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ROYAL BOTANIC GARDENS, KEW

BULLETIN OF
MISCELLANEOUS
INFORMATION

1927



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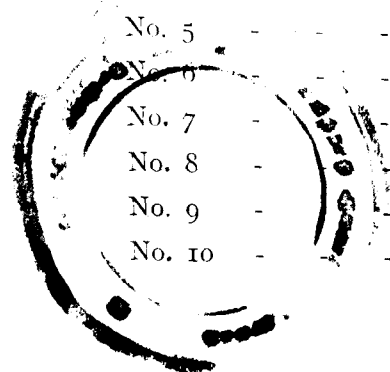
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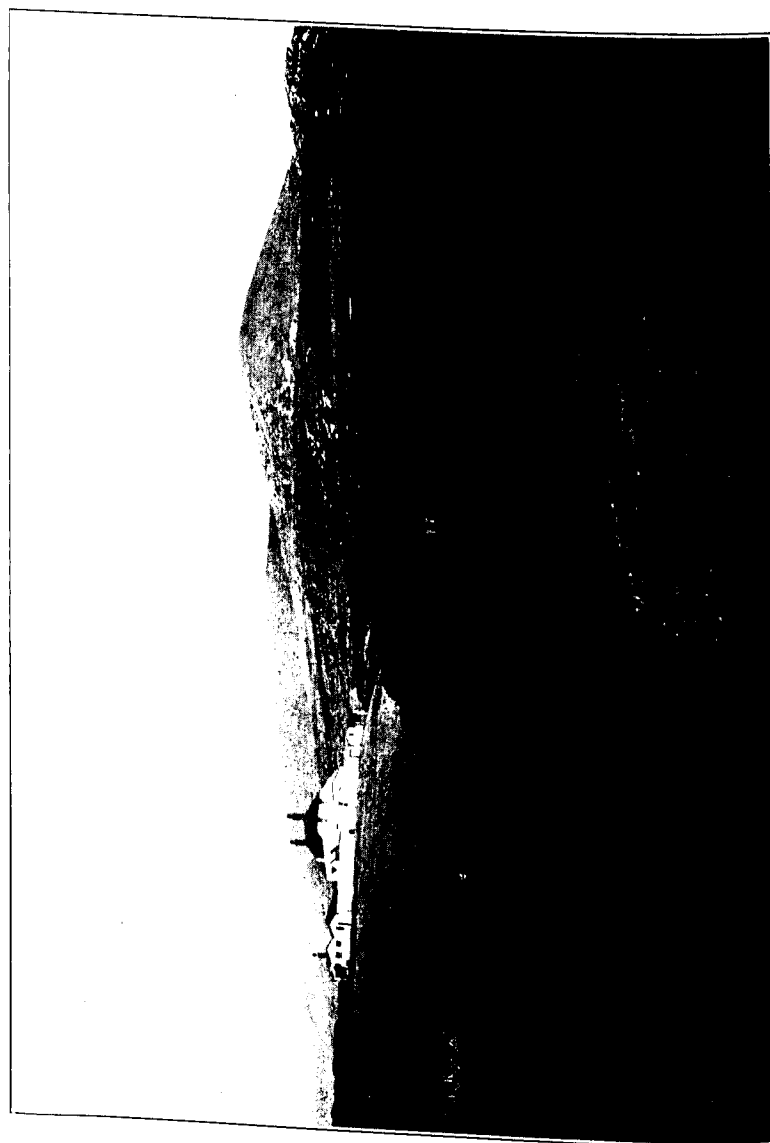
ERRATA.

Page 82, line 6, for *Maung Law Tek* read *Maung Saw Teh*.

Page 89, line 6 from bottom, for H. C. Watson, Conservator of
Forests, read H. W. A. Watson, Chief Conservator of Forests.

Page 301, line 21, for **Diplache** read **Diplachne**.

PLATE I.



Hill Cove, from Kent Paddock, West Falklands. Young poplars (foreground), old plantation (middle distance).

BULLETIN OF MISCELLANEOUS INFORMATION

No. 1 1927

ROYAL BOTANIC GARDENS, KEW

I.—THE FALKLAND ISLANDS.

The afforestation of the Falkland Islands, the earlier account of which was given in *Kew Bulletin* 1919, pages 209-217, has been the subject of further experiments since the appointment of Mr. James Reid as forester in 1920. Introductions have been attempted with seedlings and seeds from England and Scotland, with plants from South America and the Scilly Isles and with seeds from New Zealand and other sources.

From these experiments it is clear that the most hopeful results are to be expected from trees raised from seed sown in the Islands.

The Conifers and other trees which had been imported as seedlings and planted at Mt. Low, East Falklands, in 1920, survived the first few years, the Sycamores remained 4 inches high, the Alders and Mountain Ash reached a height of 2 feet. In 1923, however, the severe storms of wind and snow proved fatal to them and they have gradually died out.

Several species of Conifers have been tried with varying success, Scots Pine attaining a height of 12 inches, Corsican Pine 12 inches, Sitka Spruce 9 inches, Austrian Pine 2 feet, Norway Spruce 6 inches, Maritime Pine 8 inches, and *Pinus insignis* 14 inches. Most of these died soon after they were planted out; some Corsican Pine have survived but have made little new growth, whilst the Scots Pine and Sitka Spruce raised from locally-sown seed have made strong short growths and an abundance of fibrous roots.

In 1923 young seedlings of *Nothofagus antarctica* 2 to 2½ feet high, and *N. obliqua* 12 to 16 inches high, were obtained from Punta Arenas. They were placed in a nursery with seedlings of *Alnus incana* 6 inches, Willows 4½ to 5 feet, and *Pyrus Sorbus* 18 to 20 inches high, all of which promised well, although the *Nothofagus* had arrived with roots in a damaged condition. The *Nothofagus antarctica* has given encouraging results and is even more successful than *N. obliqua*.

The introduced broad-leaved species have not done so well. All the Sycamore, Alder and Mountain Ash plants introduced from England and planted at Mt. Low in 1920 eventually succumbed. The Poplars, 13 to 15 feet high, at Kent Paddock, Hill Cove, West Falklands, planted by Mr. Blake thirty years ago (*K.B.* 1919, p. 214) have thrown up suckers freely. From these some 600 transplants up to 6 feet high have been successfully established.

To face page I.]

there under the protection of the gorse hedge, which is from 6 to 8 feet in height.

Seeds of various species received from New Zealand did not prove satisfactory, the only ones germinating being *Pinus insignis* and *Pittosporum crassifolium*. A consignment of New Zealand plants brought by H.E. The Governor from the Scilly Isles in 1924 proved more successful. They included *Olearia Traversii*, *O. semidentata*, *Brachyglottis repanda*, *Escallonia rubra*, *E. macrantha*, *Pittosporum crassifolium*, *Corynocarpus laevigatus*, *Metrosideros robustus*, *Coprosma Bruniana*, species of *Myoporum* and *Veronica*. They were started into growth in boxes and later put out in the nursery beds, where the *Escallonia* flowered. Subsequently they were planted out under shelter of a hedge at Hill Cove and at first did well. In June, 1925, however, they were severely checked by frost and their woody stems damaged.

The general results of these experiments have led to the decision to abandon any further attempts at afforestation at Mt. Low, East Falklands, and to concentrate for the time on Hill Cove, West Falklands, where there is better soil and more sheltered conditions, especially by the gorse hedges. This, however, will be no easy task, for it involves transporting the seedlings raised at Port Stanley 130 miles by sea to Hill Cove.

Mr. Blake has placed the paddock at Hill Cove, an area of 10 acres, at the disposal of the Government, and has rendered every assistance to the scheme in the difficult and expensive task of preparing seed beds and land ready for planting.

Here in the autumn of 1925 ground was prepared for planting. Ditches were cut at 15 yards interval and led into a natural stream which flows through the middle of the paddock. Holes were prepared 3 feet apart, turf being removed and the soil and clay broken up to a depth of 14 inches. In several cases the moor pan was found to be only some four inches below the ground surface and this necessitated breaking up with crowbars and pickaxes. Six acres so prepared have already been planted out with 30,000 conifers of which the Scots Pine and Sitka Spruce give promising results. All the trees planted were raised at Port Stanley except 1,000 Scots Pine which were raised at Hill Cove, West Falklands. The nursery at Government House, Port Stanley, has been stocked with 40,000 seedlings, part of which it is proposed to plant out at Hill Cove next spring and the remainder in the following year.

Tumping was tried when planting out, but this system proved a failure, as during the winter months the soil was reduced to a powder and in spring the high winds carried it away and left the dry grass roots exposed. The cultivating-iron and wedge-shaped spade proved the most suitable tools, but an ordinary garden spade was used when the roots were too large for the wedge.

It is interesting to note that the New Zealand Flax (*Phormium tenax*) imported in 1920 has now become fairly well established

PLATE II.



The old plantation, Hill Cove, from the north-west.
Nothofagus antarctica in centre.



The old plantation, Hill Cove, showing Scots Pine and *Nothofagus antarctica* to right of picture.

[To face page 2.]

PLATE III.



In the old plantation, Hill Cove, West Falklands. Scots Pines and Poplars.

To face page 3.]

and the average height is 3 feet 6 inches. Only two plants survived from a sowing of seed and they measure 2 feet 6 inches. The plants are well sheltered and are growing on a fairly dry bank of red clay mixed with loam.

Throughout the whole period of these afforestation experiments there has been a low rainfall with strong winds in the spring, and excessive moisture when the trees were dormant.

The results so far obtained, both negative and positive, are a distinct advance in the problems connected with afforestation in these Islands. It is to be hoped that the work initiated during Mr. Reid's term of office will be continued, as there is a good indication now that so many of the difficulties have been appreciated that a certain measure of success will be obtained.

We are indebted to the late Governor, Sir John Middleton, K.B.E., C.M.G., for the accompanying illustrations.

II.—ON THE FLORA OF THE NEARER EAST: III.*

A. R. HORWOOD and W. B. TURRILL.

A COLLECTION MADE BY THE RT. HON. SIR RONALD C. LINDSAY, G.C.M.G., C.B., C.V.O., NEAR ANGORA.

Since the completion of Boissier's *Flora Orientalis*† very considerable botanical collections have been made in the Nearer East. Many German botanists have collected in Asia Minor, and the richness of the flora, especially in herbaceous and suffruticose plants, is indicated by the large numbers of new species described by Bornmuller, Haussknecht, and other systematists. The phyto-geographical importance of Asia Minor to students of the Mediterranean and Central European floras can scarcely be over-estimated. Evidence is accumulating that many genera have their headquarters in the Nearer East, from whence species have radiated westwards, spreading through the Mediterranean Basin and even northwards in Western Europe, and also across the Balkan Peninsula into Central Europe. Fortunately Kew possesses excellent sets of many of both the older and the more recent collections from Asia Minor, and our material from the Mediterranean Region as a whole probably forms the best collection in existence in any single institution.

The Rt. Hon. Sir Ronald C. Lindsay, G.C.M.G., lately H.B.M. Ambassador to the Republic of Turkey (now H.B.M. Ambassador to Berlin) has presented to Kew a set of 87 well-dried plant specimens collected in the neighbourhood of Angora in 1926. Useful field-notes accompanied the plants, most of which have been definitely determined, though a few which are not fruiting have to remain

* Continued from *K.B.* 1926, p. 380.

† Vol. V. was published in 1884, and the Supplementum in 1888.

without a trivial. Two new species occur in the collection, and these have been described as *Vicia anatolica* and *Ruta lindsayi*. It has been considered advisable to publish an annotated list of the whole collection in the hope that others visiting the Nearer East will contribute specimens to Kew.

Sir Ronaki has kindly supplied the following particulars:—

“ 1, Holland Park, W. 11.

“The collection of plants, of which a list is given below, was made in a rather haphazard manner between April 15th and June 7th, at Angora, the new capital of Turkey. The collector does not claim to be a botanist—indeed he has little more than a bowing acquaintance with the commoner English flowers; but the finding and preservation of the plants afforded him agreeable relaxation in the intervals of exacting official business, and it will be a great satisfaction to him if the collection proves to be of some slight interest to serious scientists.

“The climate of Angora is typically continental. Winter is intensely cold in general, but thaws supervene periodically and turn the whole country into a sea of mud. April is usually a dry month, but in May there are heavy storms of rain. From June to September the heat is torrid and everything dries up. Autumn is the finest season of the year, with bright sunny days and frosty nights. There are no meteorological records.

“The country round Angora is completely bare. Not a tree is to be seen over a vast expanse except in straggling orchards on the hills and in some valley-bottoms. There is no scrub. The plants enumerated here were all gathered in the neighbourhood of Chankaya, about 4 miles south of Angora, at an elevation of from 2,800 to 3,300 feet above the sea level, where the soil is a decomposed volcanic rock. Vegetation is the reverse of luxurious and there are few annual plants. Aromatic herbs of all kinds are the most abundant.

“The collection would have been less incomplete if a rain storm had not come through the roof and ruined a number of specimens.

“ R. C. Lindsay.”

Systematic List and Notes.

Adonis sp. Angora: Chankaya, April and May, scarlet flowers with a black centre, No. 20.

Delphinium orientale Gay in Des Moulins Catal. Dord. 12 (1840).

Angora: Chankaya, 15th-31st May, 2 feet high with purple flowers, fairly common, No. 64.

Distr. Medit. Region.

Berberis crataegina DC. Syst. ii. 9 (1821).

Angora: Chankaya, 6th May, thorny bush 6 feet high, with yellow flowers, No. 19.

Distr. Asia Minor, Armenia, N. Persia.

Glaucium flavum Crantz Stirp. Austr. ed. i. ii. 133 (1763) sensu lato.

Angora: Chankaya, 25th May, scarlet flowers with no black blotch at the base of the petals, only two plants found, No. 55; scarce at Angora, May 15th-30th, apricot-yellow, 18 inches high, No. 56; Chankaya, May, scarlet flowers, fading tawny, with small black blotch at the base of each petal, No. 53.

Three colour varieties are represented in the collection. Possibly they may be referable to *G. leiocarpum* Boiss., but without field studies and breeding experiments on the group we are unable to decide if this is really distinct specifically from *G. flavum* Crantz. None of the Angora specimens has mature fruits.

Distr. (of species). Medit. Region and Cent. Europe.

G. grandiflorum Boiss. et Huet Diagn. ii. v. 15 (1856).

Angora: Chankaya, May, scarlet petals each with a large black blotch, No. 54.

Distr. Asia Minor to Persia.

Hypocoum grandiflorum Benth. Catal. Pyr. 91 (1826).

Angora: May, a small straggling plant with rather heart-shaped yellow flowers, common everywhere on lower ground, but not too common at 1,000 m. No. 70.

Distr. S. Europe and Orient.

Alyssum campestre L. Sp. pl. ed. 2. ii. 909 (1763).

Angora: Chankaya, April and May, a small woolly herbaceous plant, with yellow flowers, common in rocky places, No. 14. In the absence of fruit the determination is somewhat tentative.

Distr. Cent. and S. Europe, Asia Minor to Armenia, Syria.

A. desertorum Stapf in Denkschr. Akad. Wien li. 302 (1886).

Angora: Chankaya, April-May, a herbaceous, hard, tough plant with yellow flowers, common in rocky places, No. 12.

Distr. E. N. Temp. Region.

Barbarea plantaginea DC. Syst. ii. 208 (1821).

Angora: Dikmen Brook, 16th-30th April, a tall coarse plant with yellow flowers in large heads, No. 9.

Distr. Asia Minor, Syria, Armenia, N. Persia.

Crambe tatarica Sebeók. Diss. inaug. de Tataria hungarica 7, cum tabula (1779) sec. Simonkai Enum. Flor. Transsilv. 103 (1886).

Angora: very common in the lower plains, but not many on high ground, 15th-30th May, a bush 2 feet high, probably a biennial, with large very deeply cut leaves, and many small white flowers in large inflorescences, No. 37.

Hesperis pendula DC. Syst. ii, 457 (1821).

Angora: Chankaya, 16th-30th April, a fairly common sticky plant with brownish and sweet-scented flowers, No. 8.

Distr. Asia Minor, Armenia, Syria.

Isatis glauca Auch. ex Boiss. in Ann. Sci. Nat. Ser. 2, xvii. 201 (1842).

Angora: Embassy Garden, 5th June, a handsome plant 2 feet high, with yellow flowers, No. 72. In the absence of fruit we are not quite sure of the determination.

Distr. Asia Minor, Armenia, N. Persia.

Lepidium perfoliatum L. Sp. Pl. 643 (1753).

Angora: Chankaya, April-May, a tall plant with yellow flowers, No. 2.

Distr. E.N. Temp. Region.

L. draba L. Sp. Pl. 647 (1753).

Angora: Chankaya, May, a tall coarse ubiquitous weed with large heads of very small white flowers, No. 29.

Distr. Medit. Region.

Matthiola oxyceras DC. Syst. ii. 173 (1821).

Angora: Chankaya, 1st-15th May, a common straggly plant, with woolly silvery leaves and yellow to pink flowers, No. 21.

Distr. Asia Minor to Caucasus, Irak and Arabia.

Saponaria prostrata Willd. Enum. 465 (1809).

Angora: Chankaya, May, No. 45.

The specimen represents a *forma foemina*, in which the stamens are reduced to functionless vestiges and the petals have somewhat narrower and shorter laminae.

Distr. Asia Minor and Armenia.

Silene densiflora d'Urv. Enum. 47 (1822).

Angora: Chankaya, 15th-30th May, a sticky plant, with very small yellow flowers, in close bunches at the nodes of an erect stem up to 2 feet high, common, No. 50.

Distr. Balkan Peninsula, Crimea, Caucasus, Asia Minor.

Hypericum aviculariaefolium Jaub. et Spach, Pl. Or. i. 59, t. 30 (1842-43).

Angora: Chankaya, 15th-20th May, a fairly common, small, bushy plant 6-8 inches high with glaucous leaves, No. 77.

Distr. Asia Minor.

H. hyssopifolium Vill. Hist. Dauph. iii. 505, t. 44 (1809).

Angora: Dikmen Valley, 31st May, 1 foot high with handsome pyramidal inflorescences, not too common, No. 76.

In the broader inflorescence this agrees with the var. *lydium* Boiss., in the shape of the sepals with the var. *elongatum*, Boiss.

Distr. Medit. Region to Cent. Asia.

H. scabrum L. Cent. i. 25 (1755).

Angora: Chankaya, May, 10 inches high, common, No. 30.

Distr. Asia Minor to Cent. Asia.

Linum anatolicum Boiss. Diagn. i. i. 56 (1842).

Angora: Chankaya, 15th-30th May, a plant with straggling stems and of a silvery appearance, 8 to 10 inches high, pale lilac flowers, common, No. 58.

Distr. Asia Minor.

L. balansae Boiss. sensu Freyn in Bull. Herb. Boiss. iii. 101 (1895) et Bornm. in Verh. Zool.-Bot. Ges. xlviii. 567 (1898). *Linum mucronatum* Bert. var. *latifolium* Freyn in Oest. Bot. Zeitschr. xl. 211 (1890), nomen solum.

Angora: Chankaya, 15th-31st May, a bright and pretty plant, 10 inches to 1 foot high, with spreading branches and yellow flowers, No. 67.

Distr. Asia Minor.

Ruta lindsayi Turrill sp. nov.: ab *R. cilicica* (Boiss. sub *Haplophyllum*) Turrill comb. nov. pedicellis longioribus ovarii gibbis multo majoribus distinguitur.

