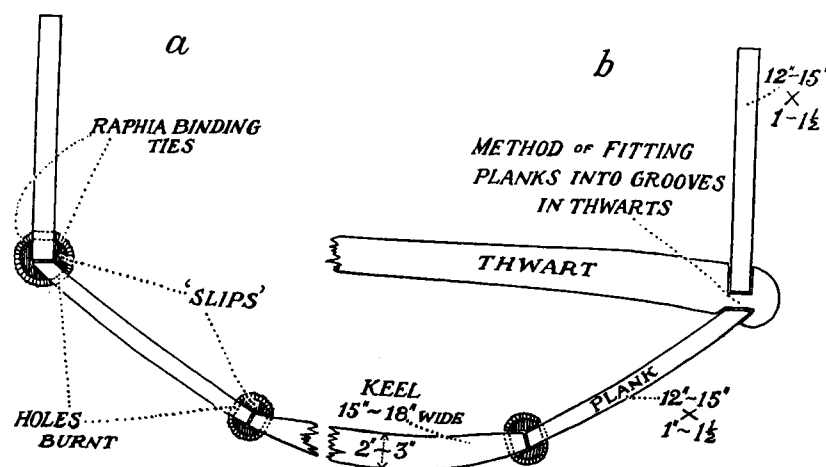
The canoe is from 20 to 30 feet long, with a 3 to 4 feet beam. The bottom is formed by a single log with a considerable camber. At the bow the log is tapered to a round prow, 3 inches in diameter, and projecting 2 to 3 feet beyond the stempost at surface level. The

false or "peace" prow is fitted on to this as shown in the drawing on page 415 and in plate X.

The log forming the bottom piece is cut with an edge from a large sound log, generally of Mpewere (*Piptadenia africana* Hook.), as that is the commonest tree around the northern shores of the lake. It does not provide good timber, and any but seasoned heartwood easily rots and is eaten by insects.

A better timber is provided by Nkoba (a species of *Lovoa*, probably *L. Brownei* Sprague), which is fairly plentiful along the lake shore and more easily worked; a consideration when the natives' tools are not of the best quality steel. Other timbers used are Nongo (*Albizia coriaria* Welw.) and Mugavu (*A. Zygia* (DC.) Macbride): these are both durable but hard to work and not plentiful in the size required. Miovu (*Entandrophragma* spp. generally *E. utile* Sprague), is not often used as it is required for furniture, and Mvule (*Chlorophora excelsa* Benth.) of any size is scarce around Entebbe and too valuable.

The sides of the canoe consist of two planks of the same timbers as those used for the keel. Those next the keel are of one piece and are bent round fore and aft and held in position at each end by fitting into a slot in the stem and stern posts. They are tied down to the bottom with raphia, through holes which are burnt about 2½ to 3 inches apart and 1 inch from the edge of the plank. The planks, which are of seasoned wood, are bent by being first wetted and then heated by a small fire built on and below them. The upper planks are usually joined towards each end by scarf joints sewn together.



The stem and stern posts are straight pieces of Mukokowe (*Ficus* sp.), or sometimes Nkoba, about 18 to 24 inches long and 2½ inches thick, with a groove cut on the inside to take the ends of the side planks. These posts are only tied down to the keel and the plank-ends tied in.

The thwarts are fitted after the lower planks and are slightly flattened in the middle to form seats. They are most important, as they both hold the sides of the canoe together and also keep them the required distance apart. No particular timber appears to be used for this purpose, but Nkoba has been identified, as well as Mugavu and Nsambya (*Markhamia platycalyx* Sprague).

No nails enter into the construction of the canoe; everything is tied or sewn by Bibo fibre (*Raphia monbuttorum* Drude). Holes are burnt, three or four turns of raphia are then made through each pair of holes, and chafing prevented by further horizontal binding. The binding is tightened both inside and outside the canoe by forcing underneath it slips of a hard pliant wood, Mperewere (*Acalypha neptunica* Mull. Arg.). The slips are about 3 feet long and are made to butt together and so help to caulk the seams, which are further caulked by the use of Ebyai, banana fibre.

LIV.—TENDER DICOTYLEDONS.

An addition* has been made to the series of new editions of the Kew Hand Lists and Guides, which are so important a feature of the Royal Botanic Gardens, Kew, and are also of so much value to the horticultural public, in the recent publication of the second edition of the "Handlist of Tender Dicotyledons and Gnetaceae."

During the past few years new editions of the Lists of Trees and Shrubs (the 3rd) and of the Coniferae (also the 3rd) have been published, as well as a third edition of the Herbaceous Plant List and Lists of Rock Garden Plants and Hardy Monocotyledons. It is hoped in due course to bring out new editions of the Lists of Ferns and of Orchids.

All the Museum Guides have also recently been re-edited and published and they contain a vast amount of information about the economic plants of the world and the products derived from them.

As the Preface to the new edition of the Handlist of Tender Dicotyledons contains some particulars of general interest, it is here reprinted in full.

Throughout the preparation of this list great care has been taken to bring the nomenclature as well as the taxonomy up to date. Recent monographs and papers on special groups have been consulted and followed wherever it has been considered advisable.

Special mention is made of the following families and genera:—The Cactaceae have been arranged according to the standard monograph by Britton and Rose, except where the names adopted in that work are not in accordance with the International Rules of Botanical Nomenclature.

*Hand-list of Tender Dicotyledons and Gnetaceae cultivated in the Royal Botanic Gardens, Kew. Second Edition, 1931. To be purchased at the Royal Botanic Gardens, Kew, price 3s. 6d., postage 2d.

For the Crassulaceae, Berger's recent monograph in Englers' *Pflanzenfamilien* (1930) has been followed.

The name *Mesembryanthemum* has been retained in a broad sense for the well-known genus of succulent plants, although that is now divided into over one hundred genera by specialists on this genus. The name of the segregate genus to which each species is referred is added in brackets.

It should be pointed out that *Olearia stellata* DC. and *O. Gunniana* Hooker are now regarded as distinct species and should not have been printed as synonyms. A. W. H.

Thirty years have elapsed since the first edition of the Handlist of Tender Dicotyledons cultivated in the Royal Botanic Gardens was published. Many new introductions have taken place since the year 1899, and unfortunately a good many plants formerly in cultivation in this country no longer exist in our Collections. Every effort is made at Kew to obtain and maintain the wild plants from which our cultivated Horticultural varieties have been derived. But for their careful preservation in Botanic Gardens they would soon be neglected and lost among the host of new and so-called "improved" varieties which are constantly being produced by horticulturists.

For grace and beauty such wild plants as *Pelargonium inquinans* and *P. zonale* from S. Africa, the parents of the garden "Geraniums"; *Begonia Davisii*, *B. Pearcei* and *B. fulgens*, the elegant parents of the huge-flowered tuberous Begonias, beloved of the florist; *Begonia socotrana*, one of the parents, with the S. African *B. Dregei*, of the "Gloire de Lorraine" forms of winter-flowering Begonias; the wild species of *Petunia*, *P. integrifolia* and *P. nyctaginiflora*, from which all garden Petunias have come, and the original species of *Salpiglossis*, *Nemesia*, etc., are well worthy of preservation; moreover the educational interest of such wild species, especially when they are seen alongside the forms that have been produced from them by hybridisation and selection, is one of the objects which a Botanic Garden such as Kew should always strive to keep in the foreground.

Reference to the earlier numbers of the "Botanical Magazine" will reveal how great a number of beautiful Tender Dicotyledonous plants no longer exist in our collections and it is much to be desired that efforts should be made to reintroduce the plants which were the pride of the skilful gardeners of the last century. As references are made in the Original Preface to the various plant houses, it is necessary to point out that several changes and developments have been effected since Sir William Thiselton-Dyer wrote his Preface.

AUSTRALIAN AND NEW ZEALAND PLANTS.

The Mexican House had always been a difficult house to maintain in a good and clean condition, owing to the height of the roof

and to the prevalence of pests due to the heat and humidity. This year, therefore, it has been converted into a cooler house, mainly for Australian and New Zealand hard-wooded plants. The side windows have been made to open and it is now a continuation of the main house for the reception of the many new additions to our rich Australian and New Zealand collections.

Certain plants such as the Lord Howe Island Palms and the Javanese Rhododendrons still occupy their old position in this wing.

RHODODENDRON HOUSE.

A new Rhododendron House, built of teak, has been added on to the west side of the Northern Octagon of the Temperate House adjoining the N. Wing devoted to the Himalayan Rhododendrons. Here the newer Chinese Rhododendrons are being grown which are not hardy in the open at Kew.

INSECTIVOROUS PLANTS.

A new Insectivorous Plant House was built in 1928 on the south side of House No. 10, in place of the old porch where they were formerly exhibited. This long low house faces due south and the stage is close to the glass so that the plants get the full benefit of the sunlight with ample ventilation. The new house has proved to be admirably adapted for the cultivation of these interesting plants, and, as will be seen from the list, we now have *Cephalotus*, *Darlingtonia*, *Dionaea*, *Drosophyllum*, *Heliamphora* and *Roridula* in cultivation, in addition to a large number of species of *Drosera*, *Pinguicula* and *Sarracenia*.

THE ECONOMIC HOUSES.

The two houses (Nos. 11 and 12) devoted to Tropical and Sub-tropical plants of Economic interest have long been inadequate for the growing of such important plants and for their proper display. The houses have been rebuilt this year and are now nearly twice the size of the original houses, while the roof has been raised to the same height as that of the Victoria Regia House. Among plants whose Economic importance has recently been recognised, which may be seen in the new houses, mention may be made of the species of *Hydnocarpus* and *Taraktogenos*, the seeds of which yield Chaulmoogra Oil, the specific for Leprosy; *Aleurites Fordii* and *A. montana*, the sources of Tung Oil, a valuable oil derived from the seeds, which is used in making paints and varnishes; and the Sumach, *Rhus Coriaria*, a valuable source of Tannin in connection with leather industries. All these have been distributed to those Dominions and Colonies where they are likely to flourish and prove a commercial success.

On the Southern face a long narrow house has been built, in continuation of the Insectivorous Plant House, for the accommodation of the collection of Pelargoniums from South Africa, which need a house fully exposed to the sun for their proper cultivation.

THE SHERMAN HOYT CACTUS HOUSE.

A new Cactus House facing south is being built at right angles to House No. 7 at the N. end of the "T Range" for the collection of Cacti presented to Kew by Mrs. Sherman Hoyt, of South Pasadena, California. The plants and the desert background here displayed were exhibited at the Chelsea Show of 1929, and Mrs. Hoyt has very generously provided the funds for the erection of this new Cactus House, which bears her name. The Cacti, which will be seen here, will be planted among blocks of stone and sand, brought over from California, as they occur in the desert and as they are depicted in the painting of the actual desert forming the background.

Among some of the more remarkable plants now grown at Kew and exhibited in houses open to the public, may be mentioned *Didierea mirabilis* now in House No. 5. These plants were presented to Kew some years ago by the Governor General of Madagascar. In the same house some fine plants of *Fouquieria splendens* and a large plant of the Giant Cactus, *Cereus giganteus*, may also be seen.

In the Victoria Regia House (No. 10) the large plant of the Madagascar Aroid *Typhonodorum Lindleyanum* and the Ambatch plant of the Nile Sudd (*Herminiera elaphroxylon*), the light wood of which is used for making floats and rafts, should also be noticed.

Attention may also be drawn to the interesting parasitic tree *Nuytsia floribunda* (Loranthaceae) of Western Australia, *Aeginetia indica* (Orobanchaceae), parasitic on grasses, etc., the giant *Lobelia Gibberoa* from the Central African Mountains (Himalayan House) and to the interesting Myrmecophilous plant *Myrmecodia Antoiniei*, all of which are now in cultivation at Kew.

The new Hand List enumerates nearly 5,000 species.

ARTHUR W. HILL.

LV.—THE WOOD STRUCTURE OF FOKIENIA HODGINSII AND CERTAIN RELATED CONIFERAE.

C. R. METCALFE.

In *Kew Bulletin* 1931, p. 107, a note was published dealing with two essential oils which have recently been acquired for the museum collection. One of these, known as "Pe-Mou," is distilled from the rootwood and stumps of *Fokienia Hodginsii* Henry & Thomas (*Cupressus Hodginsii* Dunn), a conifer found in the mountainous parts of Annam and Tonking, in Indo-China and Fokien. It was thought that a study of the wood anatomy of this species and a comparison of it with that of the closely related species *Cupressus sempervirens* L., *Libocedrus macrolepis* Benth. & Hook. f. and *L. decurrens* Torr. might be of some interest. Observations were also made on the wood anatomy of *Thuja dolabrata* L. and *T. plicata* D. Don. The work was carried out in the Jodrell Laboratory where sections of the woods were cut on a Reichert wood-cutting

microtome, stained in iron-alum haematoxylin and safranin, and mounted in balsam.

A very marked similarity between all the woods was observed, but, none the less, characters were found by means of which they could be distinguished from one another, at all events in the samples of wood examined. All the woods were characterized by well-defined annual rings which were clearly marked by the abrupt transition from the small-celled autumn wood to the larger thin-walled tissue formed in the spring. There was a gradual decrease in the size of the cells in passing from the spring to the autumn wood. The woods also agreed in being devoid of resin canals, and in having columns of parenchymatous cells, running parallel with the axis, distributed in the wood. The medullary rays were in most instances uniseriate and homogeneous. Exceptions to this were *Libocedrus decurrens* and *Cupressus sempervirens*, in which some of the medullary rays were two cells wide in places. Deposits of resin were present in varying amounts in the medullary ray cells of all the species examined (this is not indicated in the diagrams). The quantity of resin in the ray cells of *Fokienia Hodginsii* was very small in the two samples of this wood that were examined. The wood of the two species of *Thuja* differed from that of the other genera in having the parenchyma cells containing resin arranged in very definite peripheral bands as seen in transverse section. Moreover, the transverse section of the wood of *T. plicata* differed from that of *T. dolabrata* owing to the fact that whereas in the former the parenchyma cells were isolated or in groups of two or three together and always confined to the autumn wood, in *T. dolabrata*, although the parenchyma bands were present chiefly in the autumn wood, they were also to be seen in the more open spring wood as well. In addition, isolated columns were scattered throughout the wood. *T. plicata* differed also in having much broader annual rings in which the tracheid walls were much thinner than those in *T. dolabrata*. However, it is chiefly on the basis of the characters to be seen in the tangential section that the woods can be distinguished from one another. The most important features noted in each of the species are given below.

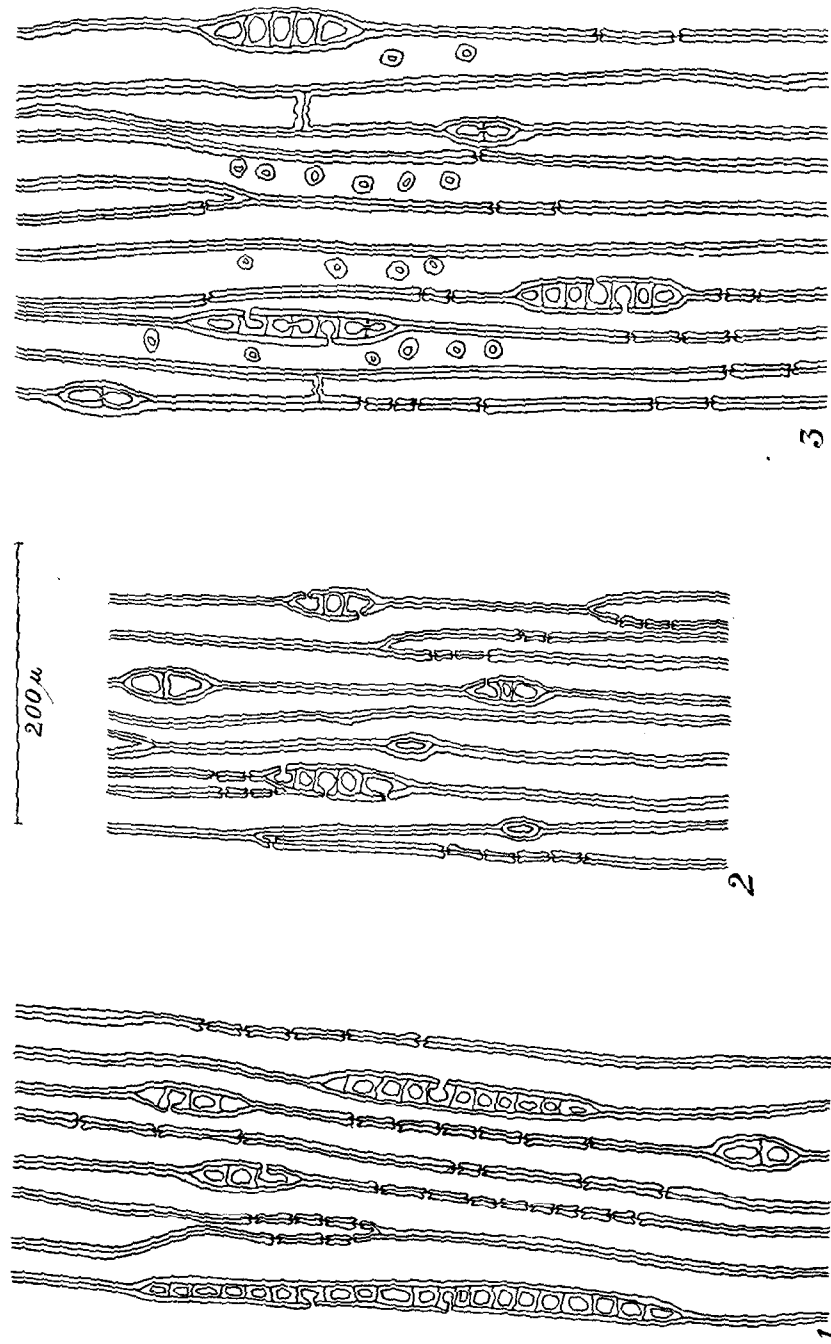
The figures represent tangential sections of the woods. Deposits of resin were present in many of the medullary ray cells, but these are not indicated. From the medullary ray cells of *Fokienia Hodginsii* the deposits of resin were almost absent.

Thuja plicata. (Fig. 1.)

Uniseriate medullary rays from one to twenty cells high predominantly of about twelve cells. Occasional bordered pits present on the tangential walls of the vertical tracheids.

Thuja dolabrata. (Fig. 2.)

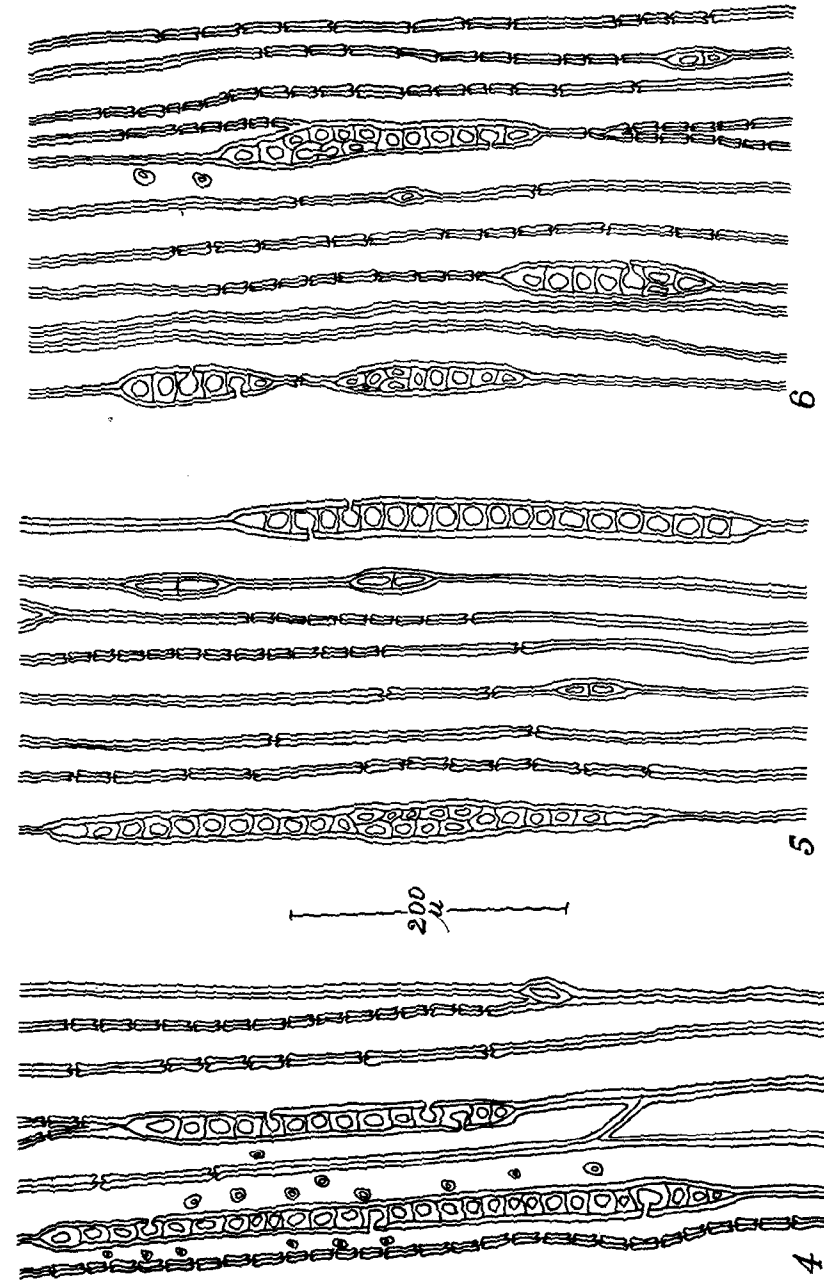
Medullary rays small and uniseriate, predominantly one to four cells high although occasionally as many as seven cells high. Bordered pits on the tangential walls of the vertical tracheids only in the autumn wood and then small and not numerous.



1, *Thuja plicata*, from Oregon.

2, *Thuja delavayana*, from Japan.

3, *Fokienia hodginsii*, from Foochow.



4 and 5, *Cupressus sempervirens*, different parts of the same section, country of origin uncertain.

6, *Libocedrus decurrens*, from California.

Fokienia Hodginsii.

The tangential section (fig. 3) resembles *Cupressus sempervirens* in having bordered pits in one or more rows on the tangential walls of the vertical tracheids, and very rarely medullary rays that were more than one cell wide for short distances. However, it could be distinguished at once from *Cupressus sempervirens* by the medullary rays ranging from one to fourteen cells in height, whereas those of *Cupressus sempervirens* ranged from two to forty-two cells. The cells at either end of the medullary rays were very pointed.

In transverse sections the tracheids and annual rings were very similar to those of *Thuja plicata* and *Libocedrus decurrens*. Parenchyma cells much less numerous than in the *Thujas* examined, solitary or in pairs, scattered throughout the wood and not in definite peripheral bands.

Cupressus sempervirens. (Figs. 4 and 5.)

This species could be distinguished in tangential sections by the fact that although most of the medullary rays were uniseriate a few of them were more than two cells wide at odd points. This was true also of *Libocedrus decurrens* (fig. 6), but whereas the medullary rays of *Cupressus sempervirens* were from two to forty-two cells high, those of *Libocedrus decurrens* ranged only from one to fourteen. Large bordered pits were locally abundant on the tangential walls of the vertical tracheids.

Libocedrus macrolepis.

Numerous small bordered pits occur on the tangential walls of the vertical tracheids, but are chiefly confined to the autumn wood. Medullary rays one to twenty cells high, seldom exceeding eighteen. Practically all uniseriate but here and there more than one cell wide for a short distance.

Transverse sections show numerous parenchyma cells with dark-coloured resinous contents scattered throughout the wood, but locally aggregated in rather definite bands in the autumn tissue. Most easily distinguished from *Fokienia Hodginsii* by the more numerous parenchyma cells with dark contents.

Libocedrus decurrens. (Fig. 6).

It is doubtful whether this species could be distinguished with any certainty from *L. macrolepis*. The only differences noted were that in *L. decurrens* the height of the medullary rays did not exceed fourteen cells, and the number of rays that were more than one cell wide was greater than in *L. macrolepis*.

Radial sections of all the species were also examined but no characters of great diagnostic value were noted. They were characterized by a single row of densely crowded bordered pits (less crowded in *Thuja dolabrata*), and slit-like pits on the radial walls of the medullary ray cells.

The specimens of wood used in this investigation were from the collections in the Kew museums, and as far as could be ascertained were correctly named.

LVI.—DIOSCOREAE NOVAE ASIATICAE.*

D. PRAIN ET I. H. BURKILL.

Dioscorea (Stenophora) Chingii *Prain et Burkill*: species foliis cordatis integris inflorescentiis pendentibus floribusque maris despicientibus, quoad stamina antheribus eversis longa cum *D. tenuipede* Franchet et Savatier, et *D. enneaneura* Prain et Burkill, congruens, sed ob perianthium *D. nipponicae* Makino, modo infundibulare cum iis discrepans.

Partes inferiores ignotae. *Caules* laeves, politi, inermes, sinistrorsum volubiles: prophylla adsunt. *Folia* cordata, glabra, siccitate nigricantia, 7-nervia, apice breviter acuminata, basi majorum sinu aperto ornata vel minorum fere truncata, ad 10 cm. longa et 7 cm. lata: areola intranervia interior clausa oblanceolata: areola a nervorum paribus alternis amplexa late ovata: petiolus glaber, ad 10 cm. longus. *Inflorescentiae masculae* in axillis foliorum vel bractearum apices versus ramorum productae, binae, pendentes: axis sub triangularis, glaber: flores vel in cymis 2-3-ni vel singuli, breviter pedicellati, oblique despicientes vel pedicello aliquatenus curvato extra flexi: bractae late ovatae, obtusae, rugatae, concavae: pedicellus 1 mm. longus vel brevior. *Perianthium* infundibulare: pedicellus 1 mm. longus vel brevior. *Sepala* 1.25 mm. longa, lare, vix 2 mm. longum, tubo perbreve. *Petala* breviora, apicem versus reflexa. *Stamina* sex, basi floris inserta: filamenta porrecta, sed sub antheribus extra leviter flexa: antherae intactae quadrilobatae. *Gynoecium* fere nullum. *Planta feminea* ignota.

CHINA AUSTRALIS, in provincia Kwang-si, R. C. Ching 5347.

Typus in Herbario Horti Botanici Nov-Eboracensis conservatur.

Dioscorea (Lasiophyton) Craibiana *Prain et Burkill*: species e grege *D. kamoensis* Kunth, a qua foliis biformibus nunc trifoliolatis, nunc apices ramorum versus praesertim simplicibus aptius distinguenda: et enim infructescentiis capsulisque longioribus.

Partes inferiores ignotae. *Caules* glabri, inermes, sinistrorsum volubiles. *Folia* pleraque trifoliolata: foliolum medium oblanceolatum, basi acutum, apice acuminatum, ad 12 cm. longum, ad 4 cm. latum, trinerve, nervis lateralibus e medio divergentibus apud centimetrum alterum longitudinis laminae, apicem nequaquam attingentibus: foliola lateralia obliqua, dimidio interiore dimidiis folioli medii simillima, dimidio exteriori semi-ovata: folia simplicia cum floribus producta, ovata, ad 8 cm. longa, ad 4.5 cm. lata, 7-9-nervia: pagina superior glabra, nervis praeter medium applanata;

*Articles on *Dioscorea* have appeared in *Kew Bull.* 1891, 268; 1895, 230; 1896, 74; 1916, 190; 1919, 339; 1925, 58; 1926, 118; 1927, 225; 1931, 88.

pagina inferior glabra, nervis majoribus prominentibus: petiolus ad 6 cm. longus: petioluli ad 4 mm. longi. *Flores masculi* ignoti. *Flores feminei* ad 60, in spicis ad 40 cm. longis dispositi. *Sepala* crassa, 1.25 mm. longa, apice pilis perparvis induta. *Petala* paullulo minora. *Staminodia* minutissima. *Capsulae* ad 25 mm. longae, pedicellatae, pedicellis 2 mm. longis, apice obtusae, basi rotundatae: alae ad 6 mm. latae, pergamentaceae, stramineae. *Semina* basin versus alata.

SIAM, in comitatu Prachinburi ad Sriracha, Mrs. D. J. Collins 1547.

Typus in Herbario Horti Botanici Regalis Kewensis conservatur.

Dioscorea (Lasiophyton) Esquirolii Prain et Burkill: inter affines (memorandas *D. Scortechinii* Prain et Burkill, *D. Cumingii* Prain et Burkill, *D. polyphyllam* R. Knuth, aliasque capsulas horizontales grandes efferentes) tomento griseo facile distinguitur.

Partes inferiores ignotae. *Caulis* densissime griseo-tomentosus, aculeis paucis armatus. *Folia* alterna, supra pubescentia, plus minusve glabrescentia, infra tomentosa, biformia, pleraque pentaphylla: foliolum medium late lanceolatum, basi acutum, apice longe acuminatum, ad 20 cm. longum, ad 5.5 cm. latum: foliola externa inaequilatera dimidio interiori dimidiis folii medii similia sed parum minora, dimidio exteriori semi-ovata: foliola intermedia medio similia sed parum minora: petiolus densissime griseo-tomentosus, aculeis parvis leviter armatus, foliolis aequilongus. *Folia simplicia* cum floribus producta ovata, conspicua. *Racemi masculi* spiciformes in inflorescentiis magnis compositi, 15-40-flori, ad 25 mm. longi, in axillis bractearum 2-10-nati vel rarissime singuli: axis griseo-tomentosus: pedicelli 1 mm. longi: bractee florum late ovatae, in pedicellis insidentes et bracteolis adjuvantibus flores amplexantes: bracteolae bracteis aliquatenus minores, forma similes. *Perianthium* globoso-crateriforme, glabrum. *Sepala* crassa, ovata, obtusa, 1 mm. longa. *Petala* simillima sed subacuta. *Stamina* tria, dimidio sepalorum aequalia: staminodia tria, tenuia, staminibus aequilonga. *Flores feminei* in spicis ad 35 cm. longis compositi. *Perianthium* eo floris maris simile; sepala et petala paullulo majora. *Staminodia* minuta. *Capsulae* magnae, horizontales, apice truncatae, basi cordatae: alae subrectangulares, ad 35 mm. longae, ad 11 mm. latae. *Semina* basin versus alata: ala castanea.—*Dioscorea* sp., Prain et Burkill in Journ. As. Soc. Bengal, N.S. x, 1914, p. 24.

CHINA AUSTRALIS, in provincia Kwei-chow, *Esquirol* 970: et in provincia Kwang-si, R. C. Ching 7461, 7467. Exemplum primum capsulas praebet: exempla alia flores masculas et femineas praebent. Primum in herbario Horti Botanici Regalis Kewensis conservatur: alia in Herbario Horti Botanici Nov-Eboracensis conservatur. Si typum requires accipe primum.

Dioscorea simulans Prain et Burkill: species quoad folia *D. trisectam* Griseb., brasiliensem praestanter simulans sed quoad flores cum ea discrepans: a speciebus Asiaticis omnibus adhuc repertis floribus maris plus minusve rotatis longe distat.

Partes inferiores ignotae. *Caules* laeves, inermes, glabri, virides, sinistrorsum volubiles. *Folia* glabra, alterna, foliolis ternis composita: foliolum medium ad 10 cm. longum, ad 4 cm. latum, sublanceolatum vel saepe longissime acuminatum, nervis lateralibus duobus supra laminae basin e nervo medio diffusis areolam lineari-lanceolatam ambientibus: foliola lateralia obliqua, dimidio externo cordata, ad 8.5 cm. longa, ad 3.5 cm. lata: petiolus ad 6 cm. longus: petioluli 0-6 mm. longi. *Flores masculi* in inflorescentias spiciformes subhorizontales ad 15 cm. longas dispositi, suspicientes, pedicellati, pedicellis 1 mm. longis: axis minutissime asperulus, subtriangularis: bractee breviter ovatae, acuminatae, scariosae, 1 mm. longae. *Perianthium* rotatum. *Sepala* apice rotundata, 1.5 mm. longa. *Petala* sepalis paullulo breviora, conformia. *Stamina* biformia, biserialia: antherae ante sepala latiusculae; antherae ante petala duplo minores: filamenta brevia. *Gynoeceum* minutissimum. *Flores feminei* in spicis binis dispositi: spicae dispaes, altera plus minusve 20-flora, ad 12 cm. longa; altera multo minor. *Perianthium* rotatum, perianthio masculo simile. *Staminodia* minutissima. *Stigmata* tria: stylus brevis. *Ovarium* ad anthesin 4-5 mm. longum. *Capsula* ignota.

CHINA AUSTRALIS, in provincia Kwang-si, R. C. Ching 5319, 5335.

Typus (5335) in Herbario Horti Botanici Nov-Eboracensis conservatur.

LVII.—MISCELLANEOUS NOTES.

DR. RUDOLPH MARLOTH.—We deeply regret to record the death at Caledon of this veteran South African botanist. He had suffered for some years from heart trouble, which unfortunately had considerably hampered his botanical work. Marloth was the last of a small circle of South African botanists whose activities were greatest towards the close of last century. Although more or less contemporary with Bolus, MacOwan and Medley Wood, his work shows ample evidence of more modern methods of botanical research. Where Marloth differed from them was mainly in his field work. Although sometimes an indifferent collector, he was a very acute observer of plants in the field and of all biological phenomena connected with them. In addition he was by profession an analytical chemist and an expert photographer.

In the course of his professional duties Marloth travelled widely in the Union. He thus had many opportunities for collecting plants and became acquainted with many members of the farming community. His opinion was sought on wide and varied subjects,

even including handwriting as an indication of character. His "Dictionary of the Common Names of South African Plants" contains some 2000 records of vernacular names and is particularly useful to the overseas visitor, since the Dutch have a name for most of the more conspicuous and useful plants.

Marloth's *Magnum Opus*, his "Flora of South Africa," was planned to appear in four volumes, three of which have been published, the first in 1913, and the last, we understand, was ready for press at the time of his death. This work is illustrated with a large number of coloured plates and photographs, and although not a complete *Flora*, it serves admirably as an introduction to the wonderful and peculiar vegetation of Southern Africa.

Another important publication was his "Das Kapland," which gives a general phytogeographical account of the vegetation of South Africa. This classical work is profusely illustrated by beautiful photographs and drawings.

When the Botanical Survey of the Union was inaugurated in 1918, Dr. Marloth was appointed in an honorary capacity as representative at the Cape. Some years later he was made officially responsible for this region on condition that his private herbarium should eventually accrue to the State. This herbarium is rich in succulent plants, especially from Namaqualand, supplemented by excellent photographs and biological notes, and will form a valuable addition to the National Collection at Pretoria.

Dr. Marloth was President of the Botanical Section of the South African Association for the Advancement of Science at Cape Town in 1903, and President of the Association at Kimberley in 1914. He pursued his favourite subject right up to the time of his death, and was very helpful to the present writer on his tour in South Africa in 1928-9, when he accompanied him for some days through the Little Karoo.

J. H.

SPENCER MOORE.—The death on March 14th of Mr. Spencer le Marchant Moore at the advanced age of eighty breaks one of the last links with the past generation of systematic botanists.

Moore had been engaged in botanical work for well over half a century, his first published paper, containing descriptions of new Chinese Phanerogamia, having appeared as long ago as 1875. He was on the staff at Kew in the Herbarium from 1872 to 1880, and after working privately from 1880 to 1898, accepted a post as part-time assistant in the Department of Botany, British Museum (Natural History), which he retained till his death. He visited Matto Grosso, Brazil, in 1891-2, and Western Australia in 1894-6, the botanical results of these two expeditions appearing respectively in the *Transactions and Journal (Botany)* of the Linnean Society. In later years he worked chiefly at the Gamopetalae, especially those of Australia and Tropical Africa, and was a recognised authority on certain groups of Compositae.

International Address Book of Botanists.—This compilation, to which attention was drawn in K.B. 1930, p. 499, is now nearing completion, and it is expected to be published in the autumn. The contents consist of Geographical Indices in English, French, and German, in which the countries are grouped under continents; Indices of Botanists, Societies, Universities, etc. and Institutions arranged alphabetically by countries; and an Index of Personal Entries to facilitate reference to the body of the work. It is estimated that there will be more than 13,000 entries.

The Committee appointed by the Fifth International Botanical Congress, 1930, to carry out this work have been fortunate in securing the co-operation of a number of collaborators, who have collected the relevant information for their respective countries.

The low price at which it has been possible to publish the book is due to the assistance the Committee has received from the Bentham Trustees and from a grant from the Carnegie Corporation of New York.

The publication of the work has been undertaken by the Bentham Trustees, who have entrusted its issue to Messrs. Baillière, Tindall and Cox, 7 and 8 Henrietta Street, Covent Garden, London, W.C.2, to whom all orders should be addressed. The price will be 12s. 6d., postage 6d. (U.S.A. and Canada \$3.25).

Java Cacao.—The high position held by Java cacao in the cacao markets of the world and the importance of the variety grown on the quality of the product and its market value have recently been the subject of an interesting article by no less an authority than Dr. C. J. J. van Hall.* The author points out that the fine quality of Java cacao is undoubtedly due to its strong Criollo characteristics. In considering the types of cacao at present grown in the various cacao-producing countries of the world, he shows how the tendency in many has been for the Criollo type, where originally grown, to be supplanted by Forastero or types that are predominantly Forastero. Where this has occurred it is noticeable that a lowering of the average or relative price of the exported beans has always resulted. Trinidad is quoted as an example where this has taken place. The author uses these arguments as a plea to planters in the Dutch East Indies to refrain from establishing trees other than those with marked Criollo characteristics if their present enviable position is to be maintained. The figures furnished of cacao prices over a period of years show how the price of Java cacao—considered always a superior or luxury grade—is generally more than double or even three times the price realized by West African and certain other grades. An additional advantage is that the price of the higher

*"De Herleving van de Cacaocultuur in Ned.-Indië en de Invoer van Cacao-Variëteiten uit andere Landen," Dr. C. J. J. van Hall. Berichten van de Afdeling Handelsmuseum van de Kon. Vereeniging Koloniaal Instituut No. 58, pp. 9 (Druk J. H. de Bussy, Amsterdam, 1931). Price F.0.40.

grade article is fairly stable and not subject to the ups and downs that characterise the cheaper sorts.

An account of the varieties better known to the cultivators in Java is given, which includes an account of the origin and history of the now well-known "Djati-Roenggo Hybrid." This arose as a result of hybridization of a single Forastero tree (imported by an estate manager in Java in 1888 from Venezuela as "Caracas cacao") with the true Criollo then existing in Java. Fortunately, this hybrid possessed a preponderance of Criollo characters. Up to about 1900 Java cacao consisted of more or less pure Criollo, but after that date beans of a more hybrid or mixed nature began to be marketed. Reference is made in the article to the decline of interest in cacao cultivation in Java that took place with the advent of *Hevea* rubber, but it is stated that a distinct revival of interest is now noticeable.

F. N. H.

Ramie.*—Among recent numbers of "Die Tropenreihe" series is a brochure devoted entirely to the cultivation and production of Ramie fibre. From it a good insight is obtained into present-day developments with Ramie in the Argentine. The author is careful to distinguish between "white" and "green" Ramie, which he refers to as *Boehmeria nivea* Hk. et Arn. and *Boehmeria utilis* Bl. respectively. The distinguishing characters and the respective cultural requirements of both species are outlined. An important chapter is that relating to fibre-treating machinery, especially as many of the newer and more successful machines are described and illustrated. Numerous photographs of the industry in South America—taken by the author—occur in the text, and a large bibliography, which adds considerably to the value of the publication, is appended.

Imperial Institute Annual Report, 1930.—The Annual Report of the Director for 1930 will interest not only those who are familiar with the work of the Imperial Institute, but also those who are unaware of its recent activities and developments.

The first part of the Report summarises the work of the several Advisory Technical Committees of the Plant and Animal Products Department, the value of whose assistance the Director emphasises in his Introduction to the Report. It also deals with investigations carried out by the Imperial Institute in connection with matters relative to the work of these Committees, as well as enquiries from overseas countries which required technical and commercial information in connection with plant products and industries.

The second part of the Report similarly deals with the Mineral Resources Department.

*"Die Ramiekultuur," von Prof. Dr. Kempfski, Landwirtschaftlicher Sachverständiger, Buenos Aires: Die Tropenreihe No. 35, pp. 116, ill. 50. (Tropenverlag—Fr. W. Thaden, Hamburg, 1931. Price 2M.)

An account is also given of the improvements which have been effected in the various Dominion and Colonial Courts of the Exhibition Galleries. A notable feature in this is the large number of additional panoramas which have been set up, illustrating various industries. The fact that many of these have been presented by various public and other bodies connected with overseas parts of the Empire, indicates the value placed on this type of exhibit. More than 370,000 people attended the Cinema for which the Empire Marketing Board is financially responsible.

Mention might also be made of the excellent reference library which is maintained at the Imperial Institute. The additions to the library during the year were 4466 books, including official reports and pamphlets. This figure does not include 740 periodicals which are regularly received.

Abies Pinsapo.—An interesting treatise on the Spanish Fir* has recently been published by M. A. Barbey, a grandson of Edmond Boissier who first discovered and described the species nearly a hundred years ago. The work treats in detail with the history and the peculiarly localized distribution of *Abies Pinsapo* in the mountainous districts round Ronda in South Spain, in which region it is endemic. Various aspects of the ecology of the species are dealt with and the concluding portion is devoted to insects known to attack the species. The numerous photographs are an important feature of the work. Some of them illustrate only too vividly the harmful influence on the species of the herds of goats that abound in those areas.

F. N. H.

Flora of the Presidency of Madras.†—Part ix of this work has appeared. It comprises the families from *Commelinaceae* to *Cyperaceae*, leaving only the *Gramineae* to be dealt with. One new genus, 9 new species (described in the *Kew Bull.* in 1928, 1929, 1930, and 1931), 5 new varieties and 6 new combinations are included. The present part contains 155 pages as against an average of 196 and the price has been correspondingly reduced.

Welsh Timber Trees.‡—In the Preface to this work by Mr. H. A. Hyde, Keeper of the Department of Botany, National Museum of Wales, we are informed that "it is the first of a series of projected

* A travers les Forêts de Pinsapo d'Andalousie, Paris, Librairie Agricole de la Maison Rustique, 1931, pp. 110, plates 41.

† Flora of the Presidency of Madras, J. S. Gamble, Part ix, by C. E. C. Fischer. Published under the authority of the Secretary of State for India in Council. Adlard & Son, Ltd., 21, Hart Street, London, W.C., 1931. Price 6s. 8d. or Rs. 4. As. 8.

‡ Welsh Timber Trees: Native and Introduced, by H. A. Hyde. Published by the National Museum of Wales and by the Press Board of the University of Wales, Cardiff, 1931, pp. viii+107, 21 text figures, 3 maps and 25 full-page plates. Price 1s.

Museum publications dealing with the Botany of Wales." Such a series will doubtless be greatly appreciated and be of considerable value to teachers and all who are interested in Nature. That the first of the series should deal with trees and their commercial importance is appropriate at a time when so much attention is being paid to afforestation, and those who use Mr. Hyde's book can soon familiarise themselves with the commoner native and exotic trees used for commercial planting, not only in Wales but in the whole of the British Isles. In an Introduction of several pages the author gives a botanical description of a tree, refers to the tree flora of Wales, directs attention to Welsh specimen trees, Welsh vegetation, etc. He then gives a short review of Welsh forestry, describes wood structure and then passes on to descriptions of the chief timber trees and their uses. Each subject is described in easily understood language with a minimum of scientific terms, and is accompanied by excellent photographs of trees, and drawings, made from nature by Miss E. A. Jenkins, of shoots, flowers, and fruits of the species described. The work concludes with an excellent Bibliography and Index.

As the book is priced at the modest figure of one shilling it is within the reach of everyone. Although primarily written for the people of Wales the book will be found to be equally useful to people in other parts of the British Isles. As it is a Welsh publication the common name of some of the trees is given in Welsh as well as in English; thus, amongst others, Hornbeam has its equivalent Oestrwydden, and the Beech, Ffawyddden.

W. D.

Perpetual Carnations.*—Although not written for the commercial or expert cultivator, this handbook is full of pointers and reminders for the experienced grower. For the tyro the whole routine of carnation growing is fully explained, the author, although a commercial grower of long experience, having the faculty of understanding the difficulties of the beginner.

Besides dealing with the various phases of carnation growing, including insect pests and diseases, the book includes a monthly calendar of work for the year.

*Perpetual Carnations: a Handbook to their Cultivation, by Laurence J. Cook. Ernest Benn, Ltd., Bouverie House, London, 1931, pp. 104, figs. 20. Price 3s. 6d. nett.

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THOMAS FORD CHIPP.

LVIII.—THOMAS FORD CHIPP.

In the brief notice of the death of Major Chipp, published in *Kew Bulletin* No. 7 as it was going to press, a fuller account of his many activities was promised, and in the following notice an attempt is made to appreciate all he achieved, more particularly by publishing some of the tributes to his work which have been received from those with whom he was closely associated.

Chipp devoted himself to Kew, and in his many external activities, as well as in his immediate duties as Assistant Director, the welfare of the establishment was his first thought. His work at Kew was characterised by great thoroughness and by close attention to detail. He almost always started the day by making a tour of the Gardens or visiting some particular portion before breakfast, and thus became well acquainted not only with the collections but also with all the members of the Gardens staff. His interest in the welfare of the Student Gardeners was greatly appreciated by them, since they realised they could always discuss their affairs with him and receive sympathetic consideration and often valuable advice. His personal interest in them and in their work, both in class and in the Gardens, was continued when their training was completed. Many expressions of deep sorrow have reached Kew from old Kewites stationed throughout the world.

His application to duty and determination to advance in his profession should be a source of inspiration to all young Kewites. He was always ready to assist their Mutual Improvement Society by giving special lectures, which were looked forward to with pleasurable anticipation; for his grasp of whatever subject he happened to be dealing with and his clear, forceful and lucid style rendered it a pleasure to listen to him. He also took an active part in the affairs of the Kew Guild, holding the office of Chairman of the Committee for a time.

In short he took a live interest in all the various activities of the establishment, and the recollection of his cheery presence and hearty early morning greeting will long be treasured as a pleasant memory by all who came in daily contact with him.

It was not until the late autumn of 1928 that Chipp had the opportunity of paying an official visit overseas in connection with the Empire Marketing Board's grant to Kew for this purpose. During the winter of 1928-29 he was deputed by the Director to

visit the Sudan and Cyprus, on the invitation of the respective Governments, to advise on agricultural and horticultural problems. While in the Sudan he was able to visit the little-known Imatong Mountains, on the Uganda border, and made some interesting discoveries, which were published in the *Kew Bulletin* 1929 (pp. 177-197). His visit to Cyprus led to the sending over of three young Cypriot horticulturists to undergo a course of horticultural and botanical training at Kew and thus widened the sphere of Kew's activities. On his way home he visited Sicily and studied the Sumach and Citrus industries in the island.

In 1930, after participating as a Delegate in the French Centenary Celebrations in Algeria, he was invited by Mrs. MacIver to join her expedition to explore the western mountains of the Hoggar Massif of the Central Sahara. On this expedition Chipp displayed his usual energy, and endured considerable hardships and difficulties of transport. Papers on these two African journeys were published in the *Geographical Journal*, as mentioned below by Mr. Hinks.

Chipp was a keen Fellow of the Royal Geographical Society and a constant attendant at the meetings of the Society. Mr. A. R. Hinks, the Secretary, writes as follows:—

"Our friend Chipp gave this Society one excellent paper, 'Forests and Plants of the Anglo-Egyptian Sudan' (G.J. 75 (1930) pp. 123-143), and he wrote also a little later a valuable note for the *Journal* on 'The Vegetation of the Central Sahara' (G.J. 76 (1930), pp. 126-137), which was published but not read at one of our meetings. He gave us also an admirable Christmas lecture to young people which was not published—Christmas lectures never are. These were his actual contributions to the publications of the Society. He was always most ready to help in every way possible and we had the advantage of his advice in preparing the forthcoming new edition of our 'Hints to Travellers.'

"He was a member of the Geographical Club and one of the most constant attenders at the Dinners, at which he will be very greatly missed, for I know no member whose company was more sought and appreciated. I wish that I could find words to give you a better account of how much he was valued in our Society."

Chipp was a member of the Colonial Office Forestry Examining Board, and also often had to assist the Director in giving advice to the Colonial Office about candidates applying for positions in the Colonial Service. The following extract from a letter to the Director, from Major R. D. Furse, the Director of Recruitment, Colonial Office, is a very fine tribute to this side of his activities:—

"You know, as well as I do, the immense amount of unselfish and valuable work that Chipp has done for us ever since he went to Kew, particularly in advising us about the qualifications of candidates for certain branches of the Colonial Service and their fitness for specific posts. In addition he gave us valuable help in connection with the Forestry Examining Board from the time it started until

his death. Others, I know, are writing of this, but I should like to mention one aspect of his work on that Board, which I was perhaps in a better position to see than anyone else, and which was very typical of the man. Every year I noticed that it was Chipp who voluntarily, but quite unobtrusively, took on the main share of the burden of all the tiresome detail of preparation and organisation, which was necessary to success. He did it very quietly, very unselfishly and very thoroughly. Nothing was left out.

"I think it was that quality of undeviating thoroughness and unsparing devotion to duty which impressed me most about Chipp. Nothing ever seemed to be too much trouble for him, and one could never call on him for help without getting it in full measure, and ungrudgingly given, however busy he was. It is not for me to try to give an appreciation of his character as a whole, but no one could work with him, even to the limited extent that I was privileged to do, without feeling the better for having come in contact with a man who was so strong, and so capable and so devoted, and who carried about him the atmosphere of serenity and happiness which is the hall-mark and the reward of such men."

Mr. Fraser Story has also sent the following sympathetic note of Chipp's work for the Forestry Commission, in which he always took the keenest interest:—

"The Forestry Commissioners in common with all who have been associated with Dr. Chipp in his active and remarkably useful career wish to express their profound regret at the loss which forestry has sustained by his untimely death. He was extremely sympathetic with the aims of the forestry movement and helpful in advancing the work.

"In a brief categorical account it is impossible to say much about Chipp's general influence, but it should be realised that this was very considerable and was always so practical and well directed that it proved exceedingly effective. With his scientific and technical knowledge, strength of character and splendid sense of duty, personal contact was in his case a very important factor for good.

"A definite instance of Chipp's helpfulness to the Commissioners was furnished last February when, although hard pressed for time, he undertook to report on a paper dealing with a forestry research subject of considerable length and complexity which had been submitted to the Commissioners with a view to publication. Chipp's report entailed careful study, and the criticism and advice offered were most valuable and showed how painstaking had been the examination of the material.

"In connection with forestry discussions at the meetings of the British Association, Chipp rendered extremely useful service in contributing papers and assisting in the general organisation of the Forestry Sub-Section.

"Another of Chipp's activities was in connection with the Forestry Examining Board of the Colonial Office, and the Commissioners are informed that the work which Chipp performed from the inception of the scheme of examinations in 1925 up to 1931 was of utmost value and most highly appreciated. Chipp was Chairman of the Board in 1928 and 1930, and it was characteristic of him that in the present year, in order again to place his services at the disposal of the Colonial Office, he declined to take part in an attractive botanical expedition in Central Europe which he had been invited to join.

"Much though he did for forestry in connection with Government Departments, it was to the Empire Forestry Association, which is an unofficial body, that Chipp devoted most of the time he could spare for this subject. The work seemed to have a special appeal for him and from the commencement of his appointment as Assistant Director at Kew he took an active interest in the Association's affairs. He was a member of the Governing Council from 1923 to 1929 and Vice-Chairman during part of that period. He served on the Publications Committee from 1923 onwards and was Chairman of that Committee for the last three years. In addition to many reviews, particularly those of forestry books and periodicals relating to Africa, Chipp contributed the following articles to the *Empire Forestry Journal* issued by the Association:—'The Gold Coast Forestry Problem,' 'The Value of an Arboretum,' 'Federated Malay States: Forest Conference,' and 'A Tour of the Anglo-Egyptian Sudan.'"

Chipp was also a valued member of the Imperial Institute Advisory Committee on Timbers, as the following note from the Secretary of the Committee testifies:—

"Major Chipp was appointed to the Imperial Institute Advisory Committee on Timbers in January 1929, and took an active interest in their work. His forestry experience had impressed upon him the importance of the correct botanical identification of timbers offered on the market, and this led to his proposing the formation of a standard collection of Empire woods, correctly named, with timber and botanical specimens from the same tree. His proposal was cordially adopted by the Committee, in association with the Empire Timbers Committee (Department of Scientific and Industrial Research), and transmitted to the Standing Committee on Empire Forestry with a view to the subject being placed on the Agenda of the next Empire Forestry Conference. Major Chipp's last contribution to the Committee's work was a suggestion that attention should be given to the commercial possibilities of a number of light woods occurring in West Africa."

He was also Secretary of the Association of Economic Biologists, and it was with great regret that he resigned the office, after serving for a year, on account of the work entailed by the forthcoming International Botanical Congress. Dr. Imms writes as follows:—

"My late friend, Chipp, was one of the most energetic and successful secretaries this Association could have wished for. When he decided to resign his position as General and Botanical Secretary, after only holding the office for a single year (1927), everybody viewed the decision with general regret. Heavy duties attendant upon the (then) forthcoming Botanical Congress decided his resignation. His business efficiency, cheery personality and tact in dealing with everybody he came in contact with made him a most popular secretary."

His work in connection with the British Empire Vegetation Committee was a subject in which he took the deepest interest and to which he devoted very much of his own time after he had completed his official duties. Prof. Tansley, with whom he was so closely associated in this work, has sent the following account detailing the importance of Chipp's work in this direction:—

"In 1924 the First Imperial Botanical Conference was held in London. It seemed to some of us that the opportunity ought not to be missed 'for discussion among Botanists from different parts of the Empire on the very important subject of what could and should be done to advance and consolidate our knowledge of the plants and vegetation which form one of the greatest imperial assets.*' In the effort to organise an adequate consideration at the Conference of the problems concerned with the vegetation, as distinct from the flora, of the Empire, Chipp was very deeply interested and, working in the closest collaboration with Prof. Tansley (who was residing abroad for the nine months immediately preceding the Conference), took upon his shoulders the whole of that portion of the work of preparation which could only be done in England. To the work of the Conference itself he made more than one important contribution.

"The section of the Conference dealing with this subject was highly successful and concluded with the passing of several resolutions,† among which one established a Committee (the British Empire Vegetation Committee) to carry into effect such of the remaining resolutions as could be given practical effect in this way. Of this Committee Chipp was Secretary from its inception in 1924 to the time of his death. Its work lay very close to his heart and his services were invaluable. The first work of the Committee was the preparation of 'Aims and Methods in the Study of Vegetation,' which was completed and published in 1926. In this again Chipp collaborated with Professor Tansley, and his wide and thorough knowledge of the official botanical organisation of the Empire as well as his personal experience as a forester in Malaya and West Africa, added immensely to the value of the book, to which he contributed an important chapter. He also most efficiently organised its distribution throughout the Empire, so that the book reached those for whom it was primarily intended in the shortest possible time.

*Report of the Imperial Botanical Conference, 1924 (Cambridge University Press, 1925), p. 240.

†Ibid: Resolutions 7 to 13, pp. 383-384.

"The next work of the Committee was to arrange for the production and publication of citations and summaries of all current work on Empire vegetation, and the regular publication of these under the name of British Empire Vegetation Abstracts began (in the Journal of Ecology) in 1928. Here again Chipp's organising ability and the punctuality and accuracy with which he invariably carried out all his undertakings were of the greatest value.

"The third task of the Committee was the organisation of the production and publication of a series of Handbooks on the vegetation of the various Dominions, Colonies, Protectorates and Mandated Territories. This extensive undertaking was discussed at the short Second Imperial Botanical Conference in 1930, and a scheme was drafted by the Committee. Chipp himself was to have started on the first handbook (West Africa) in the coming Autumn.

"It is indeed difficult to know how the work is to be carried out now that he has gone."