Herba perennis, basi suffruticosa, caulibus basi ascendentibus deinde erectis simplicibus molliter breviterque pubescentibus omnino foliosis teretibus. *Folia* caulina anguste elliptico-lanceolata vel oblanceolata, apice acuta, basi leviter angustata, sessilia, 1-2 cm. longa, 2-4 mm. lata, sparsim breviter pubescentia. *Corymbus* subdensus, pedicellis 5-7 mm. longis albo-pubescentibus; bractee late ovatae, acutae, albo-pubescentes, et ciliatae, breviter pedicellatae, inferiores, 1 cm. longae, 6 mm. latae. *Sepala* late oblata, obtusa, 2.5 mm. longa, 3.5 mm. lata, longe albo-pubescentia et ciliata. *Petala* latissime ovata, vix carinata, apice rotundata, 8 mm. longa, 7 mm. lata, glabra, siccitate luteo-aurea. *Stamina* 10, filamentis lanceolato-subulatis apice gradatim acuminatis fere 5 mm. longis basi 1 mm. latis inferne barbatis, antheris oblongis 2 mm. longis. *Ovarium* glabrum, apice gibbis ovoideis loculis majoribus 1.5 mm. longis instructum, loculis quadriovulatis; stylus 5 mm. longus.

ANATOLIA: Angora, near "Five Trees," 2nd June, *Lindsay* 85.

The collector refers to this as a rather handsome plant, about 9 inches high, with the yellow flowers in close flat-topped heads. Only a few plants were seen.

Those who wish to keep up the genus *Haplophyllum* can refer to the plant as *H. lindsayi* Turrill, or if it is preferred to drop the asperate to *Aplophyllum lindsayi* Turrill.

Rhamnus petiolaris Boiss. Diagn. ii. v. 75 (1856).

Angora: Chankaya, May, common, No. 78. The specimens have smaller leaves than usual.

Distr. Asia Minor to Armenia and N. Syria.

R. petiolaris Boiss. var. *velutina* Boiss. Fl. Or. ii. 18 (1872).

Angora: Chankaya, May, No. 79.

Distr. Asia Minor.

Astragalus melanophrurius Boiss.? Fl. Or. ii. 276 (1872).

Angora: Chankaya, 1st-20th May, a woolly plant, 1-2 feet high, with yellow flowers, common in lower ground, No. 22.

Distr. Asia Minor.

Hedysarum varium Willd. Sp. Pl. III. ii. 1206 (1803), sensu Boiss. Fl. Or. ii. 518 (1872).

Angora: Chankaya, 25th May, yellow flowers, No. 48.

Distr. Gallipoli Peninsula to Irak.

Lathyrus sphaericus Retz Obs. iii. 39 (1783).

Angora: Chankaya, 15th May, flowers brick red, No. 28.

Distr. Medit. Region.

Pisum elatius M.B. Flor. Taur.-Cauc. ii. 151 (1808).

Angora: Chankaya, 15th-30th May, standard white or pale blue, keel dark blue. Nos. 59, 60.

Distr. Medit. Region.

Vicia anatolica Turrill sp. nov.: ab *V. hybrida* L. foliis angustioribus et floribus vexillo praecipue minoribus, ab *V. lutea* L. vexillo adpresse sericeo distinguitur.

Planta annua, usque ad 2.5 dm. alta. *Caules* 3-4 scandentes vel prostrati, longitudinaliter sulcati, leviter adpresse hirsuto-pubescentes. *Folia* hirsuta, inferiora haud cirrhifera, 4-6-juga, foliolis obovatis vel elongato-obovatis apice saepe valde retusis basi angustatis vel petiolulo brevissimo praeditis 5-6 mm. longis circiter 3 mm. latis; superiora cirrhifera 6-8 cm. longa 7-8 juga, foliolis linearibus apice tridentatis vel truncato-apiculatis basi petiolulo 0.5-0.75 mm. longo instructis usque ad 2 cm. longis 1.5 mm. latis. *Flores* axillares, solitarii vel bini, pedicellis 1-2 mm. longis suffulti. *Calyx* flavo-viridis, hirsutus, ore obliquo, tubo 5 mm. longo, laciniis lanceolato-subulatis acuminatis 2-2.5 mm. longis superioribus brevioribus. *Vexillum* oblongum, apice truncatum, basi angustatum, 1.7 cm. longum, 8 mm. latum, dorso hirsutum. *Alae* 1.5 cm. longae, lamina 3 mm. lata. *Carina* 1.3 cm. longa, *Legumen* immaturum deflexum vel subdeflexum, compressum, apice basique angustatum, 3 cm. longum, 8 mm. latum, adpresso-sericeum.

ANATOLIA: Angora district: Chankaya, yellow flowers, May 10th-20th, common, *Lindsay* 51.

The specimens here described have not been matched at Kew or the Natural History Museum, nor do they agree with any of the published descriptions of new species from the Orient in their combinations of characters. The vexillum is hairy on the back as in *V. pannonica* Jacq. and *V. hybrida* L. The colour of the flowers resembles, so far as one can judge from dried material, that

of *V. melanops* S. et S., but the vexillum is shorter, straighter, and more regularly oblong.

Amygdalus orientalis Ait. Hort. Kew ii. 161 (1789).

Angora: Chankaya, 15th April, masses of mauve-purple flowers, leaves and fruit woolly and silvery, common, Nos. 80, 81.

Distr. Asia Minor to Armenia and Syria.

Rosa canina L. Sp. Pl. 491 (1753) var. *collina* Boiss. Fl. Or. ii. 685 (1872).

Angora: Inja Su, 28th May, rose-white flowers, No. 62.

R. canina L. var. *vulgaris* Koch sensu Boiss. Fl. Or. ii. 685 (1872).

Angora: Chankaya, 15th-31st May, rose-pink flowers, No. 47.

Distr. (of sp.). Europe east to Persia.

R. sulphurea Ait. Hort. Kew ii. 201 (1789).

Angora: Chankaya, 1st-20th May, a very handsome bush with numerous yellow flowers, common, No. 27.

Distr. Asia Minor to Transcaspia.

Artemisia squamata L. Sp. Pl. 242 (1753).

Angora: Chankaya, 31st May, a common plant 2 feet high, No. 86.

Distr. Asia Minor to Irak and Palestine.

Scandix iberica M.B. Flor. Taur.-Cauc. i. 425 (1808) et iii. 236 (1819).

Angora: Chankaya, 16th-30th April, small white flowers, No. 3.

Distr. Asia Minor to Persia.

Asperula arvensis L. Sp. Pl. 103 (1753).

Angora: Chankaya, 15th May, small blue flowers, common, No. 23.

Distr. Europe and Medit. Region.

Galium coronatum S. et S. Prodr. Fl. Graec. i. 90 (1806), et Fl. Gr. t. 125, sensu Boiss. Fl. Or. iii. 79 (1875).

Angora: Chankaya, April and May, with tough root and yellow axillary flowers, very common, No. 4.

Distr. Greece to Persia and Syria.

Valeriana tuberosa L. Sp. Pl. 33 (1753).

Angora: on Dikmen Hill, 20th April, pinkish-mauve flowers, not very common, No. 16.

Distr. E.N. Temp. Region.

Asyneuma lobelioides Hand.-Mazz. in Ann. Hofmus. Wien. xxvii. 431 (1913).

Angora: Chankaya, 31st May, small pale blue flowers, sessile on straight spiky branches, Nos. 84, 84a.

Distr. Asia Minor.

Campanula lyrata Lamk. Encycl. Meth. i. 588 (1783).

Angora: Chankaya, 15th-30th May, tall erect plant with hard woody stem and root and blue flowers, common, No. 33.

Distr. Gallipoli Peninsula, Asia Minor to Caucasus.

Anagallis foemina Mill. Gard. Dict. ed. 8 (1768).
 Angora: Embassy grounds, 15th-30th May, a prostrate plant with small bright blue flowers on long pedicels, No. 57.
Distr. Nearly cosmopolitan.

Lysimachia atropurpurea L. Sp. Pl. 147 (1753).
 Angora: Dikmen brook-side, 15th-25th May, crimson flowers, No. 69.
Distr. Balkan Peninsula and Asia Minor.

Vinca herbacea W. et K. Pl. rar. Hung. i. 8, t. 9 (1802).
 Angora: Chankaya, 15th April-15th May, contorted flowers of a strong blue colour, very common everywhere, No. 15.
Distr. S.E. Europe, Asia Minor to Palestine and Persia.

Alkanna orientalis Boiss. Diagn. i. iv. 46 (1844).
 Angora: Bendi Dere, 16th-30th April, a tall coarse plant with small yellow flowers very attractive to bees, No. 10.
Distr. Greece, Asia Minor east to Persia, and south to Syria.

Anchusa italica Retz. Obs. i. 12 (1779).
 Angora: Chankaya, 15th-31st May, common, No. 41.
Distr. S. and Cent. Europe, Asia Minor to Persia, Siberia, and N. Africa.

A. leptophylla R. et S. Syst. iv. 90 (1819).
 Angora: Chankaya, 10th-30th May, 18 inches high, with bright blue particularly brilliant flowers, very common, No. 35.
Distr. Asia Minor, Armenia to Crimea.

Lappula barbata Gürke in Engl. u. Prantl. Pflanzenfam. iv. 3A. 107 (1893).
 Angora: Chankaya, 25th May, on high dry ground, No. 44.
Distr. S.E. Europe to Persia and Siberia.

Moltkia aurea Boiss. Diagn. i. iv. 49 (1844).
 Angora: Chankaya, 15th April-20th May, flowers yellow on a curving flower stem, very common, No. 26.
Distr. Asia Minor.

M. coerulea Lehm. in Neue Schr. naturf. Ges. Halle III. ii. 6 (1817).
 Angora: Chankaya, April and May, rather small bright blue flowers, very common, No. 11.
Distr. Asia Minor, Syria.

Nonnea macrosperma Boiss. et Heldr. Diagn. i. xi. 97 (1849).
 Angora: Chankaya, 15th-31st May, a coarse plant up to 1 foot high, small yellow flowers in large round head, common in low ground, scarce at higher elevations, No. 40.
Distr. Asia Minor to Armenia.

Paracaryum ancyritanum Boiss. Fl. Or. iv. 260 (1879).
 Angora: Chankaya, May, drooping mauve flowers with big sepals, plant much larger in low ground, No. 24.
Distr. Asia Minor.

P. incanum Boiss. Fl. Or. iv. 262 (1879).
 Angora: Chankaya, May, a coarse silvery plant 15 inches high with maroon to chocolate flowers, No. 73.
Distr. Asia Minor, Caucasus.

Linaria coridifolia Desf. Cor. Tourn. 32, t. 22 (1808), *modo corifolia*.
 Angora: Chankaya, near "Five Trees" and elsewhere, 10th-30th May, 10 inches to 2 feet high, very small pale blue lilac flowers, Nos. 32, 39.
Distr. Asia Minor and Armenia.

Veronica multifida L. Sp. Pl. 13 (1753) var. **tenuifolia** Boiss. Fl. Or. iv. 442 (1879).
 Angora: Chankaya, April and May, a straggly, hairy plant with pale blue flowers, very common, No. 1.
Distr. (of var.). Asia Minor to Caucasus and Crimea.

Hyoscyamus niger L. Sp. Pl. 179 (1753).
 Angora: Chankaya, 15th-31st May, No. 82A.
Distr. E.N. Temp. Region.

H. reticulatus L. Sp. Pl. ed. 2. 257 (1762).
 Angora: Chankaya, 15th-31st May, No. 82.
Distr. Gallipoli Peninsula, Asia Minor to Persia.

Orobanche anatolica Boiss. et Reut. in DC. Prodr. xi. 17 (1847).
 Angora: Chankaya, 15th-30th May, only two specimens found, No. 61.
Distr. Asia Minor to Persia.

Acanthus hirsutus Boiss. Diagn. i. iv. 85 (1844).
 Angora: Chankaya, 10th-30th May, flowers creamy white, fairly common, No. 36.
Distr. Most of Asia Minor and Rhodes.

Globularia trichosantha F. et M. Ind. Sem. Hort. Petrop. v. 36 (1839).
 Angora: Chankaya, 15th April-15th May, a herbaceous plant in thick clumps, globular heads of indigo-blue flowers, fairly common, No. 18.
Distr. Asia Minor, Armenia, Syria.

Ajuga chia Schreb. Unil. 25 (1774).
 Angora: Chankaya, May, a low bushy plant, with yellow single flowers, very common, No. 74.
Distr. Balkan Peninsula to Persia and Syria.

Lallemantia iberica F. et M. Ind. Sem. Hort. Petrop. vi. 53 (1840).

Angora: Chankaya, 20th-30th May, 10 inches high with pale blue flowers in an erect head, No. 42.

Distr. Asia Minor to Persia and Palestine.

Marrubium pestalozzae Boiss. Diagn. ii. iv. 53 (1859).

Angora: Chankaya 1st-15th May, a tall very woolly plant with small narrow leaves and small dirty white flowers, No. 31. The present young specimen differs from other collections *Balansa* 1182 (Ouchak, Phrygia) and *Bourgeau* 221 (Elmalu, Lycia), as now in Herb. Kew., in the more floccose indumentum and thinner more long-petiolated leaves. We disagree with the reduction of the species to *M. praecox* Janka.

Distr. Asia Minor.

Phlomis lanceolata Boiss. Diagn. i. v. 36 (1844).

Angora: Chankaya, 31st May, large yellow flowers, No. 87. Our plant agrees fairly well with the original description but we have not seen the type specimen. In the Fl. Or. iv. 783 (1879) the species is reduced to *P. armeniaca* Willd.

Distr. Asia Minor and Kurdistan.

Salvia bornmuelleri Hausskn. in Mitt. b. Ver. Jena, ix. 21 (1891)? Angora: Chankaya, 20th May-5th June, bushes up to 2 feet high with lavender flowers, common, No. 52.

Distr. Asia Minor.

S. cadmica Boiss. Diagn. i. v. 6 (1844).

Angora: Chankaya, 20th-30th April, large white flowers, fairly common, No. 5.

Distr. Asia Minor.

S. ceratophylla L. Sp. Pl. 27 (1753).

Angora: Chankaya, 15th-31st May, a coarse plant with crinkly very narrow leaves, a tall spike, and very small dirty-white flowers, common on high ground, No. 68.

Distr. Asia Minor to Persia and Syria.

Scutellaria orientalis L. Sp. Pl. 598 (1753) var. **pinnatifida** Reichb. Ic. Crit. i. 10, t. 8f. 16 (1823); Jaub. et Spach Ill. Fl. Or. v. t. 413 (1853-57).

Angora: Chankaya, 1st-15th May, small to large yellow-lemon flowers, common, No. 25.

Distr. Balkan Peninsula, Asia Minor to Persia and Syria.

Aristolochia maurorum L. Sp. Pl. ed. 2. 1363 (1763).

Angora: Chankaya, 1st-15th May, flowers like a Dutchman's Pipe, growing out of the stem just above the ground, seed-pod ribbed heart-shaped, nearly 1 inch long, No. 38.

Distr. Asia Minor to Persia.

Elaeagnus angustifolius L. Sp. Pl. 121 (1753).

Angora: Chankaya Road, 15th-31st May, a silvery tree 10 feet high, thorny, small yellow flowers with strong rather sickly sweet smell, No. 71.

Distr. Medit. Region to China.

Euphorbia condylocarpa M.B.? Flor. Taur.-Cauc. i. 377 (1808).

Angora: Chankaya, 20th April, not uncommon, No. 17.

Distr. Cauc., Armenia, N. Persia.

E. gerardiana Jacq. Austr. v. 17, t. 436 (1778).

Angora: Chankaya, 15th-31st May, yellow heads, very common, No. 46.

Distr. E.N. Temp. Region.

E. sect. Myrsiniteae.

Angora: Embassy grounds, 16th-30th April, pinkish colour, fleshy, not common, No. 6.

Orchis incarnata L. Fl. suec. ed. 2, 312 (1755) and var. **oleocheilos** Boiss. Fl. Or. v. 71 (1884).

Angora: Chankaya, May, flowers purple, common on low ground, only one or two seen at 1000 m., No. 75.

Distr. (of var.). Asia Minor to N. Persia.

Gladiolus segetum Ker-Gawl in Bot. Mag. t. 719 (1804).

Angora: on road to Dikmen, on high ground, 15th May, purple flowers, No. 34.

Distr. Medit. Region.

Iris kerneriana Aschers. et Sint. ex Baker Gard. Chron. N.S. xxi. 795 (1884); Dykes, The Genus Iris, 70 (1913).

Angora: Chankaya, 15th-31st May, narrow leaves and yellow flowers, only one plant found on high ground, No. 66.

Distr. Asia Minor and Armenia.

Allium pulchellum Don in Mem. Wern. Soc. vi. 46 (1826-32).

Angora: Dikmen Valley, 4th June, 9 inches high, with a single stem, pale purple flowers on long pedicels in a loose head, No. 83.

Distr. Cent. and S. Europe, N. Asia Minor to Cauc.

A. rotundum L. Sp. Pl. ed. 2, 423 (1762).

Angora: Chankaya, 25th May-5th June, 1 foot to 18 inches high, purple flowers with white stamens, fairly common, No. 65.

Distr. Cent. and S. Europe, Asia Minor to Armenia and Irak.

Fritillaria sp.

Angora: Chankaya, 18th April, only one specimen found, perhaps the last of the season, blue and yellow flowers, No. 7. This may be a new species related to *F. citrina* Baker. We have not matched it at Kew but desire more material before describing it.

Gagea arvensis Dum. Prodr. Fl. Belg. 140(1827).
Angora: Chankaya, 16th-30th April, yellow flowers, common,
No. 13.
Distr. Europe and Medit. Region.

Ornithogalum narbonense L. Cent. Pl. ii. 15(1756).
Angora: Chankaya, 25th May-5th June, stem 18 inches high,
with small white flowers in a pyramidal raceme, common on lower
ground, No. 63.
Distr. Medit. Region.

O. umbellatum L. Sp. Pl. 307(1753).
Angora: Chankaya, 15th-31st May, 8 inches high, white flowers,
common, No. 43.
Distr. Europe, Asia Minor, N. Africa.

Ornithogalum sp.?
Angora: Chankaya, 15th-31st May, 1 foot high, white flowers
in a pyramidal raceme, No. 49.
We are doubtful about this plant. It very closely agrees with a
specimen collected by Wiedemann in "Anatolia" and named
O. narbonense L. in Herb. Kew. Our specimens have no under-
ground parts and the tepals are either uninerved or with only faint
or vestigial lateral nerves.

III.—BACTERIAL WILT DISEASE OF BANANAS. S. F. ASHBY.

The photographs in plates iv, v and vi, show the effect of
inoculating tomato and tobacco plants with pure cultures of a
bacterium isolated from banana varieties affected by a vascular
wilt disease in Trinidad. An account of the symptoms, character
of the bacterium, and inoculation experiments was published in
Tropical Agriculture, June, 1926. It was shown that the organism
was evidently identical with a bacterium isolated by Rorer in 1910
from bananas affected in the same way and successfully inoculated
into several varieties. Rorer suspected that it might be a strain of
Bacterium solanacearum E. F. S., but was unable to obtain infections
on solanaceous plants in Trinidad, and Erwin F. Smith could not
make it infect tomato plants at Washington. Its identity had,
therefore, been in doubt for some fifteen years. The inoculations
I carried out on the two solanaceous species were made with pure
cultures isolated from naturally diseased banana plants of the Giant
Fig and Red Fig varieties and cultures reisolated from diseased
suckers of the Gros Michel and Sucrier varieties, which had been
inoculated with pure cultures from the Giant and Red Figs. Pure
cultures reisolated from tomato and tobacco were also used for
reinoculating plants of tomato and tobacco. Uninoculated control

PLATE IV.

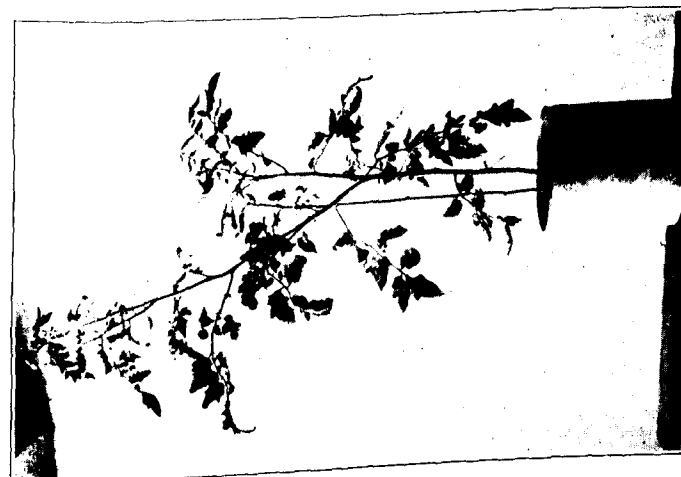


FIG. 2.—Tomato plant with inoculated branch. (See page 15.)



FIG. 1.—Tobacco plants, control and inoculated. (See page 15.)

PLATE V.

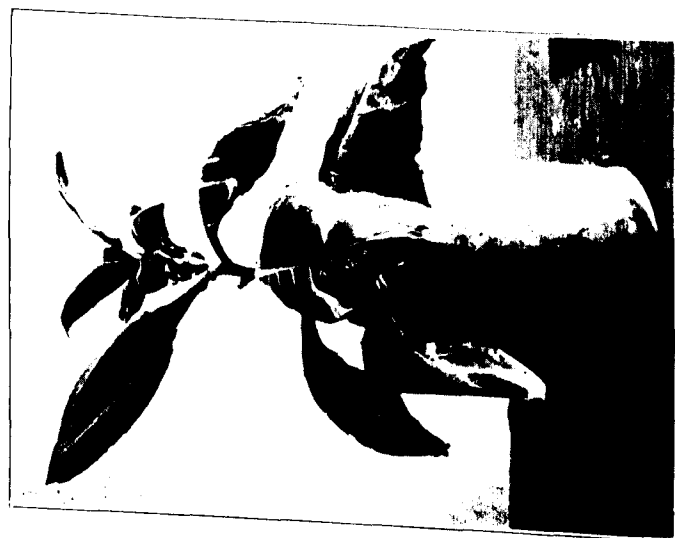


FIG. 4.

Inoculated tobacco plants. (See page 15, 16).



FIG. 3.

plants were maintained, and it may be added that no bacterial wilt disease of solanaceous or other crop plants had been observed in the locality where the inoculations were made. The young plants used were growing in galvanised cans in a glass house at the Imperial College of Triopical Agriculture, Trinidad, at the height of the dry season (March and April) under conditions of high temperature and low atmospheric humidity. The inoculations were made by pricking into the stems with sterilised needles three days old growths on slants in tubes of potato extract saccharose agar, started from single colonies in petri dishes poured with the same medium.

Fig. 1 shows an uninoculated tobacco plant (left) and an inoculated tobacco plant (right) photographed twenty-four days after inoculation. The plant which became diseased was inoculated in the stem from cultures isolated from naturally affected suckers of Giant and Red Figs. It showed a one-sided wilt of a leaf six days after inoculation and the leaves then wilted successively; at the end of seventeen days all the leaves had wilted and gone dry except a rosette of small leaves at the apex of the stem and these showed flabby tips; during this period growth was stagnant. The inoculated bacterium was reisolated from the midrib of a wilting leaf after nine days, and from the midrib of an apical young leaf after sixteen days. After twenty-five days the plant was cut up and the vascular region found to be browned throughout the stem, which showed a dirty-white alkaline bacterial ooze from the severed base; the bulk of the roots were healthy in appearance. The failure of the leaves, which was at first usually on one side of the midrib, took the form of dry reddish-brown papery patches between the main veins. The uninoculated plant remained quite healthy.

Fig. 2 shows a tomato plant which was inoculated with cultures reisolated from diseased Gros Michel and Sucrier banana suckers. It had forked into two nearly equal branches and one of these (right) was inoculated two inches above the fork. This branch made practically no growth for ten days while the other grew vigorously. Adventive root-initials appeared on the inoculated branch, and a brown streak within the cortex, but there was no wilting of foliage and after a month, when the photograph was made, the branch had begun to make appreciable growth.

Fig. 3 shows a tobacco plant sixteen days after being inoculated in the stem, at the same time and with the same cultures direct from the bananas, as the tomato plant in Figure 2. Leaves began to wilt after seven days and continued to fail progressively, but slowly, while the plant made appreciable growth. After eleven days the inoculated bacterium was recovered from a wilting leaf. At the end of a month some of the larger leaves were still in all stages of wilting and drying up and at the apex of the stem was a rosette of small abnormally dark green leaves, some of which had flabby tips. The plant was cut up and browning of the vascular region found extending

throughout the stem and into the petioles of the older leaves; the severed base showed bacterial ooze while the roots appeared normal.

Fig. 4 shows the same tobacco plant, but with the pot turned round (Figure 3 was photographed on a panchromatic plate with a green screen, and Figure 4 on a similar plate with an orange-red screen, with the result that dead patches show white).

Fig. 5 shows a tomato plant inoculated at two points on the stem with cultures reisolated from the tobacco and tomato plants shown in Figures 1 and 2. It was photographed twelve days later. Reflexing of petioles and wilting of leaves had begun four days after inoculation, and after eight days all the leaves had wilted and adventive roots had pushed abundantly on the stem, which showed dark streaks within the cortex. The inoculated bacterium was recovered in poured plates from the midrib of a leaf near the apex of the stem. The plant was cut up after two weeks and browning of the vascular region found to be general throughout the stem and leaf stalks; the severed base of the stem showed abundant dirty-white ooze, but the bulk of the roots were of normal colour.

Fig. 6 illustrates the pushing of adventive roots above and below the upper inoculation pricks on the stem of the tomato plant shown in Figure 5.

It may be added that a tobacco plant (not photographed) inoculated at the same time with the same reisolated cultures from tobacco and tomato as the plant in Figure 5 showed one leaf wilting after four days and a successive wilting of leaves with development of brown patches usually at first on one side of the midribs until after nineteen days all the leaves had dried up except a rosette of six small leaves at the apex of the stem, three of which were flabby. The plant was cut up and browning of the vascular region found to extend throughout the stem with bacterial ooze from the severed base, while the root system was normal in colour. The tomato plant shown in Figure 2, and another tomato plant inoculated with cultures from Gros Michel and Sucrier bananas which showed no noticeable effects after a month, were allowed to grow on, and both were reported by Professor Briton-Jones (my successor at the Imperial College of Tropical Agriculture) two months later, to be wilting; he forwarded to me portions of the stems, sterilised with mercuric chloride solution and placed in sterilised tubes, and I recovered the inoculated bacterium from the browned vascular regions of both plants.

The cultural characters of the organism isolated from naturally affected and inoculated banana plants and from inoculated tomato and tobacco plants may be briefly summarised.

The surface colonies which appear at tropical room temperature (mean of about 25° C.) on potato extract saccharose agar plates after three days, are white or dirty-white, circular or nearly circular, entire, wet-shining, with a tendency to flow when the plate is tilted;

PLATE VI.



FIG. 6.—Inoculated tomato stem with adventive roots. (See page 16).

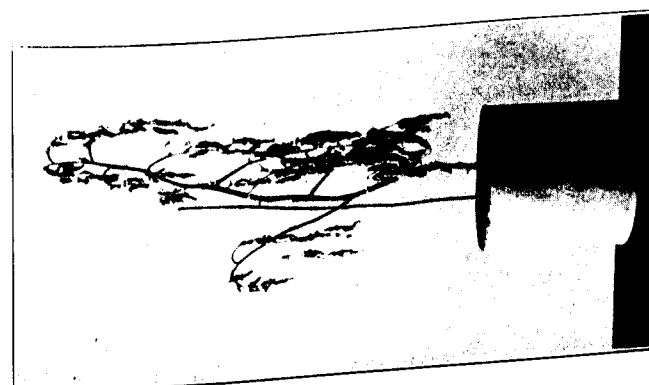


FIG. 5.—Inoculated tomato plant. (See page 16).

after a few days they turn brown. On sterilised white potato slabs there is at first a wet-shining, dirty-white spreading growth, which gradually turns brown and may become finally, after a week or more, jet black. Some cultures, however, after turning brown do not become black. Beef broth peptone gelatin is not liquefied. Lavender coloured separated litmus milk turns blue after three or four days, and this colour gradually increases in intensity; there is no clot and no surface growth, but a dirty-white deposit; after a month or more the strongly alkaline milk becomes more or less translucent. Hanging drops from nutrient broth cultures twenty-four hours old show a small proportion of individuals actively motile; it is a short rod often in pairs about $1.5 \times .5$ microns in size and stained smears show polar staining.

The cultural characters of the organism and the symptoms of the wilt on inoculated tobacco and tomato plants are in full agreement with those recorded for and due to *B. solanacearum* E. F. S.

B. solanacearum has been recorded by Jochems and by Palm and Jochems as attacking monocotyledons in the East. Natural infection occurred in Sumatra on two species of *Canna* (*C. glauca* Rosc. and *C. indica* L.) and on two species of *Commelina* (*C. benghalensis* L. and *C. nudiflora* L.). Pure cultures isolated from *Canna* were found to infect tobacco and balsam (*Impatiens balsamina* L.) and cultures from *Commelina* infected young plants of Hevea rubber, castor oil, tobacco and tomato. In 1924 these authors listed 128 species of flowering plants in thirty-five families susceptible to *B. solanacearum*, of which ninety species had been found infected under natural conditions; no species of *Musa* was mentioned in this list.

Although a general infection of the whole plant can be effected by inoculation into the aerial parts, the field evidence, especially for solanaceous species, indicates that infection is normally from the soil into injured roots (the potato also by means of infected tubers). The recent occurrence of the disease on the Giant Fig banana in Trinidad was restricted to a plot on one plantation, although plantings from the same batch of suckers had been made at a number of other points in the island; infection from the soil appeared therefore to be indicated, and was the more probable because the susceptible "Moko" plantain had been abandoned many years ago as a temporary shade for cacao on this plantation owing to the disease. In 1911 Rorer recorded natural infection of the Chinese or Cavendish banana, in Trinidad, and inoculated it successfully with pure cultures of the bacterium; this variety is grown widely by the peasantry and appears now to be attacked rarely, but should the area in this variety be considerably extended there will be danger of spreading the disease in infected planting material.

I am much indebted to Dr. C. L. Withycombe for the photographs.

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IV.—THE GRASSES OF THE FIJI ISLANDS. V. S. SUMMERHAYES and C. E. HUBBARD.

The first collection of plants of any importance made in Fiji was that of the United States Exploring Expedition under the command of Commodore Wilkes in 1852, the plants being determined by Asa Gray. Other collections were made later and the whole was summed up in Seemann's admirable "Flora Vitiensis" published in 1865. In this he enumerates 19 species of *Gramineae*. Since then only isolated papers on the flora have appeared while some collections have not been dealt with critically at all. Since 1919, however, Mr. W. Greenwood has been collecting in the Islands and his plants are being dealt with at Kew. Among them are a large number of grasses, many of which are new to Fiji, the greater part of these being comparatively recent introductions while others are rarer indigenous species from the mountains. Since many of the former are becoming serious pests in the sugar plantations and cultivated ground generally, it has been thought useful to summarise our present knowledge of the grasses of Fiji in this paper. A simple key is provided to enable persons with only an elementary knowledge of botany to name the species encountered, while the principal economic uses of the species are given. The term "lemma" is used throughout the paper instead of "flowering glume." In all 59 species are here enumerated, a striking increase on the number in "Flora Vitiensis."

KEY TO SPECIES.

- Leaf-blade articulated with the sheath; Bamboos with woody culms *Schizostachyum* & *Bambusa* spp. (p. 44).
- Leaf-blade not or rarely articulated with the sheath:
- A. Male and female spikelets in separate inflorescences, or in different parts of the same inflorescence and of different appearance:

- Male spikelets in large terminal panicles; female spikelets in sheathed "cobs" in the axils of the lower leaves..... *Zea Mays* (p. 25).
- Male and female spikelets in the same inflorescence, the male at the ends of the branches, the female below them, or mixed:
- Female spikelets enclosed in an ovoid or globose ivory bead-like sheath; leaf-blades sessile, 1-2 in. broad; culms 3-6 ft. high *Coix Lacryma-Jobi* (p. 25).
- Female spikelets not as above, the ovary and palea enclosed in the inflated papery lemma; leaf-blades stalked, $\frac{1}{4}$ - $\frac{1}{2}$ in. wide; plant up to 2 $\frac{1}{2}$ ft. high..... *Leptaspis angustifolia* (p. 40).

AA. Spikelets all perfect, or male and perfect, in the latter case a male being near a perfect spikelet:

Spikelets arranged in solitary or paired spike-like racemes, each raceme or pair of racemes supported by a leaf-like spathe, forming a spatheate panicle:

Racemes solitary, in flattened heads; spikelets long-awned, awns about 1 $\frac{1}{2}$ in. long ... *Themeda quadrivalvis* (p. 31).

Racemes paired; spikelets awnless or very shortly awned:

Spikelets awnless; panicle linear, erect, loose; spathes green *Cymbopogon refractus* (p. 30).

Spikelets awned; panicles oblong, spreading, dense; spathes reddish-brown ... *Cymbopogon coloratus* (p. 30).

Spikelets not arranged in a spatheate panicle:

Spikelets enveloped by long silky hairs from the base and forming a silky panicle:

Culms 1 $\frac{1}{2}$ -4 ft. high; leaf-blades 6-12 in. long, $\frac{1}{2}$ - $\frac{1}{4}$ in. wide; panicle spike-like, cylindrical, 2-8 in. long...

Imperata cylindrica var. (p. 26).

Culms 6-20 ft. high; leaf-blades over 1 ft. long, over $\frac{1}{2}$ in. wide; panicle oval, spreading, over 1 ft. long:

Branches of panicle rather tough; stalks of spikelets spreading; spikelets $\frac{1}{2}$ in. long, awned.....

Miscanthus japonicus (p. 26).

Branches of panicle very fragile; stalks of spikelets adpressed; spikelets $\frac{1}{2}$ in. long, awnless.....

Saccharum officinarum (p. 26).

Spikelets not enveloped by long silky hairs from the base:

B. Spikelets sessile or very shortly stalked, crowded, forming unbranched spikes or spike-like racemes (which are sometimes much reduced), solitary or several clustered at the apex of the culm or scattered along a short axis:

C. Spikes or racemes solitary, or with very short axillary racemes (*Stenotaphrum*):

D. Spikelets closely adpressed to and partially or wholly sunk in cavities in the rhachis:

E. Spikelets $\frac{1}{6}$ - $\frac{1}{4}$ in. long, arranged in two rows on one side of the rhachis:

Leaves lanceolate, finely pointed; spikes slender; rhachis $\frac{1}{8}$ – $\frac{1}{4}$ in. wide; spikelets $\frac{1}{6}$ – $\frac{1}{8}$ in. long.....*Stenotaphrum subulatum* (p. 35).
 Leaves narrow, blunt; spikes stout; rhachis $\frac{1}{8}$ – $\frac{1}{3}$ in. wide; spikelets $\frac{1}{3}$ in. long.....*Stenotaphrum secundatum* (p. 35).
 EE. Spikelets $\frac{1}{4}$ – $\frac{1}{2}$ in. long, arranged in two rows on opposite sides of the rhachis; leaves finely pointed*Lepturus repens* (p. 44).
 DD. Spikelets not sunk in cavities in the rhachis:
 Spikelets each or two to three together surrounded by bristles:
 Bristles free at the base, glabrous, persistent.....*Setaria glauca* (p. 38).
 Bristles united at the base, the inner hairy, falling with the spikelet at maturity:
 Leaves 9–18 in. long; spikes 3–10 in. long; bristles fine, closely adpressed, not or hardly thickened at the base.....*Cenchrus calyculatus* (p. 39).
 Leaves 3–9 in. long; spikes 1–3 in. long; bristles stout, spreading, much thickened at the base.....*Cenchrus echinatus* (p. 39).
 Spikelets not surrounded by bristles:
 Spikelets awnless; spike partially or wholly enclosed in uppermost leaf.....*Thuarea involuta* (p. 39).
 Spikelets awned; raceme exserted:
 Spikelets all awned, awns $\frac{1}{2}$ –1 in. long.....*Dichanthium caricosum* (p. 29).
 Spikelets in lower part of raceme awnless; awns of upper spikelets 2–4 in. long.....*Heteropogon contortus* (p. 30).
 CC. Spikes or racemes paired, digitate or scattered:
 F. Racemes symmetrical (i.e. not one-sided):
 Racemes 1–3 together at the apex of the culm; spikelets $\frac{1}{4}$ – $\frac{1}{2}$ in. long:
 Sessile spikelets with broad, blunt, almost flat lower glumes, shortly hairy; leaves usually glabrous.....*Dichanthium caricosum* (p. 29).
 Sessile spikelets with narrow, pointed, convex lower glumes, glabrous; leaves shortly hairy.....*Ischaemum aristatum* (p. 25).
 Racemes 3 or more, spikelets $\frac{1}{4}$ – $\frac{1}{2}$ in. long:
 Panicle 4–9 in. long; lower glume of sessile spikelets pitted....*Amphilophis glabra* (p. 29).
 Panicle $1\frac{1}{2}$ –3 in. long; lower glume of sessile spikelet not pitted:

Leaves narrow, up to 1 ft. long; racemes bare at the base; lower glume not grooved.....*Dichanthium annulatum* (p. 29).

Leaves narrow-lanceolate, $1\frac{1}{2}$ – $3\frac{1}{2}$ in. long; racemes with spikelets right to the base; lower glume grooved.....*Pollinia glabrata* (p. 28).

FF. Spikes and racemes one-sided:

Spikelets awned:

Racemes clustered at the apex of the culm:

Culms erect, 1–3 ft. high; spikes 6–10; spikelets wedge-shaped.....*Chloris truncata* (p. 42).

Culms creeping, up to 15 in. high; spikes 3–6; spikelets narrowly oblong*Chloris cynodontoides* (p. 43).

Racemes scattered:

Racemes elongated; leaf-blades $\frac{1}{4}$ – $\frac{3}{4}$ in. wide: Racemes longer than the internode between them; spikelets loose.....*Oplismenus compositus* (p. 37).

Racemes shorter than the internode between them; spikelets contiguous*Oplismenus hirtellus* (p. 37).

Racemes reduced to sessile clusters; leaf-blades $\frac{1}{4}$ – $\frac{1}{2}$ in. wide*Oplismenus imbecillis* (p. 37).

Spikelets awnless:

Spikelets breaking up at maturity, leaving the glumes on the stalks:

Spikelets 1-flowered, $\frac{1}{2}$ in. long; low, creeping, perennial grass...*Cynodon Dactylon* (p. 42).

Spikelets 3–6-flowered, $\frac{1}{4}$ – $\frac{1}{2}$ in. long; erect, annual grass.....*Eleusine indica* (p. 43).