Finally Chipp's labours as Co-Secretary with Mr. F. T. Brooks of the Fifth International Botanical Congress, held at Cambridge last year, must be recorded, and this can best be done in Mr. Brooks's own words:—

"As one of the two joint Secretaries of the Fifth International Botanical Congress, Chipp was an ideal colleague. He never spared himself in this work and nothing was too much trouble for him. His great organising ability, his capacity for looking ahead, and his attention to detail were of supreme value to the Congress. His promptitude was amazing, and he was quite distressed if he could not answer an enquiry by return of post. Above all, his cheerful personality and greatheartedness were a constant inspiration to his colleague. All who came into contact with him during the Congress were loud in their praise of his charm of manner and unfailing helpfulness. Subsequently, Chipp was appointed joint Editor of the Congress Report. He threw himself into this work with characteristic enthusiasm and laboured unceasingly to make the Report worthy of the occasion. The Report was nearly ready for publication when death overtook him."

The following extract from the Preface to the Report of the Proceedings of the Fifth International Botanical Congress is reproduced by kind permission of Professor Seward:—

"Members of the Congress who were privileged to enjoy the friendship of Dr. Chipp or to make his acquaintance in August of last year will realise the greatness of the loss which our Science has suffered through his sudden death, at the age of 45, on June 28 last. By his untiring energy, his unfailing kindness, his natural gaiety of spirits, and most of all by his lovable character, Dr. Chipp won the affection of all with whom he came in contact. He made his way in the world by ability and determination, and as Assistant Director of the Royal Botanic Gardens, Kew—a position to which he was appointed in 1922, he fully justified the confidence placed in him

by those in authority and fulfilled the promise of his earlier years. Our sympathy goes out to the widow and children of a man whose personality will always be one of the most highly prized memories of his fellow botanists. The success of the Fifth International Congress was in no slight degree due to the splendid co-operation of Dr. Chipp with his brother Secretary in the manifold duties inseparable from a large international assembly."

The following letter to the Director from a botanist in Washington, D.C., indicates the feelings expressed by many of our colleagues overseas:

"I am sorry to have been so long in writing just a word to express my very sincere sympathy in the loss which Kew and you personally have sustained in the death of Major Chipp. The news was slow in reaching me, and even now it is almost impossible for me to realise the fact of his death, though it comes often to mind. The reason is of course one that you will have heard from scores of his friends—his abounding good spirits and apparently superb vitality, which seemed to be based on the enjoyment of perfect health. Out of all the botanists gathered in England last summer, he would be the last to go, I should have said.

"After the Congress was over, I saw rather more of him than before. I was feeling decidedly under the weather myself and his unbounded good spirits and genial hospitality did me a world of good. I have never known anyone with a finer instinctive capacity for drawing people to him as friends, and I shall always believe that the friendly spirit prevailing in the Cambridge meetings was due in great measure to his unconscious influence. In spite of a thousand demands upon his time, he was invariably patient and helpful, and of him I have heard nothing but the highest praise.

"These are things that I know about, myself, but as to what his loss means to you personally, I can only guess, though I am sure that he brought into his official relations the same whole-souled loyalty and quick perceptions that were so evident otherwise. The traits of personality and character which made Chipp such a delightful companion, host, and friend stand out very sharply in my memory, making me regret very strongly that, busy though he invariably was, I did not make a greater effort to see more of him than I did."

The preparation and publication of a new International Address-Book of Botanists, decided upon by the Congress, was entrusted to an International Committee consisting of Chipp, Prof. Diels of Berlin, and Dr. Merrill of New York. A great deal of the work of collecting information, and almost all the labour of final collation and the arrangements for publication, were carried out by Chipp with his usual ability, and the work is now in the printers' hands.

The following list enumerates Chipp's more important contributions to Botany and Forestry:—

A revision of the genus *Codonopsis* Wall. (Journ. Linn. Soc. Bot. xxxviii, pp. 374-391, 1908).

(With T. A. Sprague) *Entandrophragma* (key to species; Kew Bull., 1913, pp. 63-64).

Mahogany borers of the Gold Coast (Kew Bull., 1913, pp. 72-75).

The reproduction of *Musanga Smithii* (Kew Bull., 1913, p. 96).

A list of trees, shrubs and climbers of the Gold Coast, Ashanti and the Northern Territories. 1913.

A list of the herbaceous plants and undershrubs of the Gold Coast, Ashanti and the Northern Territories. 1914.

Edited the Gardens' Bulletin, Straits Settlements, Vol. ii, nos. 6-11, 1920-21. He contributed about thirty short articles to it during that period. Two of the more important are: (1) A host index of fungi of the Malay Peninsula, vol. ii, 1920, pp. 231-238 and 276-282; (2) A list of the fungi of the Malay Peninsula, vol. ii, 1921, pp. 311-315.

Danger from Forest destruction on the Ejura and Mampong scarps (Journ. Gold Coast Agric. & Comm. Soc. vol. i, pp. 131-136, 1922).

Buttresses as an assistance to identification (Kew Bull. 1922, pp. 265-268).

The Forest Officers' handbook of the Gold Coast, Ashanti and the Northern Territories. 1922. (Includes thesis for Ph. D.)

Notes on Upper Guinea Flacourtiaceae (Kew Bull., 1923, pp. 265-266).

New species of *Rinorea* from West Africa (Kew Bull., 1923, pp. 289-299).

The Gold Coast forestry problem (Empire For. Journ., vol. ii, pp. 65-75, 1923).

The value of an arboretum (Empire For. Journ., vol. iv, pp. 168-186, 1925). (Paper read before the Forestry Subsection of the British Association, Southampton, 1925.)

(With A. G. Tansley—Editors) Aims and methods in the study of vegetation. 1926. (A chapter contributed by T. F. Chipp.)

The Gold Coast forest: a study in synecology (Oxford Forestry Memoirs, No. 7, 1927). (Thesis for D.Sc.)

The Imatong Mountains, Sudan (Kew Bull., 1929, pp. 177-197). Illustrated.

A tour of the Anglo-Egyptian Sudan (Empire For. Journ., vol. viii, pp. 37-44, 1929).

Contributed a "vegetation map and notes on vegetation belts" to D. A. Bannerman's "The Birds of Tropical West Africa," pp. xxix-xlv. 1930.

Forests and plants of the Anglo-Egyptian Sudan (Geogr. Journ., vol. lxxv, pp. 123-143, 1930). Illustrated.

The Vegetation of the Central Sahara (Geogr. Journ. vol. lxxvi, pp. 126-137, 1930). Illustrated.

The Vegetation of Northern Tropical Africa (Scottish Geographical Magazine, pp. 193-214, 1931). Illustrated.

LIX.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXXII.

Oldenlandia comata Craib [Rubiaceae-Hedyotideae]; ab *O. dichotoma* Koenig calycis segmentis multo longioribus distinguenda.

Herba annua, 23-27 cm. alta, caule erecto supra medium ramoso angulato praecipue ad angulos puberulo-scaberulo ad 1.5 mm. diametro. *Folia* opposita, lanceolata angustave lanceolata, apice acuta, basi cuneata, 3-6 cm. longa, 0.6-1.1 cm. lata, rigide membranacea, sicco subviridia, subtus pallidiora, supra setulis sparsis scaberula, subtus praecipue ad costam nervosque laterales similiter scaberula, costa supra conspicua saepe pallida subtus prominente, nervis lateralibus utrinque circa 5 subtus conspicuis, margine parum recurva, ciliolata, petiolo 2-5 mm. longo suffulta; stipulae breves, pilis rigidis instructae, apice pluri-fimbriatae. *Cymae* et terminales et ex axillis supremis ortae, pedunculo communi incluso circa 6 cm. longae; pedicelli usque ad 2.5 mm. longi sed saepissime breviores; bracteae parvae, deciduae. *Receptaculum* circa 0.5 mm. longum, glabrum. *Calycis* segmenta 4, lanceolata, acuta, ad 1.5 mm. longa, ciliolata. *Corollae* tubus 1.5 mm. longus, intra pilosus, lobi 4, oblongi, obtusi, 2 mm. longi, ad 1 mm. lati, intra pilosi. *Stamina* 4, antheris parum exsertis 1 mm. longis, filamentis gracilibus apicem versus corollae tubi insertis antheris paulo brevioribus. *Stylus* glaber, stigmatibus duobus brevibus inclusis paululo ultra 3 mm. longus. *Capsula* parum compressa, receptaculo paulo longior, calycis segmentis coronata, apice loculicide dehiscens.

Saraburi, Muak Lek, Put 1858.

Oldenlandia gracilipes Craib [Rubiaceae-Hedyotideae]; ab *O. diffusa* Roxb. pedicellis elongatis recedit, *O. Hornerianae* Miq. facie parum similis, sed ramulis gracilioribus haud conspicue angulatis differt.

Herba copiose ramosa, caule inferne indurato paululo ultra 1 mm. diametro, ramulis gracilibus compressis haud acute angulatis primo puberulo-scaberulis mox teretibus glabris. *Folia* opposita, linearia, acuta, 1.7-2.5 cm. longa, margine revoluta ad 1 mm. lata, rigida, sicco subviridia, subtus pallidiora, supra setulis brevibus scaberula, costa supra parum impressa subtus prominente, sessilia. *Flores* punicei (ex *Kerr*), in cymas saepissime trifloras ramos et ramulos breves laterales terminantes saepissime dispositi, interdum etiam solitarii, axillares; pedunculus communis haud evolutus; pedicelli graciles, 7-17 mm. longi, glabri. *Receptaculum* haud 1 mm. longum, glabrum. *Calycis* segmenta 4, receptaculo breviora, rarissime paulo longiora, glabra. *Corolla* campanulata; tubus circa 4 mm. longus, dorso glaber, intra pilis brevibus in series 4 longitudinales cum lobis alternantes dispositis instructus; lobi 4, late lanceolati, acuti, circa 2.5 mm. longi, intra puberuli. *Filamenta* brevia, ad corollae tubi apicem inserta, antheris exsertis circa 1.25 mm. longis. *Stylus*

*Continued from K.B. 1931, p. 280.

glaber, 5 mm. longus, stigmatibus duobus revolutis. *Capsula* subglobosa, circa 1.75 mm. longa, calycis segmentis coronata, apice loculicide dehiscens, glabra.

Chantabun, Taruāng, 200 m., savannah, *Kerr* 9720.

Oldenlandia Lakshnakarae Craib [Rubiaceae-Hedyotideae]; ab *O. ovatifolia* DC. antheris duplo longioribus, ab *O. Marcanii* Craib corollae lobis et antheris brevioribus et foliis haud glabris recedit.

Herba annua, erecta, inflorescentia inclusa 3–10 cm. alta, caule brevi pubescente vel piloso, saepissime inferne folia duo opposita et apice folia 4 verticillata gerente. *Folia* inferiora parva, demum decidua, superiora oblonga vel ovato-elliptica, 1–4 cm. longa, 0.6–1.8 cm. lata, rigide membranacea, sicco viridia, subtus pallidiora, supra marginem versus sparse breviter setulosa, aliter glabra, subtus ad costam nervosque laterales pubescentia, costa supra conspicua subtus prominente, nervis lateralibus utrinque 4–5 supra conspicuis vel subconspicuis subtus subprominentibus, margine setuloso-ciliata, breviter petiolata. *Pedunculi* terminales, solitarii vel interdum gemini, puberulo-scaberuli; bractae parvae; pedicelli 3–7 mm. longi, fere glabri. *Receptaculum* 0.5 mm. longum, glabrum. *Calycis* segmenta 4, deltoidea, subobtusata, receptaculo subaequilonga. *Corolla* alba (ex *Lakshnakara*); tubus 0.5 mm. longus; segmenta 4, suboblonga, acuta, 2.5 mm. longa, 1 mm. lata, intra inferne pilis transverse septatis longe pilosa. *Filamenta* ad corollae tubi apicem inserta, 1.5 mm. longa, glabra, antheris 1 mm. longis. *Stylus* 3 mm. longus, puberulus, stigmatibus breviter lobato.

Chaibadan, evergreen forest, *Lakshnakara* 275.

Oldenlandia lanceolata Craib [Rubiaceae-Hedyotideae]; ab *O. comata* Craib pedicellis elongatis filiformibus, calycis segmentis brevioribus distinguenda.

Herba ramosa, caule inferne indurato ad 1.5 mm. diametro primo angulato sicco pallide viridi demum subterete sicco pallide brunneo glabro. *Folia* opposita, lanceolata vel latius lanceolata, apice acuta, basi attenuato-cuneata vel cuneata, interdum acuminata, 1.5–4.2 cm. longa, 0.5–1 cm. lata, membranacea, sicco viridia vel plus minusve brunnescentia, subtus parum pallidiora, supra puberulo-scaberula, subtus subglabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 6 supra vix conspicuis subtus conspicuis vel subprominulis, petiolo 7–15 mm. longo suffulta; stipulae breves, persistentes, apice longius pauci-fimbriatae. *Flores* albi (ex *Kerr*), in cymas et axillares et terminales paucifloras foliis saepissime duplo longiores dispositi praetereaue floribus solitariis axillaribus saepe additis; pedicelli graciles, 7–15 mm. longi; bractae parvae, deciduae. *Receptaculum* breve, glabrum. *Calycis* segmenta 4, lineari-lanceolata, acuta, 1.25 mm. longa, glabra. *Corollae* tubus 2.5 mm. longus, apice pilosus, lobi 4, oblongo-lanceolati, tubo paululo longiores. *Stamina* 4, exserta; filamenta 1.5 mm. longa, ad corollae tubi apicem inserta; antherae circa 0.8 mm. longae. *Stylus*

gracilis, 3 mm. longus, stigmatibus brevibus. *Capsula* receptaculo paulo longior, 2.5 mm. longa, 3.5 mm. lata, apice loculicide dehiscens, calycis segmentis persistentibus.

Saraburi, Hin Lap, 200 m., crevices of limestone rocks, *Kerr* 9134.

Oldenlandia Marcanii Craib [Rubiaceae-Hedyotideae]; ab *O. ovatifolia* DC. antheris multo longioribus inter alia distinguenda.

Herba annua, erecta, inflorescentia inclusa 4–12 cm. alta, caule angulato breviter pubescente vel scaberulo apice folia 4 verticillata et basem versus saepissime tantum duo opposita gerente. *Folia* inferiora saepissime ovata, circa 5–7 mm. longa, petiolo 2–3 mm. longo suffulta, mox decidua, suprema inter se interdum inaequalia, interdum aequalia, oblonga vel oblongo-ovata, apice rotundata, apiculata, basi cuneata, haud rarius fere rotundata, 2–5.3 cm. longa, 1.5–2.5 cm. lata, rigide membranacea, sicco viridia, subtus parum pallidiora, pagina utraque glabra vel superiore marginem versus sparsissime brevissime setulosa, costa supra conspicua subtus subprominente, nervis lateralibus utrinque 4–5 pagina utraque conspicuis, petiolo brevi vel vix distincto suffulta; stipulae breves. *Pedunculi* terminales, solitarii, rarissime gemini vel per tres, nudi, glabri vel inconspicue puberuli, angulati, 2–6 cm. longi, apice parvi-bracteati, bi- vel tri-furcati; pedunculi partiales ad 2.5 cm. longi; bractae circa 1 mm. longae; pedicelli saepissime 3 mm. longi. *Receptaculum* 0.5 mm. longum, glabrum, pallide maculatum. *Calycis* segmenta 4, oblongo-lanceolata, subacuta, receptaculo subaequilonga, ciliolata. *Corolla* alba (ex *Marcan*); tubus 0.75 mm. longus; segmenta 4, oblongo-linearia, subacuta, fere 4 mm. longa et 1 mm. lata, intra inferne pilosa. *Stamina* 4, filamentis ad corollae tubi apicem insertis 2 mm. longis glabris, antheris circa 1.8 mm. longis. *Stylus* 4.5 mm. longus, glaber, stigmatibus bilobulato.

Kanburi, Sai Yok, 250 m., limestone hill, *Marcan* 2376.

Oldenlandia viarum Craib [Rubiaceae-Hedyotideae]; ab *O. dichotoma* Koenig partibus omnibus et praecipue fructu maioribus recedit.

Herba erecta, 11–22 cm. alta; caulis simplex vel e basi ramosus, cum ramulis angulatus, sicco viridis, ad angulos pallidus et ibi puberulo-scaberulus, circa 1 mm. diametro. *Folia* opposita, lanceolata angustave lanceolata, apice acuta, basi cuneata, 2–4.2 cm. longa, 2.5–6 mm. lata, chartacea, sicco viridia, subtus pallidiora, supra scaberula, subtus subglabra, costa supra conspicua subtus prominente nervis lateralibus utrinque 4–5 subobscuris, margine parum revoluta, scaberula et basem versus setosa, petiolo brevi vel vix distincto suffulta; stipulae breves, pallidae, amplexantes, apice fimbriis 1–3 deciduis instructae. *Cymae* et axillares, parvae, et terminales, paniculam laxam usque ad 12 cm. longam et 20 cm. latam in plantis ramosis vel circa 4 cm. longam et 4 cm. latam in plantis simplicibus formantes; pedicelli 4–18 mm. longi; flores purpurei (ex *Kerr*).

Receptaculum 1 mm. longum, glabrum. *Calycis* segmenta 4, lanceolata, subacuta, 0.5 mm. longa, ciliolata. *Corollae* tubus 3 mm. longus, circa 1 mm. diametro, glaber, lobi 4, oblongo-spatulati, obtusi, 2.75 mm. longi, 1 mm. lati, intra basi pauci-pilosi. *Filamenta* fere ad corollae tubi apicem inserta, 1 mm. longa, antheris oblongis exsertis filamentis paulo brevioribus. *Stylus* stigmatibus ad 1.25 mm. longis inclusis 3 mm. longus, glaber. *Capsula* subglobosa, paululo ultra 2 mm. diametro, receptaculo vix longior, sicco viridis, apice loculicide dehiscens.

Satul, 5 m., roadside, *Kerr* 13669.

Mussaenda Garrettii *Craib* [Rubiaceae-Mussaendeae]; *M. pentasemiae* C. E. C. Fischer quoad calycis segmenta omnia expansa similis, sed ramulis haud pilosis, foliis angustioribus inter alia facile distinguenda.

Frutex volubilis (ex *Garrett*); ramuli primo dense ferrugineo-tomentosi, glabrescentes, cito longitudinaliter corrugati, lenticellis paucis. *Folia* anguste oblonga, oblongo-lanceolata vel oblongo-oblancheolata, apice subacuminata, obtusiuscula, basi attenuata vel acuminato-attenuata, 6.5–11 cm. longa, 2–3.5 cm. lata, chartacea, pagina utraque ad costam densius ferrugineo-hirsuta vel saepe inferiore rubro-ferrugineo-hirsuta, ad nervos similiter sed sparsius et brevius hirsuta, aliter superiore sparse hirsuta, inferiore pilosa, costa supra prominula subtus prominente, nervis lateralibus utrinque 10–12 supra conspicuis subtus prominulis intra marginem longius prorsus curvatis et attenuatis, nervulis paucis supra conspicuis subtus rete laxum plus minusve conspicuum efficientibus, margine integra, ciliata, petiolo 1–2 cm. longo indumento ei ramulorum simili tecto supra canaliculato suffulta; stipulae diu persistentes, deltoideae vel late deltoideae, obtusae vel obtuse acuminatae, ad 4 mm. longae, pilis ferrugineis tectae. *Cymae* terminales vel ex axillis duabus supremis ortae et paniculam pseudoterminali formantes; pedunculi communes circa 2 cm. longi, partiales ad 7 mm. longi, indumento ei ramulorum simili tecti; flores sessiles vel pedicellis brevibus suffulti; bractee lanceolatae, subacutae, ad 3 mm. longae. *Receptaculum* 3 mm. longum, ferrugineo-hirsutum. *Calycis* segmenta omnia expansa; lamina alba (ex *Garrett*), oblongo-lanceolata, saepissime 3–3.5 cm. longa et circa 1.4 cm. lata, pagina utraque praesertim ad nervos subhirsuta, 3–5-nervia; petioli 10–13 mm. longi, hirsuti. *Corolla* extra pubescens, ante anthesin clavata, breviter acuminata, 2 cm. longa, parte apicale expansa 7 mm. longa; tubus intra superne pilosus, apice dense barbatus; lobi 2 mm. longi, 1.75 mm. lati, acute caudato-acuminati, reflexi, medio incrassati. *Stamina* inclusa, antheris linearibus 3 mm. longis, filamentis brevibus.

Doi Angka, Doi Pa Mawn spur, 1460 m., *Garrett* 525.

Urophyllum aequale *Craib* [Rubiaceae-Mussaendeae]; *U. Griffithiano* Hook. f. facie subsimile, sed stipulis pro longitudine conspicue angustioribus facile distinguendum.

Arbor gracilis, circa 5 m. alta (ex *Kerr*); ramuli primo quadrangulares, iuventute pilis paucis sericeis instructi, cito glabrescentes. *Folia* elliptica vel oblongo-elliptica, apice caudato-acuminata, summo apice obtusiuscula, pilis albis comata, basi rotundata, rarius cuneato-rotundata, saepe parum inaequilateralia, 9–15 cm. longa, 4–6.8 cm. lata, rigide chartacea, sicco supra plus minusve brunnescentia, subtus pallide viridia, supra ad costam iuventute pilis paucis instructa, matura glabra, subtus ad costam, nervosque laterales, et nervorum axillas pilis primo sericeis et ad nervulos pilis brevibus sparsis instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque 8–10 supra impressis subtus prominentibus intra marginem anastomosantibus, nervulis supra subprominulis subtus prominulis, margine parum recurva, primo pauperius ciliolata, petiolo 9–12 mm. longo pilis adpressis tecto supra canaliculato suffulta; stipulae mox deciduae, ad 1.9 cm. longae et 3 mm. latae, dorso pilis adpressis pallidis tectae. *Cymae* axillares, sub anthesin petiolo paulo breviores vel ei subaequilongae, umbelliformes, pedunculo communi ad 6 mm. longo pubescente suffultae; pedicelli circa 3 mm. longi, pubescentes. *Receptaculum* breve, pilis brevibus pallidis subadpressis sparse instructum. *Calyx* 2 mm. longus, apice denticulatus vel subdenticulatus, extra indumento ei receptaculi simili instructus. *Corollae* tubus 1.5 mm. longus, dorso glaber, intra apice longe piloso-barbatus, lobi 5, carnosii, circa 4 mm. longi et 2 mm. lati, glabri. *Stamina* 5, filamentis circa 1 mm. longis ad corollae tubi apicem insertis, antheris 1.5 mm. longis apiculatis. *Discus* carnosus. *Stylus* brevis.

Satul, Klawng Ton, 300 m., by stream in evergreen forest, *Kerr* 14448.

Urophyllum crassum *Craib* [Rubiaceae-Mussaendeae]; ab affini *U. longifolio* Hook. f. ramulis iuventute glabris fuscis mox brunneis vel fusco-brunneis, stipulis fuscis fere glabris, inflorescentia densiore, alabastris maioribus brevius et crassius pedicellatis distinguendum.

Frutex circa 3–4 m. altus (ex *Kiah*); ramuli glabri, iuventute fuscii, mox brunnei vel fusco-brunnei, striati, lenticellis haud conspicuis. *Folia* oblongo-lanceolata vel longius oblonga, apice caudato-acuminata, basi rotundata vel interdum parum inaequilateralia, latere altero rotundata, altero cuneata vel cuneato-rotundata, ad 27 cm. longa et 7.5 cm. lata, rigide chartacea, sicco viridia vel saepius brunnescentia, supra glabra, subtus ad nervos pilis brevibus inconspicuis instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 15 supra conspicuis subtus prominentibus superioribus intra marginem anastomosantibus, nervis transversis subtus prominulis, petiolo ad 1 cm. longo supra canaliculato pilis paucis adpressis instructo suffulta; stipulae mox deciduae, 1.5 cm. longae, basi 2 mm. latae, sicco fuscae, pilis paucis adpressis instructae. *Cymae* axillares, condensae, petiolo subaequilongae;

pedicelli 2 mm. longi, puberuli. *Receptaculum* pedicello subaequilongum, sicco fuscum, inferne pilis paucis adpressis instructum. *Calyx* 1.5 mm. longus, truncatus, pauperius ciliolatus. *Corollae* tubus 2.25 mm. longus, glaber, lobi 5, incrassati, vix 4 mm. longi, 2 mm. lati, intra basi pilis erectis dense barbati. *Stamina* 5, parva. *Stylus* stigmatibus 5 inclusis 5 mm. longus.

Banang Sta, Kiah 24326.

***Urophyllum fuscum* Craib** [Rubiaceae-Mussaendeae]; ab *U. longifolio* Hook. f. foliorum nervis lateralibus paucioribus, ab *U. talangense* Craib ramulis fere glabris, foliis paulo crassioribus, receptaculo pilis distinctis instructo haud puberulo recedens.

Frutex circa 4 m. altus (ex *Kerr*); ramuli primo quadrangulares, pallide virides, nodos versus pilis paucis instructi, aliter glabri vel pilis perpaucis instructi, mox olivacei vel fusco-olivacei. *Folia* saepissime oblango-oblancoolata, apice longius acuminata vel subcaudato-acuminata, basi cuneata vel rotundato-cuneata, saepe parum inaequilateralia, 12–20 cm. longa, 3.5–5.8 cm. lata, rigide chartacea, sicco supra saepissime fusco-viridia, subtus pallide viridia vel plus minusve fuscuscentia, supra glabra, subtus ad costam pilis paucis instructa vel glabra, ad nervos et in nervorum axillis pubescentia, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 12 supra conspicuis subtus prominentibus, nervulis supra conspicuis vel subprominulis subtus prominulis, margine parum recurva, pauperrime ciliolata, petiolo ad 1.5 cm. longo pilis paucis adpressis inconspicuis instructo vel subglabro supra canaliculato suffulta; stipulae mox deciduae, 12–15 mm. longae, circa 3 mm. latae, dorso dense adpresse subhirsutae. *Cymae* axillares, umbelliformes, petiolo dimidio breviores, subsessiles vel pedunculo communi circa 1 mm. longo suffultae; bracteae parvae; pedicelli 3 mm. longi, pubescentes. *Receptaculum* pilis brevibus adpressis sparse tectum. *Calyx* circa 1.5 mm. longus, apice truncatus vel breviter denticulatus. *Corolla* pallide viridis (ex *Kerr*); tubus 2 mm. longus, extra glaber, intra apice dense barbatus; lobi 5, oblongi, subobtusiusculi, 3.75 mm. longi, 2.25 mm. lati, glabri. *Filamenta* circa 1 mm. longa, glabra, ad corollae tubi apicem inserta, antheris 1.5 mm. longis longius acuminatis. *Stylus* brevis, fere ad basem lobatus.

Pang-nga, Kao Katakam, 400 m., evergreen forest, *Kerr* 18411.

***Urophyllum longipes* Craib** [Rubiaceae-Mussaendeae]; ab affini *U. glabro* Wall. foliorum rete multo laxiore, pedunculis pedicellisque conspicue longioribus recedit.

Frutex circa 2 m. altus (ex *Kerr*); ramuli glabri, iuventute pilis paucis instructi, quadrangulares, primo subfusci, mox cinnamomei vel cinereo-cinnamomei, ad 2.5 mm. diametro. *Folia* saepissime oblango-oblancoolata vel oblango-lanceolata, apice acuminata vel caudato-acuminata, summo apice subacuta, basi saepissime parum inaequilateralia, cuneata vel rotundata, 8–14 cm. longa, 3–4.3 cm.

lata, chartacea, glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 12 supra subprominulis subtus conspicue prominulis subpatulis intra marginem anastomosantibus, margine anguste recurva, petiolo usque ad 5 mm. longo supra canaliculato suffulta; stipulae cito deciduae, 8 mm. longae, dorso superne adpresse strigillosae, sicco fuscae. *Cymae* axillares, triflorae, pedunculo communi 1–1.8 cm. longo apice parvi-bracteato, pedicellis 4–7 mm. longis cum pedunculo pilis brevibus adpressis subsparse instructis. *Receptaculum* 2 mm. longum, sicco atrum, pilis brevibus adpressis paucis instructum. *Calyx* 1 mm. longus, apice parvidenticulatus vel fere truncatus. *Corollae* tubus vix 3 mm. longus, superne induratus, dorso glaber, intra apice dense barbatus, lobi 5, indurati, sub anthesin parum recurvi, 2 mm. longi, vix 1.5 mm. lati. *Filamenta* circa 0.5 mm. longa, glabra, ad corollae tubi apicem inserta, antheris 1.25 mm. longis conspicue acute acuminatis. *Stylus* 2 mm. longus, glaber, stigmate 5-lobato ad 1.75 mm. longo. *Fructus* fere 5 mm. diametro, sicco fuscus, calyce persistente coronatus.

Betong, 300 m., by stream in evergreen forest, *Kerr* 7607.

***Urophyllum olivaceum* Craib** [Rubiaceae-Mussaendeae]; ab *U. longifolio* Hook. f. foliorum nervis lateralibus minus numerosis, pedunculo longiore, ab *U. longipede* Craib foliis maioribus, nervis lateralibus haud patulis recedens.

Ramuli primo angulati, pilis sparsis instructi, cito glabri, virides vel olivacei, teretes, striati, lenticellis haud conspicuis. *Folia* oblango-lanceolata, oblango-elliptica, vel oblango-oblancoolata, apice longius subacuta acuminata, basi cuneata vel rotundato-cuneata, saepe parum inaequilateralia, 11–20 cm. longa, 3.5–6 cm. lata, rigide chartacea, sicco viridia, subtus parum pallidiora, supra glabra, subtus ad costam pilis longiusculis sparse instructa, ad nervos nervulosque pilis brevioribus similiter instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 10 supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, margine anguste cartilaginea, parum recurva, sparse longius ciliata, petiolo 6–10 mm. longo subsparse piloso supra canaliculato suffulta; stipulae ad 13 mm. longae, dorso densius adpresse hirsutae, mox deciduae. *Cymae* axillares, solitariae vel geminae, umbelliformes, pedunculo communi 1.4–2.5 cm. longo sparse piloso apice bracteato suffultae; pedicelli infructescentes ad 9 mm. longi, pilis adpressis sparse instructi. *Fructus* circa 5 mm. diametro, calyce persistente coronatus, pilis adpressis brevibus sparse instructus.

Chantabun, Kao Sabap, *Put* 903.

***Urophyllum talangense* Craib** [Rubiaceae-Mussaendeae]; ab *U. longifolio* Hook. f. foliorum nervis lateralibus paucioribus, ab *U. fusco* Craib internodiis haud glabris, foliis tenuioribus, receptaculo puberulo recedit.

Arbor parva (ex *Kerr*); ramuli primo quadrangulares, pilis brevibus adpressis subsparse tecti, mox teretes, glabri, olivaceo-virides, striati. *Folia* oblongo-lanceolata, oblongo-oblancoolata, vel suboblunga, apice longius acuminata, subacuta, basi cuneata vel rotundata, saepe parum inaequilateralia, 15-23 cm. longa, 3.5-7.5 cm. lata, chartacea, sicco viridia, subtus parum pallidiora, supra ad costam pilis perpaucis, subtus ad costam nervosque pilis paucis instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque 10-13 supra conspicuis subtus prominulis intra marginem anastomosantibus, nervis transversis supra conspicuis vel subprominulis subtus prominulis, margine anguste recurva, petiolo usque ad 1 cm. longo pilis adpressis sparse instructo supra canaliculato suffulta; stipulae mox deciduae, ad 8 mm. longae, dorso adpresse subhirsutae. *Cymae* axillares, petiolo subaequilongae vel eo paulo longiores, pedunculo communi ad 5 mm. longo adpresse pubescente apice parvi-bracteato suffultae; pedicelli circa 3 mm. longi, puberuli. *Receptaculum* puberulum, 1.5 mm. longum. *Calyx* circa 0.5 mm. longus, apice truncatus. *Corolla* alba (ex *Kerr*); tubus 2 mm. longus, extra glaber, intra apice dense barbatus; lobi 5, deltoidei, subacuti, 2 mm. longi, 1.5 mm. lati, carnosii, glabri. *Stamina* 5, filamentis 0.5 mm. longis ad corollae tubi apicem insertis glabris, antheris 1 mm. longis apice caudato-acuminatis. *Discus* carnosus. *Stylus* 2 mm. longus, glaber, stigmatis ramulis 5 stylo dimidio brevioribus.

Puket, Talang, 50 m., evergreen forest, *Kerr* 17437.

LX.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXVII.

1261. **Muraltia Rogersii** *N. E. Brown* [Polygalaceae]; species foliis solitariis *M. linophyllae* DC. affinis, sed habitu decumbente et sepalis obtusis (nec acutis) facile distinguenda.

Fruticulus nanus, 15-20 cm. altus, ramosus. *Rami* decumbentes, foliosi, minute puberuli. *Folia* solitaria, linearia, mucronato-acuta, 5-12 mm. longa, 1 mm. lata, supra plana, subtus convexa, apice leviter recurva, primum appresse pubescentia, demum glabra. *Calyx* 3 mm. longus, sepalis ellipticis obtusis. *Corolla* 5 mm. longa, rosea, apice carinae atro-rubro; petala superiora quam inferiora multo breviora, acute bifida; carinae limbus subquadratus, obtusus; cristae lobulis late rotundatis. *Capsula* suborbicularis, 2.5 mm. diametro, leviter pubescens, cornubus 3 mm. longis.

SOUTH AFRICA. Cape Province: Mossel Bay Div.; at Mossel Bay, *F. A. Rogers* 26960.

1262. **Melanorrhoea pilosa** *Ridley* [Anacardiaceae-Anacardieae]; species a *M. Curtisii* Oliv., cui affinis, paniculis pilosis et foliis multo majoribus distat.

Arbor ramis crassis. *Perulae* lanceolatae, dense ferrugineo-velutinae, inferiores 1 cm. longae. *Folia* oblanceolata, obtusa vel

rotundata, 17-25 cm. longa, 8-12 cm. lata, coriacea, glabra, nervis utroque latere costae 16, reticulatione conspicua; petioli 1.5 cm. longi, crassi. *Paniculae* pilosae, 15-18 cm. longae, ramis inferioribus 5-6 cm. longis, ramulis 1 cm. longis in apicibus congestis. *Pedicelli* 5 mm. longi, graciles, pilosi. *Flores* ut videtur albi. *Calyx* papiraceus, calyptratus, 2.5 mm. longus, parce pilosus, apice acuto piloso. *Petala* 5, lanceolato-linearia, 2.5 mm. longa, pilosa. *Stamina* 5-7, petalis aequilongae, glabra, filamentis filiformibus, antheris oblongis obtusis. *Discus* pilosus. *Ovarium* globosum, glabrum, gynophoro 1 mm. longo, stylo glabro.

MALAY PENINSULA. Pahang: Ulu Rumpin, Cherok, *F. R. Lambak* 2739 (type); Kuantan Town, Kuantan, *Yeap* 3636.

This is allied to *M. Curtisii* Oliv., but distinct in the pilosity of the inflorescence and flowers, and in the larger leaves. There are generally 5 stamens, but occasionally 6-7.

1263. **Berzelia Rogersii** *N. E. Brown* [Bruniaceae]; species ab omnibus congeneribus capitulis maximis (1.5 cm. diametro) distinctissima.

Frutex ramosus; rami dense foliati, laxe villosi. *Folia* patula vel adscendentia, linearia, nigro-apiculata, 1-1.5 cm. longa, 0.75 mm. lata, supra plana, subtus carinata, marginibus minutissime scaberula et longe villosa-ciliata. *Capitula* subumbellato-corymbosa, conferta, 1.5-1.7 cm. diametro. *Pedunculi* 2.5-3 cm. longi, villosi, foliis redactis 5 mm. longis glabris imbricatis vestiti. *Bractae* subspathulato-lineares, incurvae, 7-8 mm. longae, 1-1.5 mm. latae, intus apice barbato-villosae, dorso glabrae. *Flores* sessiles, incurvato-obliquae. *Calycis* lobi 5-6, erecti, lineares, acuti, 2-3 mm. longi, vix 0.5 mm. lati, apice brunnei, plus minusve villosi. *Petala* 5-6, perigyna, spathulato-linearia, obtusa, 4-5 mm. longa, 0.75-1 mm. lata. *Stamina* 5-6, perigyna, petalis breviora. *Ovarium* semi-inferum, 1-loculare, 1-ovulatum; stylus unicus, 2.5-3.5 mm. longus, tortuosus. *Fructus* obconicus, 3 mm. longus, sulcato-costatus.

SOUTH AFRICA. Cape Province: Caledon Div.; near Hermanus, *F. A. Rogers* 26561.

Quite distinct from all other species by the large size of the flower heads and the long spreading leaves.

1264. **Terminalia Curtisii** *Ridley* [Combretaceae]; species ab affini *T. citrina* Roxb. differt foliis lanceolatis eglandulosis, floribus minoribus paniculatis, calycis lobis dentiformibus acutis.

Frutex inflorescentia excepta glaber. *Folia* lanceolata, obtusa, basi rotundata, 6-10 cm. longa, 3-4 cm. lata, tenuiter coriacea, nervis tenuibus utroque latere costae 12 ad apices inarcuantibus reticulatione minuta conspicua; petioli graciles, 1 cm. longi, eglandulosi. *Paniculae* axillares et terminales, patentes, pubescentes, 7-10 cm. longae. *Bractae* lanceolatae, acuminatae, 2 mm. longae. *Flores* copiosi, sessiles, albi. *Calyx* tubo 1 mm. longo

glabro, limbo patelliformi 2 mm. lato intus lanuginoso, lobis dentiformibus acutis. *Stamina* 10, filamentis glabris 2 mm. longis, antheris oblongis. *Stylus* cylindricus, superne attenuatus, 3 mm. longus. *Drupa* elliptica, 1.7 cm. longa, 7 mm. diametro.

MALAY PENINSULA. Penang: Waterfall, woody climber, *Curtis* 3207. Negri Sembilan: Pasir Panjang, *Usope* 4204. Perak: Larut, parasite, flowers white, 90–150 m., *Kunstler* 3173.

This plant has been referred by King and myself to *Terminalia citrina* Roxb. var. *malayana* C. B. Clarke, from which it now appears to me very distinct. The leaves are much thinner, smaller, lanceolate-acuminate, and eglandular, the flowers are smaller, in longer and laxer panicles with a less hairy rhachis, and the calyx-lobes are sharp-toothed. The inflorescence in *T. citrina* var. *malayana*, as represented by the Mt. Ophir plant of Griffith and Maingay, has stouter racemes, not panicles, of flowers.

Curtis on two specimens describes the plant as a woody climber, but Kunstler as a parasite.

1265. *Sutera hirta* N. E. Brown [Scrophulariaceae-Manuleae]; affinis *S. marifoliae* O. Kuntze, sed ramis crassioribus pubescentibus pilis longis subrigidis differt.

Fruticulus circiter 30 cm. altus, divergenti-ramosus, pilis patulis subrigidis dense pubescens. *Rami* 2 mm. crassi. *Folia* opposita, late elliptica vel suborbicularia, obtusa vel subacuta, basi rotundata vel leviter cuneata, 4–14 mm. longa, 4–10 mm. lata, utrinque 2–3-dentata; petiolus 1–2 mm. longus. *Flores* solitarii, axillares. *Pedicelli* 3–5 mm. longi. *Calycis* *tubus* vix 1 mm. longus; lobi 3–5 mm. longi, lineari-filiformes. *Corolla* extra glanduloso-pubescent, lutea; *tubus* 6–7 mm. longus; lobi subaequales, suborbiculares, 2.5 mm. diametro. *Capsula* 3–5 mm. longa.

SOUTH AFRICA. Cape Province: Caledon Div.; near Hermanus, F. A. Rogers 27235.

1266. *Rubia haematantha* Airy-Shaw [Rubiaceae-Galieae]; a *R. charifolia* Wall., cui similis, habitu caespitoso nec scandente, corolla atrosanguinea nec lutea, lobis longius appendiculatis recedit.

Herba perennis, glaberrima, radice multicipite lignescente. *Caules* primum erecti, caespitosi, demum dense intertexti, gracillimi, quadrangulares, leves vel vix scaberuli, 2–3 dm. longi, internodiis 1–4 cm. longis. *Folia* sena, angustissime linearia, circiter 2–3 (raro usque 5) cm. longa, acutissima, fere pungentia, supra plana levia, subtus levia vel parce scaberula costa prominente, marginibus incrassatis revolutis sursum scabris. *Inflorescentia* axillaris, e cymulis brevipedunculatis paucifloris composita; bracteae foliiformes. *Flores* pedicellati vel sessiles, pedicellis filiformibus usque 5 mm. longis. *Receptaculum* ovoideum, minutum. *Calycis* *limbus* obsoletus. *Corolla* rotata, atrosanguinea, 4 mm. diametro (segmentorum appendiculis inclusis), segmentis oblongis 1 mm. latis trinerviis in appendiculas vel caudas filiformes fere 1 mm. longas

subabrupte attenuatis. *Stamina* patentia, brevissima, ad corollae sinus attingentia, circiter 1 mm. longa; antherae minutae, ellipsoideae, luteae, filamentis subaequilongae. *Styli* 2, liberi, brevissimi, clavati. *Fructus* carpello altero abortu plerumque haud didymus, 3–4 mm. diametro, niger, carnosus.

CHINA: SZECHUAN. Open dry stony meadows on the mountains S.E. of Mu-li, lat. 27° 50' N., long. 101° E., 3300–3600 m., Aug. 1922, *Forrest* 22147 (type): "Plant of 1 ft. Flowers very dark crimson."

YUNNAN. Dry open stony pasture, on the Tong Shan in the Yangtze bend, lat. 27° 20' N., 2700 m., Sept. 1913, *Forrest* 10981: "Plant of 6–9 inches. Flowers deep maroon crimson." Ad latera montium niveorum prope Lichiang in dumetis apertis saxosis, 3400 m., 14 Aug. 1914, *Schneider* 2961 (?2261): "Flores purpurascens." Dry stony pasture slopes on the Goo-du Shan, lat. 28° 12' N., long. 100° 12' E., 2700–3000 m., July 1921, *Forrest* 20558: "Matted plant of 12–14 inches. Flowers black crimson."

This is one of the most distinct species of the genus *Rubia* found in China. In general facies it much resembles *R. charifolia* Wall., from Nepal, Sikkim and Bhutan, but the different habit, and the dark crimson flowers, drying almost black, immediately distinguish it.

A note may here be added with regard to *R. charifolia* and a species from Burma very generally confused with it, *R. angustissima* Wall. Both these species were published by George Don in his Gen. Syst. iii. 643 (1834). The descriptions were certainly very brief, but, taken in conjunction with the type specimens and the respective geographical areas, not inadequate. The type of *R. charifolia* apparently exists only in the Wallich Herbarium, but there is a duplicate of that of *R. angustissima* in the Kew Herbarium. Kurz, for some unaccountable reason, reduced *R. charifolia* to *R. angustissima* (Journ. As. Soc. Beng. xvi. 2. 162: 1877), a reduction which Hooker maintained in the Flora of British India iii. 203 (1881). Apart from the thickish pedicels and minute subulate bracts of *R. angustissima*, contrasting with the filiform pedicels and longer linear bracts of *R. charifolia*, the two species can easily be separated on vegetative characters alone. The former is on the whole a coarser plant, much less branched, with the leaves in fours (as stated by Don) and as much as 16 cm. in length, while those of the latter species are rarely half that length, generally very much shorter.

Wallich collected *R. angustissima* on Taong Dong on two occasions: 13th Nov. 1826 (field no. 775) and 26th Nov. 1826 (field no. 776). On his labels he used the specific epithet "equisetoides." The only other collection known to the writer is the following: Ani Sakan, nr. Maymyo Plateau, alt. 3500 ft. [1050 m.], 15 Oct. 1911, J. H. Lace 5495 (Herb. Kew.).

1267. *Hesperantha discolor* N. E. Brown [Iridaceae-Ixieae]; affinis *H. pilosae* Ker, sed foliorum vaginibus et caule glabris, perianthio multo majore tubo bracteis non longiore conspicue differt.

Planta 15-30 cm. alta, omnino glabra. *Caulis* foliis tribus instructus. *Folia* erecta, 4-17 cm. longa, 1-2 mm. lata, tenuia, acuta, marginibus non incrassata. *Spica* 4-8 cm. longa, laxa 3-6-flora. *Bractae* exteriores 8-13 mm. longae, acutae, interiores breviores. *Perianthii tubus* 1 cm. longus, bracteis longior, tenuis; lobi 1.3 cm. longi, elliptico-oblongi, obtusi, extra purpurei (siccati), intus albi (vel lutei?). *Stamina* 9 mm. longa. *Stylus* 1-1.1 cm. longus, tubo perianthii aequilongus, non exsertus; stigmata 7 mm. longa, filiformia, staminibus breviora.

SOUTH AFRICA. Cape Province: Worcester Div.; between Osplaats and Tunnel Sidings, 600-900 m., *F. A. Rogers* 16740.

Some species of this genus and of *Geissorhiza* so nearly resemble one another when dried that they are very liable to be mistaken for one another. The difference between the two genera is not very clearly stated in books, so that it may not be out of place here to point out that the distinction consists in the relative length of the style and perianth-tube. *Hesperantha* has a style that is very much shorter than the stamens, and not exserted from the mouth of the perianth-tube, with 3 long, filiform stigmas, about as long as or rather shorter than the anthers and spreading among them.

Geissorhiza has a style as long as the stamens and exserted far beyond the mouth of the perianth-tube, with 3 linear-filiform stigmas recurving over the tops of the anthers.

1268. ***Geissorhiza Rogersii*** *N. E. Brown* [Iridaceae-Ixieae]; species *G. secundae* Ker et *G. pubescenti* Wolley-Dod aspectu similis, sed caule puberulo, inflorescentia ramosiore, bracteis acutioribus et tubo perianthii bracteis multo breviora manifeste differt.

Planta 15-26 cm. alta. *Caulis* circiter 1 mm. crassus, ramulis floriferis gracilibus 1-3 instructus, glaber vel minute puberulus. *Folia* tria, 3-15 cm. longa, 1.5-4 mm. lata, linearia, acuta, tenuia, costa atque marginibus necnon vaginarum venis minute ciliatis. *Spicae* saepe laxae 2-4-florae. *Bractae* exteriores 1-1.6 cm. longae, interiores breviores, omnes acutae, glabrae, superne rubicundae. *Perianthii tubus* 1 mm. longus, bracteis multo brevior; lobi 1.5 cm. longi, elliptico-oblongi, obtusi, pallide lilacini? *Stamina* lobis perianthii duplo breviora. *Stylus* 1 cm. longus, staminibus aequilongus; stigmata 3 mm. longa, supra stamina recurvata.

SOUTH AFRICA. Cape Province: Worcester Div.; between Osplaats and Tunnel Sidings, 600-900 m., *F. A. Rogers* 16725.

1269. ***Tritonia parvula*** *N. E. Brown* [Iridaceae-Ixieae]; species minima, foliis angustissimis ab omnibus distincta.

Planta 5-13 cm. alta, glabra. *Cormi* 6-8 mm. diametro, conico-globosi, reticulato-fibrosi. *Folia* 4-5, adscendentia, curvula, 3-6.5 cm. longa, 1 mm. lata, angustissime linearia, acuta. *Caulis* erectus, haud 1 mm. crassus, superne subflexuosus, floribus 1-4. *Bractae* 6-8 mm. longae, membranaceae, exteriores apice tridentatae, purpureo-tinctae. *Flores* 18-27 mm. longi, rosei; perianthii tubus

1-12 mm. longus; lobi 8-13 mm. longi, 4-8 mm. lati, elliptici vel oblongo-elliptici, basi angusti, apice rotundati, tres inferiores callo utro prope basin instructi.

SOUTH AFRICA. Cape Province: near Oudtshoorn, *Muir* 4724.

Distinguished from all other members of the genus by its small size and very narrow leaves. The calli on the lower lobes of the flower are somewhat like those on the flower of *T. securigera* Ker.

1270. ***Wurmbea conferta*** *N. E. Brown* [Liliaceae-Anguillaridae]; species floribus in spicam dense confertis ab omnibus congeneribus distinctissima:

Folia circiter tria, 15-22 cm. longa, 2-4 mm. lata, ob margines inflexos subulata, basi vaginata, glabra. *Spica* conica vel oblonga, 2.5 cm. longa, 13-15 mm. crassa, dense multiflora. *Flores* sessiles, glabri, lutei; tubus 4 mm. longus; lobi suberecti, lanceolati, 4.5-5 mm. longi, 1.5 mm. lati. *Stamina* ore tubi inserta, 2 mm. longa. *Ovarium* trigonum; styli 3 mm. longi, e basi crassa attenuati.

SOUTH AFRICA. Cape Province: Worcester Div.; Orchard Siding, 420 m., *F. A. Rogers* 16551.

LXI.—ON THE FLORA OF THE NEARER EAST: X*. A CONTRIBUTION TO THE FLORA OF SOUTH MACEDONIA. W. B. TURRILL.

Two small but interesting collections of plants have been received from the Hon. H. G. Chick, H.M. Consul-General at Salonica. The first was made on May 5th of this year in the beech-woods on the Cholomondos mountains in the south-eastern portion of Khalkidikē. The second was made on the 11th of the same month on Mount Pangaion, which lies back from the sea to the west of Cavalla, and south-east of the plain of Seres. The highest point on Pangaion is known as Pilaf, and is about 5400 ft. The peak ascended was "Pilikanos," behind Rhodoleivos village and level with the patches of snow on Pilaf and other parts of the group. On the Kavalla sheet (42° 41') of the K. u. k. Militärgeogr. Instit., 1916, the range is named Prnar, with the highest peak Pilav tepe, 1872 m. On the same map the village named by Mr. Chick as above is apparently Razolivos (Radulevo). In other maps the range is called the Bunar Dag.

The Khalkidikē Peninsula was crossed by Grisebach (Reise durch Rumelien und nach Brussa, ii. 10 seq., Göttingen 1841), who studied the flora on the Cholomondos heights (l.c. 21). Previous to this Grisebach had sailed from Enos to Thasos, via Maronia. From Thasos he went to Athos, leaving the Peninsula and passing into Khalkidikē across the Xerxes Canal. He thus missed the Pangaion range entirely.

Since neither the Khalkidikē Peninsula nor the Pangaion range has been much investigated floristically the following lists of

*Continued from *K.B.* 1930, p. 493.

Mr. Chick's collections are published and it is hoped that more collections from Greek Macedonia will add further to our knowledge of the plant distribution in this area.

Collection A. (Cholomondos Mountains, Khalkidikē Peninsula). *Helleborus cyclophyllus* Boiss., *Dentaria bulbifera* L., *Berteroa incana* DC. var. *trichocarpa* Rohl., *Helianthemum salicifolium* Mill., *Viola gracilis* S. et S. sensu Becker, *Silene italica* Pers., *Moenchia mantica* Bartl., *Geranium sanguineum* L., *G. lucidum* L., *G. molle* L., *Erodium cicutarium* L'Hér., *Cytisus hirsutus* L., *Coronilla emeroides* Boiss. et Sprun., *Vicia grandiflora* Scop. var. *Kitaibeliana* Koch (var. *sordida* Griseb.), *Orob. hirsutus* L., *Aremonia Agrimonoides* (L.) DC., *Saxifraga chrysosplenifolia* Boiss., *Saxifraga granulata* L. var. *graeca* Engl., *Galium Cruciatum* L., *Doronicum cordatum* Schultz, *Symphytum bulbosum* Schimp., *Anchusa italica* Retz., *Myosotis sylvatica* Hoffm., *Parentucellia latifolia* Car., *Veronica Teucrium* L. subsp. *pseudochamaedrys* Nym., *Ajuga genevensis* L., *Euphorbia Myrsinites* L., *Cephalanthera longifolia* Fritsch, *Orchis mascula* L., *O. simia* Lamk., *O. provincialis* Balb., *Asphodelus ramosus* L., *Ornithogalum tenuifolium* Guss.

Collection B. (Mt. Pangaion).

Hypocymus grandiflorum Benth., *Nasturtium officinale* R. Br., *Rorippa thracica* Fritsch, *Aubrieta intermedia* Heldr. et Orph. var. (?), *Reseda lutea* L., *Polygala nicaeensis* Risso subsp. *mediterranea* Chod., *Hypericum rumelicum* Boiss., *Genista rumelica* Vel. (flowers smaller than usual), *Trigonella corniculata* L., *Onobrychis arenaria* DC., *Coronilla emeroides* Boiss., *Scandix australis* L., *Jasminum fruticans* L., *Fraxinus Ornus* L., *Anchusa moesiaca* Vel., *Verbascum phoeniceum* L., *Veronica Teucrium* L. subsp. *pseudochamaedrys* Nym., *Pedicularis Friderici-Augusti* Tomm. var. *rubriflora* Hayek, *Thymus comptus* Friv., *Ajuga genevensis* L., *Salvia Horminum* L., *Euphorbia Seguieriana* Neck., *Iris Pseudacorus* L., *Asphodeline lutea* L.

The specimens are preserved in the Herbarium, Royal Botanic Gardens, Kew.

One species in the second collection has not been matched with any material at Kew or the British Museum (Natural History). It appears, however, from the description to be *Fritillaria Drenovskii* Degen et Stoy., a species very recently described and figured in Mitt. Königl. Naturwiss. Inst. in Sofia, iv. 142 (1931). The following description, drawn up from Chick's specimens, supplements the original description in some respects. *F. Drenovskii* was first collected in Mt. Ali-Botuš in the south-west of Bulgaria (Bulgarian Macedonia) not far north of the Greek-Bulgarian boundary.

***Fritillaria Drenovskii* Degen et Stoy.** *Caulis* erectus, gracillimus, glaber, basi rubellus, usque ad 3.5 dm. altus. *Folia caulina* 4-5, glabra, ecirrhusa, inferiora linearia, 12-13 cm. longa, usque ad 7 mm. lata; superiora anguste linearia, apicem versus attenuata, 4-6 cm. longa, 1-2 mm. lata. *Flos* solitarius, nutans

vel subnutans. *Perigonium* conicum, phyllis anguste spathulato-oblongis vel oblongis 2 cm. longis 5 mm. latis extra purpureo-aeneis intus flavidis apice leviter ciliolato-pappilosis haud tessellatis 5-7-striatis; foveola anguste oblonga. *Filamenta* 1 cm. longa, papillosa. *Antherae* 6 mm. longae, mucronulatae, flavidae. *Ovarium* anguste obconicum, 6 mm. longum; stylus 1 cm. longus, apice plus minusve inaequaliter trifidus, papillosus vel fere glaber.

Greek Macedonia: Mt. Pangaion, peak "Pelikanos," west of Cavalla (Kavalla), 11.5.1931, H. G. Chick 7B.

F. Sieheana Hausskn, which, from its published description and figure, appears to be of described species the most nearly related to *F. Drenovskii*, was collected in Cilicia, in the lower forest region, Kajakarak, 500-1000 m., by W. Siehe in 1912.

LXII.—THE GENERA TINNEA AND RENSCHIA. A. A. BULLOCK.

In a great natural family such as the Labiatae it is inevitable that genera should be founded on characters which in other less natural families would be regarded only as of specific value. The genera *Renschia* Vatke, and *Tinnea* Kotschy et Peyr., constitute a case in point.

Renschia was founded by Vatke (1) on *Tinnea heterotypica* S. Moore (2). In the "Pflanzenfamilien" Briquet (3) preferred to defer any decision until *Tinnea heterotypica* was better known, but Baker (4) maintained Vatke's genus, separating it from *Tinnea* on account of the long exertion of the corolla-tube from the calyx, a character which never occurs in the latter genus, where the corolla-tube is not, or scarcely, longer than the calyx.

The discovery of a second species in Tanganyika Territory by Mr. P. J. Greenway seems to render advisable the retention of *Renschia* as a distinct genus. The phylogenetic development of the inflorescence of *Tinnea* has been admirably demonstrated by Robyns and Lebrun (5). Their classification of the genus into sections and subsections is based on this. Even when a distinct terminal inflorescence is formed, however, the persistent bracts are always more or less leaf-like, and the impression of a raceme-like panicle, characteristic of *Renschia*, is rarely given. The presence of two bracteoles on the pedicel is characteristic of both genera, and in this connection Spencer Moore's observations (2) may be recalled.

Moore noted that *Tinnea aethiopica* Kotschy et Peyr. is commonly cultivated (6), and that under these conditions the two bracteoles

(1) Vatke in Linnaea xliii. 94 (1880-82).

(2) Spencer Moore in Journ. Bot. vi. 69, t. 185, fig. 3 (1877).

(3) Briquet in Engl. et Prantl, Natürl. Pflanzenf. iv. 3A. 214 (1897).

(4) Baker in Dyer, Fl. Trop. Afr. v. 500 (1900).