Spikelets falling entire from their stalks at maturity, always 2-flowered, the lower flower male or barren:

G. Racemes paired or clustered at the apex of the culm:

H. Racemes paired; lower glume absent:

Racemes 2–6 in. long; spikelets $\frac{1}{4}$ in. long, elliptical, blunt, hairy*Paspalum conjugatum* (p. 34).

Racemes $\frac{1}{2}$ – $1\frac{1}{2}$ in. long; spikelets about $\frac{1}{8}$ in. long, ovate, acute, glabrous.....*Paspalum vaginatum* (p. 34).

HH. Racemes clustered (more than two):
 Lower glume absent; leaves blunt;
 sheaths much compressed.....
Axonopus compressus (p. 33).
 Lower glume present although very small;
 leaves acute; sheaths slightly com-
 pressed;
 Spikelets about $\frac{1}{8}$ in. long.....
Digitaria pruriens (p. 31).
 Spikelets $\frac{1}{4}$ – $\frac{1}{6}$ in. long:
 Culms usually erect; leaf-blades
 $1\frac{1}{4}$ –6 in. long; racemes $2\frac{1}{2}$ – $4\frac{1}{2}$ in.
 long; fruiting glume (lemma)
 black...*Digitaria chinensis* (p. 32).
 Culms creeping and ascending; leaf-
 blades $\frac{1}{4}$ – $1\frac{1}{4}$ in. long; racemes
 1–2 in. long; fruiting glume
 (lemma) pale.....
Digitaria longiflora (p. 31).
 GG. Racemes scattered:
 Stalks of spikelets swollen and darkened at
 the tips*Eriochloa ramosa* (p. 32).
 Stalks not swollen or darkened at the tips:
 Racemes short, $\frac{1}{4}$ –1 in. long, slightly
 shorter to slightly longer than the
 internodes...*Echinochloa colona* (p. 36).
 Racemes $\frac{3}{4}$ –3 in. long, usually much
 longer than the internodes:
 Racemes 8 or more:
 Culms 3–8 ft. high; leaves narrow, up
 to 1 ft. long; panicle 4–8 in. long;
 spikelets $\frac{1}{8}$ in. long.....
Brachiaria mutica (p. 33).
 Culms 6–18 in. long; leaves lanceo-
 late, $\frac{1}{2}$ – $2\frac{1}{2}$ in. long; panicle 1–3
 in. long; spikelets $\frac{1}{8}$ – $\frac{1}{12}$ in.
 long.....*Urochloa reptans* (p. 35).
 Racemes rarely 7, usually fewer:
 Racemes 2–4 in. long; spikelets silky-
 hairy on margins, elliptical,
 acute *Paspalum dilatatum* (p. 34).
 Racemes $\frac{3}{4}$ – $2\frac{1}{2}$ in. long; spikelets
 glabrous:
 Spikelets orbicular, rounded at apex,
 brownish, $\frac{1}{12}$ in. long.....
Paspalum orbiculare (p. 34).
 Spikelets narrowly oblong-elliptical
 or ovate-oblong, not rounded,
 $\frac{1}{8}$ – $\frac{1}{4}$ in. long:

Leaves glabrous; spikelets widest
 towards tip; upper lemma
 rounded
Brachiaria distachya (p. 32).
 Leaves hairy; spikelets oblong-
 lanceolate; upper lemma
 with a fine point.....
Urochloa paspaloides (p. 36).

BB. Spikelets all or some stalked, more or less loose, forming
 an open or contracted panicle:
 Spikelets large, $\frac{1}{4}$ – $\frac{1}{2}$ in. long, 1-flowered, very much
 compressed except when in fruit; glumes very small
Oryza sativa (p. 40).

Spikelets not having the above characters in com-
 bination:

K. Spikelets all awnless (also rarely so in *Garnotia*):
 Spikelets bulging on one side, more or less com-
 pressed, $\frac{1}{8}$ – $\frac{1}{12}$ in. long, brownish.....
Cyrtococcum oxyphyllum (p. 38).

Spikelets symmetrical or nearly so:
 Leaves broadly lanceolate; lemmas usually spiny
Centotheca latifolia (p. 43).

Leaves narrow to narrowly lanceolate:
 Spikelets 3–12-flowered (rarely 2-flowered):
 Panicle closely branched; branches short;
 spikelets oblong; keels of paleas shortly
 hairy*Eragrostis plumosa* (p. 42).
 Panicle very loose and wavy; branches
 long; spikelets narrow; paleas glabrous
Eragrostis pilosa (p. 42).

Spikelets 1–2-flowered:
 Spikelets prickly-warty
Vetiveria zizanioides (p. 28).

Spikelets smooth:
 L. Spikelets 2-flowered, falling entire from
 their stalks at maturity; fruiting
 glume (lemma) hard and enclosing
 grain:

Lemmas similar in texture and shape;
 spikelets $\frac{1}{8}$ in. long, on very short
 stalks (rarely longer than the spike-
 lets); panicle-axis shortly hairy
Isachne vitiensis (p. 40).

Lemmas different in texture and shape,
 the lower resembling the upper
 glume; spikelets $\frac{1}{12}$ – $\frac{1}{8}$ in. long, on
 stalks longer than the spikelets;
 panicle-axis glabrous:

HH. Racemes clustered (more than two):
 Lower glume absent; leaves blunt;
 sheaths much compressed.....
Axonopus compressus (p. 33).
 Lower glume present although very small;
 leaves acute; sheaths slightly com-
 pressed:
 Spikelets about $\frac{1}{2}$ in. long.....
Digitaria pruriens (p. 31).
 Spikelets $\frac{1}{4}$ – $\frac{1}{2}$ in. long:
 Culms usually erect; leaf-blades
 $1\frac{1}{2}$ –6 in. long; racemes $2\frac{1}{2}$ – $4\frac{1}{2}$ in.
 long; fruiting glume (lemma)
 black...*Digitaria chinensis* (p. 32).
 Culms creeping and ascending; leaf-
 blades $\frac{1}{4}$ – $1\frac{1}{4}$ in. long; racemes
 1–2 in. long; fruiting glume
 (lemma) pale.....
Digitaria longiflora (p. 31).
 GG. Racemes scattered:
 Stalks of spikelets swollen and darkened at
 the tips*Eriochloa ramosa* (p. 32).
 Stalks not swollen or darkened at the tips:
 Racemes short, $\frac{1}{4}$ –1 in. long, slightly
 shorter to slightly longer than the
 internodes...*Echinochloa colona* (p. 36).
 Racemes $\frac{3}{4}$ –3 in. long, usually much
 longer than the internodes:
 Racemes 8 or more:
 Culms 3–8 ft. high; leaves narrow, up
 to 1 ft. long; panicle 4–8 in. long;
 spikelets $\frac{1}{2}$ in. long.....
Brachiaria mutica (p. 33).
 Culms 6–18 in. long; leaves lanceo-
 late, $\frac{1}{2}$ – $2\frac{1}{2}$ in. long; panicle 1–3
 in. long; spikelets $\frac{1}{2}$ – $1\frac{1}{2}$ in.
 long.....*Urochloa reptans* (p. 35).
 Racemes rarely 7, usually fewer:
 Racemes 2–4 in. long; spikelets silky-
 hairy on margins, elliptical,
 acute...*Paspalum dilatatum* (p. 34).
 Racemes $\frac{3}{4}$ – $2\frac{1}{2}$ in. long; spikelets
 glabrous:
 Spikelets orbicular, rounded at apex,
 brownish, $\frac{1}{12}$ in. long.....
Paspalum orbiculare (p. 34).
 Spikelets narrowly oblong-elliptical
 or ovate-oblong, not rounded,
 $\frac{1}{2}$ – $\frac{1}{4}$ in. long:

Leaves glabrous; spikelets widest
 towards tip; upper lemma
 rounded
Brachiaria distachya (p. 32).
 Leaves hairy; spikelets oblong-
 lanceolate; upper lemma
 with a fine point.....
Urochloa paspaloides (p. 36).

BB. Spikelets all or some stalked, more or less loose, forming
 an open or contracted panicle:
 Spikelets large, $\frac{1}{4}$ – $\frac{1}{2}$ in. long, 1-flowered, very much
 compressed except when in fruit; glumes very small
Oryza sativa (p. 40).
 Spikelets not having the above characters in com-
 bination:
 K. Spikelets all awnless (also rarely so in *Garnotia*):
 Spikelets bulging on one side, more or less com-
 pressed, $\frac{1}{8}$ – $\frac{1}{2}$ in. long, brownish.....
Cyrtococcum oxyphyllum (p. 38).
 Spikelets symmetrical or nearly so:
 Leaves broadly lanceolate; lemmas usually spiny
Centotheca latifolia (p. 43).
 Leaves narrow to narrowly lanceolate:
 Spikelets 3–12-flowered (rarely 2-flowered):
 Panicle closely branched; branches short;
 spikelets oblong; keels of paleas shortly
 hairy*Eragrostis plumosa* (p. 42).
 Panicle very loose and wavy; branches
 long; spikelets narrow; paleas glabrous
Eragrostis pilosa (p. 42).
 Spikelets 1–2-flowered:
 Spikelets prickly-warty
Vetiveria zizanioides (p. 28).
 Spikelets smooth:
 L. Spikelets 2-flowered, falling entire from
 their stalks at maturity; fruiting
 glume (lemma) hard and enclosing
 grain:
 Lemmas similar in texture and shape;
 spikelets $\frac{1}{8}$ in. long, on very short
 stalks (rarely longer than the spike-
 lets); panicle-axis shortly hairy
Isachne vitiensis (p. 40).
 Lemmas different in texture and shape,
 the lower resembling the upper
 glume; spikelets $\frac{1}{2}$ – $\frac{1}{4}$ in. long, on
 stalks longer than the spikelets;
 panicle-axis glabrous:

- Culms to over 10 ft. high; leaf-blade margins rough; spikelets blunt, $\frac{1}{8}$ – $\frac{1}{4}$ in. long.....
Panicum maximum (p. 37).
- Culms 2–4 ft. high; leaf-blade margins smooth; spikelets pointed, $\frac{1}{12}$ – $\frac{1}{8}$ in. long.....
Panicum decompositum (p. 37).
- LL. Spikelets 1-flowered, breaking up at maturity leaving the glumes on their stalks; fruiting glume (lemma) delicate with the grain free:
 Panicle dense; branches erect, with spikelets right to the base; spikelets $\frac{1}{8}$ – $\frac{1}{2}$ in. long.....
Sporobolus indicus (p. 41).
- Panicle loose; branches spreading, naked at the base; spikelets $\frac{1}{20}$ – $\frac{1}{16}$ in. long.....
Sporobolus diander (p. 41).
- KK. Spikelets all, or at least some of them, awned:
 Spikelets in threes, one sessile, two stalked, each shortly bearded at the base with brown hairs
Chrysopogon aciculatus (p. 28).
- Spikelets solitary, paired or if clustered then glabrous:
 Spikelets long hairy, bulging on the sides.....
Rhynchelythrum Dregeanum (p. 38).
- Spikelets shortly hairy or glabrous, not bulging:
 Spikelets delicate, $\frac{1}{8}$ – $\frac{1}{4}$ in. long; culms weak, 1–3 ft. long*Garnotia stricta* (p. 41).
- Spikelets firm or hardened; tall, slender to coarse grasses, usually over 3 ft. high:
 Annual; leaf-blades $1\frac{1}{2}$ –3 in. wide; spikelets elliptic-ovate, obtuse.....
Sorghum bicolor (p. 27).
- Perennial; leaf-blades $\frac{1}{2}$ – $\frac{3}{4}$ in. wide; spikelets narrow- to lanceolate-oblong, acute:
 Sessile spikelets $\frac{1}{8}$ in. long, $\frac{1}{12}$ in. wide, oblong-lanceolate; branches of panicle divided.....*Sorghum halepense* (p. 27).
- Sessile spikelets $\frac{1}{8}$ in. long, less than $\frac{1}{4}$ in. wide, narrowly lanceolate; branches of panicle simple, rarely divided.....
Amphilophis glabra (p. 29).

In the following enumeration when there are more than one species in a genus, characters of generic value are given usually in

the description of the first species only. In a few cases such characters are given separately at the beginning. Only such synonymy as seems necessary is given.

1. COIX Linn.

C. Lacryma -Jobi Linn. Sp. Pl. ed. i. 972; Seem. Fl. Vit. 326.

Erect annual. Culms stout, 3–6 ft. high. Leaves smooth, glabrous; blades narrowly lanceolate, 4–18 in. long, 1–2 in. wide. Spikelets unisexual in terminal and axillary spike-like racemes; male inflorescence $\frac{1}{2}$ – $1\frac{1}{2}$ in. long, with spikelets $\frac{1}{4}$ – $\frac{1}{2}$ in. long in groups of two or three, of which one is sessile and the others stalked, on a slender rhachis protruding from a shining, white or bluish, globose or ovoid, ivory bead-like sheath $\frac{1}{4}$ – $\frac{1}{2}$ in. long, which encloses the female spikelet.

Viti Levu: Mts. near Lautoka, 900 ft., Jan., Greenwood, 186! Taveuni: Somosomo, May, Seemann, 692! Ngau: Sept., Milne 176! Ovalau: Wilkes! Matuku: Challenger Exped., July, Moseley! (Herb. Mus. Brit.). Without definite locality: Nov., Harvey! (Herb. Mus. Brit.). Home! (Herb. Mus. Brit.). Swamps, near streams, edges of creeks, on open hill-sides, etc., common, 800–1500 ft. (Greenwood).

Native in Tropical Asia; cultivated or as a weed in the tropics and in some warm temperate countries.

In India this grass is used as fodder for cattle. The false fruits are used as beads for decorative purposes, and one variety with thin shells is an important cereal in Burma, etc.

Vern. Names: "Job's Tears," Sila (Fiji).

2. ZEA Linn.

Z. Mays Linn. Sp. Pl. ed. i. 971.

Stout annual, 10–16 ft. high. Leaf-blades narrowly lanceolate, to over 3 ft. long and 4 in. wide, the tips usually drooping. Spikelets unisexual in different inflorescences; male spikelets in large terminal panicles up to 8 in. long composed of spike-like racemes; the female in 4–11 longitudinal rows on the axis of stout, sheathed "cobs" of varying size borne in the axils of the lower leaves, with the styles projecting as long silky tassels.

An important cereal and fodder plant of American origin, cultivated generally by the white settlers. For information on cultivation, etc., see Montgomery, Corn Crops (1913) 1–275; Burt Davy, Maize (1914).

Vern. Names: "Maize" or "Indian Corn." Sila ni papalagi (Fiji).

3. ISCHAEMUM Linn.

I. aristatum Linn. Sp. Pl. ed. i. 1049. *I. ciliare* Retz. Obs. vi. 36.

Perennial. Culms 2–5 ft. high, nodes bearded. Leaf-sheaths loose, hairy; blades narrow, 6–12 in. long, shortly hairy.

Spikelets paired, one sessile, the other stalked, on the hairy, jointed rachis of paired, $1\frac{1}{2}$ –2 in. long spike-like racemes, falling at maturity with the joints and stalks. Spikelets all alike, $\frac{1}{8}$ in. long, 2-flowered, lower male, upper perfect, purplish, glabrous, awned, awn $\frac{1}{2}$ in. long; glumes coriaceous; lemmas membranous.

Vanua Levu: Tabacola near Lambasa, May, *W. E. Lindsay in Herb. Greenwood*, 590!

Tropical Asia and Malaya.

Said to have first appeared near Lambasa about 4 years previously, i.e. in 1919. May quite possibly become a pest in cane lands.

4. IMPERATA Cyr.

I. cylindrica Beauv. Agrost. 165, var. **Koenigii** Dur. & Schinz Consp. Fl. Afr. v. 694. *I. arundinacea* Seem. Fl. Vit. 322.

Tufted perennial. Culms $1\frac{1}{2}$ –4 ft. high. Basal leaf-blades narrow, 6–12 in. long, $\frac{1}{2}$ – $\frac{3}{4}$ in. wide, upper shorter. Spikelets paired, unequally stalked, on the continuous branches of a silvery, silky, cylindrical, spike-like panicle 2–8 in. long; spikelets falling entire at maturity, all alike, $\frac{1}{8}$ – $\frac{1}{6}$ in. long, 2-flowered, lower floret barren, upper perfect, awnless, enveloped by long silky hairs from the base.

Viti Levu: Lautoka, Apr., *Greenwood*, 32! Vanua Levu: *Wilkes*! Wakaya: Oct., *Milne*, 397! Ngau: Sept., *Milne*, 176! Oct., *Milne*, 218! Viti Levu, Ovalau & Koro: without definite locality, *Horne*, 203! Common, in waste places, on the edges of drains and on well-drained dry slopes.

Tropical Africa and Asia, Malaya and Polynesia.

Of little or no agricultural value. It is a pestilent weed on cultivated ground, and when once established is extremely difficult to eradicate. "Spreads like couch-grass" (*Horne*).

5. MISCANTHUS Anderss.

M. japonicus Anderss. in Oefv. Vet. Akad. Stockh. 1855, 166.

Perennial. Culms 6–15 ft. high, stout. Leaf-blades narrow, $1\frac{1}{2}$ –3 ft. long, $\frac{3}{4}$ – $1\frac{1}{4}$ in. wide, glabrous, margins rough. Spikelets paired, unequally stalked, on the continuous or obscurely jointed, slender branches of a broad oblong or oval panicle 1– $1\frac{1}{2}$ ft. long; spikelets falling entire at maturity, all alike, lanceolate, $\frac{1}{2}$ in. long, 2-flowered, lower floret barren, upper perfect, enveloped by long silky hairs from the base, usually awned, awn $\frac{1}{2}$ – $\frac{3}{4}$ in. long.

Viti Levu: Lautoka, Feb., *Greenwood*, 277! Common, all over mountain slopes and in swamps, nearly to sea-shore.

China, Japan, Malaya and Polynesia.

Periodically burnt off by natives to get at wild yams (*Greenwood*).

6. SACCHARUM Linn.

S. officinarum Linn. Sp. Pl. ed. i. 54; Seem. Fl. Vit. 321. *Eulalia japonica* Seem. Fl. Vit. 321 (as to the Fiji specimens), non Trin.

Perennial. Culms stout, solid, 6–20 ft. high. Leaf-blades up to 5 ft. long and $2\frac{1}{2}$ in. wide. Spikelets paired, one sessile, the other stalked, on the jointed fragile branches of a very large, dense, oval panicle; spikelets falling entire at maturity, all alike, narrowly oblong, nearly $\frac{1}{2}$ in. long, 2-flowered, lower floret barren, upper perfect, awnless, enveloped by long silky hairs from the base.

Taveuni: Somosomo, May, *Seemann*, 691! Also on Vanua Levu according to *Seemann*. Without exact locality: *Horne*, 701! Occurs all over the group, often apparently wild, but also now cultivated extensively.

Tropics generally, cultivated.

Natives employ juice for sweetening their puddings (*Seemann*).

Vern. Names: Dovu (*Seemann*); Vico (*Horne*).

7. SORGHUM Pers.

S. bicolor Moench. Meth. 207.

Annual. Culms stout, up to 14 ft. high. Leaf-blades narrowly lanceolate, up to 22 in. long, $1\frac{1}{2}$ –3 in. wide. Spikelets paired, dissimilar, one sessile, the other stalked, on the tough branches of dense, narrowly oblong panicles 3–10 in. long, by 2– $3\frac{1}{2}$ in. wide; spikelets falling entire at maturity, 2-flowered, the upper floret of the sessile spikelet alone perfect, the remainder male or barren. Sessile spikelet $\frac{1}{2}$ in. long by $\frac{1}{8}$ in. wide, elliptic-ovate, shortly hairy, straw-coloured with brownish tips, awned, awn $\frac{1}{2}$ in. long. Stalked spikelets narrow, $\frac{1}{4}$ – $\frac{1}{2}$ in. long, reddish-brown.

Taveuni: cultivated, *Seemann*, 689!

Cultivated in tropical and subtropical regions.

S. halepense Pers. Syn. i. 101. *Andropogon halepensis* Brot. Fl. Lusit. i. 89.

Perennial from a long rhizome. Culms slender to moderately stout, $1\frac{1}{2}$ –4 ft. high. Leaf-blades narrow, 6–20 in. long, $\frac{1}{4}$ – $\frac{3}{4}$ in. wide. Panicle narrowly ovate or oblong, 5–12 in. long, 1– $2\frac{1}{2}$ in. wide, more or less dense. Sessile spikelets oblong-lanceolate, about $\frac{1}{2}$ in. long, $\frac{1}{2}$ in. wide, straw-coloured to purplish, shortly hairy, awn $\frac{1}{2}$ in. long. Stalked spikelets lanceolate, $\frac{1}{2}$ – $\frac{3}{4}$ in. long, pale to deep purple.

Viti Levu: Lautoka, June, *Greenwood*, 302!

Occurs in most warm temperate and subtropical countries.

Occasionally grown as a fodder grass in America, etc., but is difficult to eradicate when once established. Originally imported into Fiji about 1905, to supply feed for stock. Although at first difficult to grow it later spread rapidly and is now a troublesome pest in cane land in the Ba district. It also occurs occasionally in Wadi district. It grows along railway lines and seeds are carried along by passing trains, and swept out elsewhere.

Vern. Name: "Johnson Grass".

8. VETIVERIA Thouars.

V. zizanioides Nash in Small Fl. S.E. U.S., 67.

Perennial from a stout rhizome. Culms stout, up to 9 ft. high. Leaf-sheaths compressed, especially at the base; blades narrow, 1-3 ft. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, glabrous. Spikelets paired, nearly alike, one sessile, the other stalked, on the jointed, fragile, whorled branches of an oblong, usually contracted panicle up to 1 ft. or more long; spikelets falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect, the remainder male or barren. Sessile spikelet narrowly lanceolate, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, purplish, awnless; glumes with minute prickly warts, those of the stalked spikelets almost smooth.

Viti Levu: Lautoka, Apr., *Greenwood*, 228!

Native in Tropical Asia.

Cultivated on account of aromatic rhizomes in many parts of the Tropics. The source of Vetiver Oil. "Planted as a border to paths up to houses but has been thrown on rubbish heaps and become established and now quite naturalised" (*Greenwood*).

Vern. Name: "Vetiver Grass".

9. CHRYSOPOGON Trin.

C. aciculatus Trin. Fund. Agrost. 188. *Andropogon aciculatus* Retz. Obs. v. 22; Seem. Fl. Vit. 320.

Perennial. Culms erect from a creeping base, slender, 1-2 ft. high. Leaves densely tufted; blades 1-5 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, obtuse or acute, glabrous. Spikelets in threes at the ends of the branchlets of a narrow, 1-3 in. long panicle, one sessile, the others stalked, falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect. Sessile spikelets $\frac{1}{8}$ in. long, narrowly lanceolate, shortly bearded at the base with brown hairs, awned, awn $\frac{1}{8}$ - $\frac{1}{2}$ in. long. Stalked spikelets $\frac{1}{4}$ in. long.

Viti Levu: Lautoka, Feb., *Greenwood*, 17! Taveuni: June, *Seemann*, 686! Ovalau: Oct., *Milne*, 280! Also in Vanua Levu and Lakemba (*Seemann*). In dry sunny places (*Seemann*), and waste places on high grounds (*Milne*). Not frequent.

Tropical Asia, Australia and Polynesia.

10. POLLINIA Trin.

P. glabrata Trin. in Bull. Acad. St. Pétersb. i. (1836) 70.

Weak, straggling, branched, glabrous annual. Culms up to 4 ft. long, slender, many-jointed. Leaf-blades narrowly lanceolate, finely pointed, rounded at the base, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide. Spikelets paired, alike, one sessile, the other stalked, on the fragile rhachis of 4-9 very slender, glabrous, spreading, spike-like racemes forming a panicle $1\frac{1}{2}$ -3 in. long; spikelets falling entire at maturity, $1\frac{1}{2}$ - $1\frac{1}{4}$ in. long, 2-flowered, lower floret of sessile spikelet alone

perfect, remainder male or barren, awned, awn very fine, flexuous, up to $\frac{1}{2}$ in. long; lower glume grooved.

Viti Levu: Mt. Evans, falls, 2000 ft., May, *Greenwood*, 223! Lautoka, on mountains, 800 ft., May, *Greenwood*, 716! Vanua Levu: mountains on Mathuata coast, in shade at edge of forest, 400 ft., May, *Greenwood*, 673!

Polynesia and Philippine Islands.

11. AMPHILOPHIS Nash.

A. glabra Stapf in Prain Fl. Trop. Afr. ix. 172. *Andropogon glaber* Roxb. Fl. Ind. i. 271.

Erect tufted perennial. Culms moderately stout, to over 3 ft. high. Leaf-blades narrow, to more than 1 ft. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, finely pointed, margins rough. Spikelets paired, one sessile, the other stalked, on the fragile, jointed rhachis of several shortly stalked, slender racemes, forming a narrowly oblong, purplish panicle 4-9 in. long, $1-1\frac{1}{2}$ in. wide. Racemes $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, obscurely hairy. Spikelets falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect. Sessile spikelets narrowly lanceolate, $\frac{1}{8}$ in. long, awned, awn $\frac{1}{4}$ - $\frac{1}{2}$ in. long; lower glume pitted. Stalked spikelet $\frac{1}{8}$ in. long, awnless.

Viti Levu: Lautoka, Jan., *Greenwood*, 1! Vanua Levu: Lambasa, 100 ft., Aug., *Greenwood*, 1 A!

Tropical Asia, Tropical and South Africa, Madagascar, N.E. Australia and Polynesia.

12. DICHANTHIUM Willemet.

D. caricosum A. Camus in Lecomte Fl. Gen. l'Indo-Chine vii. 318. *Andropogon caricosus* Linn. Sp. Pl. ed. ii. 1480.

Perennial. Culms erect from a creeping base, 1-3 ft. high, nodes usually glabrous. Leaf-blades $1\frac{1}{2}$ -8 in. long, $\frac{1}{10}$ - $\frac{1}{4}$ in. wide, finely pointed. Spikelets paired, one sessile, the other stalked, on the many-jointed rhachis of 1-3 purplish, wavy racemes 1-4 in. long. Spikelets falling entire at maturity, 2-flowered, the upper floret of the sessile spikelet alone perfect, closely overlapping, broadly oblong, obtuse, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, $\frac{1}{12}$ in. wide, shortly hairy, awned, awn $\frac{1}{2}$ -1 in. long. Stalked spikelets awnless.

Vanua Levu: Lambasa, fairly common in moist places, June, *Greenwood*, 594!

Tropical Asia, Malaya and New Caledonia.

D. annulatum Stapf in Prain Fl. Trop. Afr. ix. 178. *Andropogon annulatus* Forsk. Fl. Aegypt. Arab. 173.

Differs from *D. caricosum* as follows:—Culms densely tufted, to over 3 ft. high, nodes usually long bearded. Racemes 3-9, rarely fewer. Spikelets narrowly oblong, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, $\frac{1}{12}$ in. wide.

Viti Levu: Lautoka, sea level, June, *Greenwood*, 720!

India, China, Africa, Australia and Polynesia.

Considered good fodder in India.

13. CYMBOPOGON Spreng.

C. refractus A. Camus in Bull. Mus. Hist. Nat. Paris, xxviii. 108. *Andropogon refractus* R. Br. Prod. i. 202; Seem. Fl. Vit. 320.

Densely tufted perennial. Culms erect, 2-5 ft. high. Leaf-sheaths up to 4 in. long; blades narrow, up to 1 ft. long, $\frac{1}{2}$ - $\frac{1}{8}$ in. wide. Spikelets paired, dissimilar, one sessile, the other stalked, on the fragile, jointed rhachis of paired spike-like racemes, each pair of racemes supported by a pale green, leafy bract $\frac{3}{4}$ -1 in. long and collected into a narrow, erect, loose panicle 5-12 in. long. Racemes $\frac{1}{2}$ - $\frac{2}{3}$ in. long, spreading or reflexed. Spikelets falling entire at maturity, 2-flowered, the upper floret in the sessile spikelet alone perfect; sessile spikelets $\frac{1}{2}$ - $\frac{1}{4}$ in. long.

Viti Levu: Lautoka, mts., Dec., *Greenwood*, 178! 700 ft., Dec., *Greenwood*, 178 A! Vanua Levu: Mathuata Coast, Oct., *Seemann*, 685! Without definite locality: *Horne*, 637! Also on Lakemba (*Seemann*). Common on sunny, dry, open hillsides.

Australia and Polynesia.

C. coloratus Stapf in Kew Bull. 1906, 356.

Differing from *C. refractus* by the following:—Culms over 4½ ft. high, stout. Lower leaf-sheaths about 1 ft. long; blades 6 in. or more long. Panicle dense, spreading, 9-30 in. long; racemes very numerous, $\frac{1}{2}$ - $\frac{1}{2}$ in. long, slightly diverging; leafy bracts $\frac{1}{2}$ - $\frac{1}{2}$ in. long, reddish-brown. Sessile spikelets $\frac{1}{2}$ in. long.

Without definite locality: Comm. Imperial Institute, 30837!

A native of India.

One of the Lemon Oil Grasses. Introduced and cultivated in the islands, and possibly the same species as referred to by *Seemann* in Fl. Vit. 320.

Vern. Names: Coboi (Fiji), "Lemon Grass".

14. HETEROPOGON Pers.

H. contortus Beauv. ex Roem. & Schult. Syst. Veg. ii. 836. *Andropogon contortus* Linn. Sp. Pl. ed. i. 1045.

Tufted perennial. Culms erect or ascending, often branched. Leaf-sheaths keeled; blades narrow, 3-9 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, acute or obtuse. Spikelets 2-flowered, paired, one sessile, the other stalked, on the jointed rhachis of solitary racemes 1-3 in. long. Basal part of racemes composed of 3-10 pairs of awnless, similar, persistent, male or barren spikelets, and the upper part of to 12 pairs of dissimilar, deciduous, awned spikelets with the upper floret of the sessile spikelet alone perfect; awn bent, 2-4 in. long, dark brown.

Viti Levu: Lautoka, Sept., *Greenwood*, 97! Wakaya: Oct., *Milne*, 401! Abundant on waste ground (*Milne*).

Tropical and sub-tropical regions.

It is a good fodder when young and tender, but troublesome and even dangerous when mature on account of the sharp-pointed bases of the spikelets. Hay which has been made from it keeps for many years. The stems are used as a fibre in the manufacture of coarse mats, and for thatching in India.

15. THEMEDA Forsk.

T. quadrivalvis O. Ktze. Rev. Gen. Pl. ii. 794. *Anthistiria ciliata* Linn. f. Suppl. 113.

Annual. Culms up to 5 ft. high. Leaf-blades narrow, up to 1 ft. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. wide, glabrous or fringed with hairs. Spikelets paired, the lowest two pairs alike, sessile, sterile, persistent, forming a false cup in which are inserted one or two pairs of spikelets of different appearance, one of each pair sessile and fertile, the other stalked and sterile, the whole forming a solitary raceme supported by a leafy bract, terminating the branches and branchlets of a leafy panicle 6-12 in. long. Fertile spikelets cylindrical, $\frac{1}{2}$ in. long, awned, awn about 1½ in. long. Lower sessile spikelets compressed, $\frac{1}{2}$ in. long; glumes with warty-based hairs.

Viti Levu: Lautoka, edge of road, Oct., and Apr., *Greenwood*, 137! "Only two plants seen. Looks like a very recent introduction" (*Greenwood*).

A native of India, where it is used for fodder.

16. DIGITARIA Hall.

D. pruriens Buese in Miq. Pl. Jungh. 379. ?*Panicum sanguinale* Seem. Fl. Vit. 325.

Perennial. Culms erect or ascending from a creeping base, 6-36 in. high. Leaf-sheaths usually hairy; blades narrowly lanceolate, 3-8½ in. long (rarely shorter), $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, margins thickened. Spikelets all alike, paired, unequally stalked, on one side of and with the lower glume turned away from the three-angled rhachis of 3-13 spike-like racemes 3-6½ in. long. Spikelets 2-flowered, the upper floret only perfect, falling entire at maturity, awnless, lanceolate, $\frac{1}{2}$ in. long; lemma of fertile floret of firmer texture than the glumes, pale.

Viti Levu: Lautoka, Sept., *Greenwood*, 96! Apr., *Greenwood*, 23! In mountains at 700 ft., Dec., *Greenwood*, 407! Vanua Levu: Lambasa, Aug., *Greenwood*, 467! Ovalau: Oct., *Milne*, 277! Nairai: Nov., *Milne*, 164! Without definite locality: *Horne*, 326! *Wilkes*! Open fields, waste places and cultivated ground. Frequent everywhere.

India, Malaya and Polynesia.

D. longiflora Pers. Syn. i. 85.

Differing from *D. pruriens* by the following:—Creeping perennial grass, with ascending culms 4-12 in. high. Leaves glabrous; blades

lanceolate, $\frac{1}{4}$ – $1\frac{1}{4}$ in. long, $\frac{1}{2}$ – $\frac{1}{8}$ in. wide, rather stiff. Racemes 2–3, slender, 1–2 in. long. Spikelets ovate-lanceolate, about $\frac{1}{16}$ in. long, whitish; fruiting floret ellipsoid, white.

Viti Levu: Lautoka, very common, Jan., *Greenwood*, 187!

Tropical and South Africa, Mascarene Is., Tropical Asia, Australia and Polynesia.

Excellent sward in wet season, but dies out in May and June and gets very thin (*Greenwood*).

D. chinensis Hornem. Hort. Hafn. Suppl. 8. *Paspalum filiforme* Rendle in Journ. Linn. Soc. Bot. xxxix. 181.

Similar to *D. longiflora* and differing from that and the first species in being a tufted perennial with erect or ascending culms 9–24 in. high. Leaves glabrous; blades narrowly lanceolate, $\frac{1}{4}$ –6 in. long, $\frac{1}{2}$ – $\frac{1}{8}$ in. wide. Racemes 2–5, $2\frac{1}{2}$ – $4\frac{1}{2}$ in. long. Spikelets ovate-lanceolate, $\frac{3}{4}$ – $1\frac{1}{8}$ in. long; fruiting floret oblong, acute, black.

Viti Levu: Lautoka, common on open hillsides, 600 ft., Jan., *Greenwood*, 185! Nandarivatu, land under cultivation, 2700 ft., Sept., *Gibbs*, 867! (Herb. Mus. Brit.).

India, Indochina, Malaya, China, Japan and Korea. A recent introduction to Fiji (Rendle).

17. ERIOCHLOA H.B. & K.

E. ramosa O. Ktze. Rev. Gen. Pl. ii. 775.

Tufted, almost glabrous annual. Culms up to 2 ft. or more high. Leaf-blades narrow, 2–6 in. long, $\frac{1}{8}$ – $\frac{1}{2}$ in. wide, smooth. Spikelets alike, paired or solitary and falling entire from their stalks (the latter with thickened black tips), in two rows on one side of the three-angled rhachis of usually numerous, erect or drooping spike-like racemes, forming a loose, narrow panicle 2–6 in. long. Spikelets 2-flowered, upper floret alone perfect, oblong, finely pointed, $\frac{1}{8}$ in. long, obscurely hairy.

Viti Levu: Suva, fairly common in moist places such as on edges of gutters at sides of streets, Jan., *Greenwood*, 576! Apr., *Greenwood*, 576 A!

Common throughout Tropical Asia and Africa.

18. BRACHIARIA Griseb.

B. distachya A. Camus in Lecomte Fl. l'Indo-Chine vii. 437. *Panicum distachyum* Linn. Mant. ii. 183.

Perennial. Culms straggling and creeping below, slender, branched, 6–24 in. high, nodes glabrous. Leaf-blades 2–6 in. long (rarely shorter), $\frac{1}{4}$ – $\frac{1}{2}$ in. wide, glabrous. Spikelets alike, solitary, falling entire from their stalks, on one side of and with the lower glume adjacent to the rhachis of 2–7 spreading or reflexed, spike-like racemes $\frac{3}{4}$ – $2\frac{1}{2}$ in. long, forming a panicle 2–4 in. long. Spikelets 2-flowered, the upper floret alone perfect, oblong-ellipsoid, $\frac{1}{8}$ – $\frac{1}{4}$ in. long.

Viti Levu: Lautoka, very common, Apr., *Greenwood*, 93! Tavua, 300 ft., Oct., *Greenwood*, 328 A!

India, China, Malaya, Australia and Polynesia.

Excellent for making lawns, as it forms a thicker turf than *Cynodon Dactylon* and does not wither in dry weather. (*Greenwood*). Vern. Name: "Thurston Grass".

B. mutica Stapf in Prain Fl. Trop. Afr. ix. 526. *Panicum muticum* Forsk. Fl. Aegypt. Arab. 20. *P. barbinode* Trin. in Mém. Acad. St. Pétersb. Sér. vi. iii. 2. (1835) 256.

Differing from *B. distachya* by the following:—Perennial. Culms 3–8 ft. high, stout, nodes bearded. Leaf-blades up to 1 ft. long, $\frac{1}{4}$ – $\frac{3}{8}$ in. wide, usually glabrous. Panicle 4–8 in. long; racemes numerous, sometimes branched, flexuous, spreading, 2–4 in. long. Spikelets paired or solitary, oblong, about $\frac{1}{8}$ in. long.

Viti Levu: Lautoka, Apr., *Greenwood*, 194! Grows in wet places such as drains, etc., and with its long runners soon covers the ground.

A native of South America and West Africa, but introduced elsewhere.

A great favourite with stock, but is an extremely bad weed in cultivated land, being especially troublesome on the wet side of Viti Levu around Suva and Nausori.

Vern. Name: "Para Grass".

19. AXONOPUS Beauv.

A. compressus Beauv. Agrost. 154. *Paspalum compressum* Rasp. in Ann. Sci. Nat. sér. i. v. 301.

Tufted perennial. Culms 6–24 in. high, more or less compressed below. Leaves glabrous or with hairy margins; sheaths compressed; blades narrow to lanceolate, obtuse, rarely acute, 2–5 in. long, $\frac{1}{8}$ – $\frac{1}{2}$ in. wide, folded or flat. Spikelets alike, sessile, solitary, falling entire and with the upper glume turned away from the three-angled rhachis of 2–5 slender, glabrous spikes 2–4 in. long. Spikelets 2-flowered, upper floret alone perfect, $1\frac{1}{2}$ – $\frac{1}{8}$ in. long; lower glume absent.

Vanua Levu: Lambasa, common in moist situations, May, *Greenwood*, 592!

Native of Tropical and Subtropical America, introduced elsewhere.

An important pasture grass in the West Indies, etc.

Vern. Name: "Carpet Grass".