(5) Robyns et Lebrun in Bull. Jard. Bot. Brux. viii. 161-208, tt. 4-6 (1930).

(6) This plant was actually described from material grown from seed collected by Alexandrine Tinne near Bongo, while travelling with the disastrous Bahr-el-Ghazal expedition, and sent to her brother in England.

bear rudimentary flowers in their axils; he postulated therefore that these were abortive bracts. This view is supported by the fact that in some species of *Tinnea* few-flowered cymes are produced instead of the more usual single axillary flower; in such cases, however, the pedicels retain the two bracteoles. In Greenway's plant, described below, the solitary flowers of *Renschia heterotypica* are replaced by a three-flowered cyme, the lateral flowers of which arise in the axils of bracts, the pedicels bearing two minute bracteoles, while the central flower is borne on a naked pedicel. The result is that an elongated raceme-like panicle is produced, which is quite different in appearance from any inflorescence found in *Tinnea*.

Tinnea and *Renschia* may thus be separated by means of the following characters:—

Flowers solitary or in few-flowered axillary cymes; bracts persistent, more or less leaf-like; leaves sessile or very shortly petiolate; corolla-tube not longer than or scarcely exceeding the calyx in length.....*Tinnea* Kotschy et Peyr.

Flowers in terminal racemes or panicles of 3-flowered cymules; bracts deciduous, not leaf-like; leaves long-petiolate; corolla-tube 2-3 times as long as the calyx.....*Renschia* Vatke

Tinnea Kotschy et Peyr.

Kotschy et Peyr., Pl. Tinn. 25, t. 11 (1867); Benth. et Hook. f., Gen. Pl. ii. 1220 (1876); Briq. in Engl. et Prantl, Nat. Pflanzenf. iv. 3A. 214 (1897); Baker in Dyer, Fl. Trop. Afr. v. 496 (1900); Skan in Dyer, Fl. Cap. v. 383 (1922); Robyns et Lebrun in Bull. Jard. Bot. Brux. viii. 181 (1930); Hutch. et J. M. Dalz., Fl. W. Trop. Afr. ii. 282 (1931).

Robyns and Lebrun enumerated twenty-five species in their monograph, all natives of Tropical Africa and subtropical South Africa. Of these *T. Galpinii* Briq. and *T. Rehmannii* Schinz are confined to the Transvaal, while *T. rhodesiana* S. Moore occurs in the Zoutpansberg, Transvaal, and on the granitic rocks of the Matopo Hills, Southern Rhodesia. The remaining twenty-two species are confined to the tropics, extending northward to 10° north latitude, westwards to French Guinea (*T. Barteri* Gürke), and eastwards to Somaliland (*T. gracilipedicellata* Robyns et Lebrun). Most of them occur in the savannah country or dry forest, and are extremely local. *T. aethiopica* Kotschy et Peyr., however, extends from Northern Nigeria to Bahr-el-Ghazal on the north, and southwards to Zanzibar and Lake Nyasa, while *T. antiscorbutica* Welw. extends from Angola eastwards through Kasai and Katanga to the north of Lake Nyasa.

Renschia Vatke.

Vatke in Linnaea xliii. 94 (1880-82); Briq. in Engl. et Prantl, Nat. Pflanzenf. iv. 3A. 214 (1897), *in obs.*; Baker in Dyer, Fl. Trop. Afr. v. 500 (1900).

The two species are very distinct, and are easily separable by the following characters:—

Inflorescence a simple raceme; peduncles 1-flowered; corolla about 1.2 cm. long; an erect subshrub.....1. *R. heterotypica*

Inflorescence an elongated panicle of 3-flowered cymules; corolla 3 cm. long; a slender scrambling shrub.....2. *R. mirabilis*

1. *Renschia heterotypica* (S. Moore) Vatke in Linnaea xliii. 94 (1880-82); Briq. in Engl. et Prantl, Nat. Pflanzenf. iv. 3A. 214 (1897), *in obs.*; Baker in Dyer, Fl. Trop. Afr. v. 500 (1900).—*Tinnea heterotypica* S. Moore in Journ. Bot. vi. 69 (1877).

An under-shrub about 0.5 m. high; leaves ovate or triangular, 3 cm. long, petioles 2 cm. long; racemes terminal, 7-10 cm. long; corolla about 1.2 cm. long.

SOMALILAND. Ahl Mts., near Maid, 4500 ft., Hildebrandt 1429 (type).

2. *Renschia mirabilis* Bullock sp. nov., a *R. heterotypica* (S. Moore) Vatke, habitu scandente, inflorescentia paniculata racemiformi, floribus multo majoribus differt.

Frutex scandens, ramulis gracilibus quadrangularibus. *Folia* opposita, ovata, apice acuminata, basi rotundata vel cordata, usque 11 cm. longa et 6.5 cm. lata, infra praesertim costa et nervis lateralibus (utrinsecus 3-4) breviter pubescentia, supra glabra, marginibus grosse crenato-dentatis. *Inflorescentia* terminalis, gracilis, elongato-paniculata, circiter 15-25 cm. longa; cymulae oppositae, decussatae, 3-florae, pedunculis 1-1.5 cm. longis, pedicellis 1-2 cm. longis 2-bracteolatis. *Calyx* sub anthesin cylindricus, 1 cm. longus, labiis iis subaequantibus semiorbicularibus integris, statu fructifero accrescens et membranaceo-reticulatus, subglobosus, 1.5 cm. diametro, demum ad basin 2-valvatus, valvis integris. *Corolla* rubra, tubulosa, 3 cm. longa; labium superius integrum, erectum, 4 mm. longum; labium inferius minus, 3-lobatum. *Stamina* 4, plus minusve exserta, thecis divergentibus. *Nuculae* ellipticae, 8 mm. longae, alatae; ala membranacea, demum in fibras radiantes plumosas 3 mm. longas soluta.

TANGANYIKA TERRITORY. Mpwapwa, 1100 m., a climbing shrub with red flowers growing under trees near water in the fringing forest by stream sides, not at all common, 22 Aug. 1930, Greenway 2450 (type).

LXIII.—NOTES ON SOME AUSTRALIAN MONIMIACEAE. W. D. FRANCIS.

Recently Mr. C. T. White, Government Botanist of Queensland, forwarded to Kew for examination the whole of the material of *Wilkiea* F. Muell. and *Tetrasynandra* Perk. from the Queensland Herbarium. As a result of the examination a few deviations from the arrangement of the species adopted by Perkins and Gilg in their

monograph of the family in the Pflanzenreich are found to be necessary.

WILKIEA F. Muell.

W. Huegeliana (Tul.) A.DC., which Perkins and Gilg reduce to *W. macrophylla* (A. Cunn.) A.DC., is reinstated as a species. The differences between the species are indicated below:—

Shrub. All parts glabrous. Carpels in female flowers 8–15.....

W. macrophylla

Attaining tree size. Young shoots, young branchlets, rhachis of inflorescence, inside of female flowers (including carpels) and sometimes underside of leaves fulvous-pubescent; carpels in female flowers 20 or more.....*W. Huegeliana*

Wilkiea macrophylla is a very common shrub in the rain forests of Southern Queensland. Its rigid, glossy leaves give it a strongly xerophytic aspect, although the wood is comparatively soft to cut. As in several other species of the Australian Monimiaceae, the rays of the wood are prominent.

TETRASYNANDRA Perk.

T. laxiflora (Benth.) Perk. F. M. Bailey's name *Mollinedia subternata* is synonymous with the name of this species and not with that of *T. pubescens* (Benth.) Perk. as indicated by Perkins (Pflanzenreich, IV, 101, Monimiaceae (Nachträge), 26: 1911). The fact that in the Kew Herbarium a branchlet of *T. laxiflora* is included on a sheet with *T. pubescens* (Rockingham Bay, Dallachy) may have contributed to the confusion.

HEDYCARYA Forst.

Hedycarya loxocarya (Benth.) W. D. Francis, comb. nov. Bentham placed this species in *Mollinedia* provisionally, as he had fruit-bearing specimens only. A very fragmentary and badly preserved specimen of the species, with male flowers, originating from the Johnstone River, North Queensland (Ladbrook & Michael 173), was found in the material from the Queensland Herbarium. An examination of the damaged flowers shows that the species belongs to *Hedycarya*, and it is therefore transferred to this genus. Unfortunately it is scarcely possible to draw up a satisfactory description of the male inflorescence on account of the badly damaged condition of the flowers. Perkins, in the Nachträge to the monograph of the Family, places the species under *Wilkiea*, but remarks that she was not able to determine whether it should be in *Wilkiea* or *Hedycarya*.

LXIV.—MISCELLANEOUS NOTES.

MR. JOHN S. L. GILMOUR.—The Ministry of Agriculture and Fisheries has appointed Mr. J. S. L. Gilmour, B.A., Curator of the University Herbarium and Museum, Botany School, Cambridge, to be Assistant Director of the Royal Botanic Gardens, Kew. Mr.

Gilmour was educated at Uppingham School and Clare College, Cambridge, where he took the Natural Sciences Tripos, Part I and Part II, Botany.

OSCAR JUEL.—We much regret to record the death of Professor Emeritus Oscar Juel, who had a world-wide reputation as a botanist. Professor Juel was born in Stockholm in 1863. After taking his degree at Uppsala, he studied at the Universities of Leipzig and Bonn, his principal interests being Cytology, Embryology and Mycology. He was appointed Professor at the University of Uppsala in 1907 and held that position until his retirement in 1926. He was also Director of the Botanical Institute of Uppsala. One of his most noteworthy scientific contributions was his paper on the parthenogenesis of *Antennaria alpina*. Professor Juel was one of the founders of the Linnean Society of Sweden and was also a Vice-President of the Fifth International Botanical Congress held at Cambridge in 1930. He was a frequent and welcome visitor to Kew and his visits were always appreciated, for he had endeared himself to all by his kindly consideration and charming courtesy. His special interest lay in questions relating to Mycology and Algology.

PER AXEL RYDBERG.—We regret to record the death on July 25th, in his seventy-second year, of Dr. P. A. Rydberg, for many years a member of the staff of the New York Botanical Garden. Dr. Rydberg was born in Odh Parish, Sweden, on July 6, 1860, and emigrated as a young man to the United States, where he received his University training. He made a special study of the flora of the Rocky Mountain region, culminating in the publication of his "Flora of the Rocky Mountains and adjacent plains" in 1917. He was particularly interested in Rosaceae, Papilionaceae and Compositae, and contributed the accounts of these families published in the "North American Flora." Rydberg had a keen eye for small morphological differences, and held a somewhat restricted concept of the species. Though partially crippled for many years, he continued to carry on his work cheerfully and energetically in spite of his infirmities.

Index Londinensis, volumes 4 and 5.*—Volume 4, consisting of 568 pages, was published in October, 1930, and contains references to illustrations of plants from *Kadsura* to *Pedicellia* inclusive. Volume 5, of 549 pages, appeared in February, 1931, and contains references from *Pedicularis* to *Sapium* inclusive. It therefore deals with such important genera as *Pelargonium*, *Pinus*, *Pirus*, *Primula*, *Rhododendron* and *Rosa*.

Sound orthography and grammatical correctness are matters of importance in a work of this nature, and the Index on the whole sets a good example in this respect. It will be noted that tree names

* Published by the Clarendon Press, Oxford. Price £5 5s. each volume.

which have come down from old classical writers and which end in "us," such as *Quercus*, *Pinus*, *Rhus*, *Sambucus*, are of feminine gender, while those of recent origin, such as *Phyllanthus*, *Podocarpus*, *Pterocarpus*, are masculine. Again, the classically correct spellings "*Pirola*" and "*Pirus*" are used in preference to "*Pyrola*" and "*Pyrus*" so commonly in vogue. "*Ranunculus acer*" is the name adopted for the common buttercup rather than the archaic "*R. acris*" used by Linnaeus. In accordance with the most recent views, many of the old comprehensive genera have been broken up, so that, for example, in the case of *Pinus* there are now 9 recognized genera which formerly were all included in this genus. These are arranged alphabetically and numbered in sequence after the heading "*Pinus* Auct.," and to each species cited under the second heading "*Pinus* Linn." a number is attached in brackets indicating to which genus it properly belongs according to modern ideas. Thus *P. silvestris* is a true *Pinus* as understood by Linnaeus, but *P. Deodara* is a *Cedrus*, and *P. amabilis* is an *Abies*. Other genera in these volumes have been broken up in the same way, such as *Melanthium*, *Prunus*, *Rhipsalis*.

Numerous references will be found in the "Index" to Blanco's "Flora of the Philippines" (3rd Ed., 1878-80). Blanco was an amateur botanist and many of his illustrations are erroneously named. Dr. Merrill has issued a corrected list of Blanco's names. Hence, for each incorrectly named illustration in Blanco's Flora there are in the Index two distinct references, one giving Blanco's name and the other the correct name "fide Merrill." In each case a cross-reference is supplied.

In some botanical works the names on the plates are different from those in the text referring to the same plant. This may be due to the fact that the plates were labelled and printed some time before the text was written, when different ideas of nomenclature had prevailed in the author's mind. In these cases again there are two distinct entries in the Index, with the necessary cross-reference in each.

The illustrations in John Hill's "Family Herbal," dated 1812, are mostly very crude, and often names quite foreign to our modern ideas have been given to the plants. In these cases the editor has interpreted the plants figured in terms of modern nomenclature. For example, *Malva moschata* is called in the Herbal "Vervain Mallow. Alcea." Every reference in the Index giving the correct name is always followed by the phrase "fide Ed."

An interesting use to which the "Index" might be put would be the tracing of the evolution of the art of depicting any well-known or common plant. References to pre-Linnaean pictures should in most cases be sought for elsewhere than in the Index, as few books of pre-Linnaean date have been included in the compilation (see *K.B.* 1929, pp. 305-307).

W. C. W.

Royal Dublin Society (June 25th, 1731).—The Director, who is an Honorary Member of the Royal Dublin Society, attended the Celebration of the Bi-centenary of the foundation of the Society at Ballsbridge, Dublin, on June 25th, as one of their official guests. The following address was presented to the Society from the Royal Botanic Gardens, Kew:—

On this memorable occasion of the Celebration of the Bi-centenary of the Foundation of the Royal Dublin Society I desire on behalf of the Royal Botanic Gardens, Kew, to congratulate the Society on the fine record of valuable scientific work which has been achieved under its encouragement and assistance.

In particular, the Botanical and Horticultural World can never forget what it owes to the Royal Dublin Society in conceiving and carrying out the foundation of the famous Botanic Gardens, Glasnevin.

Fortunate alike in its situation and in the ability of its distinguished Keepers, Glasnevin holds a position not only in Ireland but throughout the world of which the Society may feel justly proud.

The enlightened policy of the Society in furthering the development of agricultural enterprise in Ireland in earlier days deserves to be remembered with gratitude on this occasion.

The Scientific World is also greatly indebted to the Royal Dublin Society for the valuable aid they have given to Research in the admirable publications of the Society.

During the festivities in connection with the Celebrations, the Director had the honour of being the guest of Their Excellencies The Governor General and Mrs. McNeill at Vice Regal Lodge.

Exploring for Plants.*—Dr. Fairchild is Senior Agricultural Explorer in charge of the Office of Plant Introduction, a branch of the Bureau of Plant Industry, Washington. He has probably visited more gardens, parks, and markets in all parts of the world than any other person, the object of his search being cultivated plants which might be of interest to farmers, fruit growers, or gardeners of the United States, as well as wild species and new plants likely to be of economic or ornamental value.

The expeditions here described took place in 1925-1927, and were for the most part accommodated by the splendidly equipped motor yacht of Mr. Allison V. Armour, "Utowana," with its laboratory and library and special facilities for drying seeds and for the transportation of living plants. The countries visited include N. Africa, the Balearic and Atlantic Islands, Ceylon, Sumatra, Java, and finally West Africa. The results are not limited to collections, living and dried, in the various Plant Introduction Gardens of the

*Exploring for Plants, by David Fairchild. The Macmillan Co., 1930, pp. xx. + 591, with 190 photos. Price \$5.

U.S. Department of Agriculture, but are already visible in many parts of the New World to which the living plants have been distributed. The attempt to combine the details of travel, the scenes and social life of many peoples, with real information for botanists and horticulturists is only partially successful, the acquisitions of real value and the numerous facts of scientific interest being overlaid and not always recoverable even from the fairly copious index. On the other hand the book is convincing in showing the surpassing value of such exploration when properly carried out and its results focussed and made permanently effective. One feature runs as a "golden thread" through the narrative, the comparative record of the food habits of the civilised world, and the difficulty of altering the local taste or of introducing a new fruit industry is fully stressed.

The author's previous experiences and visits to the world's herbaria, libraries, and botanic gardens, extending over some 30 years, brought him into touch with many scientific personalities, and instances recur in the book of new and valuable varieties resulting from the exchange of seeds and plants between research workers and breeders in different continents. Acknowledgment is made of the assistance and stimulus received in these visits, and a whole chapter is devoted to Kew. It is pleasing also to note the ungrudging praise for the skill and taste of the trained agriculturists whom the author met in our Colonies, as displayed in the West African Experimental Stations.

J. M. D.

Botanical Magazine.—The recent issue of Part iv of vol. cliv (1928) of the Magazine completes the volume, which is very appropriately dedicated to the Hon. Vicary Gibbs, V.M.H., who has done so much for the encouragement of Horticulture.

The plants figured are *Rhododendron Scottianum* Hutchinson (t. 9238), a fine species from Yunnan closely allied to *R. ciliicalyx* Franch.; *Amygdalus tangutica* Korshinsky (t. 9239), a charming almond, cultivated under the name *Prunus dehiscens*, found by Wilson in N.W. Szechuan and S.W. Kansu; *Delosperma ornatulum* N.E. Br. (t. 9240), one of Mr. Brown's segregates from the genus *Mesembryanthemum* and a new species, found from the Graaff Reinet Division to the Orange Free State, South Africa; the well-known *Gentiana sino-ornata* Balf. f. (t. 9241), from N.W. Yunnan; *Roemeria refracta* DC. var. *setosa* Turrill (t. 9242), a new combination, the plant coming from the Orient; *Epidendrum campylostalix* Reichb. f. (t. 9243), first discovered by Warszewicz in Costa Rica, and found in Guatemala, Costa Rica and Panama; *Chirita Marcandii* Craib (t. 9244), a handsome orange-flowered *Chirita* allied to *C. tubulosa* Craib, found by Mr. A. Marcan on limestone cliffs at Muok Lek some 80 km. north of Bangkok, Siam; *Primula latisecta* W. W. Smith (t. 9245), belonging to the *Geranioides* section, found by Kingdon Ward near the Tsangpo Gorges, Tibet; *Rhododendron chryseum* Balf. f. et Ward (t. 9246), an interesting yellow-flowered

species from N.W. Yunnan, a counterpart of *R. flavidum* Franch. from W. Szechuan; *Arctotis speciosa* subsp. *Hayana* Stapf et C. A. Smith (t. 9247), a new sub-species from the coast region of the Cape Peninsula and *Rosa holodonta* Stapf (t. 9248), a new species closely allied to *R. Moyesii* Hemsl. et Wils. raised from seed collected by Wilson in West Szechuan.

• *Note.*—Tab. 9218 (see *K.B.* 1931, p. 109) was published in *Bot. Mag.* as *Primula Angleniana*. This has now been corrected to *Primula Agleniana*.

Irish Flora.*—The author, who has for some years held the post of Economic Botanist of the Department of Agriculture at Ottawa, has remembered the need he felt for a handbook dealing with the plants of Ireland when he used to conduct his botanical field excursions in that country. The "Flora" does not conform to the usually accepted type, but Mr. Adams has attempted to provide a book with a purely artificial method of ascertaining the names of the ordinary wild plants of the country. The book will no doubt serve a useful purpose, but it can only be of local and somewhat limited application and interest.

In the Introduction a general review of other publications on the Irish flora is given, and the last few chapters are devoted to notes on "Relation to Environment" and on "Topographical Distribution." There are two appendices, one dealing with Poisonous Plants, the other with Irish Plant Names. The figures have been taken from "Illustrations" to Bentham and Hooker's "Handbook of the British Flora" and Butcher and Strudwick's "Further Illustrations of British Plants."

Floras of Past Ages.—Although few branches of botanical investigation so stir the imagination as the attempt to reconstruct pictures of floras of the past from the evidence of the rocks, the study of palaeobotany is always pursued by a select few and is generally regarded as one of the most specialised branches of the science. Professor Seward's previous work, "Fossil Plants," treats of the subject from a descriptive and systematic point of view, the four well-known volumes dealing in botanical sequence with forms of plants belonging to the Lycopodiales, Pteridosperms, Bennettitales, Coniferales and other important phyla. In the work now published†, the author writes from an entirely different standpoint and supplements his descriptive volumes by a treatise giving a general review of the land floras of the past. Based on his own unrivalled experience but freed from the mass of anatomical and other detail with

*A Student's Illustrated Flora, being a Guide to the Indigenous Seed-plants of Ireland, by J. Adams, M.A. L. Reeve & Co., Ltd., 1931, pp. 343, figs. 578, 1 map, 12s. net.

†Plant Life through the Ages. A Geological and Botanical Retrospect, by A. C. Seward. Published by The Cambridge University Press, London, pp. xix + 601, figs. 140. Price 30s. net.

which palaeobotanical research is necessarily associated, the author produced a scholarly and singularly readable volume and a valuable contribution to palaeobotanical literature, which will be warmly welcomed by "non-fossil" botanists and other scientific workers.

The volume is divided into 16 chapters, the first eight being largely introductory, dealing with such subjects as Geological Cycles, the Interpretation of the Fossil Record and the Earliest Records of Plant Life. The remainder concern the main theme and give successive outlines of the floras of the Devonian Period, the earlier and later Carboniferous Vegetation, the Permian, Triassic, Jurassic, Cretaceous, Tertiary and Quaternary Periods.

The work is copiously illustrated from the botanical, geological and geographical standpoints, and a series of landscape drawings from the pen of Mr. Edward Vulliamy are worthy of special mention. In the course of his treatment of the different Periods, Prof. Seward discusses Gondwanaland, the Ice Ages, the Wegener hypothesis, and on these and other subjects discussed his views are welcome. A notable feature is the very extensive bibliography. The later chapters, in their bearing on the origin of existing floras and problems of present-day distribution, are of great interest.

***Mucuna gigantea* (Willd.) DC.**—Dr. J. Muir, of Riversdale, S. Africa, has recently forwarded to Kew material of a species of *Mucuna* (no. 4769) collected by himself in Portuguese East Africa in connection with his studies on the dispersal of seeds by ocean currents. He requested that it should be compared with *M. gigantea* DC. and *M. quadrialata* Baker, and at the same time raised the question as to whether the latter was a distinct species.

Mr. E. G. Baker (Leg. Trop. Afr. 381) states that *M. gigantea* occurs on the island of Pemba as a cultivated plant, but he makes no comparison between it and *M. quadrialata*, which had been described from Zambesiland and Zanzibar; nor did Mr. J. G. Baker state the affinities of this latter species. A critical examination of the type of *M. quadrialata* in the Kew Herbarium has shown that there is no specific difference between the two species, and *M. quadrialata* Baker therefore becomes a synonym of *M. gigantea* (Willd.) DC.

M. gigantea was based on an excellent figure and description by Rheede (Hort. Malab. viii. 63, t. 36, 1688). Linnaeus in his Sp. Pl. ed. 2, 1019 (1763) cited this figure under the American species *Dolichos altissimus* Jacq., but Willdenow (Sp. Pl. iii. 1041, 1803), separated the Indian plant under the name *Dolichos giganteus*, which was subsequently transferred to *Mucuna* by De Candolle (Prodr. ii. 2).

Mucuna gigantea is a well-known plant on the Indian Ocean littoral, and an interesting feature is the dispersal of its seeds by means of ocean currents.

R. A. D.

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BULLETIN OF MISCELLANEOUS INFORMATION

No. 10 1931

ROYAL BOTANIC GARDENS, KEW

LXV.—THE BREATHING ROOTS OF *SONNERATIA* AND *BRUGUIERA*: A REVIEW OF THE RECENT WORK BY TROLL AND DRAGENDORFF. C. R. METCALFE.

The waterlogged root system of *Sonneratia* spp. was first investigated by Goebel¹ in 1886 who attributed to their aerial roots the primary function of gas exchange between the ground root system and the external atmosphere. Since then these organs have aroused great interest amongst botanists. In days when it was customary to assign "uses" to various plant organs, usually on the basis of conjecture rather than experimental evidence, it was not unnatural to suppose that plants growing in muddy estuaries would not be adequately supplied with oxygen at the roots, and that in consequence there would arise in them devices by which this defect could be overcome. Since Goebel made his observations several investigators, e.g. Westermaier⁴, have studied this problem, all of whom seem to have been generally agreed that the aerial parts of the root systems were in some way primarily concerned with respiration. The botanist who has most recently investigated the structure and function of the roots of mangroves, as represented by the genera *Sonneratia* and *Bruguiera*, is Troll^{2,3}, who, assisted by the chemist Dragendorff, has made extensive studies of these plants as they grow in their natural habitat. These investigations, which were carried out during an expedition to the Malay Archipelago, have led to a fresh view of the physiological significance of the breathing roots of these plants.

To understand fully the facts on which this new suggestion is based it is necessary to know something of the nature of the medium in which the roots of these mangroves grow. As is well known, the plants are most commonly situated in the deposits of mud in the estuaries of tropical rivers. The level of these mud deposits is

¹Goebel, K. Über die Luftwurzeln von *Sonneratia*. Ber. der deut. Bot. Gesch. 4, p. 249, 1886.

²Troll, W. and Dragendorff, O. Über die Luftwurzeln von *Sonneratia*. Linn. f. und ihre biologische Bedeutung (mit einem rechnerischen Anhang von H. Fromherz.). Planta. Archiv. für wiss. Bot. 13, 2 and 3, pp. 311-473, 70 figs, 1 plate.

³Troll, W. Über die sogenannten Atemwurzeln der Mangroven. Ber. der deut. bot. Gesch. 1930, Generalversammlungs Heft, pp. 81-99, 12 figs., 3 pls.

⁴Westermaier. Zur Kenntnis der Pneumatophoren. Freiburg (Schweiz) 1900.

constantly rising—a fact which Troll attributes to the deposition of colloidal matter carried down in the fresh water of rivers when this becomes mixed with the salt water of the sea at high tide. Experiments have shown that the oxygen content of the mud is practically nil. It consequently happens as time goes on that the roots of *Sonneratia* become more and more deeply embedded in this anaerobic medium, and thus are in a position in which the absorption of food is considered to be relatively difficult. In order to understand how these difficulties are overcome it is necessary to follow the mode of development of the root system as a whole rather than to confine attention to the aerial portion alone as has hitherto been done.

A seedling plant of *Sonneratia alba* is provided at first with a single root which penetrates the mud and there becomes greatly branched in a manner characteristic of fibrous roots. Later on, when the level of the mud has risen, a fresh set of adventitious roots is put out from the main stem just below the ground surface, and when this happens the original set of roots falls into disuse and becomes decomposed. At this stage the root system develops members which run horizontally beneath the surface and from which are put out negatively geotropic branches growing vertically upwards and extending above the mud. These aerial portions of the root system, which are partially invested with a tissue containing abundant intercellular spaces originating in the cortex, are those to which has been attributed the function of breathing organs. Connected with these vertical structures (which arise as typical branches in the pericycle of the horizontal roots) there are developed absorbing roots immediately below soil level, and also thicker portions, described as anchor roots, penetrating more deeply into the mud. It thus happens that, by virtue of the manner in which they are developed, fresh absorbing roots are constantly being formed immediately below soil level, where the conditions are regarded as being the best possible for carrying out their function of food absorption. Not only do the horizontal roots put out aerial branches, but in mature trees they give rise to horizontal branches as well, which likewise in turn develop aerial branches. Thus horizontal and aerial roots of a first and second order are produced. In the event of the ground level rising still further a second root system similar to the first is formed higher up on the base of the tree trunk.

When this mode of development of the root system is considered in relation to the constantly rising medium in which the plants grow, it is clear that the most important function carried out by the so-called breathing roots is to ensure that there is a constant supply of absorbing roots immediately below soil level. Troll considers that this is indeed the primary function which they carry out, but at once points out that, even if this is so, the possibility that they may also serve as organs for gas exchange with the surrounding atmosphere is not thereby excluded. In fact experiments carried out on

the aerial roots under natural conditions showed that a considerable volume of carbon dioxide is actually given off. However, as the author points out, it is impossible finally to answer the question how far these organs are of service to the plant in respiration until a study of the complete metabolism of the trees has been made, and at present about this subject scarcely anything is known.

In addition to this work on the roots of *Sonneratia* spp. investigations have also been made on the "knees" of *Bruguiera*. In this genus the main roots grow horizontally, but here and there they rise above the surface of the ground, form an arch, and then grow forward again under the soil. In association with these "knees," or arches, a secondary tissue with abundant intercellular spaces is formed, to which a respiratory significance has been attached. The author points out, however, that it is in association with these "knees" that the absorbing roots are developed, and that the older ones become decomposed as they become more deeply embedded in the ground. Thus the "knees" of *Bruguiera* appear to have a somewhat similar significance to the aerial roots of *Sonneratia*.

It is pointed out that in certain plants characteristic of *Sphagnum* bogs, sand dunes, etc., where the level of the ground is liable to rise, a succession of root systems is developed in a manner somewhat analogous to that seen in the mangroves already described, e.g. in *Drosera rotundifolia*, *Caltha palustris*, *Trichophorum* (*Scirpus*) *caespitosum*, *Eriophorum vaginatum*, and *Ammophila arenaria*.

Whether the suggestions put forward in these papers will be supported by further investigations remains to be seen. However that may be, it represents an attempt to break away from preconceived notions concerning the physiological significance of the aerial roots of *Sonneratia* and the "knees" of *Bruguiera* which appears worthy of the notice of all those interested in the subject.

LXVI.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: VIII.* N. Y. SANDWITH.

NEW AND NOTEWORTHY SPECIES FROM BRITISH GUIANA:
ICACINACEAE—GESNERIACEAE.

ICACINACEAE.

Pleurisanthes flava Sandwith, sp. nov.; a *P. Artocarpi* Baill. indumento ramulorum paginaeque foliorum inferioris, inflorescentia simpliciore, floribus majoribus, stylo longiore; a *P. emarginata* van Tiegh. foliis bene evolutis haud emarginatis, floribus majoribus pentameris; a *Leretia parviflora* Ducke e descriptione simili pedicellis brevissimis, floribus flavis, petalis aliquanto latoribus, stylo piloso differt.

Frutex altissime scandens, ramulis novellis teretibus lenticellatis pilis fulvo-cinereis adpressis dense tomentosis; internodia summa

*Continued from K.B. 1931, p. 377.

1-2 cm. longa. *Folia* alterna, ovata usque elliptico-oblonga, apice acuta acuminata vel subcuspidata acumine lato obtuso tum abrupte mucronato, raro rotundata emarginata, basi rotundata vel levissime cordata, 6-14 cm. longa, 3-7 cm. lata, chartacea, integra, supra olivacea nitida oculo nudo glabra sed secus nervos pilosa necnon lamina ipsa interdum pilis raris adpressis conspersa, pulcherrime subtilissime reticulata, subtus pallidiora ubique valde molliter pubescentia fere tomentosa, nervis primariis arcuatis utroque costae latere circiter 10, cum nervis secundariis venulisque conspicue satis laxe reticulatis; petiolus flexuosus, pilis fulvo-cinereis dense tomentosus, 1-1.8 cm. longus. *Inflorescentiae* axillares, axi ipso usque 3-6 mm. insigniter adnatae, tum ramis singulis vel saepius binis plerumque simplicibus (raro sursum dichotomis) ad 5.5 cm. longis exstantibus, totae pilis fulvo-cinereis dense tomentosae; rami immaturi (ut a cl. Baillon atque van Tieghem descripti) insigniter compressi applanati, dorsiventrals, facie inferiore nudi, superiore glomerulis florum stipati; glomeruli, vel potius umbellae, alterni, sessiles, 3-5-flori. *Flores* parvi, lutei, brevissime (circiter 0.5 mm.) pedicellati vel oculo nudo subsessiles, alabastris ovoideo-ellipsoideis; bracteae minutae. *Calyx* cupularis, circiter 0.8 mm. longus atque 1.75 mm. latus, extra indumento ceterae inflorescentiae indutus, intus glaber; dentes 5, deltoidei, acuti, circiter 0.4 mm. longi atque 0.7 mm. lati, sinibus latis obtusis. *Petala* 5, spurie gamopetala, aestivatione valvata, elliptica, 2.5 mm. longa, 1-1.1 mm. lata, extra cinereo-tomentosa, intus glabra costa centrali haud conspicua notata, apice inflexo. *Stamina* 5, petalis alternantia, libera, hypogyna, glabra, filamentis 1.5 mm. longis, antheris oblongis obtusis circiter 0.8 mm. longis. *Ovarium* uniloculare, ovoideum, dense pilosum, 1 mm. longum, 0.7 mm. diametro, sensim in stylum pilosum 0.5 mm. longum transiens stigmate discoideo glabro, disco haud conspicuo glabro 0.5 mm. diametro insidens; ovula 2, pendula, quorum alterum nonnunquam absens. *Fructus* ignotus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Nov. 11th, 1929, *Sandwith* 590. Bush-rope, in mora forest. Fl. yellow. Ovaries pale green.

RHIZOPHORACEAE.

Cassipourea lasiocalyx *Alston* in Kew Bull. 1925, no. 6, p. 269.

Cuyuni River, on the right bank below the Akaio Falls, Nov. 21st, 1929, *Sandwith* 634; a low tree, about 30 ft. high, in low bush on hills by the river; calyx olive outside, pale silvery-olive-sericeous within; petals pale dirty white to whitish-mauve; style hairy.

Distr. Endemic; this locality may be the same as Bartlett's, which was one of the two cited by Alston. The large stipules are a good character of this species.

COMBRETACEAE

Terminalia Tanibouca *Rich.* in Act. Soc. Hist. Nat. Par. i. 109 (1792).—*Tanibouca guianensis* *Aubl.* Hist. Pl. Guiane 448, t. 178 (1775).

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Moraballi Creek, Essequibo River, Oct. 18th, 1929, *Sandwith* 475: a very large tree, 144 ft. high, 29 in. diam., in mora swamp-forest; flowers white, appearing with the young leaves. Compared with Aublet's specimen in Herb. Mus. Brit.

Vernacular name (Arawak), Broad-leaved Fukadi.

Distr. Guiana, Amazonian Brazil. Apparently also in Trinidad.

Mr. A. W. Exell has kindly contributed the following note:—**Combretum Cacoucia** *Exell*, nom. nov. Based on *Cacoucia coccinea* *Aubl.*

Cacoucia coccinea *Aubl.* Pl. Gui. i. 450, t. 179 (1775). Based on a plant collected by Aublet "ad ripam fluvii Sinemariensis." A specimen labelled on the back "Cayenne, Mr. Fusee Aublet," preserved in the herbarium of the British Museum, may be taken as the type, but there is nothing to indicate that it is the specimen from which Aublet drew up his original description.

Combretum coccineum *Engl. & Diels* in Engl. Mon. Afr. Pflanzen-Fam. III, Combretac.-Combretum, 110 et 112 (1899), non Lam.

The genus *Cacoucia* *Aubl.* is not separable from the genus *Combretum* and has already been reduced to sectional rank by Engler and Diels (*loc. cit.*) although a consideration of the American species only would lead to the opinion that the two genera are quite distinct. *Combretum Cacoucia* is undoubtedly closely allied to *Combretum Mooreanum* *Exell* (*Cacoucia velutina* *S. Moore*) from West Africa, even the recently discovered fruit of the latter being similarly ridged and not distinctly winged. *C. Mooreanum*, however, cannot be satisfactorily separated from other African species belonging to the Sect. *Cacoucia* (*Aubl.*) *Engl. & Diels*, such as *C. platypterum* (*Welw.*) *Hutch. & Dalz.* and *C. bracteatum* (*Laws.*) *Engl. & Diels*, which have typical winged fruits. To attempt to separate all these species from the genus *Combretum* is not feasible, as there is every grade of relationship through such species as *C. dolichopetalum* *Engl. & Diels* and *C. grandiflorum* *G. Don* to what may be considered typical *Combretum* species. To keep up the genus *Cacoucia* would logically necessitate the breaking up of *Combretum* into some twenty or more segregates, which would be very difficult to differentiate, and would serve no useful purpose.—A. W. EXELL.

CUCURBITACEAE.

Helmontia leptantha (*Schlecht.*) *Cogn.* Diagn. Cucurb. i. 20 (1876); in Engl. Pflanzenreich, iv. 275. i, p. 247 (1916).—*Anguria leptantha* *Schlecht.* in Linnaea xxiv. 779 (1851).

Moraballi Creek, Essequibo River, Aug. 21st, 1929, coll. O. W. Richards in *Sandwith* 83. Climber on fallen trees in mora forest, only once seen. Leaves entire below, trifoliate above among the inflorescences. Flowers greenish-yellow.

Distr. Guiana, Brazil.

This collection is interesting for the heterophylly of the leaves, which seems to break down the chief distinction between *H. leptantha* and *H. simplicifolia*. Future collectors would do well to make careful observations of the leaves of these supposed distinct species on all parts of the plant.

RUBIACEAE.

Neobertiera gracilis Wernham in Journ. Bot. lv. 169 (1917).

Moraballi Creek, Essequibo River, Sept. 14th, 1929, *Sandwith* 256. Herb, 1-2 ft. high, in mora swamp, very local. Fl. white. This locality lies a few miles to the south of the Macouria Creek where the type was collected by Jenman. Other collections at Kew are *Jenman* 7338, Demerara River, March 1898; *Jenman* 945, below the Kaieteur, Potaro River, Sept.-Oct. 1881; *Stockdale* 8775, Potaro Road, June 1910; *Bartlett* 8547, Rockstone, June 1904.

This is a very pretty herb or low shrub, 1-5 ft. high, with pure white flowers. The flowers were described by Wernham as tetramerous, but even on his own type specimen at least two of the calyces are pentamerous, while pentamery is obvious on the material at Kew.

Cosmibuena triflora (Benth.) Klotzsch in Hayne, Arzneig. xiv. sub t. 15 (1843).—*Buena triflora* Benth. in Hook. Journ. Bot. iii. 216 (1841).

Moraballi Creek, Essequibo River, Sept. 2nd, 1929, *Sandwith* 166. Epiphytic shrub on the crowns of lofty trees. Fl. creamy-white; tube yellowish-green.

Distr. British Guiana.

Alibertia acuminata (Benth.) *Sandwith*, comb. nov.—*Cordia* ? *acuminata* Benth. in Hook. Journ. Bot. iii. 221 (1841). *Alibertia trinitatis* Sprague et Williams in Flora of Trinidad and Tobago ii. pars. i. 19 (1928).

BRITISH GUIANA. *Robert Schomburgk* 112. S. (type). Mazaruni River, Sept. 1880, *Jenman* 729, ♂ and Aug. 1889, *Jenman* 5329, ♀. Essequibo River, on the rocky right bank at the first Falls, Sept. 10th, 1929, *Sandwith* 217, ♂; low tree or shrub, with white flowers. *Ibid.*, *Sandwith* 218, ♀; low tree with green fruit, growing by the side of 217; leaves mostly longer and broader, and less clustered at the ends of the branchlets.

TRINIDAD. *Vide* Sprague and Williams, *loc. cit.* Other characters separating this species from *A. edulis* Rich are the smaller calyx of the male flower and the shorter stipules. The leaves are usually shorter and narrower.

Basanacantha asperifolia *Sandwith*, sp. nov.; foliis satis magnis utrinque griseo-hirtellis supra asperis, lobis calycinis subulatis, corollae tubo glabrescente distinguenda; species foliis supra asperis gaudentes aut corollae tubo multo longiore aut haud glabrescente

differunt, praeterea *Randia Killipii* inflorescentia capitata, corollae laciniis antherisque multo majoribus toto caelo differt.

Frutex alte scandens; rami summi brunnei, dense hirtelli, cavi, teretes, 5-7 mm. diametro; ramuli minores, oppositi, apice foliiferi, paullo infra apicem spinis brevibus deflexis rubro-brunneis basi excepta glabris 3-5 mm. longis armati. *Folia* late elliptica vel obovato-elliptica, apice acuta atque breviter tenuiter subcuspidata vel raro rotundata atque costa excurrente mucronata, basi attenuata acuta cuneata, 7 (vulgo 12.5)-18.5 cm. longa, 3 (vulgo 6)-8.5 cm. lata, chartacea, siccitate grisea, supra passim hirtella atque densissime granulato-asperula, subtus passim hirtella mollia velutina, nervis lateralibus utroque costae latere 8-10 arcuato-adscentibus, his atque venulis haud numerosis laxe reticulatis cum costa supra impressis subtus prominentibus; petiolus dense patulo-hirtellus, 0.6-1.3 cm. longus; stipulae caducae, apice ramulorum imbricatae, triangulares, glabrae sed granulatae, 2-4 mm. longae, 2.5-3 mm. latae. *Flores* dioici, masculi tantum visi, siccitate nigrescentes, apice ramulorum in cymis ut videtur 2-5-floris dispositi; pedicelli dense patulo-hirtelli, 6-8 mm. longi. *Calyx* prope basim in lobos anguste subulatos 3-4 mm. longos pilis adscentibus fere adpressis indutos fissus. *Corollae* tubus statu vivente viridis, 2.5-3.2 cm. longus, siccitate ad 1.5 mm. latus, sub lobis ipsis ampliatus, fere glaber, sed dimidio superiore saepius sparse hirtellus; lobi demum reflexi, sordide albi, intus dense minutissime tomentelli, elliptici vel obovato-elliptici, ad 1.2 cm. longi, ad 7.5 mm. lati. *Antherae* e fauce corollae paullum exstantes, 2-2.5 mm. longae.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 27th, 1929, *Sandwith* 344. Bush-rose in mixed forest. Corolla-tube green; limb reflexed, dirty white.

Appunia calycina (Benth.) *Sandwith*, comb. nov.—*Coffea calycina* Benth. in Hook. Journ. Bot. iii. 222 (1841).

BRITISH GUIANA. *Robert Schomburgk* 92. S. (type); "shrub, fl. white." Orealla, Corentyne River, 1879, *Jenman* 370; "thirty ft. high, in woods."

Appunia debilis *Sandwith*, sp. nov.; foliis magnis *A. calycinam* simulans, sed glabris, praeterea limbo calycino ut in *A. tenuiflora* haud insigniter ampliato, ab ambabus inflorescentiis saepius ex axillis cataphyllorum orientibus, pedunculo communi longo gracili, pedunculis capitulorum longis gracilibus saepe flexuosis differt.

Frutex parvus, debilis, ad 4.5 m. altus; ramuli summi glabri, brunneo-purpurascens, ad 3 mm. diametro; internodia in ramulo summo novello saepius 5-6 cm. longa. *Folia* magna, lanceolato-elliptica, apice sensim longe acuminata acumine 1-2.5 cm. longo, basi in petiolum longe anguste acute attenuata, 11-28 cm. longa, 3-8.5 cm. lata, tenuiter membranaceo-chartacea, siccitate nigrescentia vel etiam (praecipue in nervis) purpurascens, utrinque praesertim supra nitidula, glaberrima, nervis primariis utroque

costae latere circiter 10 marginem versus laete anastomosantibus utrinque cum costa conspicuis, reticulatione venularum laxa subtus manifesta; petiolus glaber, in foliis majoribus 1-2.5 cm. longus; stipulae triangulares, acutissimae vel bidentatae, 2-3.5 mm. longae, basi circiter 3 mm. latae. *Cataphylla* subulata, minuta vel ad 3 mm. longa. *Inflorescentiae* omnino glabrae, oppositae, longae, graciles, saepius angulis fere rectis ex axillis cataphyllorum exorientes; pedunculus communis flexuosus, 8-10 cm. longus, brunneo-purpurascens; bracteae primariae ovato-oblongae, 1-2.5 mm. longae, ad 1.2 mm. latae; pedunculi ultimi terni, debiles, flexuosi, 1.4-6.5 cm. longi. *Capitula* pauciflora, saepius ut videtur 3-6-flora; bracteae late triangulares, 2 mm. longae atque latae; bracteolae minores. *Alabastra* viridia. *Flores* glabri. *Calyx* cupulari-campanulatus, cum limbo 2-5 mm. longus, ad 3 mm. latus; limbus ad 2 mm. longus, margine truncato sed undulato plus minusve 4-5-lobato nonnunquam reflexo. *Corolla* forma generis, lobis inclusis 11-12 mm. longa, extra ac intus glabra, basi ad 2.5 mm. tum paullo angustior saepe 1.75 mm. diametro; lobi 5, lineari-oblongi, 4-6 mm. longi, ad 0.7 mm. lati. *Stamina* prope basim corollae inserta, filamentis vix ad 1 mm. longis; antherae apiculatae, 1.25 mm. longae. *Ovarium* ovoideo-subglobosum, 3 mm. longum, 2.5 mm. diametro, 4-loculare, loculis uniovulatis; placentatio generis; stylus cum stigmate 1 mm. longus. *Bacca* oblongo-ellipsoidea, statu vivente primo viridis tum rubescens, siccitate nigra, 7-10 mm. longa.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 8th, 1929, *Sandwith* 400 (type): a weak shrub up to 15 ft. high, in wallaba forest; buds green; fruit green, then reddish. Ituribisi Lake, Aug. 1886, *Jenman* 2244; "shrubs a few feet high."

Appunia aurantiaca (Krause) *Sandwith*, comb. nov.—*Rudgea aurantiaca* Krause in Notizbl. Bot. Gart. Berl. vi. 206 (1914).

BRAZIL. Rio Branco, Nov. 1908, *Ule* 7709 (Herb. Kew! Herb. Berol.).

Closely allied to *A. tenuiflora* (Benth.) Hook. fil., but distinguishable provisionally by its yellowish-orange (not white) flowers and the larger more membranous leaves.

Appunia odontocalyx *Sandwith*, sp. nov.; a speciebus adhuc notis stipulis longis, calyce conspicue dentato differt; praeterea propter stigmata distincta conspicua notabilis.

Frutex 1-5 m. alta; ramuli summi pubescentes, ad 3 mm. diametro; internodia in unico ramulo viso 8-11.5 cm. longa, internodium summum 3.5 cm. longum. *Folia* satis magna, ovata vel elliptica, apice longe acuminata acumine 2-3 cm. longo, basi in petiolum satis abrupte cuneata, 14.5-18 cm. longa, 6-9.5 cm. lata, tenuiter membranaceo-chartacea, siccitate supra olivaceo-nigrescentia subtus purpurascens, supra parce sed regulariter pubescentia, subtus densius pubescentia mollia fere velutina, nervis primariis utroque costae latere 8-10 arcuatis marginem versus

anastomosantibus, rete venularum supra ut nervis obscuro subtus laxe prominulo; petiolus pubescens, brevis, 3-5 mm. longus; stipulae longae, lanceolatae, parce pubescentes, cum dentibus 1 cm. longae, basi ad 3.5 mm. latae, in medio in dentes lineari-subulatos fissae. *Inflorescentia* axillaris, ubique pubescens, e capitulis 4-5 brevipedunculatis in umbella sessili radiatis constans; bracteae basi pedunculorum lineares, 3-6 mm. longae; pedunculi 0.8-1.8 cm. longi. *Capitula* densa, ut videtur 6-10-flora; bracteolae obscurae, longae. *Flores* albi. *Calyx* cupulari-campanulatus, extra pubescens, intus glabrescens, hypanthio dentibusque inclusis ad 3 mm. longus, ad 3 mm. diametro, ore conspicue irregulariter dentato, dentibus semper 1-3 anguste triangulari-lanceolatis acutis ad 1 mm. longis. *Corolla* forma generis, matura ad 16 mm. longa, utrinque glabra nisi lobis extra prope apicem hirtellis; tubus 9-10 mm. longus, vix ad 2 mm. diametro; lobi oblongo-lineares, circiter 5 mm. longi, vix ad 1 mm. lati. *Stamina* 7.5 mm. supra tubi basim inserta, filamentis brevissimis vix ad 0.5 mm. longis; antherae apiculatae, 2.2 mm. longae. *Ovarium* ovoideo-subglobosum, circiter 2 mm. longum, 1 mm. diametro, 4-loculare, loculis uniovulatis; placentatio generis; stylus cum stigmatibus 6 mm. longus; stigmata conspicua, 1 mm. longa. *Fructus* non visus.

BOLIVIA. Cobija, Rio Acre, Jan. 1912, *Ule* 9850 (Herb. Kew! Herb. Berol.). "Shrub 1-5 m. Fl. white." Distributed from Berlin under the manuscript name *Rudgea Poeppigii* K. Schum.

The species of *Appunia* seem to vary considerably in the length of their floral parts and in the position of the insertion of the stamens.

Faramea salicifolia Presl Symb. Bot. 24, pl. 70 (1833).

Moraballi Creek, Essequibo River, Sept. 20th, 1929, *Sandwith* 308. Low shrub or tree up to 15 ft. high, in 'low bush.' Fruit a berry, yellow, turning jet-black.

Distr. Widely distributed in Tropical South America, but rarely collected in British Guiana.

Psychotria officinalis (Aubl.) *Raensch*. Nom. ed. 3, 55 (1797).—*Nonatelia officinalis* Aubl. Hist. Pl. Guiane 182, t. 70, f. i (1775). *Psychotria involucreta* Willd. Sp. Pl. i. 966 (1798) quoad syn. Aublet., non Sw.

Moraballi Creek, Essequibo River, Sept. 14th, 1929, *Sandwith* 258. Herb in dark forest. Fruit a rich, deep bluish-mauve.

Distr. Guiana. Brazil?

A very distinct species, immediately separable from *P. involucreta* Sw. and *P. rubra* (Willd.) Müll. Arg. by the smaller, narrower leaves; the long, straight, slender, hispid common peduncle; and the narrowly linear bracts. Other specimens agreeing with Aublet's example in Herb. Mus. Brit. are *Schomburgk* 680, *Jenman* 1726, 2467, 5441, 6908, *Hitchcock* 17125 and *Altson* 424. The Brazilian *P. tenerior* (Cham.) Müll. Arg. is possibly conspecific, to judge from a Sellow specimen at Kew.

P. racemosa (Aubl.) Raeusch. l.c. 56 (1797); Willd. Sp. Pl. i. 966 (1798).—*Nonatelia racemosa* Aubl. l.c. 187, t. 72 (1775).

Cuyuni River; on the Kartabo Road about 5 miles from Kartabo Point, Nov. 22nd, 1929, *Sandwith* 649. Low herb or subshrub. Corolla pale green.

Distr. Northern South America, but not yet recorded from Colombia. The only other British Guiana specimens seen in London are one collected by *Rudge*, in Herb. Mus. Brit., and *C. W. Anderson* 72, Issororo, Aruka River, 1908.

P. chlorantha Benth. in Hook. Journ. Bot. iii. 225 (1841).

Moraballi Creek, Essequibo River, Nov. 2nd, 1929, *Sandwith* 549: low tree about 40 ft. high, 6 in. diam., in wallaba forest on sandy ridge; corolla greenish-white, with pure white hairs in the throat. *Ibid.*, in wallaba forest, Sept. 23rd, 1929, *Sandwith* 324; young fruit green.

Distr. Endemic? Evidently a characteristic species of wallaba forest.

Rudgea obscura *Sandwith*, sp. nov.; affinitate vix obvia, foliis tenuibus reticulatis, inflorescentiis floribusque parvis, cymis densis capitatis, calyce truncato cognoscenda.

Frutex humilis ramulis novellis glabris brevibus ad 2 mm. diametro. *Folia* elliptica vel obovato-elliptica, apice longe (1–2 cm.) acute acuminata, basi cuneata sensim anguste acute attenuata, 6.5–16 cm. longa, 2.2–5.7 cm. lata, glabra, tenuiter chartacea, statu vivente crispata, utrinque nitidula concoloria atque fere aequaliter intricate satis crebre reticulata, nervis primariis utroque costae latere 8–10 valde arcuantibus ac anastomosantibus cum costa utrinque prominentibus; petiolus glaber, 3–8 mm. longus; stipulae triangulares, circiter 4 mm. longae, glabrae, pectinato-aristatae, aristis terminalibus ad 2 mm. longis. *Inflorescentia* terminalis, glabra, brevis, parva, vix ad 2.5 cm. diametro, pedunculo communi 0.7–2 cm. longo, cymoso-paniculata, ramis primariis saepe ad 5 umbellatis; cymae densiflorae, obovato-capitatae; bracteolae caducae, lineares, circiter 2.5 mm. longae. *Flores* sessiles. *Hypanthium* glabrum, statu vivente ochreum, 1 mm. longum. *Calyx* glaber, viridescens, cupularis, ad 1.5 mm. longus, apice applanato ad 2 mm. lato, ore truncato, denticulis vix distinguendis. *Corolla* sordide alba, parva; tubus fauce intus dense lanata excepta glaber, 2 mm. longus, 1 mm. diametro paullo excedens; lobi 4 reflexi, oblongo-elliptici, glabri, 2–2.5 mm. longi, 0.8–1 mm. lati, apiculo inflexo 0.5 mm. longo praediti. *Stamina* fauce inserta, filamentis vix 0.5 mm. longis, antheris exsertis circiter 0.8 mm. longis. *Stylus* glaber, exsertus, cum stigmatibus fere ad 5 mm. longus. *Fructus* ovoideo-subglobosus, viridi-purpureus, siccitate 7–9 mm. longus, 6–7 mm. diametro; calyx fructu insidens saepius vix ad 1 mm. longus, 2–2.5 mm. diametro.

BRITISH GUIANA. Cuyuni River; on the right bank below the Akaio Falls, Nov. 22nd, 1929, *Sandwith* 647. A low shrub in mixed low bush on hills above the river. Leaves crisped. Calyx ochre, limb often greenish. Buds cream. Corolla-lobes dirty white. Fruit greenish-chocolate.

Rudgea guyanensis (Rich.) *Sandwith*, comb. nov.—*Strepelia guyanensis* Rich. in Mém. Soc. Hist. Nat. Par. v. 180, t. 18, f. 3 (1834); DC. Prodr. iv. 498 (183?).

FRENCH GUIANA. Poiteau!

Cephaëlis Altsoni *Sandwith*, sp. nov.; *C. elatae* Sw. affinis, foliis majoribus nervis lateralibus vix prominulis sed ea *C. aneurophyllae* Standley simulantibus, bracteis involucri albis vel pallide violaceis nervis haud prominentibus, bracteolis minoribus valde distincta; a *C. dolichophylla* Standley nervis foliorum lateralibus plurimis approximatis, bracteolis minoribus statim distinguenda.

Frutex ramulis foliis inflorescentiisque glaberrimis. *Stipulae* perfectae non visae; reliquiae triangulares, 3 mm. longae, 4 mm. latae. *Folia* longa, elliptica vel oblanceolata, apice longe acutissime (1–2 cm.) acuminata, basi cuneata acute attenuata, 14–29 cm. longa, 4.5–9 cm. lata, satis firme chartacea, siccitate omnino brunneo-purpurea, nervis lateralibus utroque costae latere numerosissimis (saepius 30–40) a se saepius 3–7 mm. distantibus laete arcuantibus et margine ipso anastomosantibus haudquaquam prominentibus, venulis obscuris vel vix distinguendis; petiolus purpureo-nigrescens, 1.2–2 cm. longus, 2–3 mm. latus. *Inflorescentiae* terminales, solitariae, simplices, longipedunculatae; pedunculus purpureo-nigrescens, 10–14 cm. longus, 2–4 mm. latus. *Involucrum* siccitate 3.5–4 cm. diametro; bractae exteriores 4 inaequales, subliberae sed basi connatae, albae vel pallide violaceae, siccitate pallide rubescentes, ovatae vel late rotundatae, acutae, acuminatae vel cuspidatae, crebre obscure palmatinerviae, 1.5–2.5 cm. longae, 1–2.5 cm. latae. *Flores* numerosissimi, dense congesti, breviter ad 2 mm. pedicellati; bracteolae magnitudine valde variabili, fere subulatae ad ovato-lanceolatae, 5–10 mm. longae, 1–3 mm. latae. *Hypanthium* circiter 2 mm. longum, ad 2.5 mm. latum. *Calyx* cupularis, circiter 1.2 mm. longus, ad 2.5 mm. latus, ore truncato minute denticulato. *Corolla* alba; tubus utrinque glaber, 1.2 cm. longus, 2 mm. latus; lobi patuli, facie rotundato-obovati, marginibus involutis ac apice cucullato-inflexo, glabri, intus flavescens, 2–3 mm. longi, circiter 2 mm. lati, sed applanati majores. *Stamina* 4 mm. supra tubi basim inserta, filamentis brevissimis; antherae lineari-oblongae, ad 2.3 mm. longae. *Stylus* glaber, cum stigmatibus 1.1 cm. paullo excedens. *Fructus* albus vel pallide violaceus, ovoideo-ellipsoideus, costatus, 4–6 mm. longus, 2–3.5 mm. diametro.