20. PASPALUM Linn.

Spikelets alike, awnless, falling entire at maturity, on one side of and with the upper glume adjacent to the flattened rhachis of spike-like racemes. Spikelets 2-flowered, upper floret alone perfect; lower glume usually absent.

P. conjugatum Berg. in Act. Helv. vii. 129, t. 8.

Perennial, up to 2 ft. high, in small tufts, often with long runners. Culms erect or ascending. Leaf-sheaths compressed and keeled, glabrous or nearly so; blades narrow to narrowly lanceolate, finely pointed, up to 7 in. long, $\frac{1}{4}$ – $\frac{1}{2}$ in. wide, soft, hairy and rough on the margins. Racemes paired, 2–6 in. long; rhachis $\frac{1}{8}$ in. wide. Spikelets in two rows, solitary, $\frac{1}{6}$ in. long, broadly elliptical, greenish-yellow, hairy.

Viti Levu: Lautoka, common in shady places by sides of creeks and in other wet localities, Nov., *Greenwood*, 174!

Native in Tropical and Subtropical America and Africa, introduced elsewhere.

Often forms extensive mats in moist places, spreading rapidly and covering the ground to the exclusion of everything else. Very acceptable food to cattle and horses.

Vern. Name: "Sour Grass".

P. vaginatum Sw. Prodr. Veg. Ind. Occ. 21.

Perennial. Culms ascending from a creeping base, $1\frac{1}{2}$ –2 ft. high. Leaf-sheaths more or less compressed; blades narrow, 1–4 in. long, $\frac{1}{4}$ – $\frac{1}{8}$ in. wide, pointed, glabrous, margins smooth. Racemes 2 (rarely 3), $\frac{1}{2}$ – $1\frac{1}{2}$ in. long; rhachis $\frac{1}{4}$ in. wide. Spikelets in two rows, solitary, up to $\frac{1}{8}$ in. long, oblong, acute, glabrous.

Viti Levu: Lautoka, on mud flats near mouths of small creeks and edges of mangroves, Feb., *Greenwood*, 227! Vanua Levu: Mathuata Coast, common on mud flats, July, *Greenwood*, 227 A! A littoral species, covering acres of land behind mangroves.

Common throughout tropics of both hemispheres.

P. orbiculare Forst. Prodr. 7. *P. scrobiculatum* L. var. Seem. Fl. Vit. 326.

Perennial. Culms 1–2 ft. or more high, erect or ascending from a short rhizome. Leaf-sheaths loose, slightly compressed below; blades narrowly lanceolate, up to 9 in. long, $\frac{5}{16}$ in. wide, upper shorter and narrower, soft to rigid, glabrous or slightly hairy, margins rough. Racemes 2–5, scattered, $\frac{3}{4}$ – $2\frac{1}{2}$ in. long, rhachis $\frac{1}{4}$ – $\frac{1}{8}$ in. wide. Spikelets in 2 rows, solitary, orbicular, $\frac{1}{2}$ in. long, rounded at apex, glabrous, brownish.

Viti Levu: Lautoka, common on open hillsides, mostly in damp places, Dec., *Greenwood*, 181! Vanua Levu: Lambasa, only a few patches seen, June, *Greenwood*, 597! Ngau: Sept., *Macgillivray*! (Herb. Mus. Brit.). ? Ovalau: *Seemann*, 682! (Herb. Mus. Brit.). Lakemba: Nov., *Harvey*! (Herb. Mus. Brit.).

Tropical Asia, Malaya and Polynesia.

P. dilatatum Poir. in Lamk. Encycl. v. 35.

Robust perennial. Culms erect from a stout rhizome, $1\frac{1}{2}$ –6 ft. high. Leaf-sheaths loose, slightly compressed; blades narrowly lanceolate, finely pointed, 8–24 in. long, $\frac{1}{8}$ – $\frac{5}{8}$ in. wide; usually glabrous, margins rough. Racemes 4–5, distant, 2–4 in. long;

rhachis $\frac{1}{8}$ in. wide. Spikelets in 4 rows, paired, $\frac{1}{8}$ in. long, elliptic-ovate, acute, hairy, pale green.

Viti Levu: Lautoka, common on sides of roads, etc., Jan., *Greenwood*, 204!

Native in South America; introduced into and much cultivated in many parts of the world.

Good fodder; cattle like it (*Greenwood*).

Vern. Name: "Dallis Grass".

21. STENOTAPHRUM Trin.

S. secundatum O. Ktze. Rev. Gen. Pl. ii. 794.

Perennial. Culms ascending from a long, creeping, leafy, rooting base, from a few inches to over 1 ft. high. Leaf-sheaths much compressed, keeled; blades narrow, 1–6 in. long, $\frac{1}{6}$ – $\frac{3}{8}$ in. wide, glabrous, folded or flat, blunt or rounded. Spikelets alike, awnless, falling entire, sessile, solitary or 2–5 together on a short secondary axis, and more or less sunken in or closely adpressed to the hollows on one side of a flattened stout rhachis $\frac{1}{8}$ – $\frac{1}{4}$ in. wide and up to $\frac{1}{8}$ in. thick, forming a spike 1–4 in. long. Spikelets lanceolate-oblong to oblong, acute, $\frac{1}{2}$ in. long, 2-flowered, upper floret alone perfect.

Viti Levu: Suva, sea level, May, *Greenwood*, 641!

Tropical and South Africa, America, Australia and Polynesia.

An excellent pasture grass; also used for making coarse lawns. Said to be a nuisance in plantations in some parts of Fiji.

Vern. Names: "Buffalo Grass" (*Greenwood*). "St. Augustine Grass" (In America).

S. subulatum Trin. in Mém. Acad. St. Pétersb. Sér. vi. Sci. Nat. iii. 190.

Differing from *S. secundatum* by the following:—Annual or perennial. Culms tufted, erect or ascending from a short creeping base, up to 18 in. high. Leaf-sheaths slightly compressed, loose; blades lanceolate, finely pointed, 1–5 in. long, $\frac{1}{8}$ – $\frac{1}{2}$ in. wide, flat. Spikes slender, cylindrical, 1–6 in. long; rhachis $\frac{1}{8}$ – $\frac{1}{4}$ in. wide. Spikelets 2–4 together, sunken in the cavities on the rhachis, oblong to oblong-lanceolate, obtuse, $\frac{1}{10}$ – $\frac{1}{8}$ in. long.

Namena (Direction Island): *Wilkes*! Tutinella*: *Wilkes*!

Polynesia.

22. UROCHLOA Beauv.

U. reptans Stapf in Prain Fl. Trop. Afr. ix. 601. *Panicum reptans* Linn. Syst. Nat. ed. x. 870.

Annual. Culms ascending from a prostrate or creeping base, 6–18 in. high, many-jointed. Leaf-blades lanceolate to broadly lanceolate, $\frac{1}{2}$ – $2\frac{1}{2}$ in. long, $\frac{1}{8}$ – $\frac{1}{2}$ in. wide, rounded or heart-shaped at

* We can find no locality of this name in the Islands.

the base, glabrous or hairy on the margins. Spikelets alike, solitary, paired or clustered, shortly stalked, on one side of and with the upper glume adjacent to the 3-angled rhachis of 8-12 crowded, spike-like racemes $\frac{1}{2}$ - $1\frac{1}{4}$ in. long, forming a panicle 1-3 in. long. Spikelets elliptic-oblong, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, awnless, falling entire, 2-flowered, upper floret alone perfect.

Viti Levu: Lautoka, *Greenwood*, 328! Dec., Jan., *Greenwood*, 414! Vanua Levu: Lambasa, sea level, Sept., *Greenwood* 414 A!

Tropical and Subtropical Africa and America, Indo-Malaya, Australia and Polynesia.

Considered in India to be good fodder for cattle.

U. paspaloides Presl Rel. Haenk. i. 318. *Panicum ambiguum* Trin. in Mém. Acad. St. Pétersb. Sér. vi. Sci. Nat. iii. 243.

Differing from *U. reptans* by the following:—Annual. Culms erect or ascending, 9-24 in. high. Leaf-blades narrow, 3-9 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, scarcely rounded at the base, hairy, margins rough. Panicle 2-6 in. long; racemes 3-6, rarely more, 1-2 $\frac{1}{2}$ in. long, scattered. Spikelets oblong-lanceolate, $\frac{1}{8}$ - $\frac{1}{2}$ in. long.

Viti Levu: Lautoka, common at sea level, July, *Greenwood*, 593 A! Vanua Levu: Lambasa, common at sides of roads, and other fairly dry places, May, *Greenwood*, 593! Without exact locality: *Wilkes*!

India, Malaya, Mascarene Is. and Polynesia.

23. ECHINOCHLOA Beauv.

E. colona Link Hort. Berol. ii. 209. *Panicum colonum* Linn. Syst. Veg. ed. x. 870; Rendle in Journ. Linn. Soc. Bot. xxxix. 182.

Tufted annual. Culms slender, up to 2 ft. high. Leaves glabrous; ligule none; blades narrow, 3-12 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. wide, flat. Spikelets alike, falling entire, paired and crowded on one side of and with the upper glume adjacent to the 3-angled rhachis of usually more than 6 scattered, erect or slightly spreading spike-like racemes which are $\frac{1}{4}$ -1 in. long, forming a narrow, erect panicle, 2-5 in. long. Spikelets 2-flowered, upper floret alone perfect, ovate, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, awnless, greenish or tinged with purple.

Viti Levu: Lautoka, common on low land, June, *Greenwood*, 31! Nandarivatu, on road to Waikobakoba, in bog at 2500 ft. Sept., *Gibbs*, 694! In bush near Botanical Station, Febr., *Yeoward*!

Widely spread throughout the Tropics and warm temperate regions of the world.

Considered a good fodder grass in India, and commonly met with as a weed on cultivated ground.

24. OPLISMENUS Beauv.

Spikelets alike, awned from the slightly notched tips of the glumes, 2-flowered, upper floret alone perfect, falling entire at maturity from their stalks, on one side of the angular rhachis of scattered spike-like racemes.

O. hirtellus Beauv. Agrost. 54, 168.

Perennial. Culms slender, often several feet long. Leaf-blades lanceolate, finely pointed, rounded at the base, $1\frac{1}{2}$ -5 in. long, $\frac{1}{8}$ - $\frac{3}{4}$ in. wide, thin, soft to rigid. Racemes 3-9, distant by more than their own length. Spikelets contiguous, $\frac{1}{8}$ - $\frac{1}{2}$ in. long; awns $1\frac{1}{2}$ - $\frac{1}{2}$ in. long.

Nairai: Waste ground on mountains, Nov., *Milne*, 165!

Tropical and South Africa, Mascarene Is., Tropical and Subtropical America and Polynesia.

O. compositus Beauv. Agrost. 54.

Perennial. Vegetative characters of *O. hirtellus*, but more robust. Racemes up to 10 or more, overlapping. Spikelets loose, $\frac{1}{8}$ - $\frac{1}{2}$ in. long; awns $1\frac{1}{2}$ - $\frac{3}{4}$ in. long.

Viti Levu: Mt. Evans, near falls, about 2000 ft., May, *Greenwood*, 222!

Tropical Africa, Tropical and Subtropical Asia, Australia and Polynesia.

O. imbecillis Roem. & Schult. Syst. Veg. ii. 487. *O. compositus* Seem. Fl. Vit. 324.

Perennial. Culms very slender. Leaf-blades narrowly lanceolate, up to 2 $\frac{1}{2}$ in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide. Racemes reduced to sessile clusters. Spikelets about $\frac{1}{2}$ in. long; awns $\frac{1}{2}$ - $\frac{1}{4}$ in. long.

Taveuni: June, *Seemann*, 681! Two sterile specimens (*Seemann* 679 and 680) referred by *Seemann* erroneously to *O. Burmanni* Beauv. probably belong here, as they agree in vegetative characters.

Australia and Polynesia.

25. PANICUM Linn.

P. maximum Jacq. Ic. i. 2. t. 13.

Densely tufted perennial. Culms to over 10 ft. high. Leaves glabrous or hairy; blades narrow, 6-24 in. long, $\frac{1}{8}$ -1 in. wide, margins rough. Spikelets alike, symmetrical, awnless, falling entire from their stalks, on the branches and branchlets of a dense to moderately loose panicle 6-18 in. long. Spikelets oblong, blunt, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, 2-flowered, florets dissimilar, upper alone perfect. Lemma of upper floret firmer in texture than the glumes.

Viti Levu: Lautoka, common along drains, roads and waste lands, Jan., *Greenwood*, 195! Also right around coast from Penang to Singatoka (*Greenwood*).

Native in Tropical and South Africa and Mascarene Is; introduced and widely spread in India, America, etc.

It is one of the best fodder grasses in the Tropics.

Vern. Name: "Guinea Grass".

P. decompositum R. Br. Prod. 191. *P. amabile* Bal. in Bull. Soc. Bot. Fr. xix. 324.

Differing from *P. maximum* by the following:—Tufted perennial. Culms 2–4 ft. high. Leaves glabrous; blades narrow, 6–18 in. long, $\frac{1}{4}$ – $\frac{1}{2}$ in. wide, margins smooth. Panicle 6–18 in. long, very loose. Spikelets lanceolate, sharply pointed, $\frac{1}{2}$ – $\frac{3}{4}$ in. long.

Viti Levu: Singatoka Railway, past Na Savusavu, on sides of cuttings, Apr., *Greenwood*, 245! Wakaya: waste places, not frequent, Oct., *Milne*, 394! (*Macgillivray*, Herb. Mus. Brit.).

Australia and New Caledonia.

Used for fodder in Australia.

26. CYRTOCOCCUM Stapf.

C. oxyphyllum Stapf in Hook. Ic. Pl. t. 3096. *Panicum oxyphyllum* Hochst. ex Steud. Syn. 65. *P. trigonum* Seem. Fl. Vit. 325, non Retz.

Weak perennial grass. Culms ascending from a slender, creeping base, up to 2 ft. long, many-jointed. Leaf-blades lanceolate, $1\frac{1}{2}$ – $4\frac{1}{2}$ in. long, $\frac{1}{4}$ – $\frac{1}{2}$ in. wide, nearly glabrous above, shortly hairy beneath. Spikelets alike, asymmetrical, obliquely obovate, compressed, awnless, falling entire from their stalks, on the branches of dense, narrow panicles $1\frac{1}{2}$ – $4\frac{1}{2}$ in. long. Spikelets $\frac{1}{6}$ – $\frac{1}{2}$ in. long, brownish, 2-flowered, upper floret alone perfect.

Viti Levu: Natova, near Lautoka, in shade of trees just behind mangrove formation, May, *Greenwood*, 165! Namara, *Seemann*, 693! Waste places, Dec., *Milne*, 181! Vanua Levu: Lambasa, on mountains on lower slopes in forest clearings, July, *Greenwood*, 165 A! Ngau: Sept., *Macgillivray*! (Herb. Mus. Brit.). Without definite locality: *Wilkes*! Also on Ovalau according to *Seemann*.

Indo-Malaya, Australia and Polynesia.

27. SETARIA Beauv.

S. glauca Beauv. Agrost. 51.

Loosely tufted annual. Culms slender, 1–2 ft. high. Leaf-blades narrow, 2–12 in. long, $\frac{1}{4}$ – $\frac{1}{2}$ in. wide, flat, usually glabrous. Spikelets alike, awnless, each supported by 6–8 persistent bristles, falling entire from their very short stalks, on the axis of an erect, dense, cylindrical, golden-brown spike up to 3 in. long, $\frac{1}{2}$ – $\frac{3}{4}$ in. wide. Spikelets $\frac{1}{8}$ in. long, 2-flowered, upper floret alone perfect; bristles $\frac{1}{4}$ – $\frac{1}{2}$ in. long.

Viti Levu: Lautoka, Feb., *Greenwood*, 18!

Occurs in all warm-temperate and tropical regions.

Usually a weed of cultivated ground.

28. RHYNCHELYTHRUM Nees.

R. Dregeanum Nees in Lindl. Introd. Nat. Syst. ed. ii. 447. *Tricholaena Dregeana* Dur. & Schinz Consp. Fl. Afr. v. 769.

Loosely tufted annual. Culms slender, 1–3 ft. high. Leaves glabrous or hairy; blades narrow, 2–8 in. long, $\frac{1}{2}$ – $\frac{1}{4}$ in. wide.

Spikelets alike, awned or awnless, laterally compressed, falling entire from their stalks, on an oblong to pyramidal, loose panicle 3–6 in. long; stalks very fine, with fine silky hairs from beneath their tips. Spikelets oblong, bulging on the sides, gaping, $\frac{1}{8}$ in. long, covered with long pinkish hairs, 2-flowered, upper floret alone perfect.

Viti Levu: Lautoka, 600 ft., Jan., *Greenwood*, 171! Common on hills behind Lautoka up to 800 ft. and also in wet places on estates near the sea.

Tropical and South Africa.

Cultivated in many parts of the world as a fodder grass.

Vern. Names: "Red Top Grass," "Natal Grass."

29. CENCHRUS Linn.

C. calyculatus Cav. Ic. v. 39. t. 463. *C. anomoplexis* Labill. Sert. Austr. Cal. 14. t. 19; Seem. Fl. Vit. 324.

Erect or spreading annual. Culms over 18 in. high, stout. Leaves glabrous; blades narrowly lanceolate, 9–18 (rarely only 4) in. long, $\frac{1}{2}$ – $\frac{3}{4}$ in. wide, finely pointed. Spikelets alike, awnless, in clusters, each cluster surrounded by hard spines joined at the base into a hard cup bearing erect or spreading bristles, falling at maturity with the spines and bristles from the axis of spike-like racemes 3–10 in. long; stalks of clusters $\frac{1}{2}$ in. long, spines all slender, innermost densely hairy.

Vanua Levu: Mathuata Coast, on coast along railway embankments, rare, Apr., *Greenwood*, 664! Taveuni: June, *Seemann*, 688! Nairai: waste places, plentiful, Nov., *Milne* 163! Wakaya: waste places, frequent, Oct., *Milne*, 378! Without definite locality: *Horne*! *Seemann*'s specimen is quoted by him in *Flora Vitiensis* as Ovalau but the specimen at Kew is labelled Vuna, which is the old name for Taveuni. Also on Viti Levu according to *Greenwood*, but rare.

New Zealand and Polynesia.

C. echinatus Linn. Sp. Pl. ed. i. 1050.

Differing from *C. calyculatus* by the following:—Culms 1–2 ft. high. Leaves hairy or glabrous; blades narrow, 3–9 in. long, $\frac{1}{2}$ – $\frac{1}{2}$ in. wide. Spikes 1–3 in. long; clusters nearly sessile; inner spines much broadened at the base, sparsely hairy.

Viti Levu: Lautoka, very common, March, *Greenwood*, 60!

Native of America, introduced elsewhere.

A troublesome weed. The burrs do considerable damage by getting entangled in the fleeces of sheep.

Vern. Name: "Burr Grass."

30. THUAREA Pers.

T. involuta Kunth Enum. i. 174. *T. sarmentosa* Pers. Syn. i. 110. *Ischaemum involutum* Forst. Prod. 73.

Perennial. Culms prostrate, creeping, much branched. Leaf-

blades narrow to narrowly lanceolate, 1-5 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, glabrous or silky. Spikelets awnless, falling entire, in one row on one side of a flattened axis, forming a terminal spike $\frac{1}{2}$ -1 in. long. Spikelets $\frac{1}{8}$ - $\frac{1}{6}$ in. long, the lower 1-2 spikelets female or perfect, the upper 4-6 male. Grain closely enveloped in the thickened, widened base of the spike-axis forming a hardened fruit $\frac{1}{2}$ in. long, with a deflexed beak.

Viti Levu: Singatoka, creeping on sands near the sea, May, *Greenwood*, 271! Without definite locality: *Wilkes*! According to Seemann, collected on the Mathuata Coast of Vanua Levu and on Oneata by *Wilkes*.

Coasts of Indo-Malaya, Madagascar, Australia and Polynesia.

31. ISACHNE R. Br.

I. vitiensis *Rendle* in Journ. Linn. Soc. Bot. xxxix. 181.

Perennial. Culms up to 3 ft. high. Leaf-blades narrowly lanceolate, 3-8 in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. wide, rigid, slightly rough on both sides and on the thickened margins. Spikelets alike, ovoid, $\frac{1}{8}$ in. long, 2-flowered, florets similar, falling in parts from very short stalks, on the branches of an erect panicle 3-8 in. long, $1\frac{1}{2}$ -3 $\frac{1}{2}$ in. wide.

Viti Levu: Col i Nandarivatu, about 3100 ft., Sept., *Gibbs*, 815! (Herb. Mus. Brit.). Mt. Evans, about 3000 ft., at side of streams in open sunny places, June, *Greenwood*, 326! Woody places on mountains, *Milne*, 25!

Restricted to Fiji.

32. ORYZA Linn.

O. sativa *Linn.* Sp. Pl. ed. i. 333.

Annual. Culms 2-10 ft. long, creeping or floating. Leaf-blades 1-2 ft. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. wide, rough. Spikelets alike, falling entire from the branches of a loose panicle, one-flowered, oblong, much compressed, awned or awnless, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Glumes minute, $\frac{1}{4}$ to $\frac{1}{3}$ the length of the hardened lemma.

Viti Levu: Lautoka, in drains and other wet places, June, *Greenwood*, 303!

Native in India, cultivated generally in tropical and subtropical regions.

Escape from cultivation in Fiji. Grown very largely by Indians for food.

Vern. Name: "Rice".

33. LEPTASPIS R. Br.

L. angustifolia *Summerhayes & Hubbard* in Kew Bull. 1927.

Densely tufted perennial. Leaf-blades erect or slightly spreading, more or less rigid, narrow, 9-18 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide, sharply pointed, rough on both sides, finely veined with cross-nerves;

petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Spikelets unisexual, 1-flowered, in very narrow, erect panicles 4-5 $\frac{1}{2}$ in. long. Male spikelets with brown, ovate, spreading glumes and 6 stamens; female spikelets with glumes similar to those of the male spikelets; lemma sack-like, inflated.

Vanua Levu: Lambasa, about 300 ft., Oct., *Greenwood*, 550! In mountains at about 1200 ft., Oct., *Greenwood*, 548! In clumps in thick forest.

Restricted to Fiji.

34. GARNOTIA Brongn.

G. stricta *Brongn.* in Duperr. Voy. Bot. 133. t. 21.

Annual, sometimes perennial. Culms slender, ascending, 1-3 ft. long, branched, many-jointed. Leaf-blades narrowly lanceolate. Spikelets alike, falling entire from the branches of a very narrow, straight or wavy panicle 2-10 in. long, one-flowered, narrowly lanceolate, $\frac{1}{8}$ - $\frac{1}{6}$ in. long; lemma awned, rarely awnless, awns up to $\frac{1}{2}$ in. long.

Viti Levu: Mt. Evans, near Lautoka, on rocks in spray of waterfall, Apr., *Greenwood*, 225! Mt. Evans, on steep cliff-face in shade, about 3600 ft., Apr., *Greenwood*, 443! (An awnless form). Vanua Levu: Lambasa, on mountains in open forest, 1200 ft., Oct., *Greenwood*, 549! Lagu Lagu Mts., in shade in forest, July, *Greenwood*, 549 A!

Tropical Asia, Malaya and Polynesia.

The specimens are very variable, only the last two cited being typical. The others may possibly represent distinct species but seem more probably to be habitat forms.

35. SPOROBOLUS R.Br.

S. indicus *R. Br.* Prod. 170.

Tufted perennial. Culms erect, 1 $\frac{1}{2}$ -3 ft. high. Leaf-blades very narrow. Spikelets alike, one-flowered, breaking up at maturity leaving the glumes on the stalks, on the erect or very slightly spreading branches of dense, very narrow panicles 5-18 in. long; branches with spikelets right to the base. Spikelets lanceolate, $\frac{1}{8}$ - $\frac{1}{2}$ in. long, olive-green, awnless; glumes and lemma membranous.

Vanua Levu: Lambasa, in clumps in dry places by sides of roads, Nov., *Greenwood*, 560! Oct., *Greenwood*, 560 A!

All warm countries.

S. diander *Beauv.* Agrost. 26.

Differing from *S. indicus* by the following:—Culms 1-3 ft. high, more slender. Panicle rather loose, 4-10 in. long; branches spreading, especially in fruit, naked at the base. Spikelets $\frac{1}{10}$ - $\frac{1}{8}$ in. long.

Viti Levu: Suva, fairly common by sides of roads, etc., Jan., *Greenwood*, 577!

Tropical Asia and Australia.

36. ERAGROSTIS Beauv.

E. pilosa Beauv. Agrost. 71.

Annual. Culms 3 in. to 3 ft. high, slender to very slender. Leaf-blades short and narrow, mouth of sheath bearded. Spikelets alike, 5-12 flowered, awnless, breaking up at maturity leaving the glumes on their stalks, on the wavy, very long, threadlike branches of erect or nodding, flexuous, very loose panicles of variable size. Spikelets narrow, up to $\frac{1}{2}$ in. long, glabrous; glumes and lemmas membranous, the latter less than $\frac{1}{8}$ in. long and 3-nerved.

Viti Levu: Lautoka, Apr., *Greenwood*, 2! Sept., *Greenwood*, 92! On poor, dry, gravelly ridges, March, *Greenwood*, 139!

In Southern Europe and most warm parts of the world.

E. plumosa Link Enum. Hort. Berol. i. 192.

Differing from *E. pilosa* in the following:—Culms 6-18 in. high, slender. Mouth of leaf-sheath slightly bearded. Panicle erect, rather rigid, closely branched, 2-8 in. long; branches short. Spikelets ovate-oblong to oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, 3-9 flowered; lemmas less than $\frac{1}{4}$ in. long; palea with softly hairy keels.

Viti Levu: Lautoka, Apr., *Greenwood*, 3! Singatoka, Cuvu, on sandy soils, Sept., *Greenwood*, 65! Vanua Levu: Lambasa, on damp ground in shade under trees, sea level, Apr., *Greenwood*, 663!

Tropical Africa, Asia and America.

37. CYNODON Pers.

C. Dactylon Pers. Syn. i. 85.

Creeping perennial. Culms from a few inches to over 1 ft. high, many-jointed. Leaves short, crowded at the base of the plant; sheaths overlapping on the barren shoots, compressed; blades narrow. Spikelets alike, breaking up at maturity leaving the glumes or glume, overlapping in two rows, on one side of the slender, keeled rhachis of 2-6 straight or curved spikes $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, clustered at the apex of the culm. Spikelets about $\frac{1}{2}$ in. long, one-flowered, awnless; glumes and lemma membranous.

Viti Levu: Lautoka, very common, Feb., *Greenwood*, 265!

All warm countries.

Good lawn grass if cut well and watered regularly (*Greenwood*). Cultivated in some parts of the world for hay.

Vern. Names: "Bermuda Grass," "Couch Grass."

38. CHLORIS Swartz.

C. truncata R. Br. Prod. 186.

Tufted perennial. Culms 1-3 ft. high, erect. Leaf-sheaths much flattened; blades narrow, blunt. Spikelets alike, breaking up at maturity leaving the glumes, overlapping in two rows on one side of the slender rhachis of 6-10, erect or spreading spikes 3-6 in. long, clustered at the apex of the culm. Spikelets wedge-

shaped, the widest part above, $\frac{1}{2}$ - $\frac{1}{3}$ in. long, black at maturity, 2-flowered, lower perfect, awned; awn $\frac{1}{4}$ - $\frac{1}{2}$ in. long.

Without definite locality: *Horne*, 381!

Australia.

C. cynodontoides Bal. in Bull. Soc. Bot. Fr. xix. 318.

Differing from *C. truncata* by the following:—Creeping perennial. Culms up to 15 in. high. Leaf-sheaths flattened. Spikes 3-6, $1\frac{1}{2}$ -4 in. long. Spikelets narrowly oblong, $\frac{1}{8}$ in. long, pale; awn $\frac{1}{4}$ - $\frac{1}{3}$ in. long.

Viti Levu: Singatoka, Cuvu, on railway line, near sea, Oct., *Greenwood*, 226! Suva, Apr., *Greenwood*, 226 A!

New Caledonia.

39. ELEUSINE Gaertn.

E. indica Gaertn. Fruct. i. 8.

Annual. Culms erect, from a few inches to 2 ft. high, slender to stout. Leaves crowded near the base, usually glabrous; sheaths compressed, pale; blades narrow, 6 in. to over 1 ft. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. wide. Spikelets alike, breaking up at maturity leaving the glumes, overlapping in two rows on one side of the flattened rhachis of 2-14 straight spikes 1-7 in. long, clustered at the apex of the culm or with one or two $\frac{1}{4}$ -3 in. below it. Spikelets $\frac{1}{8}$ - $\frac{1}{6}$ in. long, 3-6-flowered, awnless, greenish.

Viti Levu: Lautoka, common, Jan., *Greenwood*, 162! Ovalau: Oct., *Milne*, 276! Ngau: Sept., *Milne*, 172! *Macgillivray*! (Herb. Mus. Brit.). Wakaya: Oct., *Milne*, 395! Without exact locality: *Horne*! (Herb. Mus. Brit.); *Seemann*, 690! (Herb. Mus. Brit.).

Native in the tropics of the Old World, introduced into the New.

Used in some parts of the world for fodder, but is generally regarded as a troublesome weed.

Vern. Name: "Crowfoot Grass" (Fiji).

40. CENTOTHECA Desv.

C. latifolia Trin. Fund. Agrost. 141. *C. lappacea* Desv. in N. Bull. Soc. Phil. ii. 189; Seem. Fl. Vit. 322; Rendle in Journ. Linn. Soc. Bot. xxxix. 182.

Perennial. Culms 1-4 ft. high. Leaf-blades broadly lanceolate, 4-10 in. long, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. wide. Spikelets alike, 1-3-flowered (lowest perfect), awnless, breaking up at maturity leaving the glumes, shortly stalked, on the long simple branches of an open, broad, lax panicle 3-10 in. long. Spikelets ovate-oblong, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, green; lemmas 5-7-nerved, usually with erect, at length deflexed spines above the middle.

Viti Levu: Lautoka, Dec., *Greenwood*, 4! Near mouth of Wai ni Mala, in shady woods, *Horne*, 107! Nov., *Milne*, 419! Nandarivatu, carpeting forest, 2700 ft., Sept., *Gibbs*, 614! (Herb. Mus. Brit.). Ovalau: Oct., *Milne*, 275! Shady places in mountains, *Horne*, 60! Nairai: In woods, Nov., *Milne*, 162!

Wakaya: July, *Milne*, 412! Oct., *Milne*, 400! Ngau: Sept., *Milne and Macgillivray*, 171! Moala: Sept., *Milne*, 132! Naviti: woody places, Dec., *Milne*, 182! Without definite locality: *Seemann*, 684! *Horne*! (both Herb. Mus. Brit.).

Tropical Asia, Africa and Polynesia.

41. LEPTURUS R.Br.

L. repens R.Br. Prodr. 207.

Creeping perennial. Leaf-blades narrow, 3-6 in. long, $\frac{1}{8}$ - $\frac{1}{4}$ in. wide, glaucous. Spikelets solitary, 1-2-flowered (lower perfect), half immersed in the hollows in the rhachis of a solitary, terminal, jointed, straight, erect spike 2-6 in. long. Spikelets $\frac{1}{4}$ - $\frac{1}{2}$ in. long; upper glume longer than the joints of the rhachis, rigid, finely pointed.

Viti Levu: Along coast from Lautoka to Ba, in sand, May, *Greenwood*, 224! Vanua Levu: Mathuata Coast, creeping on ground just above high water mark, July, *Greenwood*, 224 A! Without definite locality: *Wilkes*!

Ceylon, Malaya, Australia and Polynesia.

We have three specimens of Bamboos but in the absence of flowers the determinations remain doubtful.

Schizostachyum glaucifolium Munro in Trans. Linn. Soc. xxvi. 137. Seem. Fl. Vit. 323.

Viti Levu: near banks of rivers, *Seemann*, 694! Uvea, (? Uea) *Graeffe*, 49!

Polynesia.

Vern. Name: Bitu.

Bambusa sp. A plant with smaller and differently shaped leaves.

Viti Levu: Lautoka, in mountains, in forest near water, tall plant up to 60 ft. high, May, *Greenwood*, 278!

Planted near tracks by the natives.

DOUBTFUL SPECIES.

Olyra sp. *O. micrantha* H.B.K. according to *Seemann* Fl. Vit. 326. We can find no specimen of *Olyra* from Fiji either at Kew or at the British Museum. According to Mrs. Chase*, *Wilkes*'s specimen from Sandalwood Bay (Vanua Levu) is "a form distantly related to *O. micrantha* H.B.K." As however, with the exception of the African *O. latifolia* L., which belongs to a different section of the genus, the genus is entirely American, it seems probable that *Wilkes*'s specimen is wrongly ascribed to Fiji, especially as the U.S. Exploring Expedition touched at several places in South America.

* Proc. Biol. Soc. Washington xxi. 177, 178.

V.—THE GARDEN OF H.H. THE PRINCE OF MONACO.

W. TAYLOR.

At the desire of the Director I spent a fortnight in September last in visiting some of the more interesting gardens in the South of France and Northern Italy. Among them is the garden belonging to H.H. the Prince of Monaco, which, perhaps, is the most wonderful on the Riviera for its collection of Cacti and succulents. Jutting out into the Mediterranean about a couple of miles from Monte Carlo and backed by mountain ranges of moderate height is the principality of Monaco. Here a precipitous mass of rock has been transformed into a garden paradise, and, as the Prince spares neither money nor pains to secure the best, his garden is becoming famous throughout Europe. Monaco is truly a garden of Cacti and Succulent plants; the collection is remarkably rich in its number of species, and their condition is most satisfactory. I have never seen plants so luxuriant and perfect as they are in this garden. I did not detect a plant which had a blemish of any kind upon its stem or branches.

On this steep rocky slope a series of winding paths and short flights of steps give easy access to all parts of the garden. Much judgment has been exercised in both the planting and grouping of the different genera.

A list of all the plants in the garden would be longer than space will permit. One of the most imposing features is a group of *Echinocactus Grusonii*. The plants resemble huge cushions, several of them being at least two feet in diameter, and if it were not for their stiff spines, one would be tempted to sit on them. Among the many giants of the place is a plant of *Cereus peruvianus* var. *monstrosus* which is over 20 feet high and at the time of my visit was bearing a quantity of large red fruits. *Cereus scoparius* with its tall columnar stem reminds one of the Giant Cactus (*C. giganteus*). *C. Houlettii* is 10 feet high, whilst *C. smaragdinus*, with stems resembling huge snakes, was trailing over the rocks. A magnificent plant of *C. validus* is seen towering to a height of 20 feet or more, while *C. marginatus* and *C. gemmatus* are about 10 feet high. Good specimens of *Opuntia* include *O. senilis*, which is remarkable in having long white "hairs" on the young branches. *O. subulata* is very distinct in having its branches almost cylindrical. A very fine specimen of *O. tomentosa* is 15 feet high and nearly as much in diameter. *O. tunicata* is represented by a large clump of this very spiny species. Euphorbias of the candelabra type are represented by some very large specimens ranging in height from 10 to 25 feet, and include such species as *E. abyssinica*, *E. alcorni*, *E. grandicornis* and *E. grandidens*.

Among Aloes the tree-like *A. Bainesii* was most conspicuous, the largest specimen being about 12 feet high and branched into four good heads. There are several species of *Agave*, the most noteworthy being *A. Victoria-Reginae*—one plant in flower had a stem

12 feet high. Crassulas, Haworthias, Mesembryanthemums and many more equally notable succulent plants are quite at home and look very happy in this most interesting garden.

VI.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies: Mr. J. R. V. SMYTH, Mr. E. T. HOLMES, Mr. I. E. JAMES, B.Sc., and Mr. B. C. OWEN, B.A., to be Superintendents of Agriculture, Nigeria; Mr. J. C. HAIGH, B.Sc., A.R.C.S., Assistant Mycologist, Ceylon.

Vegetable Hair.—From enquiries recently received at Kew interest would appear to exist in certain quarters on the subject of "Vegetable Hair," a product of the Dwarf Fan Palm.

The Dwarf Fan Palm (*Chamaerops humilis* L.) is common in certain regions in South Europe and North Africa, particularly Algeria and Tunis, and is the only palm actually indigenous to Europe. In Algeria it was once regarded as a scourge on account of its deep tough roots, difficult to extirpate, and an obstacle to cultivation.

The leaves, and the fibre from the leaves and petioles, are used in the manufacture of baskets and rope, and various other articles, such as brooms, brushes, hats, etc., whilst the fibrous brown leaf-sheaths are used for mat-making.

The most interesting economic product of this palm is, however, the "Vegetable Fibre," or "Vegetable Hair" ("Crin Végétal"), of commerce. The fibre obtained from the leaves has a crinkled appearance, owing to a process of twisting it is put through in manufacture. It is frequently dyed black and is used as a substitute for horse-hair in upholstery, being very resilient and rather resistant to insect attack.

The principal countries of export of "Vegetable Hair" are Algeria and Tunis, the former country exporting over 40,000 tons (metric) in 1923. The bulk of this export goes to the United States and Italy, though Great Britain, Germany, France, Holland and Belgium are also importers. A very similar product is prepared from the "Saw Palmetto" (*Serenoa serrulata* Hook. f.) of the S. United States.

F. N. H.

Kava.—The following note has been received from Mr. N. Rowe, who has recently returned from Samoa.

Kava is a drink well known throughout the greater part of Polynesia. Its preparation by the admixture of water with the pulverised root of the kava tree *Piper methysticum* is always attended by much ceremony.

In former days the kava root having been cut in small pieces was handed to chew to young women, chosen for their good teeth

and prepossessing appearance (see *K.B.* 1887, p. 8). The kava thus treated was placed in a wooden bowl and water poured upon it. The girl in charge of the kava bowl then put in the Fow—a bundle of very narrow strips of bark resembling a bundle of garden raffia. With this she kneaded together the kava and water until the liquid had acquired the right consistency. She then got rid of the liquid from the residue by straining the Fow through it and then swinging and flacking the Fow above her head. The kava, an opaque yellow liquid, was then ready for drinking. Nowadays the kava is pounded between stones instead of being chewed; this apparently being a concession to the peculiar prejudices of the white man.

Kava must be freshly made, as in a few hours it becomes stale. The drink is cooling and well suited to a hot climate. It is a stimulant and induces an immediate craving for tobacco. To the novice kava has a flavour resembling soapy water, but as it figures so much in the ceremonial of the islands the resident must drink it and the taste is soon acquired.

Any quantity of kava prepared from the dry root of the kava tree can be drunk without fear of intoxication. Kava made from the green kava root may, however, induce temporary and partial paralysis of the legs.