BRITISH GUIANA. Mazaruni River; Macreba Falls, Kurupung River, Aug. 1925, *Altson* 322 (type). "A shrub 5–10 ft. high, growing on rocky hill slopes. Involucre white to pale violet.

Corolla white; inner face of lobes yellow. Fruit white to pale violet."

Vernacular name (Acawai), Duma-ek.

C. dichotoma Rudge, Pl. Guian. 29, t. xlv. (1805).

Moraballi Creek, Essequibo River, Sept. 9th, 1929, *Sandwith* 193. Herb or low shrub, in clearing in wallaba forest on hill. Bracts 4, plain green to dirty mauve-green when fresh. Corolla white, 6-lobed.

Distr. Guiana.

Most of the stipular teeth of this gathering are longer than those of Rudge's figure and specimens.

C. tontaneoides (Britton et Standley) R. O. Williams et Cheesman in Flora of Trinidad and Tobago, ii. i. 41 (1928).—*C. tontaneoides* Standley in Field Mus. Nat. Hist. Chicago, Bot. Ser. viii. 183 (1930), pro specie nova. *Evea tontaneoides* Britton et Standley in Journ. Wash. Acad. Sci. 1923, xiii. 106.

Moraballi Creek, Essequibo River, Aug. 16th, 1929, *Sandwith* 21. Small herb on forest floor in 'low bush' and mixed forest, growing with *C. purpurea* (Aubl.) Willd. Fl. white.

Distr. Trinidad, British Guiana, Brazil (Pará).

Geophila cordifolia Miq. Stirp. Surinam. Sel. 176 (1850).

Moraballi Creek, Essequibo River, Aug. 28th, 1929, *Sandwith* 144. Prostrate creeping herb on floor of mixed forest, scarce. Fl. white. Fr. scarlet.

Distr. Guiana, Brazil, Peru. The only other British Guiana specimen seen is *Altson* 423 from Kumaka, Kurupung River, Mazaruni River, Sept. 1925.

MYRSINACEAE.

Cybianthus Brownii Gleason in Bull. Torrey Club liii. 293 (1926).

Moraballi Creek, Essequibo River, Aug.-Nov., 1929, *Sandwith* 107, 547: a low shrub or tree, up to 15 ft. high, in wallaba-mixed forest on hill; flowers recurved, pale biscuit-coloured to pale green; fruit yellow.

Distr. Endemic.

THEOPHRASTACEAE.

Clavija lancifolia Desf. in Nouv. Ann. Mus. Par. i. 402, t. 14 (1832); Mez, Mon. Pflanzenreich, 27 (1903).

Cuyuni River, on the right bank below the Akaio Falls, Nov. 21st, 1929, *Sandwith* 635: a low shrub or tree, up to 15 ft. high, in low bush on hills by the river; leaves forming a crown at the apex of the stem, shining above, spinous-dentate; flowers pale vermillion.

Distr. Guiana; Amazonian Brazil; Eastern Venezuela, near the mouth of the Orinoco.

SAPOTACEAE.

Chrysophyllum ambelaniifolium *Sandwith*, sp. nov., affinitatis incertae.

Arbor excelsa, circiter 30 m. alta, 45 cm. diametro, cortice pallide cinereo; ramuli summi sulcati, senectute glabrescentes, novelli pilis cinereis plus minusve pubescenti-sericei. *Folia* alterna vel saepe opposita, forma atque venatione ea generis *Ambelaniae* revocantia, oblonga ad ovato-elliptica, apice insigne rotundata, obtusissima, truncata, emarginata, vel minutissime cuspidata, basi cuneata, saepius satis magna, 5-19 cm. longa, 2.5-10 cm. lata, crasse coriacea, supra nitida pallide olivacea, subtus glauca, oculo nudo glabra sed utrinque pilis albis minimis haud densis regulariter conspersa, margine revoluta, nervis primariis utroque costae latere 14-18 a se distantibus fere horizontalibus vel patulo-adscendentibus parallelis rectis prope marginem anastomosantibus utrinque praesertim supra insigne impressis, venulis omnino impressis evanidis; petiolus profunde corrugato-sulcatus, ut ramuli novelli pubescenti-sericeus, tum senectute glabrescens, 1-4 cm. longus, 1.5-3 mm. diametro. *Flores* pentameri, isomeri, in ramulis hornotinis axillares, 2-4 fasciculati, statu vivente brunnei, siccitate glaucescentes; pedicelli 3-10 mm. longi, cinereo-sericei. *Sepala* imbricata, ovata, utrinque sericea sed marginibus intus glabris, 4-5.5 mm. longa, 3-4 mm. lata. *Corolla* ovoideo-urceolata, extra siccitate cinereo-sericea, intus glabra brunnea; tubus ad 5.5 mm. longus, igitur sepala aequans vel paullo superans, ad 5 mm. diametro; lobi breves, patuli, triangulares acuti, ad 1.75 mm. longi atque lati. *Stamina* circiter 2 mm. supra basim tubi inserta, filamentis glabris circiter 2 mm. longis; antherae glabrae, ovatae, apiculatae, 1.5 mm. longae. *Ovarium* dense albotomentosum, 2 mm. altum, vix ad 2.5 mm. diametro, in stylum 3 mm. longum triente inferiore tomentosum ceterum glabrum transiens, stigmatibus simplicibus. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 3rd, 1929, *Sandwith* 372. A large tree, 103 ft. high, 18 in. diam., in dry mixed forest. Bark pale grey. Flowers brown.

Vernacular name (Arawak), Kokiritiballi; but this is applied to many other sapotaceous trees.

The affinity of this species is doubtful, and collection and examination of the seeds may prove it to be referable to the genera *Oxytheca* or *Glycoxylon*, if these are worthy of distinction. For the present, its facies and floral characters are favourable to its inclusion in *Chrysophyllum*.

Pouteria (§ *Guaepeba*) **demerarae** *Sandwith*, sp. nov.; *P. psammodendron* (DC.) Radlk. atque *P. obidensi* Huber affinis, ab illa staminibus basi tubi insertis, ab hac foliis normalibus acutis acuminatis vel cuspidatis, ab ambabus ut videtur foliis junioribus necnon saepe adultis hic illic sericeis, nervis primariis numerosioribus differt.

Arbor excelsa, 30 m. vel ultra alta, circiter 60 cm. diametro, ramulis cinereis, novellis arcte sericeis. *Folia* apice ramulorum fasciculata, obovata vel obovato-lanceolata, apice acuta vel saepius breviter (5-10 mm.) acute acuminata vel cuspidata, raro rotundata emarginata, basi in petiolum longe attenuata cuneata, 4-16 cm.

longa, 1-8 cm. lata, coriacea, utrinque nitidula, supra siccitate nigrescentia, juventute sericea tum glabrescentia, subtus sericea pallidissime cuprea vel olivaceo-cuprea, senectute nonnunquam glabrescentia, nervis primariis utroque costae latere vulgo 10-14 adscendentibus prope marginem valde arcuatis, venulis valde reticulatis rete supra impresso sed prominulo subtus prominente subtilissimo; petiolus primo cupreo-sericeus, demum nigrescens glabrescens, vulgo 1-3.5 cm. longus. Flores statu vivo pallide virides, tetrameri, per ramulos ac apud folia in inflorescentiis dense fasciculatis dispositi; pedicelli sericei, pallide cuprei vel ferruginei, maturi 4-5 mm. longi. *Alabastra* ovoidea, circiter 3 mm. longa, 2 mm. diametro. *Sepala* biserialia; exteriora brunnea, concava, ovato-oblonga, 5 mm. longa, 4 mm. lata, extra parce sericea, intus glabra; interiora tenuiora, brunnea, suborbicularia, 4-5 mm. longa, applanata 6-7 mm. lata, extra in medio conspicue dense pallide sericea, ceterum utrinque glabra, marginibus membranaceis pallidis. *Corolla* utrinque glabra, nisi lobis sub lente minutissime pulverulentociliolatis; tubus 2.5 cm. longus, ad 4 mm. latus; lobi suborbiculares ad 2 mm. longi, ad 2.7 mm. lati. *Stamina* prope tubi basim inserta, glabra, filamentis 1.25 mm. longis; antherae extrorsae, ovatae, apiculatae, 0.8 mm. longae. *Staminodia* sub sinibus ovato-lanceolata ad lanceolata, ad 1.5 mm. longa, basi ad 1 mm. lata. *Ovarium* quadriloculare, pilis longis densis facile caducis vestitum; stylus glaber ad 2.5 mm. longus. *Fructus* ignotus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Nov. 2nd, 1929, *Sandwith* 550 (type): tall tree, about 100 ft. high, in morabukea-greenheart forest; fl. pale green.

Ibid., Sept. 3rd, 1929, *Sandwith* 174: tall tree, 114 ft. high, 2 ft. diam., immature buds sericeous-green.

Vernacular name (Arawak), Asipoko; but it is applied to other species.

Pouteria (§ *Guapeba*) **Jenmanii** (Pittier) *Sandwith*, comb. nov.—*Lucuma Jenmanii* Pittier in Contr. U.S. Nat. Herb. xiii. 458 (1912).

Moraballi Creek, Essequibo River, Sept. 27th, 1929, *Sandwith* 347: tall tree, 88 ft. high, 16 in. diam., in morabukea-greenheart forest; corolla pale greenish-white. *Ibid.*, in mixed forest, Nov. 16th, 1929, *Sandwith* 621: tall tree, about 100 ft. high; fruit hairy, greyish-green. Both agree well with the type collection, *Jenman* 4107.

Vernacular name: the Arawaks gave the name "Asipoko" to no. 347, and "Broad-leaved Asipokoballi" to no. 621, but the herbarium material is indistinguishable.

Pouteria (§ *Pseudocladia*) **minutiflora** (Britton) *Sandwith*, comb. nov.—*Chrysophyllum minutiflorum* Britton in Bull. Torrey Bot. Club. xlviii. 337 (1922).

TRINIDAD. Arima, 1921, Britton, Britton and Brown 2403 (type collection). *Crueger* 247.

BRITISH GUIANA. On sandy hill-slope, Mora-mora-bisi Creek, Mapenna Creek, Corentyne River, April 1918, *Hohenkerk* in Forestry Department record no. 396A: "fruit green, yellow when ripe, like hog plum but more pointed." Kamwatta Creek, Koirimap River, Pomeroon River, July 1918, *Hohenkerk* in do., no. 396B. Moraballi Creek, Essequibo River, Sept. 1929, *Sandwith* 312: a middle-sized tree, 74 ft. high, 10 in. diam., in mixed forest; has a copious white latex; wood reddish-brown; flowers green, tetramorous, with 4 alternating setaceous staminodes between the petals.

Vernacular name (Arawak), Moraballi.

The flowers of the type collection, though younger, were found on dissection to agree well with those from the Moraballi Creek, which may be described as follows: flowers tetramorous; corolla tube 1 mm. long, adpressed-sericeous without, glabrous within; lobes broadly ovate-triangular, blunt, up to 1.2 mm. long and 1.5 mm. wide, glabrous on both sides; stamens glabrous, inserted at the base of the tube, with filaments 1 mm. long; anthers oblong-ovate, apiculate, 0.3 mm. long; staminodes about 0.7 mm. long; ovary bilocular, ovoid-subglobose, densely pilose, scarcely 1 mm. long, about 1 mm. diam.; style glabrous, 0.8 mm. long, simple at the apex. The fruits of *Hohenkerk's* and *Crueger's* specimens agree very well; they are ovoid and apiculate, the largest up to 2.4 cm. long and 1.7 cm. diam.

Pouteria (§ *Pseudocladia*) **egregia** *Sandwith*, sp. nov.; inter species americanas ut videtur anomala, foliis utrinque pubescentibus intricate reticulatis, floribus tetrameris extra sericeis, corollae lobis valvatis, ovario biloculari dignoscenda.

Arbor excelsa, 38.4 m. alta, 40 cm. diametro, ramulis novellis valde lenticellatis pubescentibus vel glabrescentibus; internodia vulgo 0.5-1.5 cm. longa. *Folia* alterna, lanceolata vel anguste elliptica, apice breviter conspicue acuminata vel subcuspidata, basi in petiolum attenuata acute cuneata, 3-10 cm. longa, 1.1-3.4 cm. lata, satis tenuiter coriacea, supra nitida, subtus siccitate glaucescentia, utrinque praesertim subtus pilis minimis regulariter dispositis conspersa, costa subtus saepe sericea, pagina inferiore punctata, nervis primariis plurimis rectis parallelis adscendentibus prope marginem anastomosantibus, cum rete venularum intricato utrinque valde prominentibus; petiolus sericeo-pubescent, supra canaliculatus, 5-10 mm. longus. *Inflorescentiae* paullo supra-axillares; umbellae sessiles, multiflorae, saepius 10-16-florae; pedicelli breves, sericei, 2-4 mm. longi. *Flores* tetrameri, parvi, pallide virides; alabastra subglobose, sericea. *Calyx* utrinque sericeus, lobis alte connatis valvatis late ovatis 1 mm. longis 1.2 mm. latis. *Corolla* tota extra sericea, intus glabra; tubus 0.5 mm. longus; lobi valvati, ovati, obtusi, tubo longiores, ad 2 mm. longi, ad 1.75 mm. lati. *Stamina* prope tubi basim inserta, glabra, filamentis 1.2 mm. longis; antherae ovato-oblongae, circiter 0.6 mm. longae, dimidio inferiore abaxiali sericeae. *Staminodia* sub sinibus inserta, subulata,

1.1 mm. longa. *Ovarium* biloculare, subglobosum, dense pilosum, ad 1.2 mm. longum, 1.5 mm. diametro, in stylum brevem simplicem basi pilosum ad 0.5 mm. longum transiens. *Fructus* oblato-globosus, basi abrupte attenuatus, minutissime tomentellus, 2.2-2.5 cm. longus atque diametro. *Semina* evoluta non visa.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Nov. 8th, 1929, *Sandwith* 573 (type): tall tree, 128 ft. high, 16 in. diam., in mixed forest; leaves thinly coriaceous; fl. tetramerous; pet. pale green with 4 setaceous staminodes alternating with them; ovary ochre; style green. Issororo Rubber Station, Aruka River, North-West District, July 1909, C. W. *Anderson* in Forestry Department record no. 386.

Vernacular name (Arawak), Kokiritiballi; Sororoborieng or Male Bullet Tree.

The valvate aestivation suggests the genus *Sarcaulus* which, however, is remarkably dissimilar in its facies, and in its pentamerous flowers with fleshy tube.

Pouteria (§ *Pseudocladia*) **cladantha** *Sandwith*, sp. nov.; *P. lateriflorae* (Benth.) Radlk. affinis, forma foliorum, pedicellis brevioribus inter alia differt.

Arbor ramulis glabris crebre lenticellatis. *Folia* oblonga vel obovato-oblonga, apice breviter (ad 5 mm.) obtuse saepius abrupte cuspidata, basi cuneata, 3.5-13 cm. longa, 1.3-6.2 cm. lata, coriacea, margine revoluta, utrinque nitida, glaberrima, subtus carnosorugulosa, nervis primariis utroque costae latere a se distantibus circiter 10 adscendentibus rectis parallelis marginem versus laete anastomosantibus, supra valde impressis vix cernendis subtus cum rete venularum valde laxo prominulis vel iam impressis; petiolus glaber, 4-8 mm. longus. *Inflorescentiae* ut in *P. lateriflora* in umbellis sessilibus secus axes vel ramulos breves axillares nunc nudos nunc foliatis dispositae; axes pallide ferrugineo-pubescentes vel glabrescentes, compresso-angulati, lenticellati, 1-5.5 cm. longi; pedicelli ac alabastra pallide ferrugineo-sericea; pedicelli maturi nigrescentes, 3.5-6 mm. longi. *Flores* tetrameri. *Sepala* utrinque pubescentia, vel exteriora extra nigrescentia glabrescentia; exteriora valde concava, semiorbicularia, 1.5-1.75 mm. longa, ad 2.5 mm. lata; interiora minora, magis ovata, vix ad 1.5 mm. longa atque lata. *Corolla* (forsan vix matura) extra parce pubescens, intus glabra, in medio in lobos 4 semiorbiculares circiter 1 mm. latos divisa. *Stamina* in medio tubo affixa; antherae ovatae, ad 0.8 mm. longae. *Staminodia* sub sinibus parva, triangulari-lanceolata, carnosae, circiter 0.25 mm. longa. *Ovarium* biloculare, pubescens, stylo glabro haud aequilongo. *Fructus* depresso-globosus, dense ferrugineo-tomentellus, 7-10 mm. longus, 9-13 mm. diametro.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Aug. 24th, 1929, *Sandwith* 113 (type): middle-sized tree, about 60 ft. high, in morabukea forest; young buds greenish. Macouria River, Essequibo River, Nov. 1886, *Jenman* 2395 (measurements of the

floral parts were taken from this collection). Haurirabo hill, Karakara Creek, Demerara River, Feb. 1910, C. W. *Anderson* in Forestry Department record no. 495 (fruits).

Vernacular name (Arawak), Haimarakushi.

Noted by Jenman as one of the useful timber trees of the Colony.

Ecclinusa psilophylla *Sandwith*, sp. nov.; *E. Glaziovii* Pierre ac *E. ramiflorae* Mart. affinis, foliis subtus glabris, apice longe conspicue anguste acuminatis vel cuspidatis, nervis primariis paucioribus magis distantibus facile distinguenda.

Arbor satis parva, ramulis novellis pilis sericeis arcte adpressis indutis. *Stipulae* lanceolatae ad ovato-lanceolatae, brunneae, secus medium sericeae, ceterum glabrescentes, 7-10 mm. longae, 4-5 mm. latae; cicatrices stipularum delapsarum manifestae. *Folia* elliptica vel oblanceolata, apice conspicue (0.5-1.5 cm.) anguste acuminata vel cuspidata, basi attenuata acute cuneata, 11.5-30 cm. longa, 3.6-10 cm. lata, rigide chartacea vel subcoriacea, utrinque nitidula, supra siccitate olivaceo-purpurascens subtus pallidiora, utrinque glaberrima vel juventute costa mesophylloque vicino subtus pilis raris adpressis praesertim petiolum versus conspersa, nervis primariis utroque costae latere 10-18 a se vulgo 0.6-2 cm. distantibus prope marginem laete arcuantibus ac anastomosantibus, nervis venulisque supra impressis sed saepe manifestis, subtus perconspicuis rete venularum intricato pulcherrimo; petiolus supra profunde canaliculatus marginibus involutis, ut ramuli arcte sericeus, 0.6-3 cm. longus. *Flores* pentameri, primo pallide virides, tum brunnei, alabastris siccitate ferrugineo-sericeis, in glomerulis sessilibus plerumque in ramulis annotinis axillaribus arcte sessiles, 2-3 mm. diametro. *Sepala* libera, valde inaequalia, oblongo-ovata ad suborbicularia, obtusa; exteriora tria extra ferrugineo-sericea vel marginibus pallidis membranaceis glabris, intus prope basim vel secus medium pallide sericea ceterum glabra, 2.25-3.2 mm. longa, 1.75-2.5 mm. lata; duo interiora minora omnino membranacea, petaloidea, utrinque secus medium vel basi tantum pallide sericea, ad 2.25 mm. longa, 1.5 mm. lata. *Corolla* sepala superans, omnino glabra; tubus obconicus, 1.25 mm. longus, ad 2.75 mm. latus; limbus applanatus 6 mm. diametro; lobi late ovati, cordiformes, obtusi, 2-2.25 mm. longi, ad 2.75 mm. lati. *Stamina* paullo infra medium tubum inserta, filamentis glabris 1.25-1.5 mm. longis; antherae extrorsae, late ovato-cordatae, apiculatae, ad 0.7 mm. longae, ad 0.75 mm. latae. *Staminodia* nulla. *Ovarium* ovoideo-subglobosum, dense pilosum, circiter 1.2 mm. longum atque diametro, in stylum glabrum 0.7 mm. longum transiens. *Fructus* carnosus, ruber, obscure ferrugineo-sericeus, maturitate glabrescens, depresso-globosus, unicus visus trispermus 2.6 cm. diametro.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 17th, 1929, *Sandwith* 281 (type): a small tree, up to 40-50 ft. high, in mora-wallaba forest; infl. cauliflorous; fl. at first pale green, then

brown; fruit red. Upper Demerara River, Sept. 1887, *Jenman* 3975; "a small tree containing caoutchouc."

Vernacular name (Arawak), Barata.

E. sanguinolenta (*Pierre*) *Engl.* in *Engl. et Prantl, Pflanzenfam. Nachtr. zu iv. i. 278* (1897).—*Ragala sanguinolenta* *Pierre, Not. Bot. Sapot. 60* (1890).

Macouria River, Essequibo River, Nov. 1886, *Jenman* 2396; "one of the timber trees of the colony yielding caoutchouc." Karakara Creek, Demerara River, Feb. 1910, *C. W. Anderson* in Forestry Department record no. 58B; "a large tree, common on creek banks."

Vernacular name (Arawak), Barataballi or Balataballi.

Distr. Guiana, Amazonian Brazil.

The above collections agree well in essentials with Mélinon specimens recently distributed from the Paris Herbarium.

EBENACEAE.

Diospyros dichroa *Sandwith, sp. nov.*; § *Rospidios, D. sericeae* DC. (*Mabae sericeae* Hiern) affinis, foliis plerumque longioribus supra eveniis, calyce multo majore lobis tubum aequantibus corollam nondum apertam includentibus differt.

Arbor parva, cortice laevi nigro; ramuli summi teretes, pilis flavis adpressis facile deterrentibus dense subsericeo-tomentosi; internodia 1–2 cm. longa. *Folia* anguste lanceolata (nonnunquam in ramulis sterilibus vel male evolutis obovato-elliptica, breviter, 1.5–4 cm. longa, ad 2 cm. lata), apice acuta vel sensim satis longe circiter 1 cm. acuminata, basi subrotundata seddenique abrupte cuneata, 3.5–9.8 cm. longa, 1.4–2.9 cm. lata, coriacea, supra glabra, opaca, siccitate nigra, crebre minute rugulosa, costa impressa, ceterum omnino evenia, marginibus sericeo-pilosis, subtus pilis longis flavicantibus nitidis adscendentibus densis pulchre sericeo-tomentosa, costa prominente, ceterum evenia; petiolus brevissimus, 1–2 mm. longus, pallide sericeo-tomentosus, indumento in folii costam transeunte. *Inflorescentiae masculae* tantum visae. *Flores* 1–2 axillares, viridi-albi, subsessiles, pedunculo communi brevissimo dense pallide fulvo-piloso. *Alabastra* matura ovoideo-subglobosa. *Calyx* extra pilis flavicantibus subadpressis densissime tomentosus, intus nitide sericeus; tubus 5–6 mm. longus, 9 mm. diametro; lobi 5–6, deltoideo-ovati, 5–6 mm. longi, 5 mm. lati. *Corolla* jam haud aperta ovoideo-acuminata, 8–10 mm. longa, 6.5 mm. diametro, extra secus margines loborum usque ad basim lineis pilorum flavicantium latis conspicuis vestita ceterum nigrescens glabra, intus glabra, infra medium in lobos 5–6 late lanceolatos 6 mm. longos basi 3 mm. latos divisa. *Stamina* circiter 45, inaequalia, basi cohaerentia, parte connata nigrescente glabra; filamenta 1.5 mm. longa, dense pilosa; antherae anguste lineari-oblongae, 2.5–3 mm. longae, connectivo inter loculos utroque latere praesertim adaxiali adpresse piloso, apice in apiculum brevissimum obtusum rotundatum

producto. *Ovarium rudimentarium* subglobosum, dense pilosum, 0.75 mm. longum atque diametro.

BRITISH GUIANA. On white sand in damp situations, Mazaruni-Kuribrong Divide, Nov. 15th, 1926, *T. A. W. Davis* in Forestry Department record no. 897. "A small tree, unknown to the Indians, growing up to about 18 in. diam. Bark smooth, black, slightly scaly on larger stems. Blaze pinkish with pore-like marks. Flowers greenish-white; nearly all the trees observed were flowering, and only staminate flowers were seen. The commonest and largest were near small creeks, associated with Clump Wallaba, but it was also seen on clay soil in swamps. Not uncommon as a tree, but abundant in its younger stages. Saplings up to about 30 ft. in height have very regular whorled branches, giving the young trees rather the appearance of the Norfolk Island Pine."—*Davis*.

Mildbraed's view of the generic relationship of *D. sericea* has been followed here, see Notizbl. Bot. Gart. Berlin x. 195 (1927).

Diospyros lissocarpoides *Sandwith, sp. nov.*; § *Patonia, D. tetrandrae* Hiern affinis, foliis coriaceis basi cordatis, inflorescentiis masculis densifloris multifloris, calyce floris masculi minus profunde fisso, antheris filamentis longioribus, stylis floris feminei glabris optime differt.

Arbor humilis, ramulis novellis pubescentibus mox glabris nitidis teretibus laevibus vel tenuissime sulcatis; internodia 2–6 cm. longa. *Folia* oblongo-elliptica, apice attenuata acuta vel conspicue ad 1.5 cm. acuminata (raro in exemplis male evolutis rotundata), basi laete rotundata, conspicue sed haud profunde (vulgo 2–6 mm.) cordata, magnitudine valde variabili, 5–34 cm. longa, 2.7–11.7 cm. lata, utrinque coriacea margine revoluta, nitida, novella subtus juventute pubescentia, mox utrinque glaberrima, nervis primariis utroque costae latere saepius 10–15 arcuato-adscendentibus ac anastomosantibus, utrinque valde saepius subaequaliter reticulata, costa supra impressa, nervis atque rete venularum intricatissimo utrinque perconspicuis; petiolus glaber, 4–10 mm. longus, 1.5–3 mm. crassus. *Inflorescentia mascula* axillaris, multiflora, cymis compluribus vel multis densissime stipatis saepius globum brevipedunculatum petiolum aequantem vel paullo superantem 1–1.5 cm. diametro praebentibus, tota juventute conspicue adpresse pilosa; bracteolae ovatae, 1.5–2 mm. longae, circiter 1 mm. latae; pedicelli brevissimi, 1 mm. longi. *Calyx* cupularis, maturitate glaber vel glabrescens, 2.25 mm. longus, 2.5 mm. latus, irregulariter acute dentato-lobatus; dentes triangulares, circiter 0.5 mm. longi, sinibus latis obtusis fere semicircularibus sejuncti. *Corolla* matura siccitate nigrescens, glabrescens vel glabra, anguste tubulosa, saepius sub lobis constricta, circiter ad 13 mm. longa; tubus statu vivente viridi-albus, ad 7 mm. longus, basi 2.25 mm. diametro; lobi 4–5 elliptici, 6 mm. longi, ad 2.75 mm. lati, statu vivente albo-flavescentes, maturitate reflexi. *Stamina* 4, basi corollae aequaliter affixa, filamentis glabris 1.5 mm.

longis; antherae lineari-oblongae, 2.5 mm. longae, connectivo latere adaxiali basi hirtello abaxiali ubique dense adpresse piloso, apice insigniter argute ad 1 mm. producto ibique glabro. *Ovarium rudimentarium* subglobosum, pilis albo-flavescentibus dense vestitum, ad 0.75 mm. longum atque diametro. *Inflorescentia feminea* axillaris, pauciflora, 1-4-flora, brevissime pedunculata, petiolo viri longior, indumento inflorescentiae masculae; bracteolae ovatae vel spatulatae, nonnunquam fere ad 3 mm. longae. *Calyx* ut in *D. tetrandra* magnus, florifer saepe 1 cm. diametro, pubescens vel glabrescens; tubus inconspicuus, 2-3 mm. longus; lobi 4, conspicui, late triangulari-ovati, insigniter plicati, 4-6 mm. longi, 6-9 mm. lati. *Corolla* glabra vel glabrescens, siccitate nigra; tubus statu vivente viridis, urceolato-tubularis, ad 6.5 mm. longus, basi 3.5-4.5 mm. diametro; lobi 4 ovato-elliptici, 6.5-8 mm. longi, ad 4 mm. lati, statu vivente albo-flavescentes, mox nigri, maturitate reflexi. *Ovarium* ovoideum, glabrum, disco fimbriato-ciliato insidens, 3 mm. longum, 2.75 mm. diametro; styli 4 glabri, basi ad 2 mm. connati, parte libera 3-4 mm. longa. *Fructus* globosus, pulposus, ad 3.2 cm. diametro, calyce accrescente magis aucto insidens.

BRITISH GUIANA. Cuyuni River, on right bank below the Akaio Falls, Nov. 26th, 1929, *Sandwith* 696, ♂ (type of ♂): a small tree, about 30 ft. high, 3 in. diam., on a 'low bush' slope rising from the river; flowers in clusters; tube greenish-white; lobes 4-5, reflexed, creamy-white. Orealla, Corentyne River, Nov. 1879, *im Thurn*, ♂. Corentyne River, Nov. 1879, *Jenman* 95, ♂; "tree 20 ft. high."

Essequibo River, on left bank below the first Falls, Nov. 9th, 1929, coll. *Max Nicholson* in *Sandwith* 585, ♀ (type of ♀): fl. tetramerous; calyx green; corolla tube green; limb cream, turning black. Barima River, March 1896, *Jenman* 7009, ♀. Mazaruni River, Sept. 1880, *Jenman* 714, ♀, "10 ft. high." Below Lana Creek, Corentyne River, Dec. 1909, *C. W. Anderson* 402, ♀.

Vernacular name (Arawak), Barabara; but this is also applied to *Lissocarpa guianensis* Gleason.

The affinity of this long neglected species with the isolated *D. tetrandra* of French Guiana is of considerable interest. The male plant of *D. tetrandra* is not represented in the Kew herbarium, but it is admirably figured in Hiern's monograph.

LISSOCARPACEAE.

Lissocarpa guianensis Gleason in Bull. Torrey Club liii. 296 (1926).

Moraballi Creek, Essequibo River, Oct. 1st, 1929, *Sandwith* 363: middle-sized tree with blackish bark, 60-70 ft. high, overhanging camp by creek, in mora-morabukea forest; fl. cream. *Ibid.*, in mixed forest, Oct. 26th, *Sandwith* 525: tree 78 ft. high, 6½ in. diam.; wood a very distinct gamboge colour.

Vernacular name (Arawak), Barabara.

Distr. Endemic.

DICLIDANTHERACEAE.

Barnhartia floribunda Gleason l.c. 297 (1926).

Moraballi Creek, Essequibo River, Oct. 22nd, 1929, *Sandwith* 507. Giant bush-rose in mixed forest, only once found. Calyx greenish-white. Corolla cream, whitish-woolly within.

Distr. British Guiana. Recently collected by Ducke (Herb. Jard. Bot. Rio 22332) at Fonteboa, prov. Amazonas, Brazil.

ASCLEPIADACEAE.

Matelia stenopetala *Sandwith*, sp. nov.; *M. latifoliae* Aubl. affinis, foliis pro rata brevioribus atque latioribus, magis ovatis, brevius acuminatis, praesertim lobis calycinis corollinisque multo angustioribus, corollinis scilicet oblongis facie angusta differt.

Frutex humilis, debiliter scandens; rami minute puberuli et juventute saltem pilis multicellularibus conspicuis patentibus copiosis demum deciduis induti. *Folia* ovato-elliptica usque ovata, apice longe (ad 2 cm.) anguste conspicue acuminata, basi cuneata saepe in petiolum attenuata, nonnunquam obtusa fere rotundata, 6-17 cm. longa, 1.8-7.7 cm. lata, tenuiter papyracea, glabra costa minutissime puberula excepta, nervis primariis utroque costae latere 6-8 arcuatis satis procul a margine anastomosantibus, nervis venulisque subtus elevatis laxe reticulatis; petiolus 0.8-3.5 cm. longus, gracilis, minutissime puberulus. *Inflorescentia* axillaris, racemosa, corymbiformis, tota dense minutissime puberulo-tomentella, 1.5-3.5 cm. longa, pedunculo communi nudo 0.8-2.3 cm. longo; bracteae setaceae, vix ad 0.75 mm. longae; pedicelli fere spiraliter dispositi, adscendentes, corymbosi, graciles, sub anthesi saepius 1-2.3 cm. longi; rhachis post pedicelli lapsum cicatrice scutellata laticifera albo-flavescente notata. *Calyx* profunde fere ad basim partitus, laciniis lineari-lanceolatis obtusis granuloso-puberulis sub flore aperto reflexis 2 mm. longis basi ad 0.5 mm. latis. *Corolla* primo albo-viridis, demum albo-flavescent, rotata, lobis patulis angustis oblongis obtusis glabris ad 4 mm. longis ad 1.75 mm. latis. *Corona* carnosula, sinuato-crenulata, 1.5 mm. diametro. *Gynostegium* circiter 0.75 mm. altum, lateraliter valde excavatum, vertice suborbiculari plano 1.75 mm. diametro. *Pollinia* obovoidea. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 16th, 1929, *Sandwith* 265 (type); Macouria River, Essequibo River, Nov. 1886, *Jenman* 2417; Penal Settlement, Dec. 1919, *Hitchcock* 17165; "Massaroonie and Cuyounie," *Appun* 282; Pomeroon River, May 1883, *im Thurn*; Pomeroon River, Dec. 1922, *la Cruz* 3123; without locality, *Schomburgk* 755 (1458).

BRAZIL: gapó of Rio Negro near Barra, July 1851, *Spruce* 1713. This collection was referred to the genus *Gonolobus* by Fournier in Mart. Fl. Bras. vi. pars iv. 317 in adnot. (1885).

This is a low twiner found on the banks of creeks and rivers. The flowers are at first greenish-white, and become cream. The corona forms a conspicuous circular frill.

LOGANIACEAE.

Strychnos (§ *Longiflorae*) **diaboli** *Sandwith*, sp. nov.; inter *S. tomentosam* Bth. atque *S. triplinerviam* Mart. ponenda, ab illa foliis latioribus subtus haud dense lanatis, inflorescentiis densis, laciniis calycinis angustis, floribus multo brevioribus, staminibus inclusis: ab hac foliis haud coriaceis, indumento utriusque foliorum paginae, venatione, floribus brevioribus, staminibus inclusis differt.

Frutex altissime scandens, ramulis teretibus dense tomentosis, summis novellis fulvis ad 12 cm. longis ad 2 mm. diametro; cirrhi grisei vel griseo-fulvi, dense tomentosi, circiter 9 cm. longi. *Folia* in ramulis novellis per paria 1-3 disposita; cataphylla basi ramulorum conspicua, acuminata, concava, 4-5 mm. longa; internodia 2-5 cm. longa; lamina late ovata, ovato-elliptica, nonnunquam fere suborbicularis, apice vulgo obtusa vel rotundata atque breviter (2-8 mm.) acute cuspidata, in exemplis subellipticis attenuata acuminata, in exemplis suborbicularibus rotundata vix cuspidata, basi obtusa, nonnunquam obliqua uno latere rotundata, vel cuneata, 4.5-12 cm. longa, 3-7.5 cm. lata, tenuiter chartacea, supra siccitate obscure olivacea vel purpurascens, dense regulariter molliter pilosula, subtus pilis brevibus fulvis dense molliter velutino-pubescentia, haud lanata, pilis quam in pagina superiore haud multo densioribus, venatione ut in *S. tomentosa* saepius septuplinervia, nervis binis intimis a costa in medio folio circiter 0.7 ad fere 2 cm. distantibus, intermediis his paullo magis approximatis, extimis prope marginem vel cum margine conjunctis, nervis secundariis subhorizontalibus subparallelis sinuatis subtus cum rete venularum prominentibus; petiolus fulvo-tomentosus, 2-6 mm. longus. *Inflorescentiae* ramulos terminantes, congeste corymboso-thyrsoideae, densiflorae, 2-4 cm. diametro, passim indumento ramulorum fulvo-tomentoso praeditae; pedunculus primarius 0.7-3 cm. longus; rami primarii 1-9 mm. longi, apice ramosi cymis compluribus arcte stipatis; bractae imae lanceolatae, 4-6 mm. longae, circiter 1.5 mm. latae, superiores bracteolaeque ovato-lanceolatae vel ovatae, 1.5-2 mm. longae, circiter 1 mm. latae. *Flores* pentameri, vix ad 1 mm. pedicellati, albi, sed siccitate fauce excepta omnino fulvi. *Calyx* laciniis extra fulvo-tomentosis intus glabris, lanceolatis, 2 mm. longis, vix ad 1 mm. latis. *Corolla* extra indumento simili fulvo-tomentoso praedita, pilis ut in *S. triplinervia* brevibus homogeneis patulis, nec ut in *S. tomentosa* pilorum serie altera conspicua longiore patente; tubus 8 mm. longus, 1.5 mm. diametro, intus apice basique glaber, ceterum adpresse pilosus; lobi lanceolati, acuti, 3-3.5 mm. longi, 1-1.25 mm. lati, flore aperto patentes, extra indumento tubi, intus basi lana densa conspicua nivea induti, ceterum pulverulento-tomentelli. *Antherae* subsessiles, fauce sub lana insertae, inclusae nec cernendae, oblongae, 1 mm. paullum excedentes. *Ovarium* glabrum, ovoideum, circiter 1 mm. altum, ad 0.75 mm. diametro; stylus glaber, cum stigmate capitato circiter 8 mm. longus. *Fructus* non visus.

BRITISH GUIANA. In dense forest, Moraballi Creek, Essequibo River, Aug. 24th, 1929, *Sandwith* 109. Bush-rope with tendrils. Branchlets dark-rusty. Fl. white, whitish-woolly at the throat. Local name, Black Devil-Doer.

Strychnos (§ *Intermediae*) **Melinoniana** *Baill.* in Bull. Soc. Linn. Par. i. 256 (1880), descr. ampl., inter species huius sectionis foliis magnis, laciniis calycinis rotundatis obtusissimis, lobis corollae passim densissime albo-lanatis, ovario dimidio superiore piloso distinguenda.

Frutex altissime scandens, ramulis summis teretibus glaberrimis cinereis vel purpurascens ad 2-5 mm. diametro; internodia 2-10 cm. longa; cirrhi glabri, circiter 4-7 cm. longi. *Folia* in eodem frutice lanceolata ad ovata, apice attenuata acuta vel nonnunquam acuminata, basi cuneata, 7.5-20 cm. longa, 3.5-10 cm. lata, coriacea, utrinque nitida, glaberrima, supra siccitate pallide olivacea vel brunnescentia, subtus saepius glaucescentia, conspicue quintuplinervia, jugo intimo a costa prope medium folium 1.5-3 cm. distante, nervis secundariis regulariter subhorizontalibus parallelisque, his cum venulis utrinque praesertim subtus valde reticulatis; petiolus glaber, nigrescens, 5-11 mm. longus. *Inflorescentiae* axillares, racemoso-thyrsoideae, saepe a basi ramosae, cymis apice ramulorum brevium congestis, 1-4 cm. longae, 1-2.5 cm. latae, passim dense minute hirtellae, vel inferne glabrescentes nigrescentes; bractae primariae ovatae obtusae concavo-cymbiformes ad 2 mm. longae, rarius ovato-lanceolatae ad 3 mm. longae; bracteolae imbricatae, summae rotundato-ovatae, obtusae, vix ad 1.5 mm. longae, circiter 1.2 mm. latae, extra hirtellae, conspicue ciliatae. *Flores* pentameri, albi, suaveolentissimi. *Calyx* extra hirtellus, laciniis valde imbricatis ciliatis semiorbicularibus rotundatis obtusissimis 1 mm. longis fere ad 1.5 mm. latis. *Corolla* extra basi glabra excepta pulverulento-tomentella; tubus cylindricus vel fere subcampanulatus, 3-3.75 mm. longus, applanatus ad 3 mm. latus, intus basi glabra excepta albo-pilosus; lobi flore aperto patentes, demum reflexi tubo longiores, lanceolati, acuti, 4-5 mm. longi, basi ad 1.2 mm. lati, intus passim per totam longitudinem sed praesertim in medio densissime albo-lanati. *Stamina* flore aperto exserta, fauce inter bases loborum inserta, filamentis conspicuis glabris 2-2.5 mm. longis; antherae oblongae, 1.2 mm. longae. *Ovarium* ovoideo-subglobosum, 1 mm. altum, 1 mm. diametro, dimidio superiore valde albo-pilosum; stylus inferne pilosus, ceterum glaber, cum stigmate capitato 3.5-6 mm. longus. *Fructus* immaturus viridis, obovoideus, apiculatus, ad 11 mm. longus, ad 8 mm. diametro.

Moraballi Creek, Essequibo River, Sept. 26th, 1929, *Sandwith* 342. Bush-rope with hard hook-like tendrils, in mora-morabukea forest. Flowers white, white-woolly within, strongly and sweetly scented of *Philadelphus*. *Ibid.*, in mixed forest, Oct. 5th, 1929, *Sandwith* 377. Young fruit green.

Local name, White Devil-Doer.

Distr. British Guiana, French Guiana.

The original account of *S. Melinoniana* is incomplete and misleading, the sepals for example being described as "acute." The above amended description is based on the British Guiana material, which matches the type. *S. Solerederi* Gilg (French Guiana) is apparently allied. The leaves of *S. Melinoniana* also resemble those of *S. Mittscherlichii* Schomb. and *S. smilacina* Benth. in the section *Longiflorae*. *S. cogens* Benth., which was described without flowers, differs in the indumentum of the branchlets and the veins of the lower surface of the leaves, which have a much finer and more intricate reticulation. Of other possibly allied species described without flowers, *S. panurensis* Sprague and Sandwith differs especially in the narrow acutish calyx-lobes and the glabrous ovary; while *S. gigantea* Barb. Rodr. has more acuminate leaves, more rounded at the base, their secondary nerves ascending, instead of subhorizontal, and far less regular and parallel.

CONVOLVULACEAE.

Lysiostyles scandens Benth. in Hook. Lond. Journ. Bot. v. 356 (1846).

Moraballi Creek, Essequibo River, Sept. 19th, 1929, *Sandwith* 297 (flowers) and Nov. 13th, 601 (fruit). Bush-rose in mixed forest; corolla white, lobes with long acuminate points; fruit hard, glaucous, covered with scales, with a single large central seed.

Distr. British Guiana. Represented at Kew only by Schomburgk's collections. The fruit is distributed for the first time.

SOLANACEAE.

Markea porphyrobaphes Sandwith, sp. nov.; *M. sessiliflorae* Ducke affinis, floribus distincte pedicellatis, corolla bicolori basi intus purpurea, staminibus brevioribus sed antheris longioribus differt.

Frutex ope radicum secus truncos saepe alte scandens; ramuli glabri, nitiduli, corrugato-suberosi. *Folia* ovata usque lanceolato-elliptica, apice conspicue (ad 1.5 cm.) acute acuminata, basi semper rotundata nonnunquam levissime cordata, 6–20 cm. longa, 2.7–10 cm. lata, chartacea sed carnosio-corrugulata praesertim subtus saepe nitida, costa excepta glabra eciliata, nervis supra plus minusve impressis, subtus laxe reticulatis, costa subtus praesertim dimidio inferiore crassa spongioso-suberosa saepe minutissime tomentella, nervis primariis arcuatis utroque costae latere circiter 5–6; petiolus corrugato-suberosus, 5–12 mm. longus. *Flores* ramulos breves laterales terminantes, solitarii vel gemini; pedicelli breves, minutissime tomentelli vel glabrescentes, 3–4 mm. longi. *Calyx* siccitate saepius nigrescens, minutissime tomentellus; lacinae anguste oblongae, apice caudato-acuminatae, caudis inclusis 2–3 cm. longae, 4–6 mm. latae, opacae, obscure trinerviae, plerumque haud reticulatae, caudis 2–6 mm. longis. *Corolla* albo-flavoviridis, tubo intus basi purpureo, ceterum haud marmorata, siccitate

nigrescens, minutissime tomentella; *tubus* (nervis inclusis) 5–5.5 cm. longus, basi cylindrica angustissima 1 cm. longa, 2–3 mm. lata, tum ampliatus saepe ad 1.5 cm. latus; lobi suberecti, subaequales, triangulari-ovati, fere ad 1 cm. longi atque lati. *Stamina* inclusa, prope basim partis tubi ampliatae (igitur 1–1.5 cm. supra tubi basim) inserta, basi incrassata pilosula, ceterum glabra, 1.3–1.5 cm. longa; antherae 8–10 mm. longae. *Ovarium* glabrum, circiter 3 mm. longum, basi disco annulari cinctum; stylus glaber, ad 4.3 cm. longus. *Bacca* non visa.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept.-Oct. 1929, *Sandwith* 251, 279 (type), 518: a climber up trunks by rootlets, in swamps or on the bank of the creek; corolla whitish, creamy-yellow, or greenish-cream, purple within at the base of the tube. Mazaruni River, Sept. 1880, *Jenman* 633, "a few feet high, supported by trunk of tree." Upper Demerara River, Sept. 1887, *Jenman* 3974.

LENTIBULARIACEAE.

Utricularia Schimper Schenck in Pringsheim, Jahrb. Wiss. Bot. xviii. 230, t. vi, f. 4 (1887).—*U. concinna* N.E. Br. in Trans. Linn. Soc. ser. ii. vi. 55, pl. 10, figs. 7–11 (1901).

Moraballi Creek, Essequibo River, Aug. 27th, 1929, *Sandwith* 133. Epiphyte, along trunk of large felled tree towards its crown; bracts green; flower white.

Distr. Dominica. British Guiana.

This beautiful little species has apparently not been collected in the Colony since *U. concinna* was described by Mr. Brown. The latter has been identified with *U. Schimper* by Dr. J. H. Barnhart, who has not yet published the species as a member of the genus *Orchyllium*.

GESNERIACEAE.

Nautilocalyx lacteus Sandwith, sp. nov.; *N. picto* (Hook.) Sprague affinis, foliis supra demum glabris, corolla haud intus purpureo-striata, filamentis glabris, glandula disci singula differt.

Herba humilis, prostrata, omnibus fere nodis radicans; caules purpurascens, plus minusve sulcato-angulati, pilis multicellularibus plus minusve densis adpressis vel patulis vestiti, 2–5 mm. diametro; internodia vulgo 3–9 cm. longa. *Folia* opposita, elliptica usque ovata, apice attenuata acuta vel subacuminata, basi attenuata cuneata sed haud decurrentia, saepe obliqua, 5–15 cm. longa, 2.6–6.5 cm. lata, tenuiter papyracea, juniora rugosa, adulta laevia, regulariter obtuse crenata, adulta supra costa pilosa excepta omnino glabra, subtus pallidiora nonnunquam purpurascens, nervis venulisque dense adpresse pilosa mesophyllo etiam sparse pubescente, nervis primariis arcuatis multis a se 5–12 mm. distantibus, supra siccitate cum venulis costaeque impressis sed obvis subtus conspicue laxe reticulatis; petiolus dense pilosus, 0.7 (vulgo 2)–5 cm. longus. *Flores* axillares, 1–4; bractae prope basim pedicellorum lineari-lanceolatae, apicem versus dentatae, villosae,

6-12 mm. longae, circiter ad 1 mm. latae; pedicelli villosi, breves, 2-13 mm. longi. *Calycis* laciniae lineari-lanceolatae, conspicue dentatae, dense villosae, 1-1.8 cm. longae, 1.5-3 mm. latae. *Corolla* omnino lactea, haud purpureo-striata, basi calcar 2-3 mm. longo praedita; tubus subinfundibularis, basi glabrescens, ceterum utrinque plus minusve pilosus, circiter ad 3.5 cm. longus, apice 7-11 mm. latus; lobi rotundato-orbiculares, haud fimbriati, indumento simili vel glabrescentes, 4-6 mm. longi, 5-9 mm. lati. *Stamina* filamentis glabris ad 1.8 cm. longis. *Glandula disci* 1, quadrata, apice lobulata, circiter 1.5 mm. longa atque lata. *Ovarium* pilosum, ovoideum, 3.5 mm. longum, 2.5 mm. diametro; stylus pilosus, cum stigmatibus 1.5 cm. longus. *Fructus* globosus, granulatus atque pilosus, 6-7 mm. diametro.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Aug. 13th, 1929, *Sandwith* 3 (type): ground herb, common in mixed forest and low bush; flowers milk-white. Essequibo River, 1881, *Jenman* 1297. Bartica Grove, Nov. 1886, *Jenman* 2364. Flemming's Camp, Unabaruka Creek, Essequibo Co., Aug. 1930, *Martyn* 226. Dense upland forest, Rockstone, July-Aug. 1921, *Gleason* 611. Dense upland bush, Kangaruma-Potaro Landing, June 1921, *Gleason* 199. Vryheid, Demerara River, June 1924, *Altson* 110. Cuyuni Creek, *Appun* 338. Mazaruni River, Aug. 1889, *Jenman* 5457. Kumaka, Kurupung River, Sept. 1925, *Altson* 422. Anandabaru, Kopinang River, April 1926, *Altson* 484. Mount Russell District, March 1886, *Jenman* 2080.

Evidently one of the commonest herbs on the forest floor throughout British Guiana. The species is placed in the genus *Nautilocalyx* in accordance with the views expressed by Sprague in Kew Bull. 1912, pp. 85-90.

Centrosolenia densa (C. H. Wright) Sprague in Kew Bull. 1912, 87, in obs.—*Episcia densa* C. H. Wright in Kew Bull. 1895, 17; Bot. Mag. t. 7481.

Moraballi Creek, Essequibo River, Aug. 18th, 1929, *Sandwith* 49. Ground herb, characteristic of clearings in mixed forest. Leaves usually purple beneath. Sepals green to red. Corolla white, tube pilose.

Distr. Endemic.

Codonanthe calcarata (Miq.) Hanst. in Linnaea xxxiv. 416 (1865), partim quoad plantam Fockeanam.—*Nematanthus calcaratus* Miq. in Linnaea xxii. 472 (1849).

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 18th, 1929, *Sandwith* 286: epiphyte on branch overhanging creek; roots very intricate, usually colonised by vicious small ants and forming a large round mass; leaves very fleshy; corolla white; filaments red in the lower half. Other collections from the Colony are *Hitchcock* 17234, Penal Settlement, Dec. 1919; *Jenman* 1067, Kaieteur

Savannah, Potaro River, 1881; *Jenman* 236, Corentyne River, Nov. 1879.

SURINAM. Berlyn, *Focke* 941. Para, *Went* 379.

FRENCH GUIANA. *Poiteau* in Herb. Gay.

BRAZIL. Without locality, *Gwynne Vaughan*, comm. 1898. Pará, *Burchell* 9737.

Two very distinct species of *Codonanthe*, with a similar epiphytic habit and with the roots colonised by ants, are frequent in the forests of Guiana, and both were found near the camp occupied by the Oxford Expedition. They are immediately distinguished by the characters of the calyx. In one species the calyx is split into two distinct lips, in the upper of which the four posterior calyx-lobes are completely fused into a broad conspicuous porrect spathe, while the anterior lip is represented by the narrowly linear-lanceolate fifth calyx-lobe which is deflexed. In the other species, the four porrect posterior calyx-lobes are quite free and are more or less equal in size and shape to the deflexed anterior lobe. The shape of the corollas of the two species is also very different, the tube in the species with the spathaceously-split calyx being suddenly and conspicuously amplified a short distance above the base, whereas the tube of the other species is very gradually widened from the base to the apex.

These two species were included by Hanstein under his *Codonanthe calcarata*, which he based on Miquel's *Nematanthus calcaratus*, although he described the calyx as "laciniis teste Miq. spathaceis, in spec. Wullschl. lanceolatis, acutis." It is clear that Hanstein did not see Miquel's type specimen which was collected near Berlyn, Surinam, by Focke, although he cites the specimen. This type has been borrowed from the Utrecht Herbarium and proves to represent the species with the spathe-like calyx, although the leaves are somewhat larger than those of other collections. The other specimens cited by Hanstein obviously belong to the other species, which cannot possibly be identified with *C. calcarata* (Miq.) Hanst. One of these collections, *Sagot* 426, has been widely distributed in European herbaria, and Fritsch, when comparing two new species collected by Ule, has followed Hanstein in identifying *Sagot*'s plant with *C. calcarata*, but it has the calyx of the other species. A large series of specimens from Trinidad, and others from Panama and Colombia, some of which have sometimes been referred to *C. calcarata*, show the 5 subequal, narrow, calyx-lobes of the other species. Pulle, in his Enumeration of the Plants of Surinam, p. 420, failed to distinguish the two; he correctly identified *Went* 379 with *C. calcarata*, but also referred to it *Wullschlaegel* 379 which Hanstein described as having lanceolate, acute calyx-lobes and which evidently belongs, like *Sagot* 426, to the other species. This latter species, so widely distributed in Trinidad and Northern South America, is certainly closely allied to *C. formicarum* Fritsch, but in addition to the distinctions given by Fritsch in Engl. Jahrb. xxxvii. 491-2 (1906), one may mention the shining stems, the base of the much thicker

leaves which is frequently rounded, and the much narrower corolla-tube which is also more gradually ampliate than that of *C. formicarum*. This plant may be described here as follows, and Sagot 426, a collection which is to be found in several great European herbaria, is selected as the type:—

Codonanthe confusa *Sandwith*, sp. nov.; *C. formicarum* Fritsch, affinis, foliis crassis carnosiss, forma corollae differt; a *C. calcarata* (Miq.) Hanst. ob calycem in lacinias divisum nec spathaceo-fissum toto caelo abhorret.—*C. calcarata* Hanst. in *Linnaea* xxxiv, 416, partim, haud *Nematanthus calcaratus* Miq.; Fritsch in *Engl. Jahrb.* xxxvii, 491 in obs. (1906).

Fruticulus epiphyticus, radicibus nodigenis repens; caules nitentes, minute puberuli, facile decorticantes. *Folia* ovato-elliptica usque elliptica, apice acuta vel saepe breviter acuminata, basi cuneata acuta vel obtusa vel rotundata, 1–5.4 cm. longa, 0.6–2.2 cm., lata, crassa, carnosissima, glabra, integra, vel dimidio superiore obscure crenata, siccitate saepe rubescentia, costa supra impressa subtus prominente, ceterum evenia; petiolus plus minusve minute puberulus, 2–8 mm. longus. *Flores* 1–3 axillares, pedicellis puberulis vulgo 3–8 mm. longis. *Calyx* in lobos 5 subaequales lineari-lanceolatos puberulos 2.5–4.5 mm. longos, 0.5–1 mm. latos divisus, antice ita fissus ut lobi 4 porrecti sint lobus anticus quintus deflexus sit. *Corolla* alba, limbo nonnunquam pallide carneo, ad 2.5 cm. longa, saepius brevior, basi calcari brevi 2–3 mm. longo praedita; tubus basi 1–2 mm. latus, tum sensim ampliatus, sed semper satis angustus, apice 3.5–5 mm. tantum latus; limbus ad 1.2 cm. diametro, lobis inaequalibus rotundatis, majoribus usque 4–5 mm. longis atque latis. *Stamina* inclusa, filamentis glabris circiter 1.1 cm. longis. *Ovarium* ovoideum, circiter 3.5 mm. longum, 2.5 mm. latum; stylus glaber, 1 cm. longus, sursum incrassatus. *Bacca* matura rubra, ovoideo-subglobosa, 7–9 mm. longa, 5–7 mm. diametro.

TRINIDAD. Santa Cruz, 1908, *Hart* in *Herb. Trin.* 7008. Mora Forest, 1927, *Broadway* 6784. Oropuche local road, 1926, *Broadway* 6175. Quare river forests, 1928, *Broadway* sine no. Aripo road via Arima, 1926, *Broadway* sine no. Maracas Valley, 1920, *Britton and Hazen* 1633. Without locality, *Fendler* 490.

FRENCH GUIANA. Karouany, 1855, *Sagot* 426 (typus).

SURINAM. *Hostmann* 285.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 20th, 1929, *Sandwith* 316: epiphyte; corolla tube and spur white; lobes pink; berry red when ripe. Macouria River, Essequibo River, Nov. 1886, *Jenman* 2517.

COLOMBIA. Jimenes, Rio Dagua, April 1876, *André* 2484.

PANAMA. Chagres, Jan. 1850, *Fendler* 178.

LXVII.—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: III.* H. N. RIDLEY.

BURSERACEAE.

Canarium angulatum *Ridley*, sp. nov.; ramis angulatis *C. legitimo* Miq. affinis, sed foliolis bijugis cuspidatis basi cordatis, paniculis rigidis, floribus subsessilibus furfuraceis differt.

Arbor. *Folia* bijugata. *Foliola* 5, oblonga, cuspidata, basi rotundato-cordata, 9–11 cm. longa, 4–4.5 cm. lata, coriacea, glabra, nervis 10-jugis subtus elevatis intra margines arcuantibus; petioluli 5 mm. longi, crassiusculi. *Paniculae* validae, 18 cm. longae, ramis crassis angulatis furfuraceis 2–6 cm. longis. *Flores* congesti, in apicibus ramulorum sessiles vel pedicellis crassis 2 mm. longis. praediti. *Sepala* brevissima, ovata, rotundata, furfuracea. *Petala* triangulari-ovata, obtusa, 3 mm. longa, furfuracea. *Stamina* brevissima, gracilia, e disco annulari crassiusculo glabro orta, antheris minutis. *Ovarium* hirtum, globosum, stigmate disciformi obscure lobato.

BORNEO. Sarawak: near Kuching, *Haviland* 2259: "Tree; petals green, disc yellow, stigma yellow, ovary three-celled, ovules ascending."

RHAMNACEAE.

Ventilago malaccensis *Ridley*.

BORNEO. Sarawak: Rejang Kapit, *Haviland* 2863.

This is more pubescent than the typical Malay form, the costa beneath the leaf being pubescent.

Ventilago borneensis *Ridley*, sp. nov.; *V. Maingayi* Laws. affinis sed foliis, fructibus, paniculis multo minoribus, fructus calyce patelliformi vix dentato alam non amplexente, fructu omnino pubescente, ala acuta.

Frutex, ramulis glabris gracilibus. *Folia* alterna, coriacea, glabra, elliptica, obtuse acuminata, basi obtusa, integra, 7–10 cm. longa, 3–4 cm. lata, nervis gracilibus 9-paribus cum costa subtus elevatis, nervulis cum reticulationibus utrinque conspicuis elevatis; petioli crassiusculi, atri, rugosi, 5 mm. longi. *Panicula* terminalis, 6 cm. longa, hirta, ramis simplicibus. *Flores* dissiti, pauci, perianthio non viso. *Fructus* breviter pedicellatus, pedicello 1 mm. longo pubescente. *Calyx* patelliformis, obscure 5-dentatus, hirtus. *Drupa* superior, globosa, 5 mm. longa, pubescens, costata, ala plana lanceolata acuta pubescente 2 cm. longa 5 mm. lata.

DUTCH BORNEO. South and East Div.: Banjarmasin, *Motley* 356.

This species is allied to *V. Maingayi* Lawson in the calyx not embracing the drupe, but the leaves and fruits are much smaller and the panicle much less branched. The only specimen is in young fruit.

*Continued from *K.B.* 1931, p. 39.

Smythea pacifica Seem.

BORNEO. Sarawak: Beccari 4062.

Ziziphus calophylla Wall.

BORNEO. Sarawak: Beccari 1200, 1631; Kuching, Haviland 2862; Baram, Sio Matu, Moulton 16: "Flowers yellow"; path to Matang, Haviland 648: "Shrub, berry yellow."

Ziziphus Kunstleri King.

BORNEO. Sarawak: Beccari 3377; Haviland 884.

Ziziphus borneënsis Merrill ms., sp. nov.: a *Z. calophyllae* Wall., cui affinis, ramis et foliis subtus rufo-velutinis, floribus paucis axillaribus rufo-tomentosis, differt.

Frutex scandens. *Caules* adulti glabri, lenticellosi, juniores dense rufo-velutini, aculeis recurvis infra petiolis 3 mm. longis. *Folia* coriacea, oblonga vel elliptica, acuta, basi rotundata, supra glabra, subtus rufo-velutina, 7-8 cm. longa, 2.5-3.5 cm. lata, nervis tribus elevatis duobus tenuioribus intramarginalibus, nervulis transversis copiosis; petioli 4 mm. longi, velutini. *Flores* 2-3 in axillo, pedunculo brevissimo, pedicellis recurvis hirtis 4 mm. longis. *Calyx* cupulatus, lobis 5 acutis hirtis. *Petala* vix breviora, glabra. *Ovarium* dense hirtum. *Drupa* oblonga, obtusa, rufo-velutina, 2.5 cm. longa, 1.4 cm. diametro.

BORNEO. Sarawak: Kuching, Haviland 1765. British North Borneo: East Coast, Creagh; Sandakan, Myburgh Province, Elmer 20361, 20149.

I cannot find any published description of this species either by Merrill or by C. B. Clarke, who had given to it the ms. epithet "brunoniana" in Herb. Kew. The flowers in all the specimens are in poor condition, but the plant is a very distinct one in its few axillary flowers and densely red-hairy branchlets and leaves.

Ziziphus inermis Merrill.

BRITISH NORTH BORNEO. Banguay island, Castro & Melegrito 1408.

Ziziphus macrophylla Ridley, sp. nov.: *Z. borneënsis* Merrill affinis, sed arbor inermis, foliis majoribus oblongis longe acuminatis, nervulis parallelis paucioribus, floribus pluribus congestis multo majoribus distat.

Arbor parva inermis. *Rami* rufo-velutini. *Folia* anguste oblonga, longe acuminata, basi obtusa, tenuiter coriacea, supra glabra, 15-20 cm. longa, 3-6 cm. lata, subtus nervis nervulisque hirtis, nervis subtus elevatis 3, intramarginalibus 2 gracillimis, nervulis transversis parallelis pluribus; petioli rufo-velutini, 1 cm. longi. *Pedunculi* axillares, crassiusculi, 5 mm. longi. *Flores* plures, congesti, pedicellis crassis 4 mm. longis dense velutinis. *Sepala* 5, ovata, subacuta, coriacea, extra dense villosa, intus glabra, 4 mm. longa. *Petala* angusta, oblongo-lineararia, multo majora,

glabra. *Stamina* sepalis aequilonga, filamentis gracilibus, antheris parvis oblongis. *Ovarium* cum disco hirtulum.

BORNEO. Sarawak: Lundu, Haviland 881: "Small tree."

This species is distinctly allied to *Z. borneënsis* Merrill, but it is a small unarmed tree, the leaves very much larger and the venation different, the flowers in larger heads and quite twice as large as those of *Z. borneënsis*.

Ziziphus Havilandii Ridley, sp. nov.: *Z. Horsfieldii* Miq. affinis sed hirta, foliis minoribus ovatis obtuse cuspidatis, nervis lateralibus nullis sed nervo intramarginali distincto, floribus paucioribus minoribus pubescentibus distat.

Frutex scandens, pubescenti-hirta. *Folia* ovata, cuspidata, cuspidate obtusa, basi rotundata, marginibus obscure crenulata, ferme integra, 2.5-4.5 cm. longa, 1.5-2 cm. lata, supra glabra, subtus nervis tribus elevatis hirtis, nervo intramarginali tenuissimo, reticulationibus minutis; petioli hirti, 5 mm. longi. *Cymae* axillares, pubescentes, pedunculis 0.5-1 cm. longis, ramis paucifloris 5 mm. longis, pedicellis gracilibus 3 mm. longis. *Sepala* acuta, triangularia. *Petala* breviora, spathulata, stamina involventia. *Discus* glaber. *Ovarium* hirtum. *Drupa* obovoidea, rubescens, hirta.

BORNEO. Sarawak: Beccari 2493; Kuching, Haviland 2134 (type): "Flowers green."

This is allied to *Z. Horsfieldii*, but is very hairy, with smaller leaves, which have the three nerves elevated at the back and hairy, and have no lateral nerves, but there is a distinct very fine intramarginal one; the flowers are fewer, rather longer, and the inflorescence is pubescent. I have seen no quite ripe fruit.

Ziziphus Horsfieldii Miq.

BORNEO: Sarawak: Rejang, Haviland 807; Kuching, Haviland 2337; Baram, Hose 169, 698. Brunei: Lobb.

Sageretia parviflora Don.

BRITISH NORTH BORNEO. Sandakan, Creagh.

Colubrina asiatica Brongn.

BORNEO. Sarawak: Beccari 1727.

Alphitonia philippinensis Braid.

BORNEO. Sarawak: Long Luma, Hose 481.

Alphitonia moluccana Teijsm. et Binn.

BORNEO. Sarawak: Kuching, Haviland 923. British North Borneo: Gaya, Creagh.

VITACEAE.

Ampelocissus cinnamomeus (Wall.) Planch.

BORNEO. Sarawak: Kuching, Haviland 2238; Entoyut river, Hose 406; Miri, Hose 543, 613. British North Borneo: Tinkayo, Creagh.

A. Winkleri Lautenb. is quite indistinguishable from this common species.

Ampelocissus amentaceus Ridley, sp. nov.; ab *A. polythyrsa* Miq., cui affinis, caule et foliis subtus rufo-tomentosis et arachnoideis, floribus dense spicatis in alveolis immersis distincta.

Frutex scandens. *Caulis* lignosus, teres, 8 mm. crassus, rufo-tomentosus et albo-arachnoideus, ramis validulis. *Folia* 4-foliolata; petioli crassi, 7-9 cm. longi, arachnoidei. *Foliola* coriacea, oblongo-elliptica, acuminata, basi obtusa vel rotundata, marginibus spinuloso-dentata, supra glabra, polita, subtus rufescentia, arachnoidea, 11-15 cm. longa, 6-9 cm. lata, nervis supra gracilibus subimmersis arachnoideis, subtus elevatis 8- vel 9-paribus; petioluli arachnoidei, crassi, 2-2.5 cm. longi. *Panicula* 15-30 cm. longa, pedunculo 7.5-10 cm. longo, spicis pluribus densis 2-3 cm. longis, rhachidibus dense rufo-hirtis. *Flores* sessiles, immersi. *Sepala* rotundata. *Petala* 4, ovata, obtusa, 1 mm. longa. *Stamina* breviora, antheris ellipticis. *Ovarium* subglobosum, glabrum.

BORNEO. Sarawak: Kuching, *Haviland & Hose* 3625 (type). Dutch Borneo: Banjarmasin, *Motley* 1000: "Fruits large, black, very sweet, but reported unwholesome."

Haviland's specimen is more robust and bigger than *Motley's* but, as he suggests, they are obviously of the same species. The stem, branches and backs of the leaves are covered with short red fur which again is coated with white arachnoid hairs, and the flowers, very closely set, are immersed in alveoli in the rhachis.

Ampelocissus debilis Ridley, sp. nov.; ab *A. thyrsiflora* (Miq.) Planch., cui affinis, differt habitu multo graciliore, foliolis oblanceolatis minoribus, inflorescentia elongata gracili, spicis parvis paucis remotis.

Frutex scandens, debilis, ramis 2 mm. crassis rufo-hirtis. *Cirrhoi* elongati, ad 7 cm. longi, rufo-hirti. *Folia* quinquefoliolata; petioli 4 cm. longi. *Foliola* subcoriacea, supra glabra (sicca grisea), costa utrinque rufo-tomentosa, oblanceolata, apiculata, basibus attenuata, marginibus denticulata, 5 cm. longa, 2.5 cm. lata, nervis subtus dense rufo-tomentosis; petioluli 5 mm. longi. *Racemi* graciles, rufo-tomentosi, 20 cm. longi. *Spicae* remotae, paucae, 1-1.5 cm. longae, rhachide dense rufo-tomentosa. *Flores* parvi, glabri, vix immersi. *Calyx* patelliformis, 5-dentatus. *Petala* oblonga, obtusa, 1 mm. longa.

BORNEO. Sarawak: Santubong, *Ridley*.

A very slender plant for the section and distinct from *A. thyrsiflora* Planch. in the much smaller leaves and long slender inflorescence with short remote flower-spikes. The leaflets are widest at the top, gradually narrowing to the base.

Pterisanthes grandis Ridley, sp. nov.; *Pt. cissoidi* Bl. affinis, sed pedicellis parce hirtulis exceptis omnino glaber, caule crasso, foliis coriaceis multo majoribus integris.

Frutex, caule glabro 1 cm. crasso. *Folia* trifoliolata; petioli validi, 10 cm. longi. *Foliola* subcoriacea, glabra, elliptica vel elliptico-lanceolata, acuminata (acumine 1 cm. longo), basibus (foliolorum lateralium inaequilateris) obtusa, 15-18 cm. longa, 6-10 cm. lata, marginibus sparse spinulosa, nervis 7-8-paribus elevatis; petioluli foliolorum lateralium 5 mm., folioli terminalis 1-2 cm. longus. *Pedunculus* 35 cm. longus, rhachide oblonga vel ovata, biloba vel triloba, oblonga 15 cm. longa 8 cm. lata, ovata 10 cm. longa 12 cm. lata, glabra. *Flores pedicellati*: pedicellus 1 cm. longus, hirtulus; calyx undulatus; ovarium complanatum. *Flores sessiles*: calyx immersus, 5-dentatus; petala brevia, ovata. *Bacca* globosa, sicca 5-6 mm. crassa, obscure lobata.

BORNEO. Sarawak: Kuching, *Haviland* 891, 1852.

Allied to *Pt. cissoides* Bl., but the whole plant is larger and stouter, the leaves entire, coriaceous and perfectly glabrous, the inflorescence larger. This is the biggest species known.

Pterisanthes hirtiflora Ridley, sp. nov.; a *Pt. heterantha* Griff., cui affinis, floribus pluribus sessilibus majoribus hirtis differt.

Frutex scandens. *Caulis* gracilis, rufo-hirtus. *Cirrhoi* elongati, graciles, 15 cm. longi, rufo-hirti. *Folia* trifoliolata; petioli 2-3 cm. longi, rufo-hirti. *Foliola* lanceolata, acuminata, remote denticulata, basi rotundata, utraque pagina setosa, lateralia 4-6 cm. longa, medianum 9 cm. longum, 3.5 cm. latum, nervis 7-paribus et costa dense rufo-hirtis, nervulis parallelis pluribus; petioluli 5 mm. longi, rufo-hirti. *Pedunculus* gracilis, 10 cm. longus, rufo-hirtus, rhachide oblonga lobata 5-7 cm. longa 1.5-2 cm. lata rufo-tomentosa. *Flores pedicellati* marginales, pedicellis gracilibus hirtis 1 cm. longis: calyx patelliformis, margine undulato; corolla 1 mm. longa, petalis hirtis oblongis obtusis; staminum filamenta gracilia, longiuscula; ovarium pulviniforme, glabrum. *Flores immersi*: calycis lobi 5, dentiformes, glabri; petala ovata, obtusa, extra hirta; stamina breviora, filamentis linearibus; ovarium quadrangulare.

BORNEO. Sarawak: Kuching, *Haviland* 2288.

This is allied to *Pt. heterantha* Griff., from which it differs in the larger hairy flowers, which are much more numerous. The buds of the sessile flowers are quite globose and covered with short spine-like bristles.

Tetrastigma Havilandii Ridley, sp. nov.; *T. papilloso* Planch. affinis, sed foliolis coriaceis laevibus adultis integris, petalis obtusis differt.

Frutex scandens, caule haud papilloso lignoso. *Folia* trifoliolata; petioli 2.5-8 cm. longi. *Foliola* coriacea, ovato-elliptica, cuspidata, basi obtusa, marginibus integra vel superne obscure serrata, 7-13 cm. longa, 3-8 cm. lata, nervis 4-paribus tenuibus inarcuantibus; petioluli foliolorum lateralium 1-3 cm. longi, folioli medii 1.5-6 cm. longus. *Paniculae* laxae, multiflorae, 5-7 cm. longae, pubescentes; pedunculi 1 cm. longi; rami 2-3.5 cm. longi; pedicelli 2 mm. longi,

pubescentes. *Calyx* cupulatus, 4-dentatus, pubescens. *Petala* 4, oblongo-ovata, obtusa. *Stamina* brevia, filamentis teretibus. *Ovarium* conicum. *Stigma* planum, papillosum.

BORNEO. Sarawak: Kuching, *Haviland* 2242 (type); Bau, *Haviland* 2054.

Allied to *T. papillosum* Planch., but the leaflets are nearly or quite entire and coriaceous, and the petals are blunt.

Tetrastigma enervium Ridley, sp. nov.; *T. Kunstleri* King affinis, sed omnino glabra, foliolis angustioribus coriaceis integris enerviis, inflorescentia glaberrima distincta.

Frutex scandens, omnino glaber, caule lignoso tereti. *Folia* trifoliolata; petioli 9 cm. longi. *Foliola* coriacea, laevia, enervia, oblonga, cuspidata, basi obliqua, integra, costa subtus elevata, 6-11 cm. longa, 3-4 cm. lata; petioluli laterales 1 cm. longi, petiolulus medius 4 cm. longus. *Paniculae* axillares, glabrae, 2 cm. longae, bracteis ovatis acutis, pedunculo 1 cm. longo, ramis paucis 1 mm. longis. *Flores* congesti, glabri, pedicellis 1 mm. longis. *Calyx* cupulatus, integer. *Petala* 4, oblonga, apicibus acutis incurvis. *Stamina* 4, filamentis brevibus, antheris magnis oblongis. *Stigma* discoideum.

BORNEO. Sarawak: Baram, *Haviland & Hose* 3197.

This is allied to *T. Kunstleri* King, but the leaves are more coriaceous, narrower, with only the faintest trace of nerves, and the inflorescence and flowers are quite glabrous.

Cissus angustata Ridley, sp. nov.; *C. adnatae* Roxb. affinis, sed ferme omnino glabra, foliis ellipticis vel ovatis basi subacutis nec cordatis.

Frutex scandens, ferme omnino glabra. *Folia* monophylla, elliptica vel ovata, basi rotundata vel obscure subacuta, apicibus abrupte acuta, marginibus subintegra vel superne obscure crenata, 7-8 cm. longa, 3.8-4 cm. lata, nervis 4-paribus tenuibus inferioribus e basi ortis, pilis paucis rufescentibus ad basin in pagina inferiore exceptis glabra; petioli 2 cm. longi. *Paniculae* axillares, 3-4 cm. longae, pedunculis 2.5 cm. longis parce rufescenti-pilosis, ramis 1 cm. longis, pedicellis glabris 4 mm. longis. *Calyx* glaber, cupulatus, 2 mm. longus, margine sinuato. *Petala* 4, oblonga, obtusa, 4 mm. longa, calyptram formantia. *Ovarium* conicum, obscure lobatum. *Stylus* cylindricus, stigmati discoideo.

BORNEO. Sarawak: Entoyut River, *Hose* 418.

This vine is undoubtedly allied to *C. adnata* Roxb., but is distinct from all forms usually included under that species by its very glabrous habit and by the leaves not being cordate. A plant much resembling it, and I think the same, is labelled "*Vitis adnata* Wall., var. *angustata* Miq. Java." It is rather more hairy, but the leaves are of the same shape. I cannot find that this variety or species is described anywhere, but it is just possible that this was what Blume

intended by his *Cissus compressa* (Bijdr. 182), to which I find no reference in Planchon's *Ampelideae*.

Leea sandakanensis Ridley, sp. nov.; a *L. sundaica* Miq., cui affinis, foliis pinnatis et planta lignosa omnino glabra differt. *Arbor* vel *frutex* ramis 1 cm. crassis, cortice laevi. *Folia* pinnata, 13 cm. longa, glabra. *Foliola* 7, papyracea, lanceolata, acuminata, basi cuneata, marginibus serrata vel ferme integra, 11-15 cm. longa, 3-6 cm. lata, nervis 8-paribus subtus elevatis; petioluli 5 mm. longi; stipulae deciduae. *Corymbus* pro genere parvus, puberulus, pedunculo 5 cm. longo, ramis florentibus 2 cm. longis. *Calyx* cupuliformis, lobis brevissimis ovatis acutis. *Petala* 5, oblonga, ovata, viridia. *Stamina* 5, biloba, antheris 5. *Stylus* subulatus, stigmati capitato-globoso. *Baccae* subglobosae, 4-lobae, 8 mm. crassae, seminibus 4 semi-orbicularibus dorsis rotundatis laevibus.

BRITISH NORTH BORNEO. Tinkayo, Bilit and Datu Laya, Creagh.

Clarke, who has put notes to all Creagh's three specimens, appears to have omitted to describe this plant which, in some respects, resembles *L. sundaica* Miq., but it is entirely glabrous except for some mealy-like puberulousness on the branches of the corymb. Its branches are very woody and I presume it is a small tree. There is only one small corymb of flowers, but in one of the fruiting specimens the corymb has two divaricating branches 9 to 10 cm. in length.

LXVIII.—MISCELLANEOUS NOTES.

JOHN BRIQUET.—We record, with deep regret, the death of Dr. John Briquet at Geneva on October 26th, at the age of 61.

Briquet's life-long connection with the Conservatorium and Botanic Garden, Geneva, commenced in 1890 when he was appointed 'Sous-Conservateur.' Six years later he became Director, a post which he held until his death, and in which he proved himself a worthy successor of Alphonse de Candolle.

During this period Briquet accomplished an unusual amount of work, both in the constructive administration of the Conservatorium and the Garden, and also in botanical research. In 1904 the Garden and the Herbarium were moved from the centre of Geneva to a more favourable site on the outskirts of the city, and much of his official work was concerned with re-arranging the important Delessert collections. In 1921, on the death of M. Augustin de Candolle, the historic Candolleian Herbarium and Library were presented to the Conservatorium by his widow and in 1924 these were housed in the Conservatorium, which had to be enlarged for the purpose. Briquet was engaged in work on these collections up to the time of his death.

Briquet's early botanical work was concerned largely with the Labiatae. "*Les Labiées des Alpes Maritimes*" (1891), in which he

paid special attention to anatomical as well as morphological characters, was followed by his account of the family in Engler and Prantl, *Pflanzenfamilien* (1895-97). Many critical papers on the Labiatae and other groups appeared in periodicals, especially in the *Annuaire du Conservatoire et du Jardin Botaniques de Genève* (changed in 1922 to *Candollea*), a journal founded by Briquet in 1897. He also published "Prodrome de la flore Corse" (1910-13), and, with Cavillier, Vols. V. and VI. of Burnat's "Flore des Alpes Maritimes" (1913-16). In addition he published valuable biographical studies of many Swiss botanists. In Britain he will be especially remembered for his theory of the hybrid origin of many of the European Mints, a group to which he had devoted particular attention, and for his characteristic kindness in naming Mint collections for British students of the genus.

It is, however, in connection with his invaluable work on Nomenclature that Briquet will be remembered by Botanists, and here again he proved an able successor to Alphonse de Candolle. In 1900 at the First International Botanical Congress held in Paris, he was appointed Rapporteur Général, a position he held up to the conclusion of the Cambridge Congress, 1930. As Rapporteur in 1900 his duties were to collect and collate all proposals concerning the Rules of Nomenclature which had appeared since the publication of the Laws of Botanical Nomenclature by Alphonse de Candolle in 1867, together with all new proposals sent in for consideration by the Vienna Congress. These were then submitted to the members of a special International Committee for their preliminary voting, and the whole of this exceedingly complicated work, together with the editorial comments by the Rapporteur, were clearly tabulated in his "Texte Synoptique" (1905) which served as a basis for the discussions at Vienna. After the Vienna Congress he prepared the International Rules of Botanical Nomenclature, ed. 1 (1906), embodying its decisions, and was also responsible for editing the second edition of the Rules (1912), which incorporated modifications introduced by the Brussels Congress (1910). At the time of his death he was engaged in the preparation of the French text of the International Rules, ed. 3, embodying the numerous alterations carried at Cambridge in 1930.

All botanists who were present at the Meetings of the Nomenclature Sub-Section will recall how indispensable were Briquet's *Recueil Synoptique* ("Blue Book") and his *Avis Préable* ("Yellow Book"). Without his lucid tabulation of the proposals the Revision of the Rules would not have been possible in the time.

Briquet was an ideal Rapporteur. Besides having a thorough knowledge of the highly technical subject of Nomenclature he had also the requisite temperament, being always calm, tactful and far-seeing, logical and scrupulously fair and impartial. His knowledge of languages was a great asset. He spoke fluent English with a slight Scottish accent due to his early education in Scotland. His

important services to Systematic Botany and to Botanical Nomenclature were recognized by the conferment of the Honorary Degree of Sc.D. at Cambridge during the International Congress.

PROFESSOR H. HUMBERT.—The appointment of Professor Henri Humbert, of the University of Algiers, as Director of Botany at the Muséum d'Histoire Naturelle at Paris, in succession to Professor Henri Lecomte, Membre de l'Institut, has been announced. Professor Lecomte's retirement, which took place on October 1st, terminates officially, to our great regret, the friendly personal connection with Kew which has existed so happily during the twenty-five years he has held his important office.

Professor Humbert has collected extensively in Madagascar and has paid special attention to the *Compositae*. He has also travelled in East and Central Africa, where he explored particularly Ruwenzori and the Virunga Mountains.

DR. JESSEN.—Dr. Knud Jessen has been appointed Professor of Botany at the University of Copenhagen and Director of the Botanic Garden and Museum in succession to the late Professor Ostenfeld (*K.B.*, 1931, p. 158). Dr. Jessen is well known for his work on recent fossil plants and on the phytogeography of Northern Europe.

Botanical Magazine.—The first part of Vol. clv., published on October 7th, 1931, contains the following plant portraits:—*Paeonia tomentosa* Stapf (t. 9249), a new species allied to *P. Wittmaniana* Steven, found in the hinterland of the Southern Caspian Sea; *Salvia Jurišićii* Košanin ex Jurišić (t. 9250), from the Balkan Peninsula; *Kalanchoe tubiflora* Hamet (t. 9251), a native of the southern district of Madagascar; *Cyrtanthus epiphyticus* J. Medley Wood (t. 9252), an interesting epiphytic species from W. Natal; *Rhododendron adenogynum* Diels (t. 9253), from Yunnan; *Onosma Hookeri Wardii* Stapf (t. 9254), a new subspecies raised at Kew from Kingdon Ward's seed collected in S. E. Tibet; *Coelogyne ovalis* Lindl. (t. 9255), a native of the Himalayas and Assam which has been in cultivation about 100 years; *Acacia fimbriata* A. Cunn. ex G. Don (t. 9256), a S. E. Queensland species which flowers freely at Kew; *Allium amabile* Stapf (t. 9257), a new species segregated by Dr. Stapf from *A. pyrrhorrhizum* Airy-Shaw, raised at Kew from seed collected by G. Forrest in N. W. Yunnan; *Reevesia pubescens* Mast. (t. 9258), raised from seed collected by E. H. Wilson near Tachienlu, the range of the species being from the Himalayas to S. W. China; and *Rhododendron hypolepidotum* Balf. f. & Forrest (t. 9259), an interesting yellow-flowered hardy species from N. W. Yunnan.

Sesse Canoes.—With reference to the article on Sesse Canoes which appeared in *Kew Bulletin* No. 8, 1931, pp. 414-417, Mr. Harris informs us that the extended keel, which projects 2 or 3 feet in the front of these canoes and serves the purpose of a rammer in warfare, may be tapered to a sharp point instead of being rounded as in the illustration on p. 415.

On p. 416 (line 3) "cut with an edge" should read "cut with an adze," and "unseasoned" should be substituted for "seasoned" in the same paragraph (line 6). The botanical names of the woods referred to as "Nongo" and "Mugavu" (line 12) should be reversed, "Nongo" being *Albizzia Zygia* (DC.) Macbride, and "Mugavu" being *A. coriaria* Welw.

List of Staffs.—It has been decided to discontinue the publication of the List of Staffs of Botanical, Horticultural and Agricultural Departments which has hitherto appeared as Appendix II to the *Kew Bulletin*. This list commenced in 1889 as an article in the text of the Bulletin and was continued as such in the following year. In 1891 it appeared as a separate appendix and continued thus each subsequent year up to 1930.

Until recently the list was the only one of its kind and was of great value to scientific workers all over the world. An interesting feature, both for reference purposes and as showing the world-wide influence of Kew, was the indication by an asterisk of men who had been trained in the Gardens. In the last list these numbered over a hundred and were distributed throughout nearly the whole Empire.

The usefulness of this appendix, has, however, now largely disappeared owing to the publication, during the last few years, of specialised lists by other institutions, namely: the list of Mycological Workers in the Empire (Imperial Mycological Institute), the list of Forest Officers in the Empire (Empire Forestry Association) and the list of Agricultural Research Workers (Imperial Agricultural Bureaux). These, together with the Dominions Office and Colonial Office List and the new International Address Book of Botanists (see below), contain all the information previously given in this appendix.

International Address Book of Botanists.*—This compilation, the origin and progress of which has been recorded in *K.B.* 1930, p. 499 and 1931, p. 429, has now been published. The following is a reprint of the preface:—

"The want of a new Address Book of the Botanists of the World was impressed on the Fifth International Botanical Congress, which

*International Address Book of Botanists, being a Directory of Individuals and Scientific Institutions, Universities, Societies, etc., in all parts of the world interested in the study of Botany. Prepared in accordance with a resolution passed at the Fifth International Botanical Congress, Cambridge, 1930. Published for the Bentham Trustees by Baillière, Tindall & Cox, 7 and 8 Henrietta Street, Covent Garden, London, pp. xv+605. Price 12s. 6d. (Canada and U.S.A. \$4).

was held at Cambridge, England, in 1930. By Resolution 8, passed at the final plenary meeting of the Congress, an International Committee was appointed to arrange for the preparation and publication of a new Address Book.

The last publication of this nature, which is now entirely out of date, is the third edition of Dörfner's "Botaniker-Adressbuch," which was published in 1909. The Committee, therefore, have had to collect the whole of the information required for the present publication.

The arrangement is by countries alphabetically. The entries under each country are, as far as practicable, in the language of the country, in roman script.

At the beginning an Index gives page reference to each country. At the end there is a page reference to each personal entry.

The entries under each country include:

- (a) Societies with their postal addresses.
- (b) Institutions wholly or chiefly botanical, their addresses and departments; educational institutions having separate departments dealing with botanical teaching and research.
- (c) The surname and initials of Botanists, both professional and amateur, with information as to their offices and other professional qualifications, their postal addresses, and their special botanical interests.

The Committee have been fortunate in securing the co-operation of a number of collaborators, who have collected the relevant information for their respective countries. The Committee desire to record their appreciation of this assistance which has so considerably lightened their task.

The low price at which it has been possible to publish this book is due to assistance the Committee has received from a loan from the Bentham Trustees, and a grant from the Carnegie Corporation of New York. The Committee desire to take this opportunity of expressing their grateful thanks for this valuable assistance.

The Committee appointed to arrange for this publication are:

Prof. Dr. L. Diels, Direktor, Botanischer Garten und Botanisches Museum, Berlin-Dahlem, Germany.
Dr. E. D. Merrill, Director-in-Chief, New York Botanical Gardens, New York, United States of America.
Dr. T. F. Chipp, Royal Botanic Gardens, Kew, England."

The publication was intended to take place in September. The slight delay is due to the lamented death of Dr. Chipp, who had shouldered much of the responsibility of this compilation. That the delay is not greater is a tribute to his thorough and far-seeing work, which has considerably mitigated the task of Miss Verbrugge, who assisted Dr. Chipp during the progress of the work and who has completed it under the supervision of the Director.

British Grasses.—We have received from the publishers a copy of the work entitled "Flowers of Grass,"* which is intended for those who have little knowledge of the group. The book is provided with keys and is illustrated with a number of figures.

J. P. LOTS.—It is with great regret that we learn, shortly before going to press, of the death in November of Dr. Johannes Paulus Lotsy at the age of 64.

Dr. Lotsy was a valued correspondent of and visitor to Kew. He was unusually widely travelled and his personal knowledge of various parts of the British Empire made him well acquainted with the work of his British colleagues. His name is familiar to students and teachers of botany through his two works "Vorlesungen über Deszendenztheorien" (2 parts, 1906, 1908), based on his course of lectures on evolution at Leiden, and "Vorträge über botanische Stammesgeschichte" (3 vols., 1907-1911), an unfinished survey of the plant kingdom based on phylogenetic hypotheses.

Lotsy will, however, probably be best remembered for his studies on the causes and methods of evolution and for his vigorous advocacy of the theory that hybridisation is the only known method. In his classic work "Evolution by means of Hybridisation" (1916) he developed this theory and, though it is now generally believed that he went too far in denying the occurrence of gene mutations, recent researches have confirmed the view that hybridisation is one of the factors leading to the evolution of new species. In his early work he advocated the limitation of the term "species" only to include homozygous biotypes, but in later years, realising that even in autogamous populations these probably do not exist, he greatly modified this idea.

Lotsy's post-war visits to New Zealand and South Africa stimulated research and resulted in the recognition of many hybrid populations. His widespread personal influence must thus be added to that exercised by his books and papers. In South Africa he worked especially on the genera *Cotyledon* and *Euphorbia*, but he also paid considerable attention to hybrids among the native and introduced human races. He was editor or co-editor of three genetical periodicals: "Genetica" (since 1919), "Bibliographia Genetica" (since 1924), and "Resumptio Genetica" (since 1925). At the time of his death he was engaged on a comprehensive work which was intended to expound fully his theory of Evolution by means of Hybridisation, and it is much to be regretted that he did not live to bring it to completion.

W. B. T.

*"Flowers of Grass," by Robert Fisher, M.A. Publishers: Messrs. Wheldon & Wesley, Ltd., London, 1931. Price 2s.

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix I 1931

ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1930.

General.

STAFF.—A change in the designation of the grades of Assistant and Sub-Assistant to Botanist and Assistant Botanist has been authorised.

As from the first of January, 1930, one Botanist has been replaced by a Deputy Keeper of the Herbarium, and this newly created post has been filled by the promotion thereto of Mr. T. A. Sprague, D.Sc., F.L.S. Mr. J. Hutchinson, F.L.S., was absent for some months on a tour in Northern Rhodesia (see p. 3) and his place was filled temporarily by Miss E. A. Bruce, B.Sc., who later deputed for Mr. E. W. B. H. Milne-Redhead, B.A., Temporary Assistant Botanist, during part of the time the latter was seconded to the Government of Northern Rhodesia as Botanist attached to the Aerial Survey (see p. 3). Mr. C. H. Jones also acted for a time as substitute for Mr. Milne-Redhead, but vacated the post to return to New Zealand. Miss M. B. Moss, B.Sc., resigned her appointment as a Temporary Assistant Botanist, and Miss C. I. Dickinson, B.A., has been appointed Temporary Assistant Botanist.

Mr. L. A. Boodle, F.L.S., Assistant Keeper of the Jodrell Laboratory, retired on reaching the age limit, after twenty-six years' service at Kew. Mr. Boodle has been succeeded as Assistant Keeper by Mr. C. R. Metcalfe, M.A., Ph.D. (*K.B.* 1930, p. 328).

Mr. A. E. Edwards, who entered Kew service in 1928 as Assistant Curator in charge of the Herbaceous and Rock Garden Department, resigned his position on being appointed Superintendent of Parks at Fleetwood.

INTERCHANGE OF OFFICERS.—The Imperial Conference held in London in 1924 directed attention to the benefits to be derived from an interchange of officers between home and overseas institutions. The matter was kept in view and was further discussed with Australian botanists on the occasion of the Director's visit to Australia in 1928. Arising out of this discussion a concrete proposal for the interchange, for the period of a year, of a Kew botanist with a botanist on the Staff of the Queensland Department of Agriculture was received from the Under-Secretary of that Department. With the approval of the Minister of Agriculture and Fisheries and with

the assistance of the grant for overseas visits from the Empire Marketing Fund, steps were taken to give effect to the proposal. In January Mr. W. D. FRANCIS, the Assistant to the Queensland Government Botanist, took up his duties at Kew, and a month later Mr. C. E. HUBBARD, an Assistant Botanist at Kew, proceeded to Brisbane to be attached to the Herbarium there. Mr. Hubbard, who has made a special study of grasses, was selected with the definite purpose of investigating the pasture grasses of Queensland. During his sojourn at Brisbane he has explored the surrounding area and has made extensive collections for the herbaria at Brisbane and Kew.

OFFICIAL VISITS.—THE DIRECTOR left Kew on the 24th October for South Africa, at the invitation of the Government of the Union, in order to visit botanical and allied institutions in that country. After leaving South Africa he will proceed to Uganda and Kenya, by arrangement with the Colonial Office, and will be present at the Conference of Directors of Agriculture of East Africa to be held at Amani at the end of January. He will return to Kew in March.

In January the ASSISTANT DIRECTOR attended as a delegate the Congrès de la Rose et de l'Oranger au Sahara, organised in connection with the Centenary Celebrations of Algeria. The Congress assembled at Algiers and subsequently went to the Oasis of El Golea. After returning to Algiers in February, the Assistant Director joined an expedition which explored the western mountains of the Hoggar massif of the Central Sahara. Preliminary accounts of this expedition have appeared in the Meteorological Magazine, July 1930, and in the Geographical Journal, August, 1930. From the results of the expedition it is now possible to connect the distribution of the vegetation in the northern part of Africa with that of the Gulf of Guinea flora. The specimens collected enabled the exact delimitations of the Mediterranean and Tropical African floras to be ascertained. A considerable number of new records was obtained for incorporation in the Flora of West Tropical Africa.

At the request of the Secretary of State for the Colonies, Mr. H. C. SAMPSON visited the Bahamas to report on agricultural conditions. As a consequence of his visit he has been able to make recommendations for the improvement and development of agriculture in the islands. He also visited Florida in order to gain first-hand information regarding the reclamation of the rocky soils of the extreme south of that State in connection with a proposal to develop the lands of the Bahamas in a similar manner. At the request of the Secretary of State for the Colonies he visited the area south of Lake Ocheechobee in Florida, where sugar cane cultivation on a large scale, involving the extended use of mechanical tillage and harvesting machinery, is being developed. Visits were also paid by him to Bermuda and Porto Rico, where agricultural development has a distinct bearing on some of the problems met with in the Bahamas. Mr. Sampson left England on May 2nd and returned on July 27th.

Thanks are due to the Governments of the various countries visited and to their officers for the assistance given him in the course of his travels.

MR. J. HUTCHINSON was absent from June 4th until October 6th on a botanical expedition to Northern Rhodesia organised by General J. C. Smuts, P.C. He joined the party at Pretoria whence the expedition started by car on June 28th. They proceeded to Rhodesia by the Great North Road, via Messina, where Dr. I. B. Pole-Evans, C.M.G., Chief of the Division of Plant Industry in the Union of South Africa, joined the expedition. Collections of plants were made at many places along the route, including the Lundi River, Zimbabwe Ruins and neighbourhood, the Victoria Falls area, and northeastwards along the road *via* Broken Hill as far as the south end of Lake Tanganyika, the most northerly point reached. The return journey was along the same route as far as Broken Hill, where Mr. Hutchinson left the party and proceeded by rail to Elizabethville in the Belgian Congo. He returned by the railway *via* Bulawayo, whence he collected in the Matopos, spent a week in the botanically little-known Zoutpansberg range in the Northern Transvaal, and a week each in the National Park, Natal, and at Port Elizabeth.

In Rhodesia and the Congo about 900 species of plants were collected, 300 in the Zoutpansberg, and about 300 in the National Park and Port Elizabeth, together with a number of living plants from the Addo Bush.

MR. E. MILNE-REDHEAD, Temporary Assistant Botanist in the Herbarium, was seconded to the Government of Northern Rhodesia for part of the year. He left Kew early in May for Broken Hill, where he was attached to the Company carrying out an aerial survey of sixty-three thousand square miles of undeveloped territory in the north-west of Northern Rhodesia. Nearly four months were spent in the Solwezi and Mwinilunga Districts, and about four hundred miles were covered on foot. With the co-operation of Dr. L. Hawkes, a careful study of the vertical aerial photographs was made in relation to the vegetation and geology. Mr. Milne-Redhead was at the same time able to make a collection of the winter and early spring floras of these botanically little-known districts. He returned to Kew early in November.

MR. C. L. COLLENETTE (*K.B. App. I*, 1930, p. 6) who was attached as botanist to the Anglo-Italian Commission for the demarcation of the boundary between British and Italian Somaliland, spent five months in the field. In addition to work in the plateau region, adjacent to the 49th meridian of longitude, he was able to make camping visits of some weeks in the Al Hills and the Surud Range, which rise to over 7,000 ft. Over 400 specimens were obtained and a paper dealing with the results is in preparation.

By the courtesy of the Belgian Government arrangements have been made for Mr. B. D. BURTT, of the Tsetse Research Department,

Tanganyika Territory, with his Government's consent, to make a series of collections in the hitherto botanically unexplored Kivu-Ruanda district. The exploration will include the Parc National Albert, which embraces the volcanic group of mountains, Namalagira, ChaNinagongo, Mikenno and Karrisimbi.

In last year's Review (*K.B.* App. I, 1930, p. 6) reference was made to a collecting tour in the British Solomon Islands undertaken by MR. J. H. L. WATERHOUSE. In the course of that tour, and after his return to Sydney, Mr. Waterhouse succeeded in interesting many people, both European and native, in his work. As a direct outcome it has been made possible for him, by assurances of assistance on the spot from missionaries and others, to undertake a further collecting tour on behalf of Kew to the island of Bougainville in the Mandated Territory of New Guinea, with an extension to the Shortland group and other islands in the British Solomon Islands Protectorate should circumstances permit. Mr. Waterhouse arrived in Bougainville in March and has since been actively engaged there in collecting under conditions exceptionally hazardous and difficult.

The foregoing visits were all rendered possible thanks to the grant received from the Empire Marketing Board for overseas missions and collecting purposes.

In addition the following visits were undertaken by members of the staff during the year:—

THE KEEPER OF MUSEUMS attended the Annual General Meeting of the Royal English Arboricultural Society, which was held in Brighton and district during the last week in August. At the conclusion of the meeting he conducted a party of members of the Society round the new Pinetum at Bedgebury. They were greatly interested in the visit and expressed their appreciation of the joint effort of Kew and the Forestry Commission in this matter.

MR. HUTCHINSON and DR. DALZIEL paid a visit to the Herbarium of the Muséum d'Histoire Naturelle, Paris, in connection with the Flora of West Tropical Africa, from April 28th to May 6th, Mr. Hutchinson then proceeding to Brussels and Berlin where he worked until 16th May.

MR. J. H. HOLLAND, Botanist in the Museums, attended the Conference of the Museums Association, held at Cardiff from June 23rd to June 27th. The Conference was attended by upwards of 250 delegates and members representative of the Museums of the United Kingdom. The gathering also included delegates from the United States, Germany, and Sweden.

MISS M. L. GREEN visited the Botanical Institutions at Berlin, Brussels, Geneva, and Zürich, during July, in order to discuss various matters concerning nomenclature in connection with the proposals submitted by British Botanists to the Fifth International Botanical Congress, Cambridge (August, 1930).

MR. OSBORN, Assistant Curator in charge of the Arboretum, visited the United States in June and spent some time at the Arnold Arboretum at Cambridge, Massachusetts. From there many private gardens and nurseries were visited, also Rochester Parks, and the Queen Victoria Park in Canada.

Subsequently he went to the New York State Plant and Fruit Breeding Institute at Geneva, Cornell University, Vassar College, the Boyce Thompson Institute at Yonkers, and the United States Department of Agriculture at Washington. The visit terminated with the New York Botanical Garden and the Brooklyn Botanical Garden.

The courtesy of his hosts in America, who afforded him facilities to visit their arboreta and gardens, is gratefully acknowledged.

OTHER ACTIVITIES.—The Director was President of the Imperial Botanical Conference which, owing to the proximity of the International Botanical Congress, was confined to one session devoted to business matters (*K.B.* 1930, p. 500).

The Director was President of Section K (Botany) at the meeting of the British Association for the Advancement of Science, which was held at Bristol during September.

TUNG OIL (*Aleurites Fordii*). Interest in the possibilities of this tree as a crop likely to prove profitable in the cooler parts of the tropics and in the sub-tropics of the Empire, has been maintained, and has been stimulated by the publication of a memorandum by the Tung Oil Sub-Committee of the Imperial Institute on the Production of Tung Oil in the Empire. Encouraging reports on the initial growth of this plant have been received from several parts of the Empire, often accompanied by enquiries for seed sufficient to establish plantations. This has involved considerable work in procuring and distributing further quantities of seed, and the development of sale seed distribution has followed as a natural sequence. Kew is being greatly helped in this work by the willing co-operation of technical officers in the countries concerned, who have undertaken the local distribution of the seed.

Aleurites montana. This species, which also furnishes Chinese Wood Oil, has not yet received much attention on account of the difficulty which has been experienced in obtaining viable seed. Further efforts have been made to procure this for trial distribution. If these efforts prove successful, it may mean a wider sphere of operations, since this species is accustomed to more tropical conditions than *A. Fordii*.

NINTH INTERNATIONAL HORTICULTURAL CONGRESS, 1930.—The Congress was held in London during August. On the morning of August 12th a party of 120 members visited Kew and were conducted round the Gardens by the Director and members of the staff. Afterwards the visitors were entertained to lunch, in the Gardens, by H.M. Government.

FIFTH INTERNATIONAL BOTANICAL CONGRESS, 1930.—The Congress was held at Cambridge in August and was attended by most of the scientific members of the Kew Staff, several of whom held official positions in the Congress (*K.B.* App. I., 1930, p. 88). The excursions after the Congress included a visit to Kew, when nearly 300 members were entertained to lunch by H.M. Government. Further reference to visits paid to Kew by Members of the Congress and to the work of Kew will be found on pages 39, 41-45.

IMPERIAL MYCOLOGICAL INSTITUTE (IMPERIAL BUREAU OF MYCOLOGY).—The new building, behind the Herbarium, with entrance from Ferry Lane, was completed and occupied during the year. The surrounding ground was levelled, sown with grass seed, and paths were made.

PUBLICATIONS.—The usual 10 numbers and 3 Appendices of the *Kew Bulletin* were published during 1930.

A new edition of the Guide to Museum No. 1, which was issued in the summer, completes the revision of the Guides to the Museums of Economic Botany.

The fifth part of Vol. IX of the Flora of Tropical Africa was published, also part ii of Vol. ii (series 5) of Hooker's *Icones Plantarum*.

A photograph of the fine statue by Sir Hamo Thornycroft, "A Sower" (*K.B.* 1929, p. 63), has been reproduced in postcard form.

The Assistant in charge of the Index Kewensis has been engaged in completing the preparation of the new edition of the Handlist of Tender Dicotyledons cultivated in the Royal Botanic Gardens, Kew, which is now in the hands of the printers. The nomenclature and taxonomy have been revised throughout as far as possible. The Cactaceae have been named in accordance with Britton and Rose's "The Cactaceae," except where names adopted in that work conflict with the International Rules of Botanical Nomenclature. The genus *Mesembryanthemum* is retained, but in all cases where the species have been transferred to other genera the new generic name is given in brackets.

COURSES OF INSTRUCTION.—At the request of the Secretary of State for the Colonies, and of other Governments, special courses of instruction were arranged for officers on deputation, and prior to taking up their appointments.

The Gardens.

VISITORS.—The number of visitors to the Gardens in 1930 was 1,544,212.

With the exception of August, September and November, each month registered a higher attendance than in 1929, and the total figures for the year show an increase of 374,312 over those of 1929.

The greatest monthly attendance was in June with 381,160, the lowest in December with 17,596. The highest daily attendance was 92,504 on Whit-Monday, June 9th; this figure is the highest

recorded on any one day since the turnstiles were installed at the entrance gates. The lowest attendance was 15 on November 28th.

PLANT HOUSES, EXTENSIONS AND ALTERATIONS.—During the year H.M. Office of Works undertook the demolition of the Economic House and the erection on the same site of a house 9 ft. longer, 18 ft. wider, and 6 ft. higher than the original structure, which at no time was large enough to accommodate this important section of the living collections. Apart from this, the restricted size of the old building hampered the true development of the plants, and it is hoped that in the new building they will be able more nearly to approximate to their natural characters. The entire woodwork has been carried out in teak. Staging 3 ft. 6 ins. wide has been erected around the sides and beneath it additional rain-water tanks have been installed. The structure has been divided transversely into two sections, the larger for tropical, and the smaller for temperate plants. Centre beds have been made in both sections, and fresh soil to a depth of 2 ft. laid down. The larger species will be planted out in these beds, which will be a great improvement, as formerly all the plants were grown in pots. At the time of the preparation of this report the glass partition separating this house from No. 10 is in process of being removed so that No. 10 and the new tropical Economic House may be thrown into one. It may be noted that the span roof of the new house and of No. 10 are of the same size.

Running the length of the new Economic House, and on its south side, is an annex, 78 ft. long and 8 ft. wide, for the cultivation of species of *Pelargonium*: previously these had been grown in the Cape House (No. 7), which has not such a favourable aspect.

Two sunk span-roofed pits have been built in the Office Yard to replace two lean-to frames. The new pits are each 80 ft. long by 10 ft. wide, and they are being used mainly for the housing of bedding plants. When the former frames were in use it was a difficult matter to give the plants proper attention during the winter months in frosty or foggy weather.

A new store shed, 20 ft. by 10 ft. by 9 ft., has been erected at the back of the bulb shed in the Office Yard for the accommodation of Wardian and packing cases.

In the following houses—Nos. 2 and 3, 6 and 6A., 18 B and C, and No. 14—some internal painting was done, whilst external painting was carried out on several houses in the T. Range and Office Yard.

ROCK GARDEN.—The extension to the Rock Garden, referred to in the last Review (*K.B.* App. 1, 1930, p. 10) was completed early in March, and immediately afterwards planting was carried out. The weather conditions since then have been so favourable to the plants grown there that the extension already has an established appearance. The extension and re-building covers that section of the Rock Garden lying between the Iris Garden and

the steps leading into the middle entrance of the Herbaceous Ground. Its principal features are a valley with a northerly aspect and small subsidiary valleys, together with a watercourse and moraine.

During October the *Primula* section of the Rock Garden, near the Cumberland Gate, was rebuilt and drained, and fresh soil was put down.

At the north end of the Rock Garden the narrow stream was extended so as almost to encircle the central portion of the new section. This will permit of a greater variety of bog plants being grown.

The *Crocus* collection near the Jodrell Laboratory was moved to a low wall which forms the boundary of the new part of the Rock Garden on its east side. The species have been separated by interplanting low-growing shrubs, such as *Veronicas* and *Helianthemums*.

The ground devoted to the Tulip collection was trenched and the soil renewed.

FLOWER GARDEN.—The beds of *Kniphofias* have been rearranged and the turf on the T. Range terrace was lifted and re-laid. This necessitated a large quantity of new soil being brought to the site.

The beds on each side of the Broad Walk, during the summer months, were planted with scarlet *Geraniums*, whilst the four beds surrounding the Circle near the Pond were planted with dwarf red *Dahlias*. The resulting effect was striking and much admired.

A collection of *Nemesias* and *Diascias* was raised from seed sent by Dr. A. L. Grant of Missouri Botanical Garden, so that she might complete her studies of these genera during her visit to England in connection with the Botanical Congress.

ARBORETUM.—Except for a gale in January the weather during 1930 may be said to have been favourable to plant growth outdoors. A great deal of showery weather prevailed during the summer months with the result that at no time did the lawns have a parched appearance, and, apart from hot and dry periods in June and August, little watering of trees and shrubs had to be done in the open. The spring was mild and fairly free from late frosts, whilst the autumn, speaking generally, was not cold or unusually stormy. November was free of fog but December had more than its usual amount. As in 1929, there was a wealth of blossom in the earlier months of the year on trees and shrubs but, with the exception of *Crataegus*, there has not been a heavy crop of berries. The autumn colours although late were very beautiful, and of those trees whose foliage was particularly striking mention may be made of *Nyssa sylvatica* and *Vitis Coignetiae*. Many of the trees retained their leaves until well into November. As a result of the heavy fogs in December the evergreen trees and shrubs have not such a clean appearance as was the case a year ago.

The collection of *Clematis* species, which formerly had occupied a number of small beds on the lawns near the Berberis Dell, has been altered so as to provide for several large beds, each being planted with a number of species and varieties. The effect of this is an improvement in the appearance of the lawns, and it also facilitates mowing. The beds of Chinese Spruce, comprising several new species introduced by Wilson and Forrest, have been rearranged so as to allow greater space between the plants, which are now between 6 ft. and 8 ft. high.

TROPICAL DEPARTMENT.—The collection of *Platyneriums* has been moved from the side of the Tropical Fernery near the potting shed to each side of the central bed of the transept. They are fixed to the branches of trees, and with other epiphytic ferns, *Bromeliads*, etc., interspersed amongst them, appear to great advantage in a natural setting.

TEMPERATE DEPARTMENT.—The section of the Temperate House known as the Mexican House has been rearranged. Many of the tropical plants grown there were duplicates of specimens growing in the Tropical Department, and the unsatisfactory heating during the winter was not suitable for them. The entire soil to a depth of 2 ft. was removed from the beds and side borders, and replaced by fresh material. To meet the requirements of the plants brought in, the side lights have been fitted with ventilating gear. A few of the larger plants and palms remain, whilst those brought in comprise Australian, New Zealand, and South African trees and shrubs. The south end is planted with *Acacias* and other sun-loving plants, all of which have made satisfactory growth during the past summer, and show promise of a good display of flower during the coming spring months. In the main building a good deal of replanting has been done; many of the *Rhododendrons* in the Himalayan section have been lifted and rearranged.

ITEMS OF SPECIAL INTEREST.—A particularly fine show was made towards the end of June by *Lilium giganteum* growing in a bed of *Rhododendrons* in the woods near the Queen's Cottage; there were eighteen spikes of bloom which ranged in height from 7 ft. to 9 ft. The bulbs were presented to Kew by the Rt. Hon. the Earl of Stair in January, 1928.

Other plants which flowered during the year and merit special mention were *Fouquieria splendens*, *Dasyllirion acrotrichum* and *Solandra Hartwegii*. Reference must also be made to *Eucryphia pinnatifolia* which was a mass of blossom during August. A large crop of fruit was borne on the orange tree, now 250 years old, which was presented in 1928 by Lord Bledisloe. In the Temperate House, *Agathis vitiensis*, a native of Fiji, has produced a number of cones, and seedlings have been raised.

House 14c, which is devoted to objects of special interest, continues to attract attention.

STUDENT GARDENERS.—The changes in personnel have been more considerable than in 1929, twenty-six men completed their training, and a corresponding number were admitted. Two Student Gardeners went to Mr. Cecil Hanbury's Garden at La Mortola for a year; three students have come from Cyprus; H.M. the King of the Belgians and the Director of the Botanic Gardens of Charles University, Prague, have each sent one of their gardeners for a period of study.

Of those who completed their training, eighteen remain in England. Ten of them secured positions in various Parks Departments; three have entered private gardens or nurseries: two have been engaged by the Middlesex County Council in connection with tree-planting on the new arterial roads: one has become an Instructor in Horticulture to the Education Committee of an important London suburb, and two have entered Reading University, one of them with a scholarship granted by the Ministry of Agriculture and Fisheries.

Six men secured appointments overseas:—one in Canada; two in the U.S.A.; one in South Africa; one in the Straits Settlements, and one in the South of France. An Italian returned to Mr. Cecil Hanbury's garden at La Mortola, whilst a Student Gardener from New Zealand returned to his own nursery business in that country.

Of the twenty-six new entrants referred to above, all except three are from Great Britain. Sixteen were previously employed in private gardens or nurseries: two came from Botanic Gardens; two from the John Innes Horticultural Institution, and three from various Parks Departments. The three from overseas are from New South Wales, Switzerland, and Germany.

HERBARIUM EXPERIMENTAL GARDEN.—In view of the proposed extension to the Herbarium building, the Experimental Garden adjoining it, which is used mainly in connection with the transplant experiments, has been moved to a new site. The new garden is at the back of the Herbarium and adjacent to the new building of the Imperial Mycological Institute. Formerly the plot was meadow land, and trenching and manuring were therefore necessary.

SUNDIAL.—A new base, octagonal in shape, has been provided for the Sundial on the lawn facing Kew Palace. The base, which is now at ground level, contains the inscription stone commemorating the discoveries of the Rev. James Bradley.

BIRDS.—During 1930 several broods of Geese and of ducks were reared. These included Magellan, Chinese Brown, Barheaded and Grey-lag Geese; East Indian Ducks, Common Pochards and Carolinas.

A Demoiselle Crane was presented to Kew and has settled down happily. Other acquisitions, either by exchange or by purchase, included Whitefaced Tree Ducks, Bahama Pintails, Rosy-bills, Common Teal and Gadwall Teal.

RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1930.

	Inches.		Inches.
January	2.65	July	2.15
February	0.52	August	2.44
March	1.43	September	2.41
April	1.96	October	0.98
May	3.05	November	3.86
June	1.59	December	1.95
Total 24.99 inches.			

The total for 1929 was 21.71 inches.

CONTRIBUTIONS TO THE GARDENS, 1930.—During the year, 950 separate consignments of living plants, seeds, etc., were received at the Gardens, which number is the highest recorded in the history of the establishment, and an increase of 41 on the previous year.

Amongst the many donations, mention must be made of the gift, by H.M. the King, of a notable collection of Orchids, chiefly Dendrobiums, collected in Nepal. Large collections of trees and shrubs, either as plants, cuttings, or seeds, have been received from the Arnold Arboretum, Harvard University. Towards the end of August, five cases, containing a particularly fine collection of plants, 88 in number, were received in excellent condition from Dr. L. Cockayne of Wellington, New Zealand, while earlier in the year Mr. A. V. Giblin of Hobart, Tasmania, sent a Wardian case containing native plants. One of the most notable additions, received from the Botanic Gardens, Singapore, in four Wardian cases, was a splendid consignment of exotic ferns which arrived in excellent condition. A collection of ferns and stove plants was received from Munich Botanic Gardens, and included several species of Platyceriums and Dischidias new to the Kew collection. Another interesting acquisition has been the succulents from the collection of the late Mr. H. J. Elwes, which have been presented by the John Innes Horticultural Institution. Major Lionel de Rothschild has again generously presented seeds collected in China and an interesting consignment he had received from Tasmania.

Resultant on Mr. J. Hutchinson's visit to the Union of South Africa (see p. 3), many plants he collected, and a large collection of native plants presented by Mr. F. R. Long of Port Elizabeth, were received. Interesting plants, bulbs and seeds were collected in the north-east of British Somaliland and in Northern Rhodesia by Messrs. C. L. Collenette and E. Milne-Redhead respectively (see p. 3), whilst plants and seeds have also been received from the Director, from South Africa.

Through the kindness of Mr. T. Hay, Superintendent of Hyde Park, many plants of considerable interest have been received, together with large batches of bedding plants and greenhouse subjects, as well as seeds in great variety. Sir John Ramsden was the generous donor of a large collection of Rhododendrons that should prove an attractive acquisition.

The most important donations were as follows :—

Public Institutions :—

- Aberdeen, Cruickshank Botanic Garden.—Seeds of Siamese plants.
 Adelaide, Botanic Garden.—Seeds of *Livistona Mariae*.
 Berlin, Botanic Gardens.—Seeds, and plants of *Mesembryanthemum rhopalophyllum*.
 Bermuda, Department of Agriculture.—A collection of plants and seeds ; 200 bulbs of *Lilium longiflorum eximium*.
 Bucharest, Botanic Garden.—95 packets of seeds.
 Buitenzorg, Botanic Gardens.—Plants of *Musa* sp. and seeds of *Musa brachycarpa*.
 Calcutta, Royal Botanic Gardens.—Seeds of *Rosa macrocarpa* and plants of *Gigantochloa verticillata*.
 Cambridge, Botanic Garden.—Plants and seeds.
 Cambridge, Mass., Arnold Arboretum.—Seeds, plants and cuttings of hardy trees and shrubs.
 Cambridge, Mass., Gray Herbarium.—Plants of *Drosera filiformis*.
 Chelsea Physic Garden, London.—Seeds of herbaceous plants.
 Copenhagen, Botanic Garden.—102 packets of seeds.
 Darjeeling, Lloyd Botanic Gardens.—167 packets of seeds.
 Dehra Dun, Forest Research Institute.—Seeds, including *Rhododendron Parishii*.
 Dresden, Botanic Garden.—A collection of Succulents.
 Dunedin, Botanic Gardens.—238 packets of seeds ; New Zealand plants and bulbs of *Lilium regale*.
 Edinburgh, Royal Botanic Garden.—180 packets of seeds ; stove and greenhouse plants.
 Geneva, Botanic Gardens.—113 packets of seeds.
 Glasgow, Botanic Gardens.—Seeds and plants, including *Aponogeton (Ouvirandra) fenestralis*.
 Glasnevin, Botanic Gardens.—53 packets of seeds.
 Grahamstown, Albany Museum.—A collection of 46 plants and bulbs, also seeds of *Gladiolus permeabilis*.
 Kirstenbosch, National Botanic Gardens.—65 packets of seeds.
 Leningrad, Botanic Garden.—88 packets of seeds.
 Lisbon, Botanic Garden.—A collection of seeds.
 London County Council, Parks Department.—Hardy plants.
 London, Hyde Park (per Mr. T. Hay).—Collections of seeds, including 130 packets from Nepal, bedding and greenhouse plants, including *Impatiens Delavayi*.
 London, National Rose Society.—Plants and cuttings of *Rosa* spp.

- Merton, John Innes Horticultural Institution.—Seeds and plants, including *Primula sinensis*, and succulents from the late Mr. H. J. Elwes' collection.
 Munich, Botanic Garden.—A collection of ferns and stove plants, including *Platynerium Wilhelminae-Reginae*, *Dischidia Rafflesiana*, and 130 packets of seeds.
 Nancy, Botanic Gardens.—46 packets of seeds.
 Newark, Ohio, Dawes Arboretum.—Seeds of Pecan, Hickory, Walnut and Ash.
 New Haven, Conn., Marsh Botanic Garden.—79 packets of seeds.
 Ootacamund, Government Botanic Gardens.—A collection of Pepper and Betel Vines.
 Ottawa, Central Experimental Farm.—Seeds of *Zizania aquatica*, and a collection of seeds and plants from the Okanagan Valley, B.C.
 Oxford, Botanic Garden.—Plant of *Shepherdia argentea*.
 Port Stanley, Falkland Islands (per Colonial Secretary).—Seeds of *Poa flabellata*.
 Pretoria, Department of Agriculture.—Tubers of *Dioscorea* spp. ; plants and seeds, including *Cotyledon clavifolia*.
 Riga, Botanical Laboratory of the University.—A collection of *Alchemilla* spp.
 Rouen, Botanic Garden.—60 packets of seeds.
 Seychelles, Department of Agriculture.—Seeds of Palms.
 Simla, Viceregal Gardens.—Miscellaneous seeds, and bulbs of *Lilium* spp.
 Singapore, Botanic Gardens.—A large collection of exotic plants, chiefly ferns, including *Platynerium Ridleyi*, *P. bifforme* and *Ophioglossum pendulum*.
 Stellenbosch, University Botanic Garden.—Plants of *Drosera cistifolia* and miscellaneous seeds.
 St. Helena, The Horticultural Officer.—Plants of *Sempervivum arboreum*.
 Washington, U.S. Department of Agriculture.—Seeds of *Juglans Hindsii*, and miscellaneous economic plants.
 Wellington, New Zealand, Director of Forestry.—Seeds, including *Podocarpus dactyloides*.
 Wisley, Royal Horticultural Society's Gardens.—Seeds and plants, including *Primula eucyclia*.
 Zurich, Botanic Gardens.—Seeds, 66 packets.

Private Donors :—

- Mr. R. C. Abdy, Michaelstowe Hall, Harwich.—Plants, seeds and cuttings.
 Mr. S. C. Atchley, Athens, Greece.—Collections of bulbs and seeds, including *Lilium Heldreichii*.
 Prof. E. B. Babcock, University of California.—Plants and bulbs collected in Greece.

Mr. Hiatt C. Baker, Almondsbury, Glos.—Herbaceous plants, and miscellaneous trees and shrubs.

Mr. F. R. S. Balfour, Dawyck, Scotland.—Plant of *Rhododendron didymum*.

Mr. T. W. Briscoe, Chepstow, Mon.—Plants, including *Habenaria spiralis*.

British School of Archaeology in Egypt (per Mr. L. H. Harding).—Bulbs, tubers and seeds collected in Egypt.

Mr. N. E. Brown, Kew.—Succulents from the Union of South Africa.

Mr. E. G. Bryant, Prieska, Union of South Africa.—A collection of bulbs.

Mr. A. C. Buller, Stellenbosch, Union of South Africa.—Plants of *Protea cynaroides*, and seeds of Cape plants.

The Viscountess Byng of Vimy, Thorpe Hall, Essex.—A collection of South African plants.

Mr. H. Campbell, Kyrenia, Cyprus.—Seeds of endemic plants.

Mr. C. E. Carr, Pahang, F.M.S.—A collection of orchids from Malacca.

Rt. Hon. Neville Chamberlain, London.—Seeds collected in East Africa.

Miss L. E. Cheesman, Sydney, Australia.—Orchids from Banks' Island.

Col. Stephenson Clarke, Cuckfield, Sussex.—Plants of *Magnolia tsaronensis* and *Hydrangea longipes*.

Dr. L. Cockayne, Wellington, New Zealand.—A collection of 88 New Zealand plants.

Mr. H. F. Comber, Edinburgh.—*Dicksonia antarctica* with parasitic *Tmesipteris tannensis* from Tasmania.

Mr. W. Cradwick, Jamaica.—Orchids and *Tillandsia* spp.

Dr. J. Burt Davy, Imperial Forestry Institute, Oxford.—Seeds of *Encephalartos transvenosus*.

Prof. H. H. Dixon, Trinity College, Dublin.—Plant of *Bulbophyllum Bittnerianum*.

Messrs. Dobbie & Co., Ltd., Edinburgh.—Bulbs of *Lilium centifolium* hybrids, and roses.

Monsieur L. A. Dode, Paris.—Plants and grafts of hardy trees and shrubs.

Mrs. E. Drayton, Buenos Aires.—Seeds and bulbs from the Argentine.

Messrs. Walter Easlea & Son, Ltd., Leigh-on-Sea.—Roses.

Mr. A. W. R. Edwards, Keswick.—Plants of *Abies pectinata* and *A. grandis*.

Mr. Clarence Elliott, Stevenage.—Alpines, also miscellaneous seeds, bulbs and plants from Chile and Peru.

Prof. M. L. Fernald, Washington, D.C.—51 packets of seeds collected in Newfoundland.

Prof. R. E. Fries, Stockholm.—Plants of *Populus tremula erecta*.

Mr. R. C. Bruce Gardner, Northwood.—Seeds of hardy trees and shrubs.

Prof. Ruggles Gates, King's College, London.—A large collection of plants and seeds of *Rumex* spp.

Rt. Hon. Sir Eric Geddes, Hassocks, Sussex.—Plants of *Cyrtostachys Lakka*, and *Crotalaria Cunninghamii*.

Hon. Vicary Gibbs, Aldenham.—Trees and shrubs, and a collection of scented-leaved Pelargoniums.

Mr. A. V. Giblin, Hobart, Tasmania.—Collection of Tasmanian plants.

Dame Alice Godman, Horsham.—168 packets of seeds of South African plants.

Mr. A. Gooding, Barnes.—Hybrids of *Richardia africana*.

Mr. P. J. Greenway, East African Agricultural Research Station, Amani.—Collections of seeds of native plants.

Mr. A. Grove, London.—Seeds of *Lilium* spp.

Mr. S. Guiton, Jersey.—Plants of *Gymnogramme leptophylla*.

Mr. C. Hanbury, La Mortola.—Seeds and plants, including *Montanoa bipinnatifida*.

Hawaiian Sugar Planters' Association, Honolulu.—Miscellaneous seeds.

The Marquess of Headfort, Co. Meath.—Plants of *Rhododendron tephropeplum*, *R. Taggianum*, etc.

Messrs. Hillier & Sons, Winchester.—A collection of trees and shrubs.

Mr. C. W. von Hirschberg, Elizabethville, Belgian Congo.—Plants of *Sansevieria* spp.; seeds of *Euphorbia* sp. and *Encephalartos* sp. from the Katanga District of the Congo.

Mrs. E. M. Holmes, Sevenoaks.—Herbaceous plants and seeds.

Dr. D. Hooper, Kew.—Seeds of drug plants.

Mr. G. H. Hunt, Birmingham.—Tuber of *Orchis hircina* collected near Rouen, France.

Capt. Collingwood Ingram, Benenden.—Miscellaneous bulbs and plants of *Prunus* spp.

Hon. Robert James, Richmond, Yorks.—136 packets of seeds collected in Yunnan.

Mr. C. H. John, Chelsea.—A collection of orchids from S. India.

Major L. Johnston, Campden, Glos.—A collection of herbaceous plants and corms of *Antholyza watsonioides*.

Dr. A. G. F. Kerr, Bangkok.—A plant of *Impatiens* sp.

Mr. C. H. Lankester, Costa Rica.—Orchids and stove plants.

Mr. H. E. Lawford, Tangier.—Bulbs collected in North Africa.

Mr. H. W. Lawton, Wellington, New Zealand.—New Zealand shrubs and seeds.

Mr. H. V. Lely, Nigeria.—Plants of *Huernia* sp.

Dr. F. Lemperg, Steiermark, Austria.—Seeds of alpines.

Mr. G. W. E. Loder, Ardingly.—Hardy shrubs, including *Olearia Lyallii*.

Mr. F. R. Long, Port Elizabeth, South Africa.—Collections of seeds and plants, chiefly succulents.

Messrs. Stuart Low & Co., Enfield.—Greenhouse plants, including Cape Ericas and *Cyclamen* in variety.

Hon. H. D. McLaren, Bodnant, North Wales.—76 packets of seeds collected in N. W. Yunnan.

Sir John Stirling Maxwell, Pollokshaws, N.B.—Conifers for the Bedgebury Pinetum.

Col. R. Meinertzhagen, London.—A collection of plants and bulbs from Gibraltar.

Lt. Col. L. C. R. Messel, Haywards Heath.—Rhododendrons and other plants.

Mr. F. W. Millard, East Grinstead.—Collections of herbaceous and alpine plants.

Mr. C. T. Musgrave, Godalming.—Alpine and herbaceous plants.

Rev. H. Muller, Rezaieh, Persia.—149 packets of seeds collected in Persia.

Mr. Amos Perry, Enfield.—Miscellaneous hardy plants and bulbs.

Mr. R. C. Pickering, Kansas City, U.S.A.—Seeds of timber trees.

Mr. C. Portsmouth, Sutton, Surrey.—Bulbs of *Lilium formosanum*.

Capt. W. H. Purvis, Leuchars, Fife.—Seeds of *Strongylodon lucidus* from Hawaii.

Sir John Ramsden, Bart., Gerrard's Cross.—A collection of rhododendrons.

Mr. A. J. Robb, Assam.—Orchids.

Major Lionel de Rothschild, Exbury.—153 packets of seeds collected in China; 155 packets of seeds collected in Tasmania.

Hon. Mrs. Ryder, Beaulieu.—133 packets of seeds; succulent plants and bulbs from South Africa.

Mr. G. O. K. Sainsbury, Hawkes Bay, New Zealand.—Tubers of *Pterostylis* sp.

Messrs. Sanders, St. Albans.—Orchids, including *Cypripedium sublaeve*, and a plant of *Anthurium Scherzerianum*.

Mr. A. Sewell, Weybridge.—Alpines, including *Primula Winteri* and *Saxifraga Vandelii*.

Mr. T. Sharp, Westbury.—Seeds, plants and cuttings of succulents.

Mr. Barnard H. Slavin, Rochester, U.S.A.—Seeds of *Leitneria floridana*.

Mr. W. C. Slocock, Goldsworth Old Nursery, Woking.—Hardy trees and shrubs.

The Earl of Stair, Lochinch Castle.—50 bulbs of *Lilium giganteum*.

Mr. G. E. Stephens, Horsham.—A small collection of exotic ferns.

Major F. C. Stern, Goring-by-Sea.—Plants and seeds.

Mr. T. P. Stokoe, Cape Town.—Seeds of Cape plants, including *Erica Alfredi*.

Mr. J. E. H. Stooke, Hereford.—Seeds of *Lilium* spp.

Sun Yat Sen Memorial Park, Nanking, China.—A collection of seeds of trees and shrubs.

Messrs. Sutton & Sons, Reading.—Seedling *Cyclamen* in variety, and plants of *Primula effusa*.

Dr. Stuart Tidey.—2 large plants of *Melocactus communis*.

Lt. Col. E. E. Todd, Gibraltar.—Plants of *Viola* spp. including *V. arborescens*; seeds of *Quercus* spp., *Erica* spp., and bulbs of *Narcissus serotinus*.

Messrs. Treseder & Co., Ltd., Cardiff.—Bedding dahlias.

The Viscount de Vesci, London.—A collection of seeds from West Africa.

Prof. F. Vierhapper, Vienna.—Fruiting branches of *Loranthus europaeus*.

Messrs. Vilmorin-Andrieux et Cie, Paris.—A collection of miscellaneous seeds.

Messrs. R. Wallace & Co., Ltd., Tunbridge Wells.—Bulbs of *Lilium sulphureum*.

Sir Oscar Warburg, Epsom.—Plants, cuttings and seeds of hardy trees and shrubs.

Mr. J. C. Watt, Aberdeen.—Seeds, including *Primula Calderiana*.

Mr. A. G. Weeks, Limpsfield.—A collection of *Gentiana* spp.

Mr. F. A. Weinthal, Roseville, New South Wales.—A collection of Australian orchids.

Mr. J. C. Williams, Cornwall.—Plants of *Azalea procumbens*.

Dr. K. Wilson, Wimbledon.—A collection of *Hippeastrum* hybrids.

Mr. A. Worsley, Isleworth.—Plants and seeds, including *Hippeastrum bicolor*.

Mr. K. Yashiroda, Japan.—Miscellaneous seeds.

DISTRIBUTION OF PLANTS AND SEEDS.—Following the circulation of the 1929 seed list, 184 consignments of seeds were sent out from Kew in the early part of the year, the total number of packets thus distributed being 11,371; hardy trees and shrubs, 4,018; herbaceous plants, 7,353.

The most important seeds specially distributed included:—*Perilla ocymoides*, *Podocarpus dacrydioides*, *Livistona Mariae*, *Gilletia sepalosum*, *Poa flabellata*, *Leitneria floridana*, and *Phaseolus vulgaris* varieties.

Wardian cases of plants were despatched to the Botanic Gardens at Singapore, Peradeniya, and Hobart, also to the St. Clair Experiment Station, Trinidad. The consignment to Trinidad were plants of *Gigantochloa verticillata* which had been sent from Calcutta via Kew so that they might receive any necessary attention on the way.

Other recipients of plants, etc., from Kew included the following:—

Basle, Botanic Gardens.—Plants of *Alpinia officinarum* and *Cephaelis Ipecacuanha*.

Buitenzorg, Botanic Gardens.—Tubers of *Gloriosa Rothschildiana* and seeds of *Tacsonia Van Volxemii*.

Cambridge, Botanic Garden.—Plants, cuttings and seeds.

Canberra, Division of Plant Industry.—Seeds of *Brachypodium pinnatum*; *Astragalus* and *Erodium* spp.
 Chelsea Physic Garden, London.—Collection of shrubs.
 Copenhagen, Botanic Garden.—Collection of ferns.
 Dairen, South Manchuria Railway Co.—Seeds of *Larix eurolepis* and *L. pendula*.
 Dresden, Botanic Garden.—Plants, cuttings and seeds.
 Edinburgh, Royal Botanic Garden.—Plants, cuttings and seeds. • •
 Glasnevin, Botanic Gardens.—Plants, cuttings and seeds.
 Jerusalem, Department of Agriculture, Forests and Fisheries.—Seeds of *Juglans* species and varieties.
 Kirstenbosch, National Botanic Gardens.—Plants of *Pelargonium inquinans*.
 London, British Association for the Advancement of Science.—Collection of shrubs and herbaceous plants, for Down House, Farnborough, Kent.
 London County Council, Parks Department.—Plants and cuttings.
 London, Hyde Park (per Mr. T. Hay).—Plants, including a collection of Magnolias.
 London, National Institute for Medical Research.—Collection of shrubs.
 London, National Rose Society.—Plants and cuttings of *Rosa* spp.
 London, The Roads Beautifying Association.—Bluebell bulbs.
 Madras, Department of Agriculture.—Seeds of *Sorghum margaritifolium* varieties.
 Merton, John Innes Horticultural Institution.—Plants, including a collection of *Aconitum* spp., bulbs, and seeds.
 Middlesex County Council, Roads Section.—Plants.
 Munich, Botanic Garden.—Plants, seeds and cuttings.
 Nassau, Bahamas, The Colonial Secretary.—Seeds of *Bassia latifolia*.
 New York Botanical Garden, U.S.A.—Roots of *Aconitum* spp. plants of *Hemerocallis* spp. and cuttings of *Populus* spp.
 Nicosia, Cyprus, Department of Agriculture.—Plants of *Rhus coriaria* and seeds of Soya bean.
 Nicosia, Cyprus, Forestry Department.—Seeds of *Juglans* species and varieties.
 Ootacamund, Government House Gardens.—Collection of greenhouse plants, also seeds.
 Peradeniya, Department of Agriculture.—Plants of *Spartina Townsendii*, and seeds of *Sorghum margaritifolium* varieties; also miscellaneous plants forwarded in Wardian cases for the Royal Botanic Gardens.
 St. Helena, The Horticultural Officer.—Collection of herbaceous plants (also seeds of *Coffea* species received from St. Clair Experiment Station, Trinidad).
 Stockholm, Botanic Garden.—Plants, cuttings and seeds.
 Summerland, B. C., Dominion Field Laboratory of Plant Pathology.—Seeds of 39 spp. of *Allium*.

Swansea, Parks Department.—Greenhouse plants, also ferns and fern allies.
 Utrecht, Botanic Garden.—Plants, cuttings and seeds.
 Wisley, Royal Horticultural Society's Gardens.—Plant of *Prunus Amygdalus* var. *macrocarpa alba*, also various seeds. c
 Messrs. James Carter & Co., Ltd., London.—Seeds.
 Dale Estate Ltd., Brampton, Ontario.—Plants of *Buddleja officinalis* and *B. madagascariensis*.
 Hon. Vicary Gibbs, Aldenham.—Collection of trees and shrubs.
 Lady Godley, Gibraltar.—Plants of *Saxifraga*, *Sedum*, and *Mesembryanthemum* spp.
 Dr. R. Guiseppe, Felixstowe.—Alpine plants.
 Mr. Cecil Hanbury, La Mortola.—Plants and cuttings.
 Messrs. Hillier & Sons, Winchester.—Plants, cuttings and seeds.
 Mr. Blythe Hurst, Prince Edward Island, Canada.—Cuttings of *Hedera helix* in variety.
 Mr. J. Johnston, Northcote, Melbourne.—Cuttings of *Salix caerulea*.
 Sir William Lawrence, Bart., Burford.—Plants, including *Orychophragmus violaceus*.
 Messrs. Stuart Low & Co., Enfield.—Plants and cuttings, also roots of water-lilies.
 Hon. H. D. McLaren, Bodnant, North Wales.—Plants, including *Stereospermum sinicum* and *Hedychium Moorei*.
 Mr. R. C. Notcutt, Woodbridge.—Plants and cuttings.
 Colonel D. V. Pirie, Savennières, France.—Collection of plants from the Temperate Department.
 Major L. de Rothschild, Exbury.—Trees and shrubs.
 Hon. Mrs. Ryder, Beaulieu.—Plants, including succulents, also bulbs and cuttings.
 Mr. W. C. Slocock, Goldsworth Old Nursery, Woking.—Plants, seeds and cuttings.
 The Earl of Stair, Lochinch Castle.—Collection of shrubs.
 Major F. C. Stern, Goring-by-Sea.—Plant of *Weldenia candida*.
 Messrs. Sutton & Sons, Reading.—Plants and seeds.
 Mrs. Mary L. Wallich, Vancouver Island.—Seeds of *Geranium Wallichianum* and *Meconopsis Wallichii*.

National Pinetum at Bedgebury.

The general climatic conditions during the year have been favourable for the growth of young trees but the wet autumn prevented early ripening of new shoots. Although the winter of 1929-30 was not marked by severe frost, dull weather and a good deal of rain kept the ground cold and prevented early growth in spring, therefore there was very little injury to young shoots through late frosts. What little injury occurred was well after the time when frost danger is thought to be past, for a sharp frost was experienced in the early hours of June 9th. Bracken shoots were killed and the

points of young growths of *Rhododendron ponticum* and sweet chestnut coppice were injured. The points of a few shoots of various spruces and firs suffered, but less seriously than in former years. Several severe frosts were experienced in November, the coldest night being that of November 16th and the early morning of November 17th, when 15 degrees of frost were registered.

Some trouble has been caused by insect pests and fungus diseases. The most troublesome pests have been green spruce aphid (*Aphis abietina*), and the two species of *Dreyfusia*, *D. nüsslini* and *D. piceae*, on various species of *Abies*. These pests are present on large trees from which they spread to young trees in the vicinity. In order that young trees may be kept reasonably free from the insects they have to be sprayed at regular intervals from early March to autumn. Control trees left unsprayed for a few months are soon adversely affected by the pests. A few trees have been killed by honey fungus (*Armillaria mellea*), a disease which is rampant amongst the old stumps of sawn-off trees, and likely to cause uneasiness for some years. A disease is also present on some of the true cypresses. This disease attacks the side shoots within a short distance of the base. An infected shoot becomes enlarged at the point of attack and eventually dies. This disease is under investigation and is thought to be due primarily to frost associated with a species of *Pestalozzia*.

Apart from the comparatively few trees attacked by pests and diseases the general health of the trees in the pinetum is good and vigorous growth has been made. Here and there are signs of leaf yellowing which suggests soil trouble, but on the whole the general condition is very satisfactory.

The work during the year has been mainly routine, keeping spaces clean round trees, mowing, cleaning ditches, cutting out dead wood from large trees, cutting back overgrown plants of *Rhododendron ponticum*, removal of dead coppice stools from avenues, attention to staking and labels, and other work incidental to a large scientific collection of trees.

As the conditions are eminently suitable for the cultivation of rhododendrons, the opportunity is being taken of forming a collection of species and hybrids supplementary to the Kew collection, and from time to time surplus plants have been sent from Kew. That the project is being watched with interest by rhododendron specialists is evident from the fact that Messrs. R. Gill & Son, on hearing that this new national collection was in course of formation, very kindly offered to present, for trial at Bedgebury, a selection of species and varieties from the famous collection at their Himalayan Nurseries, Penryn, Cornwall. This offer was gratefully accepted and seventy-six vigorous plants of Himalayan and Chinese species and chiefly Cornish-raised hybrids were received in November. They were planted on a special area of ground under, as far as possible, similar conditions, and their development will be watched

with great interest. The inclusion of this collection of plants will add materially to the interest of the establishment.

The interest that is being taken in the new Pinetum is evident from the number of people who have sought permission to view the place during the year. At the end of August a party of the Royal English Arboricultural Society visited the Pinetum and spoke very appreciatively of the work that was being carried out. The policy of the Management Committee is to admit anyone who is genuinely interested in trees, but for the present to exclude picnic parties and casual excursionists, on account of there being no provision for patrol and protection of this valuable collection, and also because the available labour is insufficient to allow the place to be maintained in a suitable condition for large numbers of visitors.

This is the fifth year since planting commenced, therefore each plant, according to the original decision, has been remeasured and the measurements recorded in the planting book.

The Museums.

Correspondence dealt with during the year showed a considerable increase. Questions relating to the economic products of plants have been received from all parts of the world, including many home queries, whilst there is a steadily increasing demand for information concerning hardy trees of possible economic importance and their cultivation. In addition to questions arriving by post, the increasing interest in hardy trees is noticeable by the number of people calling at the Museums and asking for advice.

The interior of Museum No. 1 has been redecorated during the year, and the opportunity is now being taken of thoroughly overhauling the whole of the specimens, with a view to relieving congestion by the removal of duplicates, and of renewing any that may have deteriorated. In this connection Messrs. Sutton & Sons of Reading replaced the models of vegetables that had been on view for some years by new models of up-to-date varieties. They also renewed a collection of specimens of grasses in Museum No. 2. Messrs. Chivers of Histon, Cambridgeshire, presented a new collection of preserved fruits; the Shropshire Beet Sugar Company, Limited, of Allscot, presented a fresh set of samples demonstrating the manufacture of beet sugar; Messrs. Lambert and Butler, Tobacco Merchants, London, renewed numerous samples of tobacco supplied by the firm some years ago; and Messrs. Lever Bros., Port Sunlight, replaced by new specimens a very good selection of samples of the products of the coconut and West African oil palms originally supplied by Messrs. Lever Bros. and subsidiary firms.

A new Guide to Museum No. 1 was published during the year (*K.B.* 1930, p. 500). This completes the revision of the Guides to the collections in the four Museums.

The interest displayed in the collection of plant products by local and London school authorities in recent years was fully maintained

during 1930, and very considerable numbers of children were brought by their teachers throughout the spring and summer months to study various subjects in the Museums.

* SPECIAL WORK.—During the year Mr. F. N. Howes continued his investigation on Fish-Poison Plants. The results of his studies were the subject of an article which appeared in *K.B.* 1930, pp. 129-153.

PRESENTATIONS TO MUSEUMS.—Shropshire Beet Sugar Company Limited, Allscot, Wellington, Shropshire.—Nineteen specimens demonstrating various stages in the manufacture of Beet Sugar.

Messrs. Chivers & Sons, Limited, Histon, Cambridge.—Twelve sample bottles of Bottled Fruits.

The Director, Imperial Institute, South Kensington.—Three samples of Shea Nuts. Birch twigs, whole and crushed Barley for Malt, and Beech Shavings, prepared in France and used in the manufacture of Malt Vinegar. Samples of Flax from Cyprus, and Sunn Hemp from India. Specimen of Basong Wood (*Alstonia spathulata* Bl.).

Mr. T. Hay, Superintendent, Hyde Park, London.—Three sections of wood of *Paulownia imperialis* Sieb. & Zucc.

Mr. E. R. Smith.—Thirty-seven specimens of wood collected by Mr. Gilbert of the Indian Forest Service.

Messrs. Sutton and Sons, Reading.—Thirty-eight bunches of Grasses renewed. Collection of 117 Models of Vegetables and Farm Roots.

Mr. J. A. Parker, Steam Saw Mills, Feltham.—Plank of Willow Oak (*Quercus Phellos* L.).

Messrs. Lambert & Butler, Tobacco Merchants, 141-147, Drury Lane, W.C.2.—Ten samples of Tobacco to replace old exhibits.

Agricultural Chemist, Agricultural Department, Ibadan, Nigeria.—Specimens of Shea Fruits (*Butyrospermum Parkii* Kotschy).

Miss M. S. Johnston, 276, Kew Road, Kew.—Twelve photographs of Rhodesia and other parts of Africa, Birch Bark Box, Kaffir Piano.

Mr. G. A. Catt, Squirres Experimental Station, United Fruit Company, Costa Rica Division.—Seeds of a variety of *Bactris Gasipa*ës.

H.B.M. Consul, Bahia, per Foreign Office.—Fruits of "Oiticica" or "Oiti Manso."

Mr. H. J. Rumsey, Australia.—Seeds of *Macadamia ternifolia* F. Muell.

Messrs. R. Godfrey and Sons, 7, Oxford Street, Whitstable.—Two trunks of *Populus generosa* Henry.

The Rev. H. Castle, Church of England Missionary Society, Tung-lu, China.—Leaves and Seeds of *Aleurites Fordii* Hemsl.

Mr. P. J. Greenway, East African Agricultural Research Station, Amani, Tanganyika.—Three bags made of fibre from leaves of *Sansevieria robusta* N. E. Br.

Mr. C. W. Scott, Forest Economist, Utilization Circle, 230, Dalhousie Street, Rangoon.—Botanical specimen, fruits, wood and oil from seeds of *Aleurites triloba* Forst.

Mr. F. G. Gorton, H.B.M. Consul-General, Saigon.—Wood of *Fokienia Hodginsii* Henry & Thomas, and "Pe-Mou Oil" distilled from the wood.

Mrs. Holmes, Ruthven, Sevenoaks.—Various specimens of Drug plants and two photographs of *Mandragora officinarum* L.

Mr. G. W. Hannaford, Estate Office, Carclew, Cornwall.—Specimen of wood of *Embothrium coccineum* Forst.

The Jodrell Laboratory.

A miscellaneous collection of material has been examined at the Jodrell laboratory with a view to determining its identity as far as possible from a study of its anatomy. The nature of this material was extremely varied but it consisted in the main of timbers, fibres, barks and plants used for medicinal purposes.

Amongst the more interesting items received the following may be mentioned. Supplies of botanical remains from the Egyptian tombs. One of these consisted of wooden labels which had been found attached to mummies and which were made of *Buxus sempervirens*, *Tilia* sp., *Fagus sylvatica*, *Tamarix* sp., and *Ficus Sycomorus*. Another contained a much wider range of material and consisted amongst other items of flax fruits in a remarkably good state of preservation, seeds of *Papaver* sp., *Brassica Napus*, and *Lactuca* sp., threaded almonds and walnuts, and the tubers of *Cyperus* sp., similar to "tiger nuts" or "chufas" derived from *Cyperus esculentus* at the present day. Grains of carbonized barley and wheat were also received in which the external form was retained to a remarkable degree.

A fungus-like material from Nairobi, which had been found attached to the roots of a species of *Sesbania*, was identified as aerenchyma of the same type as that described by Scott and Wager in 1888 on the roots of *Sesbania aculeata*.

An artificial leaf was identified as being made of green spun glass; "seeds" being fed to horses in the Argentine without ill effect proved to be parts of an insect; and roots imported as "liquorice" were recognised as "soap-root" (*Gypsophila* sp.).

Considerable structural alterations and much-needed improvements have been carried out by H.M. Office of Works in the photographic dark-room. These include the erection of shelves for the storage of negatives, whitewashing the interior of the dark-room, and the installation of a system of forced ventilation operated by an electric fan.

A wooden cupboard lined with lead has also been made and fitted for the storage of hydrofluoric acid, to be used for softening wood blocks before making microscopical preparations of them.

During the year an overhaul of the apparatus in the laboratory has been taken in hand and a considerable amount of modern equipment has been provided. A new automatic water still has been installed and a satisfactory supply of distilled water thus ensured. Other new apparatus includes an electrically heated paraffin oven, and a wood-cutting microtome and accessories. It is hoped that the latter will facilitate a more exact identification of the timbers received for examination, and an attempt is to be made gradually to build up a collection of microscopical slides of authentically named timbers as an aid to identification.

Visitors to the laboratory have carried out special investigations as follows:—

Dr. A. B. Misra has investigated the life histories of a number of scale insects.

Dr. J. L. S. Simpson made a study of the vascular anatomy of some of the Cucurbitaceae, using a new technique.

Miss M. E. Odell made a number of microscopical preparations of the epidermis of the leaves from several families of flowering plants, in order to compare the range of variation in their structure with that observed in fossilized plants.

Dr. J. C. T. Uphof studied the morphology of the double flowers of *Erica Mackayi*.

Members of the Herbarium Staff have used the laboratory for the growth of fungi in pure culture.

The Herbarium.

The provision of further tiers of cabinets has resulted in the filling of practically all the additional space available in the existing building. By means of adjustments, it is possible in most groups to continue the incorporation of material, but in certain families this work must unfortunately remain at a standstill until the existing buildings have been extended.

A larger number of specimens was received than in any previous year, the steadily and rapidly increasing amount of material received per annum reaching the figure of 70,146 during 1930. The bulk of this material is unnamed and the energies of the staff are taxed to the utmost in dealing even provisionally with such an enormous mass of material.

An outstanding event of 1930 was the Fifth International Botanical Congress, in preparation for which all members of the staff were engaged. With such a large influx of botanists into the country it was not surprising that Kew shared in the increased number of visitors throughout the summer and that the Visitors' Book at the Herbarium showed a record attendance.

Though many of the botanists visited Kew for a few days or weeks only, a considerable number, especially from the United States, took advantage of their stay in England to spend several months at Kew in connection with their research. As a consequence

a very material amount of time of the staff had to be allotted to visitors. Such assistance results in closer co-operation in research and in more accurate results, whilst as a return for this expenditure of time reference may be made to the greater number of donations received, and the increased offers of exchange of material with other institutions. A large increase in the number of applications for photographs of type specimens, or for the loan of material for monographic work, was also noticeable.

EUROPE, NORTH AFRICA AND THE ORIENT.

Routine.—Work on the older unmounted collections was somewhat delayed by the absence of the Store Botanist on sick leave for two months. Over 13,000 sheets were mounted and poisoned, and 8,000 laid in. This figure includes recent collections which have been mounted shortly after receipt.

Considerable advance has been made in rearranging genera in the Herbarium. The following genera, amongst others, have been written up during the year according to recent monographs or standard lists or floras:—*Polygonum*, *Scrophularia*, *Erica* (and other genera of the *Ericaceae*), *Rorippa*, *Silene*, *Alisma*, *Onobrychis*, *Trigonella*, *Juncus*, *Luzula*, *Papaver*, and *Roemeria*.

Dr. Guiseppi has again explored the wilds of Albania and brought back a valuable collection of living and dried specimens. It is intended to publish an account of his collection. Mr. H. Griffith Tedd has continued his investigations on the flora and vegetation of the Xanthi district, Thrace, and has sent many parcels of well-dried herbarium specimens, as well as packets of seeds which will be grown in the Herbarium Ground. Mr. Tedd's plants include several new species, and a considerable number of additions to the flora of Thrace, e.g. *Cotyledon lassithiensis*, which was previously known only from Crete. Mr. S. C. Atchley, in his extensive walking tours through all parts of Greece, has collected much valuable material from localities either little visited by previous collectors or from which no material has recently been received. In particular he has sent a series of *Arbutus* hybrids. From Jugoslavia the collection of Mr. J. W. Wyatt is worthy of special note, especially as it is to be regarded as a first instalment. These collections, together with plants received from Prof. Stoyanoff, indicate the continued interest of botanists in the Balkan Peninsula.

Of collections from other areas, those of the Rev. F. A. Rogers in Syria, Cyprus, and Iraq, and of Mr. Lankester H. Harding in Palestine, have filled in many gaps. Mr. Trethewy's plants from Morocco add to our collections from an area little visited by British botanists since the time of Ball and Hooker. Mr. J. W. Wyatt presented a well-dried set of plants from the mountainous areas of Austria. Island floras were added to by the donation of the late Mrs. Broun's plants from Majorca by Mr. A. F. Broun, and by an interesting set of *Sempervivums* from the Canary Islands by Dr. R.

Lloyd Praeger. British collections were increased by contributions from various donors, amongst whom may be mentioned Mr. C. H. Wright, Miss M. E. Edmonds, Mr. H. F. Devis, who presented a well-named and mounted collection of over 1,000 specimens, chiefly from the West of England, and Mr. F. Ballard, who presented a set of over 500 carefully dried specimens collected by himself in the island of Sark. Collections were also received from other members of the staff. Two interesting old collections were received, namely 630 and 800 specimens presented by Mr. S. G. Tallents and Dr. C. Metcalfe respectively, consisting in both cases of British plants collected early in the last century, thus showing interesting facts with regard to their distribution.

Research and Publications.—On the Flora of the Nearer East, V., VI., VII., VIII., IX. (*K.B.* 1930, pp. 122, 272, 375, 427, 480).

A Botanical Expedition to Persia (*K.B.* 1930, p. 49).

Influence of the Suez Canal on the Marine Phanerogamic Flora of the Eastern Mediterranean (*Journ. Bot.* lxxviii. 238 : 1930).

Geum intermedium auct. (*Journ. Bot.* lxxviii. 88 : 1930).

ASIA.

CHINA AND NORTHERN ASIA.—The work of rearrangement of genera in the Herbarium after Monographs and Revisions has been greatly extended, thirty-five genera having been dealt with. The time expended on this work has been amply justified by the increased usefulness of the collections, but in consequence the number of specimens incorporated in the Herbarium during the year was considerably smaller than in 1929. Many cultivated specimens from the Gardens, belonging mainly to critical genera, have been identified.

A further large consignment of specimens collected in Mongolia and North-West China has been received from the Abbé E. Licent. A collection of more than one thousand plants from Kwangtung was received from the National Sun-Yatsen University, Canton.

Particulars of collections from the Tibet-Burma border are given in the Indo-Malayan section of this Review.

Research and Publications.—The most important piece of research published during the year was a "Revision of the Old World Species of *Buddleja*" (*K.B.* 1930, p. 177). This included a key to and detailed indication of their geographical distribution, and descriptions of five new species. Among other papers was an article "On the Genera *Moricandia* and *Orychophragmus*" (*l.c.* 267). Two new species of *Cotoneaster*, which had been under observation in gardens for several years, having been obtained at last in the fruiting as well as the flowering stage, were described and figured in Hooker's *Icones Plantarum* tt. 3145, 3146, issued in October. The investigation on certain species of *Allium*, mentioned in the last Review, was completed and is now in the press.

Through the kindness of Dr. Maxon and Dr. Killip of the United States National Herbarium, Washington, the whole of the Chinese material of *Gentiana* and *Crawfordia* in that Herbarium has been received on loan, and all the specimens, including the very extensive collections made by Mr. J. F. Rock in Western China, have been critically identified. Among the 116 sheets of duplicates of these, received in exchange for other plants, are several new species which have been described in a paper now in the press. Two other papers on this genus are in course of preparation, and it is hoped they will be published early in 1931.

INDO-MALAYA.—Owing to the continued pressure on space in the Herbarium the bulk of the specimens from the Malay Archipelago and Philippine Islands mentioned in last year's Review still remain in the Store, though a small quantity was incorporated as space became available. Current collections, however, have mostly been laid in.

Contributions to the Herbarium were received from the Botanic Gardens, Buitenzorg, the Botanic Gardens, Singapore, and the Imperial Forest Botanist, Dehra Dun. Collections from Mrs. A. Davidson, Mrs. N. E. Parry, and the Rev. W. J. L. Wenger, made respectively in Poona, the Garo District and the South Lushai Hills of Assam, were presented by the collectors. Duplicates have also been received from the Imperial Forestry Institute, Oxford. Mr. C. E. Carr has presented a very valuable set of dried specimens and material in spirit of Malay Peninsula Orchids, including syntypes of most of his new species.

The identification of Captain F. Kingdon Ward's collection, made on the borders of Tibet and Burma in 1926, has been continued, and all the new *Gentians* have been described, while a few other plants of exceptional interest have been made the object of special investigation. Captain Kingdon Ward's collection from the Mishmi Hills, 1928, has also been taken in hand, but is not yet fully determined.

Research and Publications.—The whole of the manuscript of Part IX of the Flora of the Presidency of Madras was completed, and the part is expected to appear early in 1931.

The collection of plants sent by Koenig to Retzius, which was received on loan from Lund, as noted in the last Review, is still under investigation, a few further sheets having been discovered. Some of the sheets elucidate obscure points in Retzius, "*Observationes Botanicae*," and they are therefore of taxonomic importance. It is proposed to publish a review of the collections at an early date.

The following publications, wholly or partly prepared at the Kew Herbarium, have appeared during the year:—

Cardamoms, by I. H. Burkill (*K.B.* 1930, p. 32).

Additions to the Flora of Borneo, by H. N. Ridley (*K.B.* 1930, p. 74).

Contributions to the Flora of Siam, by W. G. Craib, E. T. Geddes and C. H. Wright, Additamenta XXVII., XXVIII. and XXIX. (*K.B.* 1930, pp. 161, 313 and 405).

A new *Berberis* from Burma (*K.B.* 1930, p. 208).

Plants new to Assam: II. (*K.B.* 1930, p. 239).

Additions to the Flora of Borneo and other Malay Islands, by H. N. Ridley (*K.B.* 1930, p. 364).

The Trees of Northern Bengal, by A. M. and J. M. Cowan (Calcutta, 1930).

AFRICA.

During the first half of the year efforts were made to complete the third part of the Flora of West Tropical Africa before Mr. Hutchinson left for Rhodesia to take part in General Smuts' botanical expedition. In consequence of this, and of his absence during the four months of the expedition, there has been a considerable accumulation of collections awaiting his critical determination, especially from West Africa.

Collections from East Tropical Africa, however, were mainly dealt with, and as much material as possible is desired from this region during the next few years so that the proposed Flora of East Tropical Africa may be made as complete as possible. It is a great assistance to the spread of knowledge when several sets of duplicates have been made, as their distribution enables other institutions to benefit from the critical work carried out in writing a Flora.

The two large collections made by Mr. Hutchinson and Mr. Milne-Redhead in Rhodesia during the last winter season have filled a blank in the herbarium, and added greatly to our knowledge of the flora of the vast Mopane and *Brachystegia* forests of that country, especially by the addition of fruiting material not hitherto known. The value of field experience and of topographical knowledge cannot be over-estimated, whilst the stimulation of interest is considerable.

NORTH-EAST AFRICA.—Two small collections received from Mrs. D. Macintosh, from the comparatively unknown mountains of Gebel Marra, have been determined. A small collection from Opari, in the Laboni Forest, on the Uganda-Sudan border, made by Mr. J. D. Snowden, was also received and named. An interesting collection of Sorghums from the Anglo-Egyptian Sudan was received from Mr. A. W. Punter of the Gezira Research Farm, Wad Medani. The collection, which comprises about 100 different forms, representative of both flowering and fruiting specimens, is being held over pending a monographic study of the genus.

Mr. C. L. Collenette's opportunities for collecting while attached to the Anglo-Italian Boundary Commission in Somaliland, were unfortunately curtailed owing to illness. His specimens, which arrived in excellent condition, amounted to 416 numbers. They have been mounted and partially named, but require careful

critical examination before publication can be attempted. Several apparently new species are included.

WEST TROPICAL AFRICA.—From Sierra Leone the most important collections are those from Mr. F. C. Deighton and Mr. R. R. Gilmville. Mr. Deighton's specimens are accompanied by useful economic notes and vernacular names, which help considerably in the work of determination.

Large collections were received from Nigeria and the Gold Coast, more particularly from Messrs. T. D. Maitland, J. D. Kennedy, H. V. Lely, A. S. Thornewill, F. R. Irvine, A. S. Thomas, C. Vigne, T. Lloyd Williams and Miss E. D. Plumptre. Mr. Maitland's collections from both upper and lower areas of the Cameroons Mountain (in number about 800) help to bridge the gap between the West Tropical and the Equatorial forest floras, and some of his specimens from the upper grasslands are either new records or have been known only from the early collectors. Mr. Kennedy's specimens illustrate the forest flora of the chief timber-producing area of S. Nigeria.

Among smaller collections, that brought by the Assistant Director from the Central Sahara was of considerable interest since the area had not hitherto been explored. A small collection of interest came from Major Powell-Cotton, who required identifications to assist him to construct a Museum exhibit of the natural environment of the Cameroons Gorilla. A useful set of Sorghums and Millets was received from the Gold Coast, forwarded by Mr. Lloyd Williams, and another was brought back from Nigeria by Mr. H. C. Sampson. Two sets of bazaar medicines were received, one from Sierra Leone, collected by Dr. Neil Leitch, Government Pathologist, with a view to an enquiry into West African *Materia Medica* and Toxicology; the other from the Gambia, sent by the Director of Agriculture, being duplicates of a set entered at the Agricultural Exhibition at Bathurst in 1930. From Liverpool Free Public Museum came a list of 34 vernacular names of African timbers. It was possible to determine about half of these and to assist the reorganisation of the African economic and anthropological exhibits at the Museum.

Research and Publications.—Work on the orchids for the Flora of West Tropical Africa has been begun. A considerable number of apparently undescribed species is in the Herbarium, and some of these have been written up, together with specimens collected by Dr. Linder for the Arnold Arboretum, and forwarded by Prof. Oakes Ames for determination.

The work on Part iii of the Flora of West Tropical Africa was completed during the first half of the year, and the correction of the proofs is being carried on as rapidly as circumstances permit, so that the volume should be issued early in 1931. Included in the families dealt with are *Rubiaceae*, with over 400 species, *Compositae*, 186 species, and *Labiatae*. The last mentioned, which are much in need of revision, entailed a considerable amount of research.

The elaboration of Part iv, comprising the Monocotyledons, has been commenced.

Agriculture in Sierra Leone (*K.B.* 1930, p. 225).

EAST TROPICAL AFRICA.—The principal collections from Uganda were those forwarded by Mr. L. C. C. Liebenberg and Mr. J. D. Snowden. Both collectors sent many instalments, those of Mr. Liebenberg including an interesting collection from the upper zones of Mt. Elgon. This was supplemented by a small set of plants from the same mountain made by Messrs. W. Soundy and G. L. R. Hancock during an entomological excursion. Mr. Snowden's most interesting contribution was from Mt. Muhavura in the Kigezi District, an area practically unrepresented in the Herbarium. Two small collections of excellent material copiously annotated were received from the Forestry Department of Uganda and were incorporated in the Herbarium.

The Forestry Department of Kenya continued to send a wealth of material collected mainly by the Conservator of Forests, Mr. H. M. Gardner, and by Mr. R. M. Graham. The preliminary determinations and notes which accompany the specimens greatly aid in their determination, and the work of naming is fairly up-to-date. As these collectors always send duplicate material several sets have been made and distributed to other institutions. An interesting series of about 200 plants, all of significance from the veterinary point of view, was forwarded by Mr. R. W. Mettam of the Veterinary Department, Nairobi. Further parcels have also been received from Miss E. R. Napier, who is in charge of the Botanical section of the Coryndon Memorial Museum, where a herbarium, which promises to be of considerable importance to the Colony, is being established.

Mr. P. J. Greenway, Botanist of the East African Agricultural Research Station, Amani, Tanganyika, has forwarded a very large number of specimens during the year. These include not only collections made by himself in various parts of Tanganyika, but a series of specimens from the Amani Herbarium representing different families in which he is specially interested. Mention may be made particularly of the Rubiaceae and Leguminosae. A large number of Zanzibar plants has also been examined for Mr. Greenway. These were collected partly by himself and partly by friends who are co-operating with him in preparation for the proposed Flora of this island. In connection with this, a set of herbaceous plants forwarded by Mr. J. H. Vaughan from Pemba Island has also been received and partly named. The work on Mr. B. D. Burtt's collection, mainly from the Kondoa Irangi District, Tanganyika, received three years ago, was completed and the duplicates were distributed. Recent sendings by this same collector have also been dealt with.

Research and Publications.—A new Stinkwood from East Africa (*K.B.* 1930, p. 68).

A visit to Kilimanjaro (*K.B.* 1930, p. 97).

Nandi Coffee (*K.B.* 1930, p. 401).

A New Genus of Iridaceae from East Africa (*K.B.* 1930, p. 465).

SOUTH TROPICAL AFRICA.—Some 700 sheets of Mr. J. Gossweiler's Angola plants, received mainly in 1905 and 1910, have been written up according to British Museum determinations and incorporated in the Herbarium.

Several small collections were received from Southern Rhodesia connected with experimental work, a set of grasses from Dr. C. K. Brain, Secretary of the Department of Agriculture, being the most interesting.

Two large collections were received from Rhodesia as a result of tours made by members of the Staff. Mr. Hutchinson's Rhodesian collection, made whilst accompanying General Smuts on his expedition to Northern Rhodesia in 1930, contained about 900 numbers representing nearly as many species, with, in most cases, four or five sets of each. The specimens are mainly from the Lundi River in S. Rhodesia, the Zimbabwe Ruins, and from Northern Rhodesia on the route from the Victoria Falls *via* Broken Hill to Lake Tanganyika. A preliminary examination of the material from the latter part of the journey shows it to contain several interesting novelties.

Mr. E. Milne-Redhead's collection was confined to Northern Rhodesia and consisted of some 850 numbers comprising about 3,000 specimens. Most of the plants were collected in the Solwezi and Mwinilunga Districts during the dry season, and are representative of the winter flora of the dry woodlands, including the "mavunda" country. Part of the collection, however, was made at Mazabuka in October when the trees and shrubs were in flower.

Material from the Belgian Congo included a small collection made by Mr. Hutchinson in the Katanga Province, and a set of about 350 specimens collected by Dr. Linder during the Harvard University Expedition to Central Africa in 1927, the duplicates of which were presented by the Arnold Arboretum.

Research and Publications.—The Genus *Brachystegia* in Nyasaland, by P. Topham (*K.B.* 1930, p. 348).

SOUTH AFRICA.—An important and large collection with many duplicates was that made by Mr. Hutchinson during his tour in South Africa in 1930. About 300 species were collected in the botanically little-known Zoutpansberg, Northern Transvaal, and these should throw considerable light on the flora of that area, which is of great phytogeographical interest. About 200 species were gathered in Natal, mainly on and around the Mont aux Sources in the National Park, and about 130 species in the neighbourhood of Port Elizabeth.

Numerous collections were received for naming from various institutions, comprising 2,500 sheets in all, many of which have been identified or the determinations confirmed. These include material from the Division of Plant Industry, Pretoria; University of the Witwatersrand; Transvaal Museum Herbarium; Albany Museum Herbarium; Natal Herbarium, Durban. The most interesting was a set of about 150 specimens collected by the late Prof. C. E. Moss in

South-West Africa, which contained succulent species of *Pelargonium* and endemic species of *Zygophyllum*, *Galenia* and other Aizoaceae, some of which had not been previously recorded from that area. An entirely different collection was received from the Waterberg District in the north of South-West Africa (forwarded by Dr. I. B. Pole Evans), containing many tropical species of *Leguminosae*, *Acanthaceae*, *Convolvulaceae*, etc. Interesting donations from private individuals included specimens from the Hon. Mrs. Ryder and from Commander T. M. Salter. That of the latter contained several type or syntype specimens of new species of *Oxalis* and *Erica* discovered by him in the Cape Province.

Research and Publications.—The investigation of several critical genera and specific groups as represented in the Fauresmith Flora has been continued as time allowed, and data on the distribution of the known species represented in the above area have been obtained for publication.

Examination of some *Scilla* specimens from the Transvaal led to the detailed investigation of the so-called *Scilla lanceaefolia* Baker, under which name some toxicological researches had been published. The results of this were summarised in a recent paper (*K.B.* 1930, p. 241). In connection with veterinary research an investigation was also undertaken at the request of the Chief, Division of Plant Industry, Pretoria, with regard to the "species" of *Cestrum* introduced into South Africa.

At the request of Dr. E. P. Phillips, the Principal Botanist, Division of Plant Industry, a complete revision of the available material of the genus *Lopholaena* DC. was undertaken. This involved the examination of about 400 sheets of specimens from South African and European Herbaria and the results have been embodied in a joint paper soon to be published. Another indigenous genus of economic importance—*Sutherlandia* R. Br.—has been studied and the results incorporated in a joint revision with Dr. E. P. Phillips.

Nuxia and *Lachnopylis* in Africa (*K.B.* 1930, p. 10).

AMERICA.

Mounting and laying in progressed satisfactorily, about 10,000 sheets being incorporated in the Herbarium. Among the more important accessions were a fine set of duplicates of plants collected in Chile by Dr. Ivan M. Johnston, including syntypes of many recently published species, and a set of the plants collected in Chile by Messrs. Clarence Elliott and W. Balfour Gourlay during their second expedition, presented by the Royal Botanic Garden, Edinburgh. A fine set of over 900 sheets of Quebec plants was received in exchange from Professor Marie-Victorin, while over 500 sheets from California and Arizona were contributed by the University of California, Berkeley. The collections were enriched also by many interesting plants from Tropical America received in exchange from the Field Museum, Chicago, while several small but important

parcels from Trinidad and Tobago were contributed by Mr. R. O. Williams, and others, from British Guiana, by the Departments of Forestry and Agriculture. The purchase of 3000 sheets from Oregon and the adjacent States considerably strengthened the representation of the flora of that part of the United States.

For the greater part of the year the work of the American section has been carried on by a single botanist, who has devoted his time almost entirely to work on the floras of British Guiana and Trinidad. The main piece of work has been the critical identification of the very important collection made in British Guiana by the Oxford University Expedition in 1929, and this will continue well into 1931. In the course of the investigation other collections from the Colony have also been named. At the same time large numbers of previously unnamed sheets of the important Ule collections from Brazil have been named and laid in, and throughout the year a great deal has been done towards the critical determination of the Tropical American material already in the Herbarium. Between the months of May and October, some additional assistance was available for naming and laying in over 2000 sheets of the Hassler collection from Paraguay. Among other collections which have been named was the first collection made in Chile by Messrs. Clarence Elliott and W. Balfour Gourlay. Several genera have been written up according to monographs, the most important piece of work of this kind being the complete rearrangement of the *Bromeliaceae*, the genera being numbered according to Harms' recently published account in the *Pflanzenfamilien*, and the species by Mez's Monograph.

Research and Publications.—A considerable amount of time has been spent in checking the typescript of portions of the Flora of Trinidad and Tobago, the Leguminosae being examined in collaboration with Mr. R. O. Williams.

A new series of taxonomic papers has been begun under the general title "Contributions to the Flora of Tropical America," the first being an account of "New and less-known species of the *Schlegelia*" (*K.B.* 1930, p. 210). The botanical results of the Oxford University Expedition to British Guiana, so far as they relate to the taxonomy of the Flowering Plants, are being incorporated in further numbers of this series, the first two papers being "Chondodendron candicans, a Menispermaceous bush-rope of Guiana" (*K.B.* 1930, p. 339), and "Annonaceae collected by the Oxford University Expedition to British Guiana, 1929." (*K.B.* 1930, p. 466.)

AUSTRALIA, NEW ZEALAND AND OCEANIA.

AUSTRALIA.—Work on Australian material has been expedited this year owing to the expert assistance received from Mr. W. D. Francis of the Brisbane Herbarium (see page 2). This has allowed Mr. Summerhayes additional time for work on Polynesian material. Amongst collections which have been examined and named during the year may be mentioned those of Dr. Basedow (from Arnheim

Land, North Australia), Mr. H. F. Comber (Tasmania), Mr. C. E. F. Allen (Port Darwin, North Australia), and Mrs. Weinholt (South Australia); the last two collections were presented several years ago.

An interesting collection of about 1000 numbers, made by Mr. H. F. Comber in Tasmania on behalf of a small syndicate of amateur horticulturists, was generously presented to Kew by Mr. Lionel de Rothschild. The collection, which was worked out conjointly with Mr. Comber, consists chiefly of plants from South and West Tasmania. It contains several new species, and a number of plants which it has been found necessary to segregate from New South Wales species with which they had previously been identified.

Several very valuable collections of named plants have been received this year as gifts from Australian botanists. These include a series from Mr. A. Morris (Broken Hill), Mrs. E. Thompson (Brisbane), and Mr. H. B. Williamson (Melbourne), whilst further instalments of useful material have been received from Dr. F. A. Rodway (Nowra, N.S.W.), Dr. J. B. Cleland (Adelaide), and the Rev. H. M. R. Rupp (Paterson, N.S.W.). About 400 named sheets of Tasmanian plants were purchased from the Tasmanian Museum.

The most valuable collection received was a very generous donation from the Regius Keeper of the Royal Botanic Garden, Edinburgh, of about 5000 sheets of duplicates from the Herbarium of the late Dr. A. Morrison. The specimens, which are in excellent condition, were mostly collected during the latter part of last century in Western Australia, South Australia and Victoria.

A large number of specimens (544 sheets in all) was sent from the Queensland Herbarium for critical examination by Mr. Francis. Amongst these is the whole of the Brisbane material of the following genera:—*Rapanea*, *Notelaea*, *Gardenia*, *Wedelia*, *Mackinlaya*, *Wilkiea* and *Tetrasynandra*; whilst selections of critical species from the following genera have also been sent:—*Spilanthes*, *Triumfetta*, *Cordia*, *Erythroxylum*, *Monotoca*, *Cassia*, *Myrtus*, *Panax* and *Pittosporum*. In working through these collections it has been possible at the same time to revise the Kew material, and the Queensland Government Botanist has been good enough to present duplicate specimens where they could be spared.

Research and Publications.—A Revision of the Australian species of *Frankenia* was published in the Journal of the Linnean Society, Botany, vol. xlviii. p. 337. This includes descriptions of 45 species, 24 of which were new to science.

A paper dealing with a number of new species discovered in Mr. Comber's Tasmanian collection is being prepared for publication.

NEW GUINEA.—Several large collections of named duplicates of the plants collected in New Guinea on behalf of the Arnold Arboretum have been presented. These have been mounted and for the most part laid in.

NEW ZEALAND.—Relatively little work has been carried out during 1930 on New Zealand plants. Dr. Allan was in England for about six months and the usual instalments of plants from him were not received. As a result of his studies of the type material in European herbaria, considerable revision will be necessary in the case of certain genera and also some changes in nomenclature.

OCEANIA.—Small collections have been received from Rarotonga (Mr. G. P. Wilder), and New Hebrides (Miss L. E. Cheesman), which were for the most part determined soon after arrival. A large collection of *Ficus*, collected in the New Hebrides by Mr. S. F. Kajewski, on behalf of the Arnold Arboretum, has been received from that Institution for determination, and work on this has been commenced.

Further supplies of material have again been received from Fiji, including consignments from Mr. W. Greenwood, and the work of determination of his valuable collections has been steadily continued.

Several further instalments have been received from the island of Bougainville, the flora of which is very little known, forwarded by Mr. J. H. L. Waterhouse (see p. 4), the latest consignment consisting of 100 specimens. The determination of his collection, which amounts to about 550 numbers, has been put in hand. Mr. Waterhouse has concentrated on woody plants, and interesting specimens of *Canarium*, *Calophyllum*, etc., have been found, but so far as the collection has been examined there do not appear to be many novelties.

Research and Publications.—Work on a joint paper with Mr. Greenwood on the Leguminosae of Fiji has been continued. A supplementary paper on the Fiji grasses was published (*K.B.* 1930, p. 252).

Ferns collected in Fiji by Sir Everard im Thurn, K.C.M.G., by Mr. C. H. Wright (*K.B.* 1930, p. 343).

PTERIDOPHYTA, BRYOPHYTA, THALLOPHYTA.

FERNS.—Owing to adjustment of staff caused by Mr. Hubbard's absence in Australia, the determination of large collections of ferns had to be postponed, and only the naming of small lots was attempted. Much help was, however, obtained from visitors, particularly from Dr. C. Christensen, Dr. W. R. Maxon and Mr. R. C. Ching, who between them named and revised many hundreds of sheets from Polynesia, America, and China respectively. No further progress in the rearrangement of the Fern collection in accordance with Christensen's "Index Filicum" could be made, but a very large number of specimens has been mounted and arranged in alphabetical sequence of genera in a special cabinet, pending incorporation.

The Herbarium was enriched by the presentation of an unusual number of collections during the year. Amongst these may be mentioned the fern herbarium of the late Dr. Eryl Smith, which

comprises over 4,000 specimens, mostly Siamese, Chinese, and Malayan species. Another interesting donation was from Dr. Millard Griffiths of Durham University, consisting of about 400 specimens collected in 1862 in New Zealand by, it is believed, Mr. R. H. Huntley, a keen naturalist and a member of the New Zealand Institute. A set of Parks' material from Fiji and Tonga was presented by Prof. E. B. Copeland, the former collection illustrating Prof. Copeland's paper on the Ferns of Fiji. Valuable material was presented by Messrs. R. E. Holttum and M. R. Henderson from Malaya, and by Mr. P. W. Richards, who gave to Kew the ferns collected by the Oxford University Expedition to British Guiana, 1929. A set of the latter was presented to the Natural History Museum, and a paper on them has been prepared for publication by Mr. A. H. G. Alston.

MOSSES AND LIVERWORTS.—Owing to pressure of other work it has not been possible to devote much time to the Mosses and Hepatics, but an interesting collection made by Mrs. E. C. MacKenzie in the Canadian Rockies, and several smaller collections, have been named.

A detailed investigation was made of an interesting Transvaal Hepatic belonging to a genus previously unrepresented in the Kew Herbarium. This resulted in the publication of a paper on A New Species of *Exormotheca* from South Africa (*K.B.* 1930, pp. 237-239).

A few specimens have been named by specialists who are monographing certain genera.

Some 450 Mosses and Hepatics collected in 1929 by Mr. C. V. B. Marquand, with the British Bryological Society, in the Breadalbanes (Perthshire), as well as on other mountains in the north of Scotland, have been presented to Kew and await incorporation.

A number of tracings of Stephani's drawings of *Hepaticae* has been incorporated.

CHAROPHYTA.—A number of specimens of *Charophyta* collected by Mr. T. B. Blow has been received from Mr. J. Groves, to whom we are also indebted for various identifications.

In collaboration with Mr. Groves a Conspectus of the Charophyta is being prepared.

ALGAE.—Work on the Revised List of Natal Algae has been retarded by the temporary cessation of collecting operations in Natal, which has made it impossible to proceed further with the naming of incomplete material, or the correction of the many dubious records.

Cases for Tilden's Index *Algarum Universalis* have been purchased, and the Index is now arranged and available for reference.

An important addition to the Herbarium was a collection of about 300 American Algae from the University of California, which have been mounted and laid in. They include syntype specimens

of several of Setchell and Gardner's species appearing in their series of papers in the University of California publications.

A visit was paid by Miss C. I. Dickinson to the Marine Biological Station, Port Erin, Isle of Man, during March, and a large amount of material was collected, part of which is being utilised in exchange for specimens from Japan.

LICHENS.—A useful addition to the Herbarium is a set of some 400 Norwegian lichens selected by Prof. B. Lynge and presented by Dr. J. Holmboe.

Mr. Paulson has very generously continued to give much of his time during his visits in assisting in the naming of lichens. During the past year he completed the determination of the material collected in Greenland by the Oxford University Expedition of 1928 and also of that collected by the Oxford University Expedition to British Guiana in 1929.

FUNGI.—Among the larger consignments of fungi received for determination there should be mentioned especially a collection from British Guiana, made by Mr. P. W. Richards and Mr. E. B. Martyn during the Oxford University Expedition of 1929, and two consignments of interesting Polyporaceae and Thelephoraceae from Mr. E. J. H. Corner (Singapore). Mr. C. G. Hansford is devoting attention to the microfungi of Uganda, especially the Meliolineae and fungi parasitic on grasses, and has sent a large amount of material, part of which will be worked out conjointly with him during his periods of leave. The microfungi of the tropics are so little known that there is a very great field for mycologists who will study special groups in the field and work them out in European herbaria. Another section which would well repay study in the tropics is the resupinate Hymenomycetes. Of these the Rev. J. Rick has sent about 160 specimens from Brazil. Among other collections received and dealt with may be mentioned fungi from the Cameroons (T. D. Maitland), India (S. R. Bose), Rhodesia (J. C. Hopkins), and South Africa (P. A. van der Bijl).

In connection with botanical survey work in Richmond Park, Surrey, numerous fungi have been named, and a few of special interest added to the collection of British fungi. Interesting species collected during the forays of the British Mycological Society have also been incorporated.

The number of miscellaneous enquiries continues to increase year by year. Sometimes newspaper publicity on certain aspects of mycology gives rise to a wave of correspondence. Following the reports of two deaths from poisoning by fungi there were many enquiries as to methods of distinguishing between edible and poisonous species, and a large number of specimens were sent for determination. Another case in which publicity has greatly increased the number of enquiries is that of the Dutch Elm Disease.

Owing to the International Botanical Congress, an unusually large number of mycologists visited the Herbarium, many of whom it was necessary to assist in regard to their work, especially those who were engaged in monographic research such as Prof. H. H. Wirtzel and Prof. J. H. Miller, who were working on *Sclerotinia* and *Hypoxylon* respectively. Such co-operation is of considerable value and Kew is indebted to both these mycologists, not only for valuable critical notes on the species but also for the presentation of material.

BIOLOGICAL AND GENETICAL HERBARIA.

About 1800 specimens have been added to these collections during the year. These include:—1. A fine series illustrating the vegetation of Richmond Park, Surrey, an area which is being surveyed in great detail by a committee composed of members of the Kew Staff and their friends. 2. Plants illustrating the vegetation which is appearing on the land-slip on the south coast of the Isle of Wight. 3. Specimens of *Anthyllis*, *Silene*, *Centaurea*, *Saxifraga* and *Ranunculus*, recording breeding and field studies (see section dealing with Experimental Work, p. 40).

A paper on "Special Herbaria as Adjuncts to Modern Botanical Research" was published in the *Journal of Ecology*, xviii. 379 (1930). A general request which was recently made for assistance in making the Kew biological and genetical herbaria as complete as possible has already received valuable response.

SUMMARY.

The routine work, apart from naming, accomplished by the regular staff and by the special Store Staff during 1930 is summarised as follows:—

Mounted (approx.)	...	...	...	40,000*
Incorporated (approx.)	...	...	...	29,900*
Duplicates distributed	...	...	...	7,689
Specimens received on loan	...	...	...	12,141
Specimens sent out on loan	...	...	...	10,581
Specimens presented or purchased	...	...	...	70,146

ILLUSTRATIONS AND PHOTOGRAPHS.

More than half of the Artist's time has been occupied by photography. On behalf of other institutions about 500 sheets of type specimens in the Kew Herbarium have been photographed, and approximately 300 sheets borrowed from abroad have been photographed for the Kew collections.

A number of photographs of the transplant experiments at Potterne and of living plants from the Gardens, including an interesting series of the seedlings of *Chirita*, were also taken. Drawings in monochrome and colour were made for the collection of drawings in the Herbarium. A number of plates were prepared from the dried specimens in the Herbarium for Hooker's *Icones Plantarum*, of

*These figures do not include the lower cryptogams.

which Vol. II, part ii. of Series 5 was published in July. In this a new system was used to replace the old lithographic reproduction, ordinary pen drawings on Bristol Board being used for reproduction instead of drawing directly on the printing stones.

Upwards of 1000 drawings and photographs of plants have been received for the collection of drawings and photographs. These include 496 plates in the set of *Addisonia*, presented by the Bentham Trustees, and 118 paintings of Natal Orchids by Mrs. M. E. Sturgeon, also presented by the Bentham Trustees. The Royal Horticultural Society has presented 35 original coloured drawings prepared for the *Botanical Magazine*. Among the other drawings and photographs received are 79 plates from the *Flowering Plants of South Africa*, from Dr. I. B. Pole-Evans; 142 photographs of new species of Rubiaceae from the Smithsonian Institution, Washington; 43 photographs of Rubiaceae from the Field Museum of Natural History, Chicago; 48 film negatives of Australian Orchids by Mr. T. Green, supplementing the large collection made by him and presented by the Bentham Trustees in 1929; 13 original paintings of Tanganyika plants by Mr. B. D. Burt; 16 proof plates of species of *Dioscorea*, prepared for the *Annals of the Royal Botanic Garden, Calcutta*, vol. xiv, from Mr. I. H. Burkill; and 14 photographs of Indian Rhododendrons and Primulas from Capt. F. Kingdon Ward.

A volume of 34 original paintings, mostly of Malayan fruits, was presented by Mr. E. H. Man. The paintings were the work of his mother, the wife of General Man, who was Governor of Penang while it was still a possession of the East India Company.

Additions to the collection of Portraits of Botanists at Kew include the photographs of Dr. Carl Christensen; the late Dr. H. B. Guppy, presented by Mrs. Guppy; the late Prof. Augustine Henry, presented by Mrs. Henry; Prof. A. S. Hitchcock; and the late Sir George Watt, presented by his daughter, Mrs. Alexander Mair.

NOMENCLATURE.

A great deal of the preparatory work for the Sub-Section of Nomenclature at the International Botanical Congress, Cambridge (1930), devolved on members of the Herbarium Staff. This included, in addition to a very extensive correspondence, the preparation of lists of Botanical Institutions, Societies, and Academies, for consideration by the Permanent Bureau of Nomenclature, and the Executive Committee of the Congress, in connection with the allocation of votes on nomenclature by these bodies; the issuing of several hundred forms of invitation to Institutions in all parts of the world to send Delegates for Nomenclature; the recording of the names of the Delegates appointed by these Institutions; devising arrangements in connection with voting, including the printing of special voting-books, and their issue to Delegates and others entitled to them; and drafting of Rules of Procedure for the Sub-Section, for consideration by its Officers.

As one of the Secretaries of the Sub-Section of Nomenclature, Dr. Sprague took a prominent part in the discussions at Cambridge. Miss M. L. Green was responsible for drawing up the English detailed report of the Proceedings of the Sub-Section.

During the discussions, the "Nomenclature Proposals by British Botanists" (vide *K.B.* 1930, App. I., p. 42) proved especially helpful, and many of the suggestions of the British Sub-Committee were adopted. The lists of *Nomina Conservanda* and of Standard-species contained in the "Proposals" were accepted in principle.

INDEX KEWENSIS.

During the past year the compilation of the Index Kewensis, Supplement VIII, proceeded steadily, the total number of new names now amounting to about fourteen thousand.

About twelve hundred names have been added to the Family Ficoidaceae, this being due chiefly to the segregation of new genera from the Linnean genus *Mesembryanthemum*.

The new entries for Supplement VIII would have reached a far higher figure had it not been for the demand on the time of the staff for work in connection with the Botanical Congress. In spite of this, however, it is hoped that the compilation of Supplement VIII will be completed by the end of the year 1931.

EXPERIMENTAL WORK.

The work at Potterne on *Primula vulgaris* has been completed and specimens of *Scilla non-scripta* have been collected from the wild state with a view to studying the flower and fruit in this species from several standpoints. The interspecific tetraploid *Saxifraga potternensis*, which was back-crossed with each parent in 1929 and with the seedling generations in 1930, showed that in back-crossing it behaved as a species and not as a hybrid, i.e., no segregation occurred in F_1 of the back-crosses.

The segregation of characters of plants growing naturally in hybrid swarms was studied in *Centaurea* and generations derived from crosses with *C. Jacea* (as one of the parents) were scored. Numerous F_1 generations of new *Silene* crosses were scored but the correlation of results is reserved till F_2 s have been obtained. The work on *Geum* has been concluded and the results have been published. *Ranunculus* sex studies have been advanced by (1) the discovery of a neuter-plant of *R. acris* in the wild state, (2) the discovery of wild sex variations, correlated with morphological variations of the outer floral organs, in *Ranunculus Ficaria*, and (3) the appearance of male *R. acris* (in about a 1:3 ratio) in F_1 plants (with a male plant as pollen parent) back-crossed with the male—i.e. "maleness" reappeared when two doses were put in.

A considerable amount of field work was done on *Centaurea* and *Silene* especially in Wales and the S. of England.

Owing to the preparations for the erection of a new wing to the Herbarium, extending over the Herbarium Garden, it has been

necessary to select a new garden site. An area of approximately the same size, with facilities for future extension, has been prepared between the Herbarium and the Imperial Mycological Institute and all stock plants were moved into it during the autumn.

Accounts of the research work at Potterne and Kew were given to the British Association at the Bristol Meeting by the Director (President of Section K), and by Mr. E. M. Marsden-Jones and Dr. W. B. Turrill.

Publications.—The History of a Tetraploid Saxifrage (*Journ. Genetics*, xxiii., No. 1, p. 83, 1930). Sterility and floral abnormality in the Tetraploid *Saxifraga potternensis* (*Journ. Genetics*, xxiii., No. 1, p. 93, 1930). The Genetics of *Geum intermedium* Willd., *haud Ehrh.*, and its Back-Crosses (*Journ. Genetics*, xxiii., p. 377, 1930).

TRANSPLANT EXPERIMENTS.

An account of these, up to the end of 1929, was published in the *Journal of Ecology*, xviii. 352 (1930).

During the year under review regular scorings have been made. A new stock of *Anthyllis* has been transplanted and plants of *Fragaria vesca* are being prepared, by cloning, for occupying the vacant parts of the beds.

VISITORS.

The number of signatures which appear in the Visitors' book for 1930 was 7,284, a figure greatly in excess of that of any previous year, and due mainly to the presence in England of the large number of botanists who attended the International Botanical Congress. It is impossible to give an idea of the nature of the activities of so many visitors, especially as most of them spent but a short time at Kew. It is also impossible to mention all by name; details are included, therefore, only with regard to those who visited the Herbarium over a considerable period or were engaged in work which is definitely connected with Kew or with the flora of the Empire.

The preparation of the Botanical Magazine and of the concluding volumes of the Index Londinensis, under the auspices of the Royal Horticultural Society, was continued, as in former years, by Dr. O. Stapf and his assistants in one of the rooms of the Library. Mr. W. J. Bean, late Curator of the Gardens, who is engaged on the preparation of a supplement to his "Trees and Shrubs Hardy in the British Isles," was also almost a daily visitor.

Representatives of the staffs of the following botanical institutions, amongst others, made use of the facilities afforded by the Herbarium and Library:—British Museum (Natural History); Botany School, Cambridge; Imperial Forestry Institute, Oxford; Imperial Mycological Institute, Kew; and the John Innes Horticultural Institution, Merton.

Amongst workers engaged in British botany mention may be made of Messrs. J. Fraser, A. B. Jackson, E. M. Marsden-Jones and H. W. Pugsley. Home workers in the cryptogamic field included

Mr. T. Petch (fungi); Dr. H. N. Dixon (mosses); Mr. W. B. Grove (Mycological literature); and Mr. R. Paulson, to whom Kew is again indebted for considerable assistance in the determination of lichens. Mrs. Clement Reid and Miss M. E. J. Chandler paid their accustomed visits in connection with their investigation of fruits and seeds from the Eocene beds of the Isle of Sheppey.

Of botanists from the Continent of Europe, the following list contains the names of some of those who visited the Herbarium for a short time only during the summer months:—Mlle. M. Bensaude (Lisbon), Dr. J. Briquet (Geneva), Mrs. H. Czeaszott (Cracow), Dr. and Mrs. B. H. Danser (Amsterdam), Dr. L. Diels (Berlin), Dr. A. Donovsky, Dr. M. A. Donk (Utrecht), Dr. Rudolf Florin (Stockholm), Dr. R. E. Fries (Stockholm), Prof. C. M. H. Glück (Heidelberg), Dr. A. Guillaumin (Paris), Dr. H. Handel-Mazzetti (Vienna), Dr. H. Harms (Berlin), Prof. H. O. Juel (Upsala), Prof. H. Klebahn (Hamburg), Père L. M. Lalonde, Dr. P. V. D. Ledoux (Brussels), Dr. R. Mansfeld (Berlin), Dr. J. Mattfeld (Berlin), Prof. R. Nordhagen (Bergen), Dr. R. Pampanini (Florence), Dr. J. Podpěra (Brno), Dr. G. E. du Rietz (Upsala), Prof. E. Rübel (Zürich), Dr. G. Schellenberg (Göttingen), Dr. C. K. Schneider (Berlin), Prof. C. Schroeter (Zürich), Prof. N. Stoyanoff (Sofia), Prof. N. E. Svedelius (Upsala).

The following paid more prolonged visits. Dr. G. Kükenthal (Coburg) spent about six weeks at Kew while continuing his monographic studies of various genera of the Cyperaceae. Dr. Carl Christensen (Copenhagen) spent about three months working on ferns, especially those from Madagascar and Samoa, and Dr. K. Domin (Prahá) stayed about two months continuing his work on the flora of Dominica. Miss M. C. Karsten (Gelderland) paid her usual summer visit in connection with work on various succulent plants.

During the first two months of the year Dr. Isaac Reichart (Tel-Aviv) worked for a considerable time in the Herbarium on the lichens and certain fungi from the Palestine area. Dr. J. M. Cowan was occupied with naming the plants collected by himself and Dr. C. D. Darlington in N.W. and W. Persia in 1929, and Dr. Hooper spent a considerable time on the drugs obtained by this same expedition, and on other Persian drugs. Mr. B. Gilliat-Smith spent some three months at Kew elaborating, in conjunction with Dr. W. B. Turrill, a list of plants of north-western Persia, which has now been published in four instalments in the Kew Bulletin.

With regard to Asia, Captain F. Kingdon Ward paid a number of visits to work out part of his North-east Indian and Upper Burmese collections, principally Rhododendrons. Mr. R. N. Parker, while on leave from India, worked for about six weeks on problems of the Indian and Burmese floras, and also devoted some time to the Gramineae, with a view to the completion of Duthie's "Flora of the Upper Gangetic Plain."

Professor W. G. Craib paid a visit of about five weeks during the summer vacation, continuing his studies on the Siamese material of the families Begoniaceae to Rubiaceae, in connection with his

enumeration of the plants of Siam. Mr. Lakshnakara spent some time on the Indo-Chinese collections before returning to Siam to take up botanical work.

Mr. H. N. Ridley devoted much time to the identification of collections from the Malay Archipelago, principally those from Borneo, and published a number of new species. Mr. I. H. Burkill continued work on the preparation of a Dictionary of the Economic Products of the Malay Peninsula. He continued his studies on the Chinese Mustards cultivated in the Malay Peninsula and the medicinal plants of that region, and publications on these subjects appeared in the Gardens' Bulletin, Straits Settlements, during the year. He also continued his work on the genus *Dioscorea*. Mr. R. E. Holttum, while in England on leave from Singapore, brought a collection of ferns for determination and comparison in the Herbarium. Mr. C. E. Carr worked for several months on the bibliography of orchids and on the naming of his extensive collections from the Malay Peninsula.

Professor W. Y. Chun (Canton) spent the whole autumn at Kew, determining material from Kwangtung and preparing data for a flora of that Province, and Mr. R. C. Ching (Nanking) spent the last five months of the year examining the material of Chinese ferns represented in the Herbarium. Mr. W. R. Price was also a frequent visitor, continuing his studies on the flora of Formosa.

Few lengthy visits were paid by botanists from the Continent of Africa, though a considerable number stayed at Kew for a short time. Professor René Maire (Algeria), after the conclusion of the Congress, was engaged in looking up certain specimens in connection with the Flora of Algeria. The flora of the Sudan was the subject of investigations by Major G. Aylmer and Mr. N. Douglas Simpson, the latter spending many weeks in the Herbarium in connection with his determination of plants he had collected in the Sudd region. Mr. J. R. Shabetai (Cairo) spent the last three months of the year in the Herbarium in connection with the Flora of Egypt.

From West Africa Dr. F. R. Irvine was the only frequent visitor. From Tanganyika Mr. L. G. T. Wigg of the Forestry Service and Mr. W. J. Hill of the Department of Agriculture both paid short visits.

Commander T. M. Salter, during a period of leave, paid several visits early in the year, investigating various critical specimens collected by him in Cape Province, while Prof. R. S. Adamson called on several occasions in connection with his studies on the Cyperaceae. Mr. N. S. Pillans was at Kew for about two months, completing his revision of the genus *Phyllica*, and Mrs. M. R. Levyns (Cape Town) commenced work in December upon her projected revision of the genus *Lobostemon*. For several months Dr. A. L. Grant, of the Missouri Botanical Garden, was engaged in critical studies of various genera of South African Scrophulariaceae, material of which she had gathered in the Cape Province during the past few

years. Of home workers, Captain Collingwood Ingram visited the Herbarium several times in connection with South African *Gladioli*, and Mr. J. D. Gillett worked for a few weeks before his visit to South Africa and Rhodesia. After his return, he studied, for a short time, the genus *Bobartia*. Mr. N. E. Brown was as usual a regular visitor during the year, being more particularly engaged on the Ficoidaceae.

As in the case of the visitors from the continent of Europe, a full outline of the interests of U.S.A. visitors cannot be attempted. The following botanists, however, may be mentioned as having paid short visits to the Herbarium in connection with their researches:—Prof. E. B. Babcock (Berkeley), Prof. D. V. Baxter (Ann Arbor, Michigan), Mrs. E. E. Clayton (Ithaca), Dr. J. N. Couch (Chapel Hill), Prof. H. C. Cowles (Chicago), Dr. B. O. Dodge (New York), Prof. C. W. Dodge (Cambridge, Mass.), Dr. C. Epling (Los Angeles), Prof. H. S. Fawcett (Riverside), Dr. Margaret Ferguson (Wellesley), Prof. T. H. Goodspeed (Berkeley), Dr. A. Gunderson (Brooklyn), Dr. A. S. Hitchcock (Washington), Miss A. E. Jenkins (Washington), Dr. L. R. Jones (Wisconsin), Prof. Alice M. Ottley (Wellesley), Prof. Donald Reddick (Ithaca), Dr. A. Rehder (Arnold Arboretum), Dr. C. L. Shear (Washington), Mrs. C. S. Simpson, Mr. C. Piper Smith (California), Dr. A. B. Stout (New York), Dr. E. C. Stakman (St. Paul), Prof. W. R. Taylor (Philadelphia), Prof. J. C. T. Uphof (Winter Park), Prof. R. P. Wodehouse (New York), Dr. R. E. Woodson (St. Louis).

Among the botanists from the United States who paid more lengthy visits was Dr. E. D. Merrill (New York), who spent several weeks working on the genus *Eugenia* as represented in Malaya. Dr. J. H. Barnhart and Dr. H. A. Gleason, both from the New York Botanical Garden, spent a considerable time at the Herbarium, the former being occupied with the family Lentibulariaceae, and with biographical research, and the latter with the flora of Tropical South America. Dr. F. W. Pennell, of the Academy of Natural Sciences, Philadelphia, studied the Scrophulariaceae of South America, especially Brazil. Prof. M. L. Fernald and Mr. Bayard Long examined the Potamogetons of A. W. Bennett's herbarium, and investigated various supposed instances of the occurrence of the same species in Western Europe and Eastern North America. Prof. W. L. Jepson, of the University of California, continued his researches on the flora of that State. Dr. W. R. Maxon, of the United States National Herbarium, spent a considerable period studying type and other material of Tropical American Ferns. Dr. J. M. Greenman examined various critical species of *Senecio* in connection with his detailed monographic studies of that genus. Chaplain and Mrs. Clemens spent several months studying the flora of Sarawak and British North Borneo, in which island they had recently made a collecting expedition.

Dr. R. Kent Beattie investigated the classification of the Eastern Asiatic species and forms of Castaneae, in connection with his

endeavours to find, and introduce into the United States, species strains of *Castanea* immune to Chestnut Blight.

In the Mycological Section, Prof. H. H. Whetzel and his assistant Miss Cynthia Westcott were at Kew for about two months early in the year, engaged on research in connection with his monograph on the genus *Sclerotinia*; and during the summer Dr. Miller put in many weeks' work in connection with his studies on *Hypoxylon*.

Of Canadian visitors, mention may be made of Prof. J. Davidson (Vancouver), Mr. H. T. Gussow, and Mr. M. O. Malte (Ottawa), who spent some time examining Gramineae. Miss Dorothy Newton (Winnipeg) was engaged in the study of general systematic botany with special reference to the flora of Canada. Prof. A. H. R. Buller paid a longer visit than usual, namely from June to December, working chiefly in connection with the fourth volume of his researches on Fungi.

Mr. R. O. Williams spent some time at Kew working upon the Flora of Trinidad and Tobago in co-operation with Mr. N. Y. Sandwith. South America was represented by Dr. Manuel Barros (Buenos Aires) and Prof. F. Fuentes (Santiago de Chile), who were working on South American Cyperaceae and Petaloid Monocotyledons respectively.

Dr. H. H. Allan (Palmerston North) spent some time in investigating certain problems in the New Zealand Flora and especially in establishing the types of species in some of the more critical genera, including *Rubus*, *Celmisia*, *Senecio*, *Gaultheria*. Of workers on the Australian Flora, Mr. H. F. Comber spent October and November in working out his extensive collections made in Tasmania, studying particularly the segregation of the hardy Tasmanian forms of species from the more tender ones of the mainland of Australia. Dr. J. McLuckie (Sydney) paid several visits for the purpose of examining the material of *Grevillea Gaudichaudiana* in the Herbarium and of examining and discussing the new special biological and genetical collections. Mr. A. Meebold (Ulm) visited Kew during the latter part of the year in order to work out a large collection made by him in Western Australia and in Hawaii. A number of novelties were detected and will be worked out at Kew shortly.

For the greater part of the year Miss M. Whiting continued her voluntary work in the Herbarium, and was engaged in arranging the Malay Archipelago collections and also in separating out and arranging the Burmese and Ceylon specimens.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed:—

Great Britain and Irish Free State.—Aberdeen, Cruickshank Botanic Garden; Cardiff, National Museum of Wales; Dublin, Trinity College, Botany Department; Edinburgh, Royal Botanic Garden; London, British Museum (Natural History), and the John Innes Horticultural Institution; Oxford, Imperial Forestry Institute.

Europe.—Berlin, Botanic Gardens and Museum; Brussels, Botanic Garden; Copenhagen, University Botanic Museum; Florence, Botanical Museum; Leiden, 'sRijks Herbarium; Oslo, Botanical Museum; Paris, Natural History Museum; Riga, Latvian Plant Research Institution; Sarajevo, State Museum; Sofia, University, Department of Botany; 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.

Australia and New Zealand.—Adelaide, Waite Institute; Palmerston North, Department of Agriculture.

America.—Georgetown, Demerara, Forestry Department; Harvard University, Gray Herbarium; New York, Botanical Garden; Rio de Janeiro, Botanic Garden; Washington, D.C., U.S. Department of Agriculture, Bureau of Plant Industry, and the U.S. National Museum.

ADDITIONS TO HERBARIUM.

The total number of specimens received during 1930 was about 70,000, of which 6,700 were purchased. The chief sources from which they were obtained are given below.

EUROPE.—Presented: Great Britain, by Messrs. F. Ballard, A. Bullock, F. Druce, H. F. Devis, J. E. Little, J. E. Lousley, C. V. B. Marquand, E. M. Marsden-Jones, C. T. Musgrave, N. Y. Sandwith, V. S. Summerhayes, S. G. Tallents, E. Thurston, T. Wiltshire, C. H. Wright, Dr. E. Drabble, Dr. G. C. Druce, Dr. C. R. Metcalfe, Dr. T. A. Sprague, Dr. W. B. Turrill, Miss M. E. Edmonds, Mrs. A. Salmon, Mrs. C. Sandwith, Mrs. Wedgwood, The Watson Botanical Exchange Club (per Mr. E. C. Wallace), and East Malling Plant Research Station; Albania, by Dr. R. Giuseppi; Balearic Islands, by Mr. A. F. Broun (coll. Mrs. H. M. Broun); Balkans, by Dr. K. Maly, and Mr. J. W. Wyatt; Czechoslovakia, by Dr. K. Domin, Flora Czechoslovenica Exsiccata, Century I, by K. Domin and V. Krajina; Caucasus, by Leningrad Botanic Museum (coll. E. and N. Bush); Corsica, by Mr. C. H. Wyatt; Latvia, by Dr. K. Starcs; Switzerland, by Rev. F. A. Rogers; Spain, by Mr. C. V. B. Marquand and Dr. J. Burt Davy (mosses); Sweden, by Dr. O. R. Holmberg; Thrace, by Mr. S. C. Atchley, Rev. F. A. Rogers, and Mr. H. Griffith Tedd; Tyrol, by Mr. J. W. Wyatt; various, by Prof. C. Sauvageau (Algae).

Purchased: Mr. T. O. Weigel, Montenegrin plants (coll. Rohlena); Dr. W. T. Szafer, Plantae Poloniae Exsiccatae, Series II, Centuria I.

ORIENT.—Presented: Cyprus, by Dr. G. C. Druce; Palestine, by the Hebrew University, Jerusalem (per Dr. A. Eig), and Mr.

Lankester H. Harding; Persia, by Mr. D. Bourke-Borrowes; various, by the Botanical Museum, Lund, duplicates from Sintenis' Herbarium orientale (per Dr. T. C. E. Fries), and by the Rev. F. A. Rogers.

ATLANTIC ISLANDS.—Presented: Canary Islands, by Dr. R. Lloyd Praeger; Azores, by Mr. T. G. Tutin (coll. T. G. Tutin and E. F. Warburg, per Sir Oscar Warburg.)

CHINA AND JAPAN.—Presented: by Dr. R. Lloyd Praeger, the Botanical Museum, Upsala (coll. H. Smith, per Prof. N. E. Svedelius), Mrs. D. Carson Roberts, Abbé E. Licent, Mr. A. P. Jacot, the U.S. National Museum (per Dr. E. P. Killip), and by Dr. Y. Yamada (Algae).

Purchased: Fr. Verdoorn, Frullaniae.

INDIA AND CEYLON.—Presented: Assam, by Mrs. A. D. Parry; Bombay, by the Agricultural Department, Poona (per Mr. G. B. Patwardhan), and by Mrs. A. Davidson (coll. Mr. Davidson); Burma, by Mr. D. Rhind and Mr. R. N. Parker; Lushai Hills, by Rev. W. J. L. Wenger; Madras, by the Department of Agriculture (per Mr. G. N. Rangaswami Ayyangar), and by Dr. J. Burt Davy (coll. Dr. J. M. Cowan and Mr. V. Narayanaswami).

MALAY PENINSULA.—Presented: by the Botanic Gardens Department, Singapore, the Agricultural Department, Kuala Lumpur, and by Mr. C. E. Carr.

INDO-CHINA.—Presented: Siam, by Dr. A. F. G. Kerr (coll. Dr. A. F. G. Kerr, Noi Put, Winit), Mr. H. B. G. Garrett, Mrs. D. J. Collins, and by Dr. Malcolm Smith (coll. Dr. Eryl Smith).

MALAY ISLANDS.—Presented: Various, by the New York Botanical Garden (per Dr. E. D. Merrill), Mrs. D. Carson Roberts, the Director, Botanic Garden, Buitenzorg, and by Dr. Malcolm Smith (coll. Dr. Eryl Smith).

AUSTRALIA.—Presented: New South Wales, by Dr. F. A. Rodway, the Rev. H. M. R. Rupp, and the Director, Botanic Gardens, Sydney; Queensland, by Mrs. Estelle Thomson, the Arnold Arboretum, Harvard University (coll. S. F. Kajewski), and the Botanic Museum and Herbarium, Brisbane (per Mr. C. T. White); North Australia, by Dr. H. Basedow; Western Australia, by the University of Durham (ferns, per Prof. B. M. Griffiths); South Australia, by Mr. J. M. Black, Dr. J. Burton Cleland, and the Waite Agricultural Research Institute (per Mr. H. C. Trumble); Victoria, by Mr. H. B. Williamson; various, by Mr. A. Morris, and the Royal Botanic Garden, Edinburgh (coll. Dr. A. Morrison); Tasmania, by Mr. Lionel de Rothschild (coll. H. F. Comber).

Purchased: Tasmanian plants (the Tasmanian Museum and Art Gallery, Hobart).

NEW ZEALAND.—Presented: by the University of Durham (ferns, per Prof. B. M. Griffiths).

POLYNESIA.—*Presented*: Fiji, by Mr. W. Greenwood (coll. W. Greenwood and H. Phillips); Hawaii, by Mr. Gerrit P. Wilder; New Hebrides, by Miss L. E. Cheesman, and by the Arnold Arboretum, Harvard University (coll. S. F. Kajewski, per Dr. A. Rehder); Society Islands, Fiji, Cook Islands and Tonga, by the University of California, Berkeley (various collectors, per Dr. E. B. Copeland); various, by Durham University (ferns, per Prof. B. M. Griffiths).

Collected: Mr. J. H. L. Waterhouse, Bougainville.

WEST TROPICAL AFRICA.—*Presented*: Nigeria, by Capt. A. S. Thornehill, Forestry Department, Sapoba (per Mr. J. D. Kennedy), the Plateau Horticultural Society (per Mr. P. F. Marleith Smith), Mr. H. V. Lely, Dr. J. Burt-Davy, and Mr. Ivan D. Hepburn; Cameroons, by the Botanic Gardens, Victoria (coll. Mr. T. D. Maitland), and Dr. J. Mildbraed; Sierra Leone, by the Agricultural Department, Freetown (coll. Messrs. F. C. Deighton and R. R. Glanville); The Gambia, by the Director, Agricultural Department, Bathurst; Gold Coast, by Dr. F. R. Irvine (coll. Dr. F. R. Irvine and Miss E. D. Plumtre), Dr. J. Burt-Davy, and the Department of Agriculture (coll. Messrs. T. Lloyd Williams, A. S. Thomas and C. Vigne).

Collected: Nigeria, by Mr. H. C. Sampson.

NORTH AND NORTH-EAST AFRICA.—*Presented*: Morocco, by Mr. A. W. Trethewy; Libya, by Mr. W. B. K. Shaw; Sudan, by Mr. A. W. Punter, Mr. J. D. Snowden, Mr. G. Aylmer and Mrs. D. Macintosh.

Collected: Algiers and Central Sahara, by Dr. T. F. Chipp; British Somaliland, by Mr. C. N. Collenette.

EAST TROPICAL AFRICA.—*Presented*: Uganda, by the Forestry Department, Entebbe (coll. Messrs. N. V. Brasnett and R. A. Gibson), the Agricultural Department, Kampala (coll. Messrs. L. C. C. Liebenberg, T. D. Maitland, J. D. Snowden, C. G. Hansford, and Mr. G. L. R. Hancock); Tanganyika Territory, by the East African Agricultural Research Station, Amani (coll. Mr. P. J. Greenway and others), the Agricultural Department (coll. Messrs. W. J. Hill, H. Musk and others), and the Department of Tsetse Research, Kondoa Irangi (coll. Mr. B. D. Burt); Kenya, by the Forestry Department, Nairobi (coll. Messrs. H. M. Gardner, R. M. Graham, I. R. Dale and G. H. Donald), the Agricultural Department, Nairobi (coll. Messrs. Lyne Watt, J. McDonald, D. C. Edwards and others), and the Coryndon Memorial Museum (per Miss E. R. Napier); Rhodesia, by the Department of Agriculture, Salisbury, the Division of Plant Industry, Pretoria (coll. Dr. I. B. Pole-Evans), Mr. J. M. Rattray, and by Miss E. Cheesman; Zanzibar, by Mr. P. J. Greenway (coll. Mrs. Taylor), and by Mr. J. H. Vaughan; various, by Dr. J. Burt-Davy, the United States Department of Agriculture (per

Dr. A. S. Hitchcock), the Arnold Arboretum, Harvard University (coll. Mr. D. H. Linder), and by Mr. R. W. M. Mettam.

Collected: Rhodesia, by Mr. J. Hutchinson, Mr. E. Milne-Redhead, and Mr. J. B. Gillett.

MASCARENE ISLANDS.—*Presented*: Madagascar, by Mr. J. Groves (coll. Mr. T. B. Blow), and by Monsieur H. Perrier de la Bâthie; Mauritius, by M. A. Raoul Lefébure and by Mr. R. E. Vaughan.

SOUTH AFRICA.—*Presented*: Cape Province, by Commander T. M. Salter, and Prof. R. H. Compton; various, by the Division of Plant Industry, Pretoria (coll. Dr. I. B. Pole-Evans, Mr. E. E. Galpin, Mr. R. A. Dyer and others), Mr. G. Thornecroft, Mr. N. S. Pillans (coll. Mr. N. S. Pillans and Mr. T. P. Stokoe), Mr. H. G. Fourcade (per Mr. N. E. Brown), the late Prof. C. E. Moss, the Hon. Mrs. E. F. Ryder, Mrs. Bolus (coll. Mr. K. Zeyder), and by the U.S. Department of Agriculture (per Dr. A. S. Hitchcock).

Purchased: Mr. E. G. Bryant, miscellaneous African specimens; Mr. N. E. Brown, Mesembryanthemums; Prof. K. Dinter, South-west African Plants.

Collected: South African plants, by Mr. J. Hutchinson and Mr. J. B. Gillett.

NORTH AMERICA.—*Presented*: Canada, by Miss C. E. Mackenzie (mosses), Mr. J. C. Bennett, and by Prof. V. Marie-Victorin; United States, by the Smithsonian Institution (per Dr. W. R. Maxon, coll. Mr. C. L. Lloyd), the University of California, Berkeley (per Dr. E. B. Copeland), Prof. N. L. Gardner, Prof. W. L. Jepson, Dr. H. M. Hall, the Arnold Arboretum, Harvard University, Dr. J. Burt-Davy, the U.S. Department of Agriculture (coll. Dr. S. F. Blake), and by the Missouri Botanical Garden (coll. E. J. Palmer).

Purchased: Mr. J. W. Thompson, Washington and Oregon plants.

CENTRAL AMERICA.—*Presented*: British Honduras, by Mr. H. P. Smart, the Field Museum of Natural History, Chicago (coll. Mr. G. L. Lundell), and the Smithsonian Institution (per Dr. W. R. Maxon).

Purchased: Mr. C. A. Purpus, Mexican plants; Mr. W. A. Schipp, British Honduras plants.

WEST INDIES.—*Presented*: Cuba, by the Arnold Arboretum, Harvard University (per Dr. A. Rehder, coll. Mr. J. G. Jack); Trinidad and Tobago, by the Department of Agriculture (per Mr. R. O. Williams), the Cotton Research Station, Trinidad (per Mr. J. Burt Hutchinson), the Arnold Arboretum, Harvard University, and by Mr. E. J. Worsley.

EAST TROPICAL SOUTH AMERICA.—*Presented*: Brazil, by Mr. B. Bolland, by the Riksmuseum, Stockholm (per Dr. G. Samuelsson, coll. P. Dusén and others), the Gray Herbarium, Harvard University (coll. Mr. L. B. Smith), and by Dr. J. Rick (fungi); British Guiana, by the Oxford University Expedition to British

Guiana (cryptogams, per Mr. P. W. Richards), the Forestry Department (coll. Mr. C. W. Anderson and others), and by the Department of Agriculture; Surinam, by the Botanic Museum of the Rijks University, Utrecht (per Dr. A. Pulle).

WEST TROPICAL SOUTH AMERICA.—*Presented*: Bolivia, by Dr. G. Samuelsson (coll. Dr. Asplund); Peru, by the Field Museum of Natural History, Chicago.

Purchased: Dr. H. Sydow, Venezuelan fungi.

TEMPERATE SOUTH AMERICA.—*Presented*: Argentine, by Prof. L. R. Parodi and by Dr. Angel L. Cabrera; Chile, by the Royal Botanic Garden, Edinburgh (coll. Mr. Balfour Gourlay and Mr. Clarence Elliott); various, by the Gray Herbarium, Harvard University (coll. Dr. Ivan M. Johnston).

Purchased: Señor S. Venturi, Argentine plants; Dr. A. Donat, Plantae Patagonicae Exsiccatae Century II.

The Library.

The additions to the library received as purchases, exchanges, and presentations during the year have been very numerous. The following remarks refer to the more important of the presentations.

The Bentham Trustees have presented a number of volumes, including several published during the 16th and 18th centuries. Among them are:—Actuarius, *De medicamentorum compositione liber*, J. Ruellio interprete, Venetiis, 1541; A. M. Brassavola, *De medicamentis tam simplicibus*, Venetiis, 1552; L. Fuchs, *Methodus, seu ratio compendiaria cognoscendi veram solidamque medicinam, ad Hippocratis et Galeni scripta*, &c., Parisiis, 1550; M. Guilandinus, *De stirpium aliquot nominibus vetustis ac novis . . . epistolae II*, una M. Guilandini, altera C. Gesneri, Basiliae, 1557; J. G. H. Kramer, *Tentamen botanicum*, Viennae, 1744; C. Le Brun, *Voyages par la Moscovie, en Perse, et aux Indes orientales*, Amsterdam, 1718, & *Voyage au Levant*, Paris, 1714; P. Magnol, *Prodromus historiae generalis plantarum*, Monspeli, 1689; Nikandros, *Nicandri . . . Theriaca et Alexipharmaca in Latinos versus redacta, per Euricium Cordum*, Francofordiae, 1532; Paulus Aegineta, *Pharmaca simplicia*, Othone Brunfelsio interprete, Argentorati, 1531; J. J. Scheuchzer, *Itinera per Helvetiae alpinae regiones facta annis 1702-1711*, Lugduni Batavorum, 1723; and J. C. D. Schreber, *Icones et descriptiones plantarum*, decas I, Halae, 1766. The Bentham Trustees have also presented M. Gandoger's *Flora Europae terrarumque adjacentium*, Paris, 1883-91, a lithographed work in 27 volumes, and have borne the expense of getting the set bound in buckram. Other presentations by the Bentham Trustees include a manuscript volume of *Notes on a course of botany and laboratory practice under Prof. Thiselton-Dyer*, South Kensington, June, 1876; a complete set of *Addisonia* to vol. xv, pt. 2, published by the New York Botanical Garden, containing 496 coloured plates, intended for the Collection

of Drawings, and numerous periodicals received in exchange for *Hooker's Icones Plantarum*.

Lieut.-Col. Sir David Prain has presented in continuation the issues for the year of several periodicals, among which are the *Bulletin de la Société Botanique de France*, *Berichte der Deutschen Botanischen Gesellschaft*, *The South African Journal of Natural History*, *The Quarterly Journal of Pharmacy*, and *Proceedings of the American Philosophical Society*.

Mr. L. A. Boodle has given to the establishment a collection of volumes mostly treating of the anatomy of plants and especially of woods. It includes:—*Timbers: their structure and identification*, by W. S. Jones, 1924; J. Moeller, *Beiträge zur vergleichenden Anatomie des Holzes*, 1876, and *Anatomie der Baumrinden*, 1882; H. Solereder, *Ueber den systematischen Wert der Holzstruktur bei den Dicotyledonen*, 1885; H. Stone, *The timbers of commerce and their identification*, 1904; and numbers 1 to 16 of *Tropical Woods*, edited by Prof. S. J. Record. Mr. Boodle's gift also includes 18 botanical papers from the *Transactions of the Royal Society of Edinburgh*.

From Dr. F. A. Rodway, of Nowra, New South Wales, several useful little volumes relating to the botany of Australia have been received. Among them are:—*The honey flora of Victoria*, by F. R. Beuhne, 1922; *All about Palms: Australia's native and cultivated species*, by G. K. Cowlshaw, 1929; *Descriptions of fifty new species of Western and Northern Australian Acacias*, by the late J. H. Maiden & W. F. Blakely, 1928 (reprinted from *Journ. R. Soc. W. Australia*, vol. xiii); *Flowers of Western Australia*, photographed by Helen Ogden, first series, 1929; *Guide to the Orchids of New South Wales*, by H. M. R. Rupp, 1930; *Flowers of our Bush*, by Estelle Thomson, 1929; and *Our own trees*, by E. A. Vidler, 1930.

The *Index Londinensis*, the new edition of G. A. Pritzel's *Iconum botanicarum Index*, to which a reference was made in the last Review, has now been issued as far as volume iv. That volume includes *Kadsura* to *Pedicellia*. The three volumes published during 1930 have been presented, as was the first, by the Royal Horticultural Society, and the need of a second set has been met by the gift of all the volumes so far issued by Miss R. Chichester, of Arlington Court, Barnstaple. The work as projected will be completed in two further volumes which will be published in 1931, and a supplement carrying it on from the beginning of 1921 to 1935 is contemplated.

Books received from their publishers:—R. Crawshaw, *The spore ornamentation of the Russulas*; C. Elliott, *Manual of bacterial plant pathogens*; J. Eriksson, *Fungous diseases of plants in agriculture, horticulture, and forestry*, ed. 2, translated from the German by W. Goodwin (from Messrs. Baillière, Tindall & Cox); G. Hegi, *Alpine flowers*, English translation by Winifred M. Dean (from Messrs. Blackie & Son); E. Thurston, *British and foreign trees and shrubs in Cornwall* (from the Cambridge University Press); F. O. Bower, *Size and form in plants with special reference to the primary conducting*

tracts; H. Correvon, *Rock garden and alpine plants*, edited by L. Barron; D. Fairchild, *Exploring for plants*; A. D. Houghton, *The Cactus book*; R. Pyle, J. H. McFarland & G. A. Stevens, *How to grow Roses*; E. Strasburger, *Strasburger's Text-book of botany*, 6th English edition, translated from the 17th German edition, by W. H. Lang; and S. H. Vines, *The proteases of plants: a record and a reply* (from Messrs. Macmillan); R. W. Butcher, *Further illustrations of British plants*, drawings by Florence E. Strudwick; A. W. Darnell, *Orchids for the outdoor garden*; and H. N. Ridley, *The dispersal of plants throughout the world* (from Messrs. L. Reeve). All these were published during 1930.

Books received from the Editor of *Nature*:—H. Brockmann-Jerosch, *Die Vegetation der Schweiz*, Lieferung 4, 1929; *The Gardener's Year Book*, 1930; J. C. Kenly, *Green magic: the story of the world of plants*, 1930; E. Step, *Wayside and woodland blossoms*, third series, 1929; and E. A. White, *The Chrysanthemum and its culture*, 1930.

The following are independent works or in some cases separates from periodicals or other publications which have been presented by their authors unless otherwise stated:—*Actes du Conseil International Scientifique Agricole*, Première Session, 1927, 2 vols., Rome, 1928 (from the International Institute of Agriculture, Rome); L. H. Bailey, *Gentes herbarum*, vol. ii, fasc. 3–5; E. G. Baker, *The Leguminosae of Tropical Africa*, part 3, completing the work, a large octavo volume of 953 pages; D. A. Bannerman, *The birds of Tropical West Africa*, vol. i (from the Crown Agents for the Colonies); H. M. L. Bolus, *Notes on Mesembrianthemum and allied genera*, part 2, pp. 161–224, 3 copies; Prince Roland Bonaparte, *Notes pteridologiques*, fasc. 14, 15 and 16 (from Dr. Carl Christensen, who published fasc. 16 with additions by himself); *Third British Empire Forestry Conference, Australia and New Zealand*, 1928, *Proceedings* (from Inspector General of Forests, Commonwealth of Australia); A. C. Burrage, (1) *The Orchidvale Collection: a list of the Orchid plants in the collection of Mr. Albert C. Burrage at Orchidvale, Massachusetts*; (2) *Catalogue of the Library of Albert C. Burrage, Esq.*, etc.; *Catalogue of British scientific and technical books*, published by The British Science Guild, third edition; Woon Young Chun, *Chinese economic trees*, 1921; J. Coutts, A. Edwards and A. Osborn, *The complete book of gardening*; B. O. Coventry, *Wild flowers of Kashmir*, series 3; Mrs. A. M. Cowan and J. M. Cowan, *The trees of Northern Bengal, including shrubs*, etc.; A. H. Crook, *The flowering plants of Hong Kong, Ranunculaceae to Meliaceae* (reprinted from *The Yellow Dragon*); Wilhelmina F. van Deventer, *De kleurstoffen van Neurospora (Monilia) sitophila*; E. De Wildeman, *Contribution à l'étude de la flore du Katanga*, supplément 3 (from Comité Spécial du Katanga); K. Domin, (1) *The Pteridophyta of the Island of Dominica*, etc.; (2) Plates extracted from his *Twenty thousand miles over land and sea*, vol. 3: *Beneath the Stars and Stripes*; A. Eig, *Monographisch-kritische Uebersicht der*

Gattung Aegilops, in *Fedde, Repertorium*, Beih. iv; W. D. Francis, *Australian rain-forest trees* (from the Council for Scientific and Industrial Research, Melbourne); L. O. Gaiser, *Chromosome numbers in Angiosperms*, II, reprinted from *Bibliographia Genetica*, vi; A. A. Grossheim, *Sketch of the vegetation of Transcaucasia*, etc., with map; J. Th. Henrard, *A monograph of the genus Aristida*, vol. i, in *Meded. 's Rijks Herb. Leiden*, no. 58; P. Herring, (1) *Studier i rosen kulturhistorie*; (2) *François Crépin*; F. L. Herrera, *Estudios sobre la flora del Departamento del Cuzco*; F. C. Hoehne, (1) *Phytophysionomia do Estado de Matto-Grosso*, etc., 1923; (2) *Observações geraes e contribuições ao estudo da flora e phytophysionomia do Brasil: Araucariândia*; F. C. Hoehne and J. G. Kuhlmann, *Utriculárias do Rio de Janeiro e seus arredores*, from *Mem. Inst. Butantan*, tome i, fasc. 1, 1918; D. Hooper, *On Chinese medicine: drugs of Chinese pharmacies in Malaya*, in *The Gardens' Bulletin, Straits Settlements*, vol. vi, pt. 1; Sir A. Hosie, *The economic and commercial products of China*, 162 ff., chiefly type-script (from Lady Hosie); F. R. Irvine, *Plants of the Gold Coast* (from the Crown Agents for the Colonies); V. L. Komarov, *Flora Peninsulae Kamtschatka*, (from the Academy of Sciences, Leningrad); A. Lemée, *Dictionnaire descriptif et synonymique des genres de plantes phanérogames*, tome 2; J. H. Maiden, *A critical revision of the genus Eucalyptus*, parts 73 and 74 (from Director, Botanic Gardens, Sydney); R. C. Marshall, *Notes on the silviculture of the more important trees of Trinidad and Tobago* (from the Conservator of Forests, Trinidad and Tobago); M. Martinez, *Plantas utiles de la República Mexicana*, 1928; P. V. Mayuranathan, *The flowering plants of Madras City and its immediate neighbourhood*, in *Bull. Madras Gov. Mus.*, new series, vol. ii (from Mr. C. E. C. Fischer); Sir H. A. Nicholls, *A text-book of tropical agriculture*, revised by J. H. Holland (from Mr. Holland); *North American Flora*, vol. 23, parts 4 and 5 (from Director-in-Chief, New York Botanical Garden); A. J. P. Oort, *Die Sexualität von Coprinus fimetarius*; *Fourth Pacific Science Congress, Krakatau*: Pt. I, *The geology and volcanism of the Krakatau group*, by Ch. E. Stehn; Pt. II, *Krakatau's new flora*, by W. M. Docters van Leeuwen; Pt. III, *Krakatau's new fauna*, by K. W. Dammerman; L. H. Pammel and others, *The weed flora of Iowa*, revised edition, 1926, in *Bull. Iowa Geol. Survey*, no. 4 (from Dr. L. H. Pammel); R. Pampanini, (1) *La flora del Caracorum (Spediz. Ital. de Filippi nell' Himalaia*, etc., 1913–14, serie II, vol. x); (2) *Flora della Repubblica di San Marino*; (3) *Prodromo della flora cirenaica della Repubblica di San Marino*; L. G. C. Pardé, *L'introduction des essences exotiques dans les forêts de l'Europe occidentale*; L. R. Parodi, *Ensayo fitogeográfico sobre el partido de Pergamino: estudio de la pradera pampeana en el norte de la Provincia de Buenos Aires*, in *Rev. Fac. Agron. y Vet.* (Buenos Aires), vii; E. E. Pescott, *The Orchids of Victoria*, 1928; V. Petrov, *Flora Jakutiae (Eastern Siberia)*, fasc. 1, edited by V. L. Komarov (from the Academy of Sciences, Leningrad); N. S. Pillans, *The African genera and species of Restionaceae*, in *Trans. R. Soc. S. Africa*, vol. xvi,

Natural History), nos. 13-16; *Nederlandsch Kruidkundig Archief*, 1929, Afl. 3, and 1930, Afl. 1-2; *Notes from the Royal Botanic Gardens, Edinburgh*, nos. 83-85; *Orchid Review*, 1930; *Preslia* (Reports of the Czechoslovak Botanical Society of Prague), vol. viii; *Proceedings of the Imperial Academy* (Japan), vol. vi, nos. 1-8 and Supplement; *Proceedings of the Royal Irish Academy*, Sect. B, vol. xxxix, nos. 3-25; *Publications de la Faculté des Sciences de l'Université Masaryk* (Brno), no. 116; *Quarterly Journal of Forestry*, vol. xxiv; *Queensland Agricultural Journal*, vol. xxxiii and vol. xxxiv, pts. 1-4; *The Queensland Naturalist*, vol. vii, nos. 4-5; *Recueil des Travaux Botaniques Néerlandais*, vol. xxvi; *Report (Annual) of the Director of Veterinary Services, Union of South Africa*, xv and xvi; *Report of the Experimental and Research Station . . . Turner's Hill, Cheshunt, 1926-29*; *Research Studies of the State College of Washington*, vol. i, nos. 3-4 and vol. ii, no. 1; *Revista de la Facultad de Agronomía y Veterinaria* (Univ. de Buenos Aires), vol. vii, no. 1; *Revista del Jardín Botánico y Museo de Historia Natural del Paraguay*, vol. ii; *The Rhododendron Society Notes*, vol. iii, no. 4, and *The Species of Rhododendron*, published by The Rhododendron Society; *Rocznik Polskiego Towarzystwa Dendrologicznego* (*Annales de la Société Dendrologique de Pologne*), vol. iii; *Rubber Research Institute of Malaya, Quarterly Journal*, vol. i, no. 4, and vol. ii, nos. 1-2, and *Annual Report, 1929*; *Science Reports of the Tohoku Imperial University* (Sendai, Japan), series 2, vol. xiii, no. 3, and vol. xiv, no. 1; series 4, vol. v, nos. 1-3; *Sinensia: Contributions from the Museum of Natural History* (Nanking), vol. i, nos. 3-7; *Studies from the Tokugawa Institute* (Tokyo), vol. i, no. 4; *Suomen Metsätieteellinen Seura* (Society of Forestry in Finland): *Silva Fennica*, 13-16, and *Commentationes Forestales*, 3-4; *Tasmanian Journal of Agriculture*, new series, vol. i, nos. 2-3; *The Tea Quarterly: the Journal of the Tea Research Institute of Ceylon*, vol. ii, pt. 4 and vol. iii, pts. 1-3; *Trabajos del Museo Comercial de Venezuela*, V-VII; *Transactions of the Royal Society of Canada*, ser. 3, sect. 5, vol. xxiii, pts. 1-2; *Travaux de l'Institut Botanique Léo Errera*, 1929; *Travaux du Laboratoire de Biogéochimie près l'Académie des Sciences de l'U.R.S.S.*, 1; *Travaux du Laboratoire Forestier de Toulouse*, vol. i, articles 3-4, and vol. ii, article 1 (suite 1); *Travaux des Laboratoires de Matière Médicale et de Pharmacie Galénique de la Faculté de Pharmacie de Paris*, vol. xx (from Prof. Ém. Perrot); *Tropical Woods* (Yale University School of Forestry), nos. 21-24; *University of California Publications in Botany*, vol. xi, nos. 18-20, vol. xii, nos. 9-13, and vol. xvi, no. 3; *University of Colorado Studies*, vol. xvii, nos. 3-4, and vol. xviii, no. 1; *The Watson Botanical Exchange Club, 46th Annual Report* (from Mr. H. Stuart Thompson); *The Welsh Journal of Agriculture*, vols. v and vi (from Prof. R. G. Stapledon); *Yale University School of Forestry, Bulletins* 26-28; and *Year Book of the Rhododendron Association*, 1930.

The Empire Cotton Growing Corporation, the Empire Marketing Board, the Imperial Bureau of Plant Genetics at Aberystwyth and

Cambridge, and the East Malling Research Station have sent their respective publications, and numerous contributions have been received from the Botanical Section of the Ministry of Commerce and Communications, Siam; the Department of Agriculture, Industry and Commerce in the Dutch East Indies; the Botanic Garden, Buitenzorg; the Bureaux of Science, Agriculture and Forestry of the Philippine Islands; and the United States Department of Agriculture.

A large number of papers, usually reprints from periodicals, have been received, mostly as gifts from their authors. Among the contributors of these the following should be mentioned:—Dr. H. H. Allan, Dr. W. R. G. Atkins, Dr. R. C. Benedict, the Rev. E. Blatter, Dr. F. Boergesen, Dr. J. Briquet, Prof. A. L. Cabrera, Miss A. Camus, Dr. L. Cockayne, Dr. A. von Degen, Mr. H. N. Dixon, Prof. K. Domin, Dr. G. Einar Du Rietz, Dr. H. Faes, Mr. O. Atkins Farwell, Dr. R. E. Fries, Dr. H. A. Gleason, Dr. A. A. Grossheim, Dr. A. W. Hill, Prof. A. S. Hitchcock, Prof. B. P. G. Hochreutiner, Dr. T. Ito, Dr. I. M. Johnston, Dr. G. von Moesz, Prof. C. H. Ostenfeld, Dr. L. H. Pammel, Prof. L. R. Parodi, Dr. B. E. Read, Prof. G. Senn, Prof. E. van Slogteren, Mr. B. Stefanoff, Dr. N. E. Stevens, Prof. N. Stoyanoff, Prof. N. Svedelius, Mr. I. Thériot, Prof. J. C. Th. Uphof, Dr. J. Valckenier Suringar, Prof. J. M. Watt, and Prof. F. E. Weiss. Papers prepared in the respective institutions have been received from the Department of Mycology, Rothamsted Experimental Station; Botanical Department, University of Birmingham; Department of Botany, Queen's University, Belfast; Botanical Laboratory, University of Utrecht; Botanical Institute of the Jagellonian University, Cracow; Forest Department, Union of South Africa; Department of Botany, University of Melbourne; Technological Museum, Sydney; Cornell University Agricultural Experiment Station; and the Missouri Botanical Garden.

Dr. W. B. Turrill has presented the letters—about 200—written to him by Mr. Gilliat-Smith from Tabriz, Persia, during the years 1925 to 1929.

A copy of the *Atlas of the Gold Coast*, published by the Gold Coast Survey Department, 1927-28, a *Road Map of the Gold Coast*, 1927, and a *Map . . . of Nigeria*, 1924, have been received from Mr. H. C. Sampson.

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix II 1931" ROYAL BOTANIC GARDENS, KEW

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs, which, for the most part, have ripened at Kew during the year 1931. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew.

HERBACEOUS PLANTS.

Acaena adscendens
argentea
Buchanani
laevigata
macrophylla
macrostemon
microphylla
myriophylla
Sanguisorbae
novae-zelandiae
trifida

Acantholimon acerosum
androsaceum
Fominii
glumaceum

Acanthus longifolius
Perringii

Achillea ageratifolia
— var. tomentosa
alpina
x argentea
chrysocoma

Achillea—cont.
Clavennae
clypeolata
conjuncta
crithmifolia
decolorans
filipendulina
grandiflora
x Grisebachii
impatiens
impunctata
Jabornegii
Kellereri
ligustica
macedonica
Millefolium
— var. roseum
moschata
nana
Ptarmica
pyrenaica
rupestris
Sarracenia
tomentosa
umbellata
Wilczekii

Aconitum *barbatum*
chinensis
Fischeri
Forrestii
heterophyllum
Napellus
— var. *carneum*
— var. *giganteum*
— var. *tauricum*
orientale
— var. *ochroleucum*
palmatum
uncinatum
volubile
vulparia

Actaea *alba*
spicata
— var. *arguta*
— var. *rubra*

Actinomeris *squarrosa*

Adenophora *khasiana*
polymorpha
Potaninii

Adonis *flammea*

Aegopodium *Podagraria*

Aethionema *amoenum*
antilibani
armenum
cappadocicum
diastrophis
grandiflorum
pulchellum
stylosa

Ageratum *conyzoides*
mexicana

Agrimonia *Eupatoria*
— var. *alba*
leucantha
odorata
pilosa

Agropyron *caninum*
cristatum
tenerum

Agrostis *alba*
— var. *stolonifera*
canina
capillaris
tenuis

Alchemilla *acutiloba*
alpina
— var. *subsericea*
conjuncta
Hoppeana
vulgaris

Alisma *Plantago-aquatica*

Allium *acuminatum*
Ampeloprasum
angulosum
ascalonicum
Beesianum
bulgaricum
carinatum
coeruleum
cyaneum
Farreri
fistulosum
grande
hymenorrhizum
karataviense
macranthum
Moly
narcissiflorum
neapolitanum
odorum
Ostrowskianum
paradoxum
roseum
Schoenoprasum
senescens
subangulatum
subhirsutum
Tubergeni
Victorialis
zebdanense

Alonsoa *incisifolia*
Warscewiczii

Alopecurus *pratensis*
— var. *foliis variegatis*

Alstroemeria *aurantiaca*
haemantha
— var. *rosea*
ligtu var. *pulchra*

Althaea *cannabina* •
— var. *narbonensis*
ficifolia
officinalis
rosea
sulphurea
taurinensis

Alyssum *argenteum*
desertorum
maritimum
orientale
saxatile
— var. *citrinum*
spinosum

Amaranthus *caudatus*
chlorostachys
hypochondriacus
retroflexus

Ambrosia *mexicana*

Amethystea *coerulea*

Ammophila *arenaria*

Amsinckia *intermedia*

Anagallis *arvensis*
grandiflora
— var. *coerulea*
— var. *phoenicea*

Anaphalis *cinnamomea*
margaritacea
nubigena var. *intermedia*
triplinervis

Anarrhinum *crassifolium*
laxiflorum

Anchusa *hybrida*
officinalis
riparia

Andropogon *arundinaceus*

Androsace *acaulis*
Chumbyi
lanuginosa
primuloides
sarmentosa
septentrionalis

Andryala *varia*

Anemone *alpina*
multifida
— var. *magellanica*
polyanthes
pratensis
Pulsatilla
rivularis
slavica
sylvestris
— var. *grandiflora*
virginiana
vitifolia var. *Farreri*

Angelica *ampla*

Anoda *hastata*
Wrightii

Antennaria *alpina*
dioica
— var. *tomentosa*
imbricata var. *rosea*
neodioica

Anthemis *arvensis*
Cotula
Cupaniana
nobilis
Sancti-Johannis
tinctoria
— var. *alba*
Triumfettii

Anthericum Halleri
Liliago
 — var. *algeriense*
racemosum var. *Dorsetii*

Anthyllis montana var. *rubra*

Anthriscus sylvestris

Antirrhinum Asarina
majus
Orontium

Apera Spica-venti

Apium graveolens

Aplopappus coronopifolius
phyllocephalus

Aquilegia canadensis var.
oxysepalus
chrysantha
 — var. *Jaeschkaui*
flavescens
formosa
 — var. *truncata*
Moorcroftiana
 — var. *alba*
nevadensis
Skinneri
vulgaris
 — var. *olympica*
 — var. *stellata*

Arabis albida
Allionii
alpina
arenosa
aubrietoides
Breweri
coeruleus
hirsuta
Holboellii
mollis
muralis
 — var. *rosea*
Soyeri

Archangelica officinalis

Arctium Lappa
nemorosum
tomentosum

Arctotis acaulis
aspera
breviscapa
stoechadifolia

Arenaria austriaca
foliosa
graminifolia
grandiflora
Kingii
Koriniana
laricifolia
longifolia
montana
parnassica
pinifolia
sarotensis
saxatilis
Steveniana
Villarsii

Argemone mexicana
 — var. *ochroleuca*
platyceras
 — var. *hispida*

Arisarum vulgare

Armeria allioides
boetica
caespitosa var.
Sundermannii
canescens
elongata
fasciculata
juncea
leucocephala
maritima
 — var. *alba*
rumelica
sardoa
Welwitschii

Arnica amplexicaulis
Chamissonis
foliosa
longifolia
montana
nevadensis
terrae-novae

Arnoseris pusilla

Arrhenatherum elatius var.
bulbosum
 — var. *variegatum*

Artemisia absinthium
annua
coerulescens
dracunculoides
integrifolia
lanata
 — var. *pedemontana*
 — var. *vallesiaca*
ludoviciana
maritima
parviflora
procera
Purshiana
rupestris
Siversiana
vulgaris

Arthropodium candidum

Arum maculatum

Asarum europaeum

Asperella Hystrix

Asperula galioides
scutellaris
tinctoria

Asphodeline lutea

Asphodelus albus
cerasiferus
fistulosus
gracilis

Aster acris
 — var. *linifolia*
 — var. *punctatus*
alpinus
 — var. *Garibaldii*
 — var. *rubra*
 — var. *speciosus*
Amellus var.
amelloides
 — var. *bessarabicus*
amethystinus
Borreri
brachytrichus
carolinianus
commutatus
cordifolius
Curtisii
Douglasii
Drummondii
eminens
ericoides
Farreri
foliaceus
 — var. *Burkei*
 — var. *frondens*
furcatus
gayanus
glabratus
glaucus
Glehnii
grandiflorus
Hauptii
Herveyi
heterochaetus
heterophyllus
himalaicus
laevis
 — var. *Fortunei*
 — var. *Geyeri*
lateriflorus
likiangensis
linariifolius
Lindleyanus
Linosyris x *acris*
Lipskyi
longifolius
Lowieanus
macrophyllus
multiflorus

Aster—cont.

Novae-angliae
— var. pulchellus
— var. roseus
Novi-belgii
— var. arcturus
— var. densus
— var. grandiflorus
— var. niveus
oreophilus
paniculatus
patulus
Piccolii
prenanthioides
ptarmicoides
puniceus
Purdomii
pyrenaeus
Radula
salicifolius
sagittifolius
scaber
spectabilis
stellaris
subcoeruleus
tardiflorus
tataricus
Thomsonii
tricephalus
trinervis
Tripodium
umbellatus
Vahlia
vestitus
vimineus

Astilbe chinensis
koreana
Davidii
Thunbergii

Astragalus ambigua
aristatus
chinensis
chlorostachys
Cicer
danicus var. albus
Echinus
falcatus

Astragalus—cont

frigidus
Glycyphyllos
hamosus
pentaglottis
purpureus
Robinsii
Roemerii
sinicus
sulcatus
Wulfenii
xiphocarpus

Astrantia Biebersteinii
gracilis
helleborifolia
major
ranunculifolia

Athamanta Haynaldii
Matthiolii
— var. hungarica

Atriplex hastatum
hortense
— var. rubrum
roseum
sibiricum

Atropa Belladonna

Aubrietia deltoidea

Avena nuda
pratensis
pubescens
sempervirens

Baldwinia uniflora

Ballota rupestris

Baptisia australis
leucantha
tinctoria

Barbarea arcuata
vulgaris

Beckmannia eruciformis

Bellium minutum
bellidioides

Berteroa incana

Beta maritima
trigyna
vulgaris

Bidens grandiflora
pilosa
tripartita

Biscutella auriculata

Blumenbachia insignis
multifida

Boltonia asteroides
— var. decurrens
incisa
latisquama var.
occidentalis

Borago officinalis

Bouteloua racemosa

Brachypodium pinnatum
— var. caespitosum
silvaticum

Brassica alba
balearica
campestris
— var. chinensis
Erucastrum
juncea
nigra
oleracea
Sinapistrum

Briza maxima
minor

Brodiaea congesta
lactaea

Brodiaea—cont.

laxa
uniflora

Bromus arvensis
carinatus
hordeaceus
inermis
japonicus
macrostachys
madritensis
secalinus
sterilis
unioloides

Bruckenthalia spiculifolia

Bryonia alba

Bulbine annua
semibarbata

Bulbinella Hookeri

Bunias orientalis

Buphthalmum salicifolium
speciosum

Bupleurum Candollei

Butomus umbellatus

Cakile maritima

Calamagrostis epigeios

Calamintha Clinopodium
Nepeta

Calandrinia discolor
Menziesii
pilosiuscula
umbellata

Calceolaria acutifolia
biflora
— var. obtusifolia
corymbosa

Calceolaria—*cont.*
 gracilis
 mexicana

Calendula officinalis
 " parviflora

Calla palustris

Callistephus chinensis

Caltha palustris
 — var. alba
 radicans

Calystegia sepium

Camassia Cusickii
 esculenta
 Leichtlinii

Camelina Alyssum
 sativa

Campanula alliariaefolia
 alpina
 barbata
 bononiensis
 — var. alba
 carpatica
 — var. alba
 — var. pelviformis
 — var. turbinata
 cochlearifolia
 — var. alba
 — var. pallida
 collina
 excisa
 garganica
 glomerata
 — var. alba
 — var. superba
 lactiflora
 — var. coerulea
 latifolia
 latifolia var. macrantha
 — var. versicolor
 latiloba
 Leutweinii

Campanula—*cont.*
 linifolia
 Marchesettii
 persicifolia
 — var. alba
 Portenschlagiana
 — var. major
 Poscharskyana
 psilostachya
 Raddeana
 Raineri
 rapunculoides
 rhomboidalis
 rupestris
 Scheuchzeri var. hirta
 Trachelium
 Tymonsii
 versicolor

Cannabis sativa

Capsella Bursa-pastoris
 grandiflora

Carduus arctioides
 crispus
 defloratus
 nutans
 stenolepis

Carex acuta
 alopecoidea
 crinita
 crus-corvi
 depauperata
 distans
 divulsa
 flacca
 flava
 Grayii
 hordeistichos
 longirostris
 leporina
 pendula
 pseudo-Cyperus
 riparia
 straminea
 strigosa
 tenella

Carex—*cont.*
 tomentosa
 vulpina

Carthamus tinctorius

Carum Carvi

Catananche coerulea

Caulophyllum thalictroides

Cedronella cana

Celsia arcturus

Cenia turbinata

Centaurea amara
 atropurpurea
 — var. sulphurea
 axillaris
 babylonica
 Cyanus
 cynaroides
 dealbata
 hypoleuca
 Jacea
 montana
 — var. alba
 nigra
 nigrescens
 — var. vochinensis
 phrygia
 pulchra
 ruthenica
 Sadleriana
 Scabiosa
 — var. alba
 spinulosa
 stricta
 Triumphettii

Cephalaria alpina
 graeca
 leucantha
 syriaca
 tatarica
 transylvanica

Cerastium alpinum
 — var. lanatum
 arvense
 Biebersteinii
 Boissieri
 grandiflorum
 macranthum
 purpurascens
 tomentosum

Cerinthe minor

Chaerophyllum aromaticum
 nodosum

Cheiranthus alpinus
 Cheiri
 Senoneri

Chelidonium majus
 — var. laciniatum

Chelone Lyonii

Chenopodium album
 Bonus-Henricus
 Botrys
 murale
 Vulvaria

Chlorogalum pomeridianum

Chorisporea tenella

Chrysanthemum arcticum
 Aucherianum
 Balsamita
 — var. tomentosum
 caucasicum
 cinerariaefolium
 coccineum
 coronarium
 corymbosum
 densum
 lacustre
 Leucanthemum
 macrophyllum
 maximum
 monspeliense

Chrysanthemum—*cont.*
montanum
Parthenium
segetum
uliginosum
Zawadskii
Cicer arietinum var. *album*
Cicuta maculata
virosa
Cimicifuga americana
cordifolia
dahurica
Cirsium acaule
arachnoideum
canum
Diacantha
eriophorum
heterophyllum
lanceolatum
monspessulanum
ochroleucum
oleraceum
tuberosum
Cladium Mariscus
Clarkia elegans
pulchella
Claytonia sibirica
— var. *alba*
Clypeola Jonthlaspi
Cochlearia anglica
danica
glastifolia
officinalis
Colchicum Bivonae
Szovitsii
Collinsia bicolor
Collomia grandiflora
linearis

Commelina coelestis
Conringia orientalis
planisiliqua
Convallaria majalis
Convolvulus pentapetaloides
siculus
tricolor
undulatus
Coreopsis lanceolata
— var. *longipes*
latifolia
rosea
tinctoria
verticillata
Corethrogyne filaginifolia
Corispermum hyssopifolium
Coronilla elgans
scorpioides
vaginalis
Corydalis cheilanthifolia
glauc
lutea
sibirica
Corynephorus canescens
Cosmos bipinnatus
Cotula coronopifolia
Cotyledon libanotica
simplicifolia
Crambe cordifolia
maritima
orientalis
pinnatifida
Craspedia uniflora

Crepis alpina
biennis
blattarioides
bulbosa
Dioscoridis
divaricata
rubra
setosa
sibirica
Crocus ancyrensis
asturicus
biflorus var. *pusillus*
— var. *Weldenii*
chrysanthus
laevigatus
longiflorus
medius
ochroleucus
Oliveri
pulchellus
reticulatus var. *micranthus*
speciosus
stellaris
vernus
Cryptotaenia canadensis
Cucubalis baccifer
Cuphea lanceolata
Cyclanthera explodens
Cynoglossum aequinoctiale
furcatum
Wallichii
Cyperus esculentus
Cypripedium spectabile
Dactylis glomerata
Dahlia Merckii
variabilis
Damasonium stellatum

Datisca cannabina
Daucus gummifer
hispidus
Datura inermis
meteloides
Stramonium
Tatula
Delphinium altissimum
amoenum
atropurpureum
carolinianum
cashmirianum
caucasicum
decorum
Delavayi
Duhmbergii
dyctiocarpum
elatum
— var. *alpinum*
exaltatum
flexuosum
formosum
Gayanum
Geyeri
grandiflorum
— var. *album*
occidentale
Pylzowii
scopulorum
speciosum
— var. *glabratum*
sulphureum
tatsienense
vestitum
Deschampsia caespitosa
— var. *vivipara*
flexuosa
Desmazeria sicula
Desmodium canescens
marilandicum

Dianthus anatolicus
arenarius
Armeria
arvernensis
atro-rubens
 — var. *croaticus*
banaticus
caesius
callizonus
chinensis
cinnabarinus
deltoides
 — var. *superbus*
fragrans
gallicus
giganteus
glutinosus
hirtus
hyssopifolius
Knappii
leptopetalus
Liboschitzianus
plumarius
pungens
Requienii
rigidus
Seguieri
serotinus
squarrosus
strictus
superbus
 — var. *Wimmeri*
tener
tenuiflorus
Waldsteinii

Dichelachne crinita
Dicranostigma Franchetianum
Dictamnus albus
 — var. *caucasicus*
Digitalis ambigua
fulva
lutea var. *macrantha*
purpurea
Dimorphotheca aurantiaca
hybrida
pluvialis

Diploaxis muralis
tenuifolia

Dipsacus asper
laciniatus
pilosus
silvester

Disporum trachycarpum

Dodecatheon Lemoinei
Meadia

Doronicum hungaricum
Pardalianches
plantagineum

Draba alpina
hirta
incana
 — var. *Adamsii*
stellata
tomentosa var. *frigida*

Dracocephalum grandiflorum
Moldavica
nutans
Ruyschiana var. *japonicum*
tanguticum

Dryas Drummondii
octopetala
 — var. *lanata*
 — var. *minor*
Sundermannii

Eatonia obtusata

Ecballium Elaterium

Echinacea purpurea

Echinocystis fabacea

Echinops banaticus
dahuricus
Gaillardotii
platylepis
sphaerocephalus

Echium roseum
vulgare

Eclipta alba

Eleocharis palustris

Elsholtzia cristata
strobilifera

Elymus arenarius
condensatus
europaeus
sabulosus
uralensis
virginicus

Emilia flammea

Epilobium amplexans
angustifolium
Dodonaei
glabellum
Hectori
hirsutum
 — var. *album*
montanum
roseum
rosmarinifolium

Epipactis palustris

Eragrostis pilosa

Eranthis hyemalis

Eremurus altaicus
himalaicus
robustus
spectabilis

Erianthus fastigiatus
Hostii

Erigeron alpinus
armerifolius
glabellus
glaucus
grandiflorus

Erigeron—cont.
Howellii
macranthus
multiradiatus
pulchellus

Erinus alpinus
 — var. *albus*

Eriogonum flavum
subalpinum
 — var. *major*
umbellatum

Eriophorum latifolium
Scheuchzeri
vaginatum

Eriophyllum caespitosum

Erodium alpinum
Botrys
chamaedryoides
 — var. *roseum*
cheilanthifolium
chrysanthum
cicutarium
gruinum
hymenodes
macradenum
Manescavii
petraeum
pusillum
Salzmannii
supracanum
supradenum x
tordilioides
virginale

Eruca sativa

Eryngium amethystinum
Bourgatii
campestre
dichotomum
Oliverianum
serbicum

Erysimum asperum
 cheiranthoides
 hieracifolium
 linifolium
 rupestre

Erythronium revolutum

Eschscholzia aurantiaca
 caespitosa
 californica

Eupatorium ageratoides
 cannabinum
 coelestinum
 glechonophyllum
 purpureum

Euphorbia altissima
 Characias
 epithymoides
 Esula
 exigua
 Gerardiana
 helioscopia
 heterophylla
 hiberna
 Lathyris
 nicaensis
 palustris
 Peplus
 uralensis
 virgata

Evax pygmaea

Falcaria vulgaris

Farsetia clypeata

Felicia Bergiana
 tenella

Festuca arundinacea
 bromoides
 duriuscula
 Eskia
 gigantea
 glauca

Festuca—cont.
 heterophylla
 montana var. *altissima*
 Myuros
 ovina
 — var. *tenuifolia*
 pratensis
 rubra
 scoparia
 silvatica
 spectabilis
 uniglumis
 vaginata

Filipendula hexapetala
 Ulmaria
 — var. *aureo-variegata*

Foeniculum piperitum
 vulgare

Fragaria chiloensis
 Daltoniana
 indica

Francoa sonchifolia

Frankenia pulverulenta

Fritillaria acmopetala
 chitralensis
 Elwesii
 imperialis
 latifolia
 Meleagris
 — var. *alba*

Gaillardia lanceolata

Galega officinalis
 — var. *alba*
 orientalis
 patula
 — var. *Hartlandii*

Galeopsis dubia
 pyrenaica
 speciosa
 Tetrahit

Galinsoga brachystephana
 parviflora

Galium angustifolium
 Aparine
 boreale
 erectum
 purpureum
 sylvestre
 tricornae

Galtonia candicans

Gaudinia fragilis

Gaura Lindheimeri

Gentiana altaica
 Andrewsii
 asclepiadea
 — var. *alba*
 cruciata
 decumbens
 — var. *alba*
 depressa
 Freyniana
 frigida
 lagodechiana
 linearis
 macrophylla
 ochroleuca
 septemfida
 — var. *latifolia*
 serrata
 straminea
 tibetica
 verna
 Waltonii
 Walujewii

Geranium albanum
 albiflorum
 Andersonii
 anemonaefolium
 armenum
 Bergianum
 collinum
 dahuricum
 dissectum

Geranium—cont.
 Endressii
 eriostemon
 gracile
 grandiflorum
 Grevillianum
 ibericum
 — var. *brachytrichum*
 incisum
 macrorrhizum
 maculatum
 nodosum
 palustre
 phaeum var. *lividum*
 pratense
 — var. *album*
 pusillum
 Pylzowianum
 reflexum
 rivulare
 Robertianum
 — var. *album*
 rotundifolium
 Richardsonii
 sanguineum
 — var. *album*
 — var. *lancastriense*
 sessiliflorum
 silvaticum
 versicolor
 Wallichianum
 Wilfordii
 Wlassovianum
 yedoense

Gerbera Anandria
 nivea

Geum bulgaricum
 chiloense
 coccineum
 elatum
 Heldreichii
 intermedium
 Jankae
 japonicum
 montanum
 molle

Geum—*cont.*
 pallidum
 parviflorum
 radiatum
 reptans
 rhæticum
 rivale
 Rossii
 strictum
 triflorum
 tyrolense
 urbanum
 verum

Gilia abrotanifolia
 achilleaefolia
 aggregata
 capitata
 densiflora
 laciniata
 liniflora
 multicaulis
 squarrosa
 tricolor
 — var. alba

Gladiolus communis
 triphyllus

Glaucium corniculatum
 flavum
 — var. tricolor
 Serpieri

Globularia cordifolia
 incanescens
 nudicaulis
 trichosantha
 vulgaris

Glyceria nervata
 septentrionalis

Glycine Soja

Glycyrrhiza echinata
 foetida
 glabra
 glandulifera
 lepidota

Gratiola officinalis

Grindelia nana
 speciosa
 robusta
 squarrosa

Gunnera manicata

Gymnolomia multiflora

Gynandropsis pentaphylla

Gypsophila acutifolia
 altissima
 cerastoides
 elegans
 paniculata
 perfoliata
 repens
 Sundermannii

Hablitzia tamnoides

Hebenstretia tenuifolia

Hedypnois cretica

Hedysarum denticulatum
 esculentum
 flavescens
 obscurum
 sibiricum

Helenium autumnale
 — var. pumilum
 — var. striatum
 Bigelovii
 Bolanderi
 Hoopesii
 puberulum
 tenuifolium

Helianthella quinquenervis

Helianthemum alpestre
 canum
 libanotis
 Tuberaria

Helianthus annuus
 decapetalus
 giganteus
 mollis
 Nuttallii
 occidentalis
 rigidus
 tomentosus

Helichrysum bracteatum
 — var. roseum
 serotinum
 siculum

Heliophila amplexicaulis

Heliopsis laevis
 scabra

Helipterus roseum

Helleborus Baumgartenii
 foetidus
 orientalis

Hemerocallis aurantiaca var.
 major
 citrina
 flava
 luteola
 Thunbergii

Heracleum candicans
 flavescens
 granatense
 Lehmannianum
 nepalense
 Panaces
 villosum

Herniaria hirsuta

Hesperis matronalis

Heuchera alpina
 bracteata
 Drummondii
 micrantha
 pilosissima

Heuchera—*cont.*
 pubescens
 sanguinea
 undulata

Hibiscus Trionum

Hieracium amplexicaule
 aurantiacum
 bombycinum
 cappadocicum
 corymbosum
 crinitum
 crocatum
 florentinum
 gymnocephalum
 Heldreichii
 humile
 Jankae
 lanatum
 maculatum
 pallidum
 pannosum
 Pilosella
 ramosum
 rupestre
 staticefolium
 tridentatum
 umbellatum
 villosum
 vulgatum

Holcus lanatus
 mollis
 — var. variegatus

Hordeum jubatum

Horminum pyrenaicum
 — var. album

Hosta decorata var.
 marginata
 Fortunei var. gigantea
 glauca
 lancifolia var. albo-
 marginata
 sub-cordata
 undulata

Houttuynia cordata
Hunnemannia fumariaefolia
Hutchinsia alpina
Hyacinthus amethystinus
 azureus
 fastigiatus
 Hackelii
 hispidus
 praecox
Hydrocotyle vulgaris
Hydrophyllum canadense
 virginicum
Hyoscyamus niger
Hypocoum procumbens
Hypericum acutum
 atomarium
 ascyron
 Coris
 delphicum
 elodeoides
 floribundum
 hirsutum
 Kotschyannum
 lysimachioides
 olympicum
 orientale
 perforatum
 polyphyllum
 quadrangulum
 rhodopeum
 rumelicum
Hypochoeris uniflora
Hyptis pectinata
Hyssopus officinalis
 — var. *aristatus*

Hystrix patula
Iberis amara
 correaefolia
 gibraltarica
 Jordanii
 pinnata
 sempervirens
 — var. *Garrexiana*
 umbellata
Impatiens Balsamina
 Balfouri
 biflora
 Roylei
 scabrida
Incarvillea Delavayi
 grandiflora var. *brevipes*
 variabilis
Inula barbata
 bifrons
 Britannica
 cordata
 ensifolia
 Helenium
 hirta
 Hookeri
 magnifica
 montana
 Oculus-Christii
 orientalis
 racemosa
 sabuletorum
 salicina
 spiraeifolia
 squarrosa
 thapsoides
Ipomoea coccinea
 montana
 purpurea
Iris aphylla
 Bloudowii
 bucharica
 Bulleyana
 Cengialtii

Iris—cont.

Chamaeiris
Clarkei
Delavayi
Douglasiana
foetidissima
 — var. *citrina*
Fontanesii
fulva
hyerensis
Kaempferi
laevigata
 — var. *alba*
longipetala var. *montana*
Milesii
missouriensis
ochroleuca
orientalis
Pseudacorus
 — var. *alba*
setosa
sibirica
Sintenisii
tenax
versicolor
Watsoniana
xiphioides

Isatis tinctoria

Isopyrum fumarioides

Ixiolirion montanum var.
 tataricum

Jasonia tuberosa

Jasione perennis

Juncus alpinus
 Chamissonis
 effusus
 glaucus
 squarrosus
 tenuis

Kentranthus Calcitrapa
 ruber
 — var. *albus*

Kitaibelia vitifolia

Kochia scoparia

Koeleria albescens
 alpicola
 phleoides

Lactuca alpina
 Bourgaei
 Dubyaea
 hastata
 macrantha
 macrophylla
 perennis
 Plumieri

Lagenophora Billardi
 Forsteri

Lagurus ovatus

Lallemantia canescens
 peltata

Lamium album
 Galeobdolon
 maculatum
 molle
 Orvala

Lapeyrousia cruenta
 — var. *alba*

Lapsana communis

Laserpitium latifolium
 peucedanoides
 Siler

Lathyrus Aphaca
 articulatus
 clymenum
 cyaneus
 latifolius
 lusitanicus
 luteus
 — var. *aureus*
 maritimus

Lathyrus—*cont.*
 montanus
 niger
 Nissolia
 odoratus
 paluster
 pannonicus
 pratensis
 roseus
 rotundifolius
 rotundifolius x tuberosus
 sativus
 silvester
 tuberosus
 undulatus
 varius
 venosus
 vernus
 — var. angustifolius

 Lavatera arborea
 cachemiriana
 Olbia

 Layia platyglossa

 Legousia falcata
 pentagonia
 speculum-veneris

 Lens culinaris

 Leontodon hastilis
 hirtus
 hispidus

 Leontopodium alpinum
 sibiricum

 Leonurus Cardiaca
 macrantha

 Lepidium Draba
 graminifolium
 latifolium
 perfoliatum
 sativum
 virginicum

Leptosyne Bigelovii
 Douglasii
 maritima

 Leucera senecioides

 Lewisia Cotyledon
 Leana

 Levisticum officinale

 Liatris graminifolia var.
 dubia
 pycnostachya
 scariosa

 Libertia formosa
 grandiflora

 Lilium carniolicum
 giganteum
 pyrenaicum

 Limnanthes alba
 Douglasii

 Limonium bellidifolium
 binervosum
 confusum
 cosyrense
 elatum
 filicaulis
 globulariaefolium
 Gmelinii
 minutum
 tomentella
 virgatum
 vulgare

 Linaria alpina
 — var. rosea
 anticaria
 Broussonettii
 dalmatica
 Elatine
 genistifolia
 melantha
 origanifolia
 purpurea

Linaria—*cont.*
 sapphirina
 tristis
 vulgaris

Lindelia spectabilis

Linum alpinum
 arboreum
 austriacum
 campanulatum
 grandiflorum
 — var. roseum
 perenne
 tenuifolium
 usitatissimum
 — var. album

Lithospermum angustifolium
 arvense
 intermedium
 officinale

Loasa lateritia

Lobelia Erinus
 sessilifolia
 tenuior

Lolium perenne

Lopezia coronata

Lophanthus scrophulariaefolia

Lotus corniculatus
 edulis
 ornithopodioides
 Requienii
 siliquosus
 tenuifolius
 Tetragonolobus

Lunaria annua
 — var. alba
 rediviva

Lupinus angustifolius
 argenteus

Lupinus—*cont.*

Barkeri
 densiflorus
 longifolius
 micranthus
 mutabilis
 — var. Cruckshanksii
 nanus
 nootkatensis
 onustus
 perennis
 polyphyllus
 — var. albus

Luzula Fosteri
 nivea
 pilosa

Lychnis alba
 alpina
 chalcedonica
 coronaria
 — var. oculata
 dioica
 Flos-cuculi
 Flos-jovis
 Githago
 Sartorii
 Sermo
 Viscaria
 — var. alba.

Lycopersicum esculentum
 — var. cerasiforme
 pyriforme

Lycopus exaltatus

Lysichitum camtschaticense

Lysimachia barystachys
 clethroides
 Fortunei
 mauritana
 Nummularia
 punctata
 vulgaris

Lythrum alatum
 Salicaria
 — var. rosea
 virgatum
 Macleaya cordata
 microcarpa
 Madia dissitiflora
 Malachra radiata
 Malcomia africana
 chia
 littorea
 maritima
 Malva crispa
 moschata var. alba
 oxyloba
 parviflora
 rotundifolia
 setosa
 silvestris
 — var. alba
 Malvastrum campanulatum
 coccineum
 Marrubium vulgare
 Matthiola sinuata var. glabra
 albiflora
 tricuspidata
 Meconopsis aculeata
 betonicifolia
 cambrica
 integrifolia
 latifolia
 nepalensis
 paniculata
 quintuplinervia
 Wallichii
 Medicago ciliaris
 falcata
 hispida
 — var. pentacycla

Medicago—cont.
 littoralis
 lupulina
 Murex
 rigidula
 sarmentosa
 sativa
 Melica altissima
 — var. atropurpurea
 ciliata
 nutans
 transilvanica
 uniflora
 Melilotus albus
 indicus
 officinalis
 Melissa officinalis var. aurea
 Mentha piperita
 pratensis
 rotundifolia
 spicata
 sylvestris
 Mertensia sibirica
 Mesembryanthemum
 crystallinum
 pyropeum
 Meum athamanticum
 Micromeria rupestris
 Microseris acuminata
 linearifolia
 Mimulus cardinalis
 cupreus
 luteus
 — var. alpinus
 — var. guttatus
 ringens
 Mirabilis Froebelii
 Jalapa

Miscanthus japonicus var.
 variegatus
 Mitella diphylla
 nuda
 pentandra
 Modiola multifida
 Molinia coerulea
 — var. variegata
 Molopospermum cicutarium
 Monarda didyma var. alba
 fistulosa
 Russeliana
 scabra
 Monolepis trifida
 Moricandia arvensis
 Morina longifolia
 Muehlenbergia mexicana
 Muscari armeniacum
 compactum
 conicum
 latifolium
 neglectum
 polyanthum
 racemosum
 Szovitsianum
 Myosotis caespitosa
 collina
 palustris
 pyrenaica
 repens
 sylvatica
 Myosurus minimus
 Myriactis nepalensis
 Myriogyne minuta

Myrrhis odorata
 Narcissus Bulbocodium
 — var. citrinus
 cyclamineus
 triandrus var. albus
 Nardus stricta
 Nasturtium sylvestre
 Nemesia foetans
 versicolor
 Nemophila maculata
 Menziesii
 — var. discoidalis
 Nepeta concolor
 Govaniana
 granatensis
 lamiopsis
 latifolia
 — var. grandiflora
 macrantha
 marifolia
 melissaefolia
 Mussinii
 nervosa
 tuberosa
 Wilsonii
 Nicandra physaloides
 violacea
 Nicotiana acuminata
 alata
 auriculata
 rustica
 Sanderæ
 sylvestris
 Tabacum
 — var. petiolaris
 Nigella damascena
 Garidella
 hispanica
 integrifolia
 orientalis

Nolana paradoxa
 prostrata
 Nothoscordum fragrans
 Oenanthe crocata
 fistulosa
 Lachenalii
 pimpinelloides
 silifolia
 Oenothera acaulis
 amoena
 biennis
 — var. grandiflora
 densiflora
 fruticosa
 glaucous
 — var. Fraseri
 lepidota
 linearis
 missouriensis
 odorata
 pumila
 rosea
 speciosa
 trichocalyx
 tetraptera
 Whitneyi
 Onobrychis viciaefolia
 Ononis arvensis var. maritima
 biflora
 hircina
 Natrix
 spinosa
 Onopordon Acanthium
 Onosma albo-roseum
 stellulatum
 Orchis ericetorum
 foliosa
 incarnata
 latifolia
 maculata
 praetermissa

Origanum hirtum
 Onites
 vulgare
 Ornithogalum arcuatum
 narbonense
 Ornithopus compressus
 roseus
 Oryzopsis miliacea
 Oxalis corniculata var. rubra
 Oxyria digyna
 Oxytropis argentea
 sulphurea
 strobilacea
 uralensis var. sericea
 Paeonia anomala
 corsica
 macrophylla
 Mlokosewitchii
 peregrina
 tenuifolia
 Wittmanniana
 Woodwardii
 Panicum bulbosum
 capillare
 Crus-galli
 miliaceum
 obtusum
 proliferum
 Papaver alpinum
 dubium
 glaucum
 hybridum
 lateritium
 macrostomum
 monanthum
 nudicaule
 orientale
 — var. bracteatum
 pavoninum

Papaver—cont.
 pilosum
 Rhoeas
 — var. latifolium
 rupifragum
 somniaferum
 — var. album
 strictum
 Paracaryum coelestinum
 glochidiatum
 heliocarpum
 Paradisea Liliastrium
 — var. major
 Parietaria officinalis
 Paronychia capitata
 Patrinia gibbosa
 palmata
 Peltaria turkmena
 Pennisetum macrourum
 Pentstemon angustifolius
 arizonicus
 barbatus
 Cardwellii
 campanulatus
 confertus
 — var. coeruleo-purpureus
 cordifolius
 diffusus
 gentianoides
 glaber
 heterophyllus
 hirsutus
 laevigatus
 — var. digitalis
 Menziesii var.
 macrophylla
 ovatus
 Richardsonii
 Scouleri
 secundiflorus
 Torreyi

Pentstemon—cont.
 tubiflorus
 unilateralis
 Watsonii
 Peucedanum alpinum
 coriaceum
 graveolens
 hispanicum
 sativum
 verticillare
 Phacelia congesta
 loasaefolia
 malvaefolia
 tanacetifolia
 viscida
 Whitlavia
 Phalaris aquatica
 canariensis
 minor
 nodosa
 paradoxa
 tuberosa
 Phaseolus multiflorus
 tuberosus
 vulgaris
 Phleum phleoides
 pratense
 Phlomis agraria
 alpina
 armeniaca
 chrysophila
 tuberosa
 umbrosa
 Phlox divaricata
 Drummondii
 paniculata
 — var. alba
 subulata
 Physostegia parviflora

Phyteuma canescens
lobelioides
 — var. *angustifolia*
orbiculare
serratum
spicatum
Vagneri

Phytolacca acinosa
clavigera
decandra

Picridium tingitanum

Picris echioides
hieracioides
pauciflora

Pisum arvense
elatius
sativum
 — var. *umbellatum*

Plantago Candollei
Coronopus
Cyanops
indica
Lagopus
lanceolata
major
maritima
media
nivalis
Psyllium

Platycodon grandiflorum
 — var. *Mariesii*

Pleurospermum Golaka

Poa annua
attica
caesia
caespitosa
Chaixii
nemoralis
pannonica
pratensis
violacea

Podolepis acuminata

Podophyllum Emodii
peltatum

Polemonium carneum
coeruleum
 — var. *himalayanum*
mexicanum
pauciflorum
reptans
sibiricum
viscosum

Polygonatum biflorum
multiflorum
verticillatum

Polygonum affine
alpinum
 — var. *polymorphum*
bistorta
compactum
divaricatum
lanigerum
molle
orientale
rude
tortuosum
viviparum
Weyrichii

Polypogon littoralis

Portulaca pusilla

Potentilla argentea
 — var. *calabra*
argyrophylla
 — var. *atrosanguinea*
 — var. *leucochroa*
aurea
cashmirica
chrysantha
Crantzii
 — var. *pyrenaica*
crinita
Cryptotaeniae
depauperata

Potentilla—cont.
fragarioides
fragiformis
geoides
gracilis
Griffithii
heptaphylla
Hippiana
hirta
Hopwoodiana
Kotschyana
macrantha
montenegrina
nepalensis
 — var. *minor*
 — var. *nana*
norvegica
 — var. *genuina*
 — var. *hirsuta*
pennsylvanica
recta
 — var. *macrantha*
 — var. *palmata*
Richardii
rivalis
rupestris
 — var. *pygmaea*
sericea
speciosa
sterilis
tanacetifolia
taurica
Thurberi
tridentata
villosa

Poterium alpinum
obtusum
officinale
Sanguisorba
sitchense
tenuifolium
 — var. *album*

Prenanthes purpurea

Primula aurantiaca
Beesiana
Bulleyana

Primula—cont.
denticulata
florindae
geraniifolia
grandis
helodoxa
involuta
japonica
 — var. *Miller's Scarlet*
microdonta
 — var. *violacea*
officinalis var. *inflata*
pulverulenta
saxatilis
secundiflora
sikkimensis
Wardii
Wilsonii

Prunella grandiflora
laciniata
vulgaris

Psoralea macrostachys

Pulicaria dysenterica

Pulmonaria angustifolia
rubra
saccharata

Puschkinia scilloides

Ramondia pyrenaica

Ranunculus aconitifolius
acris
amplexicaulis
auricomus
arvensis
bulbosus
Cymbalaria
Flammula
Gouanii
lanuginosus
Lingua
muricatus
nemorosus
parviflorus

Ranunculus—*cont.*
pedatus
psilostachys
repens
sceleratus
trilobus

Raoulia sub-sericea

Raphanus sativus

Relbunium ovale

Relhania sessiliflora

Reseda alba
lutea
luteola
odorata

Rhagadiolus stellata

Rheum acuminatum
crassinervum
officinale
palmatum
Rhaponticum
spiciforme
undulatum

Rodgersia aesculifolia
pinnata
Purdonii

Roemeria rhoeadiflora
violacea

Romulea candida

Rudbeckia amplexicaulis
californica
laciniata
— var. nitida
subtomentosa

Rumex acetosa
albusensis
alpinus
bucephalophorus

Rumex—*cont.*
conglomeratus
crispus
flexuosus
heterophyllus
Hydrolapathum
hymenosepalus
maritimus
nepalensis
obtusifolius
palustris
Patientia
pulcher
salicifolius
sanguineus
scutatus

Sagina apetala

Sagittaria sagittifolia

Salvia Aethiopsis
austriaca
campanulata
carduacea
glutinosa
grandiflora
Horminum
hierosolymitana
interrupta
Jurisicii
lyrata
pratensis
— var. Baumgartenii
Sclarea
tiliaefolia
Verbenaca
verticillata
virgata

Samolus Valerandii

Sanicula nudicaule

Santolina pinnata

Saponaria caespitosa
calabrica
cerastioides

Saponaria—*cont.*
officinalis
— var. alba
Vaccaria

Saracha Jaltomata
umbellata

Satureia cuneifolia
montana
— var. illyrica

Saussurea albescens
denticulata
pectinata
salicifolia

Saxifraga aizoides
Aizoon
— var. balcana
— var. baldensis
— var. gracilis
— var. laeta
— var. rosea
— var. notata
— var. subalpinus
calabrica
cartilaginea x cochlearis
cochlearis
— var. minor
cordifolia
— var. corrugata
Cotyledon
crassifolia
decipiens
Delavayi
— var. compacta
x Gaudinii
Geum
— var. crenata
— var. dentata
Haagii
Hostii var. altissima
hypnoides var. boreali-
atlantica
lingulata
— var. Albertii
— var. lantoscana

Saxifraga—*cont.*
x Macnabiana
Maweana
moschata var. Rhei
mutata
nivalis
pedemontana
perdurans
sarmentosa
tenella
Timbalii
x viridis

Scabiosa anthemifolia var. rosea
australis
caucasica
ciliata
Columbaria
Fischeri
graminifolia
longifolia
macedonica var.
lyrophylla
ochroleuca
Succisa
sylvatica
triniaefolia
vestina

Schizanthus pinnatus
retusus

Schizopetalon Walkeri

Scilla Lilio-Hyacinthus
messeniaca
non-scripta
peruviana
pratensis
sibirica
— var. alba

Scirpus Eriophorum
Holoschoenus
sylvaticus
triqueter

Scleranthus annuus

Scopolia lurida
Scorpiurus sulcata
 vermiculata
Scorzonera hispanica
 laciniata
Scrophularia aquatica
 nodosa
 peregrina
 Scorodonia
Scutellaria albida
 alpina
 altissima
 galericulata
 indica var. *japonica*
 peregrina
 Tournefortii
Securigera Coronilla
Sedum album
 anopetalum
 crassipes
 dumulosum
 Ellacombianum
 Ewersii
 kamtschaticum
 maximum
 Middendorffianum
 reflexum
 roseum
 rupestre
 Semenovii
 spathulifolium
 — var. *purpureum*
 spectabile
 spurium
 — var. *album*
 stoloniferum
Selinum tenuifolium
Sempervivum arachnoideum
 Boutignyanum
 Doellianum
 fimbriatum

Sempervivum—cont.
 Funkii
 glaucum
 Laggeri
 mettenianum
 tectorum
 triste
Senebiera pinnatifida
Senecio abrotanifolius
 adonidifolius
 alpinus
 clivorum
 Doronicum
 erucifolius
 japonicus
 Ledebourii
 Ligularia
 macrophyllus
 nemorensis
 Przewalskii
 rufinervis
 saracenicus
 stenocephalus
 suaveolens
 tanguticus
 Veitchianus
 Wilsonianus
Sericocarpus conyzoides
Serratula coronata
 quinquefolia
 radiata
 tinctoria
 — var. *alba*
 — var. *monticola*
Seseli Libanotis
 osseum
 Pallasii
Sesleria autumnalis
Setaria glauca
 italica
 verticillata
 viridis

Sherardia arvensis
Sida Napaea
Sidalcea candida
 neo-mexicana
Sideritis scordioides
Silene alpestris
 caucasica
 ciliata
 conica
 colorata
 cretica
 Cucubalus
 Delavayi
 elegans
 Fabaria
 fimbriata
 Fortunei
 Friwaldskyana
 fruticosa
 fuscata
 gallica
 gigantea
 italica
 khasiana
 maritima
 nicæensis
 noctiflora
 paradoxa
 pendula
 quadrifida
 Reichenbachii
 Saxifraga
 viridiflora
 Zawadzskii
Silphium Asteriscus
 perfoliatum
 scaberrimum
 terebinthinaceum
 trifoliatum
Silybum Marianum

Sisymbrium irio
 officinale
 stricissimum
 Thalianum
Sisyrinchium angustifolium
 bermudianum
 californicum
 convolutum
 striatum
Sium latifolium
Smilacina racemosa
 stellata
Smyrnium Olustratum
Solanum Dulcamara
 — var. *alba*
 nigrum
 sisymbriifolium
 villosum
Solenanthus appeninus
Solidago californica
 canadensis
 Drummondii
 elliptica
 elongata
 glomerata
 graminifolia
 juncea
 latifolia
 lithospermifolia
 macrophylla
 mollis
 neglecta
 nemoralis
 odora
 ohioensis
 petiolaris
 pilosa
 puberula
 Riddelli
 rigida
 rugosa
 scopulorum

Solidago—cont. serotina ulmifolia Virgaurea — var. cambrica	Symphyandra pendula Wanneri	Thermopsis fabacea lanceolata montana rhombifolia	Triglochin maritimum
Sonchus arvensis oleraceus paluster	Symphytum officinale orientale	Thlaspi arvense ceratocarpum	Trigonella coerulea cretica foenum-graecum hamosa polycerata radiata
Spartina polystachya	Synthyris reniformis	Thymus Chamaedrys cimicinus hyemalis odoratissimus Serpillum vulgaris	Tripsacum dactyloides
Spergula arvensis	Tamus communis	Tiarella polyphylla	Trollius altaicus asiaticus dschungaricus europaeus laxus Ledebourii pumilus — var. yunnanensis sinensis
Spergularia rubra	Tanacetum argenteum boreale vulgare	Tinantia fugax	Tropaeolum canariensis majus
Spinacia oleracea	Taraxacum officinale	Tolmiea Menziesii	Troximon glaucum laciniatum
Spiraea Aruncus — var. Kneiffii camtschatica palmata vestita	Telephium Imperatii	Tordylium maximum	Tulipa australis Kaufmanniana Kolpakowskyana praestans Sprengeri sylvestris
Stachys alpina Betonica — var. rosea germanica grandiflora palustris silvatica	Tellima grandiflora	Tradescantia congesta reflexa virginiana	Tunica prolifera Saxifraga velutina
Stellaria graminea holostea	Teucrium Botrys canadense Chamaedrys flavum lucidum montanum pyrenaicum Scorodonia	Tragopogon floccosum porrifolius pratensis orientalis	Urospermum Dalechampii picroides
Stenanthium robustum	Thalictrum angustifolium aquilegifolium calabricum Chelidonii corynellum cultratum dasycarpum dioicum Fendleri foetidum glaucum minus — var. adiantifolium — var. elatum — var. purpurascens odoratum simplex squarrosum	Tricyrtis latifolia macropoda	Ursinia pulchra speciosa
Stevia ivaefolia		Trifolium alpestre glomeratum Lupinaster medium montanum ochroleucum pannonicum physodes pratense repens rubens	Urtica cannabina pilulifera — var. Dodartii
Stokesia cyanea — var. laevis			
Stipa Calamagrostis capillata papposa pennata splendens			
Swertia Kingii			

Valeriana baltica
officinalis
pyrenaica
sambucifolia

Valerianella olitoria

Venidium decurrens

Veratrum album
viride

Verbascum Bornmuelleri
longifolium
nigrum
olympicum
phoeniceum
pulverulentum

Verbena bonariensis
corymbosa
hispida
officinalis
prostrata
tenera

Verbesina helianthoides

Veronica Allionii
Anagallis
armena
austriaca
fruticans
fruticulosa
gentianoides
grandis
incana
incisa
longifolia
montana
Nummularia
officinalis
orchidea
orientalis
pinguifolia
prostrata
satureioides
spicata

Veronica—*cont.*
spuria
Teucrium
thracica

Vicia angustifolia
bithynica
calcarata
cassubica
Cracca
disperma
Ervilia
gigantea
grandiflora
lutea
melanops
Orobus
pyrenaica
sativa
sepium
sylvatica
unijuga
villosa

Vincetoxicum fuscum
luteum
nigrum

Viola bosniaca
cornuta
cuculata
declinata
elatior
gracilis
hastata
lutea
odorata
Pesneauuii
rugulosa
rupestris
silvestris
— var. alba
striata
suavis
tricolor var. nigra

Vittadenia australis