Winter Blossoms from the Outdoor Garden.*—This attractive book is intended as a guide for those who wish to have flowers in their gardens during the winter months. The author begins with a chapter on the various methods adopted for propagating plants. Then follows an alphabetical list of shrubs and border plants that flower at this time of year. Many are well-known garden plants that may be relied on to produce flowers during the winter, but a number of doubtful ones are also included in the list. The chief genera dealt with are *Anemone*, *Crocus*, *Galanthus*, *Erica*, *Colchicum*, *Helleborus*, *Hamamelis*, *Rhododendron* and *Saxifraga*. Each plant is fully described and cultural hints are given. The book is well illustrated with twenty-four plates, of which six are coloured. It will prove a handy work of reference for the amateur who wishes his garden to be interesting during the winter months, but he may find that many bulbous plants mentioned are unobtainable, especially amongst the *Crocus* and *Colchicum*. W. I.

Science around the Pacific.†—The recently published report of the proceedings of the Pan-Pacific Science Congress (Australia) 1923 contains a wealth of papers on Agriculture, Forestry and Pure

* By A. W. Darnell. L. Reeve & Co., Ltd., 6, Henrietta Street, Covent Garden, W.C.2, 1926. Pp. xxiv + 335, ill. 24. Price 21s.

† Proceedings of the Pan-Pacific Science Congress (Australia) 1923. Vol. I. Edited by G. Lightfoot. Government Printer, Melbourne, Victoria, pp. xix + 1,024, numerous maps and text figs.

Botany as well as other branches of science from the various Pacific countries. Of the botanical Papers those on "The Evolution of the Genus *Acacia*" by R. H. Cambage, "The Sequoias of California, their Life-History and Geographical Distribution" by W. L. Jepson and Dr. W. H. van Leeuwen's paper entitled "On the present state of the Vegetation of the Islands of the Krakatau Group and of the Island of Sebesy" are of particular interest and serve to show the wide range of subject covered. The printing and arrangement are good, and many maps and diagrams are included.

The Flora of Kenya.*—An enumeration of the flora of each different country of tropical Africa is an important intermediate record between the first general survey contained in the Flora of Tropical Africa and the publication of regional floras such as the Flora of West Tropical Africa, now in the press. Mr. Battiscombe's list, although not exhaustive, contains over six hundred species and includes those most commonly encountered. The arrangement of the book is by Families on the system recently put forward by Hutchinson in his Families of Flowering Plants. With the botanical name of the species are given the vernacular names, a brief field description, the geographical distribution, and useful economic notes. The illustrations, which are well reproduced, depict types of forest vegetation, specimen trees, characteristic bark, flowers, etc. There are two Indices, one to the Botanical names and one to the Vernacular. This is the first publication to be devoted exclusively to the flora of Kenya.

Research and Crops.†—A valuable and interesting volume entitled "Research and the Land" has recently been issued by the Ministry of Agriculture and Fisheries. The work gives a summary of recent progress in the different branches of agricultural and horticultural research undertaken by the various Research institutions in the United Kingdom. The volume includes chapters on Soil Science, Plant Breeding, Growth, Nutrition, Intensive Culture, Preservation of Fruit, Entomology, Mycology and Plant Diseases generally, as well as many chapters on similar subjects connected with the animal side of Agriculture. Though the problems dealt with are primarily those concerning British crops, many fundamental principles are brought out which are of value to workers in all parts of the world.

* A Descriptive Catalogue of some of the Common Trees and Woody Plants of Kenya Colony, by E. Battiscombe. The Crown Agents for the Colonies, 4, Millbank, Westminster, 1926. Pp. iii+142, plates 40. Price 10s.

† Research and the Land: an account of Recent Progress in Agricultural and Horticultural Science in the United Kingdom. By V. E. Wilkins. Pp. xiv, 388+xxxvi, 29 plates. London: H.M. Stationery Office, 1926. Paper, 2s. 6d. net; cloth, 3s. 6d. net.

BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1927 ROYAL BOTANIC GARDENS, KEW.

VII.—HYDNOCARPUS AND TARAKTOGENOS IN THE FEDERATED MALAY STATES.

On the publication of the previous article on this subject (*K.B.* 1926, p. 17) our attention was drawn by Mr. A. S. Haynes, now British Adviser, Kedah, to the experiments that are being conducted at the Serdang Plantation of the Agricultural Department, Federated Malay States. We are indebted to Mr. B. W. Elles, the present Secretary for Agriculture, Straits Settlements and Federated Malay States, who has kindly sent the following account of the work that is being carried out there on species yielding Chaulmoogra Oil.

NOTES ON HYDNOCARPUS SPECIES UNDER CULTIVATION AT THE EXPERIMENTAL STATION, SERDANG, F.M.S.

B. Bunting and J. N. Milsum

In October, 1920, Dr. J. F. Rock, while on a visit to Kuala Lumpur, presented to the Department of Agriculture a parcel of seeds of *Hydnocarpus anthelmintica*, which he stated were obtained from trees growing in the streets of Bangkok (see *U.S. Dep. Agric. Bull.* No. 1057, p. 11). These seeds were planted at the Experimental Plantation, Kuala Lumpur, but were subsequently transferred to the Government Plantation at Serdang, which was then being opened up. From then onwards, several consignments of seeds of *Hydnocarpus spp.* have been received at Serdang and the object of these notes is to record the behaviour of the trees under cultivation, together with data collected during this period.

The planting programme at the Experimental Plantation, Serdang, provides for an area of 25 acres to be planted up with each of the following species:—*Hydnocarpus anthelmintica*, *H. Wightiana* and *Taraktogenos Kurzii*.

Hydnocarpus anthelmintica Pierre.

As previously stated, the seeds of this species were obtained from roadside trees at Bangkok, Siam. A number of seedlings were received at Serdang during February, 1922. Owing to suitable cleared land being unavailable, it was not found possible to plant out the young trees until May, 1923, when they averaged 2 feet high. The area selected for planting was on sloping land, facing west, in the arboretum. The soil is well drained, somewhat loose and

overlying laterite. Forty-eight trees were planted at a distance of 30 feet by 30 feet, triangular. This number was subsequently increased to 55, making an acre planted with this species.

The following table shows the rate of growth of the original forty-eight trees. It should be noted that, owing to the reason stated, considerable time was lost between germination of the seeds and final planting in the field.

Table 1

Rate of Growth of *Hydnocarpus anthelmintica* at Serdang.

Date.	Average Height	Increase in Height over 12 months
June, 1923 ...	2 feet 1 inch ...	—
„ 1924 ...	5 „ 6 „ ...	3 feet 5 inches
„ 1925 ...	10 „ 1 „ ...	4 „ 7 „
„ 1926 ...	16 „ 6 „ ...	6 „ 5 „

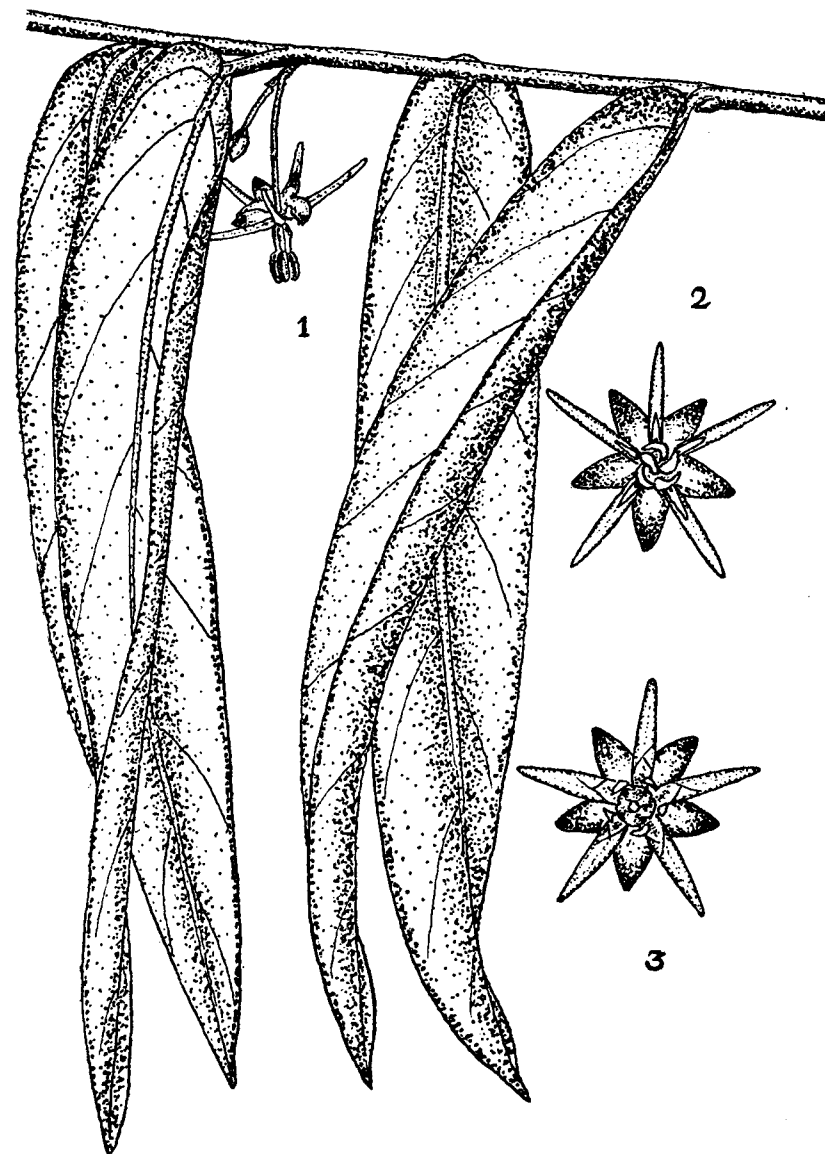
In addition to the trees in the arboretum, one of the Plantation roads was planted up with 50 young trees to form an avenue. The seedlings had been in the nursery beds for some time and when planted out early in June, 1923, averaged 7 feet in height. They were cut back to within 3 feet from the ground after planting. The distance between the trees in the rows is 33 feet and the space across the road from tree to tree is 32 feet; the planting arrangement being triangular. These trees are backward as compared with those in the arboretum, owing to the somewhat severe treatment they received at the outset. In October, 1926, the average height of the trees was 12 feet 6 inches. No sign of flowering has so far been observed.

Late in 1925 flower buds were observed on several of the largest trees in the arboretum. Only male flowers were noticed at first, but early in January, 1926, flowers of both sexes were noted, followed by the setting of a few fruits on three trees only. A number of the earliest fruits noticed failed to mature and dropped from the trees.

The flowers are unisexual and produced in short axillary cymes. They are pendulous, light green with a pink eye, very fragrant, and though small, attractive in outline. The female flower is larger than the male, the scales being broader. They appear in less abundance than the male flowers.

About thirty fruits have set on the three trees and of these twelve show signs of maturity. The first ripe fruit fell during October, 1926, and weighed 13½ ounces. It measured 3½ inches in diameter and about 3¾ inches in length. The fruit is globular in shape with a brownish tomentum in the young stage, hardening upon ripening to form a strong hard woody shell, rusty brown in

colour. The fruit broke in falling and embedded in the cream-like pulp were 18 seeds. The seeds on being cleaned were found to be of somewhat irregular shape, almost an inch long and ¾ inch

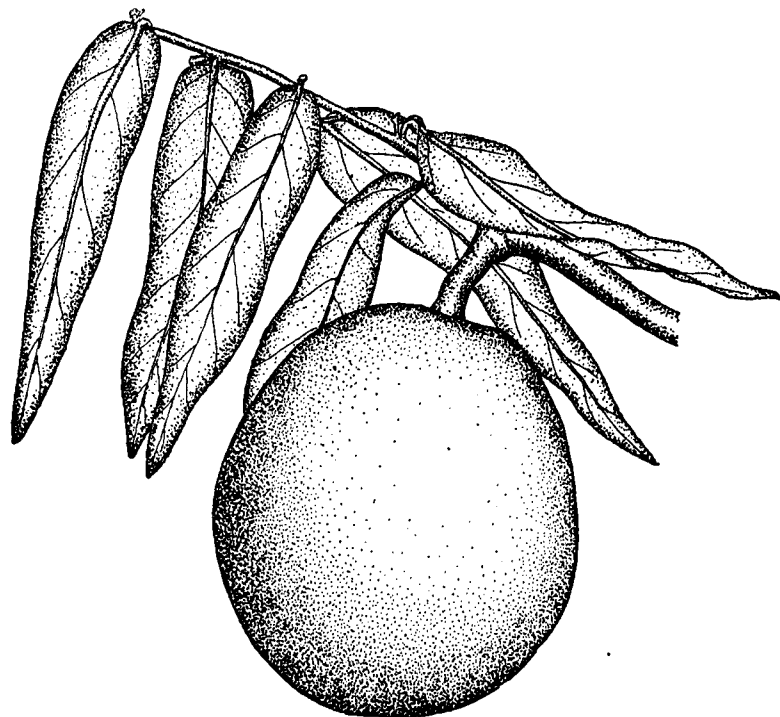


Hydnocarpus anthelmintica.

1. Branch with male flower (nat. size). 2. Male flower.
3. Female flower. 2 and 3 enlarged.

broad. The seed coat is hard and a dirty grayish brown in colour. These seeds have been planted and their power of germination will be carefully recorded.

Measurements of other fruit removed from the trees show dimensions as much as 4 inches in diameter and 4 inches in length. The fruits agree well in appearance with Dr. Rock's photograph published as Plate 11 in U.S. Dep. Agric. Bull. No. 1057, already referred to.



Hydnocarpus anthelmintica.
Fruit matured at Serdang ($\times \frac{1}{2}$).

To summarize the position regarding the species, *H. anthelmintica*, it may be stated that 100 trees are established at the Plantation and that the first fruit has ripened within 6 years from sowing the seed. It is to be noted that some delay occurred in planting out these trees in the field and should such trees be allowed to make uninterrupted growth from time of germination, it is possible that they would reach the producing stage much earlier. The tree appears to grow well under local conditions, as would be expected of a tropical rain forest species, and has not yet shown signs of being attacked by insect pests or fungoid diseases.

***Hydnocarpus Wightiana* Blume.**

The source of supply of seeds of this tree was the Bombay Presidency.

Mr. M. S. Tuggerse, Divisional Forest Officer, Honavar, Kanara, who sent the seed, supplied the following notes under cover of his letter of the 13th September, 1924.

"This is a large-sized ever-green tree growing in the rain tract of the West Coast of Kanara (Bombay), where the rainfall is from 120 to 200 inches per annum, chiefly falling between June and October. Trees of 10 to 12 feet girth with a crown spreading over 400 sq. yards of area are not uncommon. Isolated trees growing in the open often attain this size, though the stems get fluted. Trees grown mixed in the forests usually attain a great height, often from 60 feet to 80 feet, with a thin clean bole, but under such conditions the development of the crown is not great and the production of seed is naturally very limited.

"Where the object is the production of a maximum quantity of fruit per tree, planting should be done well apart. I recommend 40 trees to the acre, i.e., 33 feet by 33 feet. But the clearing of the original forest (where such has to be done for concentrated planting of a given species) would cost much and a long period would elapse before the trees attain their maximum crown development. It would, therefore, be best to plant $16\frac{1}{2}$ feet by $16\frac{1}{2}$ feet, i.e., 160 to the acre, in squares at the beginning, and to thin out the intervening trees later on, and to grow catch crops in the meantime.

"Fresh seed may be sown direct 'in situ.' For this, dig large holes 3 feet by 3 feet, refill the soil and sow 2 or 3 seeds. If more than one seed germinates pull out the rest but keep one good plant after they have grown about a foot high. Where direct sowing is not possible, raise the plants in a nursery and plant out when they are 6 to 12 ins. high. For successful results in transplanting, basket- or pot-planting is good. Seed germinates in about fifteen days after sowing.

"In Kanara the tree is found on deep alluvial deposits by the side of perennial fresh water rivulets (nallas). They also grow on mooram soils and laterite, from the sea level to 1,800 feet elevation.

"To encourage the trees to grow a large crown it is best to undertake thumb-nail pruning when the plant attains a height of about 6 feet to 8 feet; later on, training of branches must be done patiently and perseveringly. This is a markedly sun-loving tree, i.e., light demander, as most of the trees in the tropics are. For the production of fruit, sunlight is necessary, also a spreading crown.

"It appears that the tree lives to a great age under favourable conditions of soil, but trees bear fewer and fewer fruits as they grow older. In order that an old tree may be rejuvenated, lop out all smaller branches and the tree will begin to bear in the second year after pollarding. Trees that attain a maximum development may yield up to 1 cwt. of clean seed."

The first consignment of 2,000 seeds was received in October, 1924, but though given careful treatment they failed to germinate.

PLATE VII.

The seeds were dug up and examined in March of the following year and all were found to be decayed. Two further consignments of about 2,000 seeds each were received subsequently from Mr. M. S. Tuggerse, during July, 1925. In forwarding these seeds Mr. Tuggerse stated that they were collected in June, 1925, under his personal supervision. The seeds weighed 12 lbs. on arrival, giving an average of about 24 seeds to the ounce.

In addition to forwarding the seeds and notes regarding the cultivation of this tree, Mr. Tuggerse kindly forwarded specimens of mature fruits and a photograph of one of the trees from which the fruits had been collected. The fruits were found to contain an average of 20 seeds each.

The two consignments were planted on the 20th July, 1925, in several ways and gave an average germination capacity of 52 per cent. Germination commenced a month after sowing and continued for seven weeks, when the balance of seeds was found to be unsound.

The following data regarding the germination of the two consignments is recorded:—

Table 2

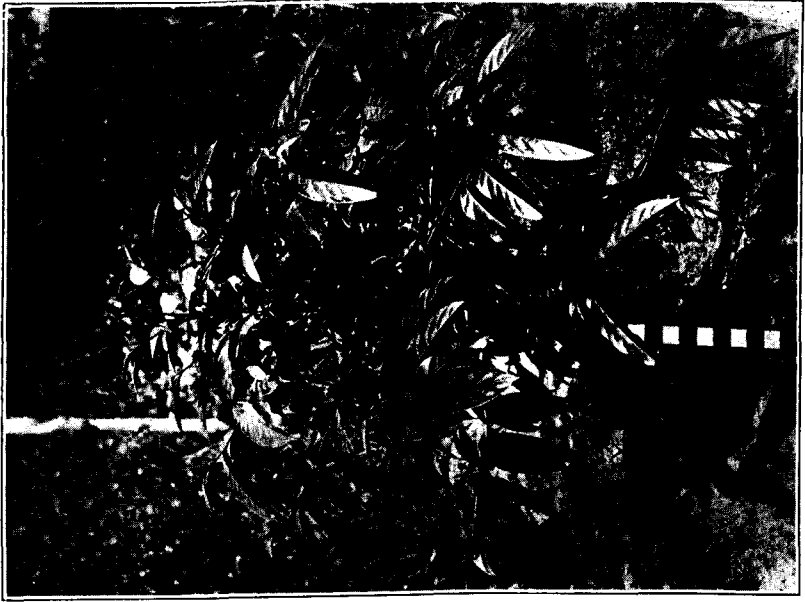
Method of Sowing	Consignment 1	Consignment 2
In nursery beds under shade	76 per cent. ...	72 per cent.
In open nursery beds ...	60 ,, ,, ...	49 ,, ,,

A certain number of seeds were planted in boxes of soil under shade. Only 28 per cent. germination was recorded, but this is thought to be due to allowing the soil in the boxes to become too dry.

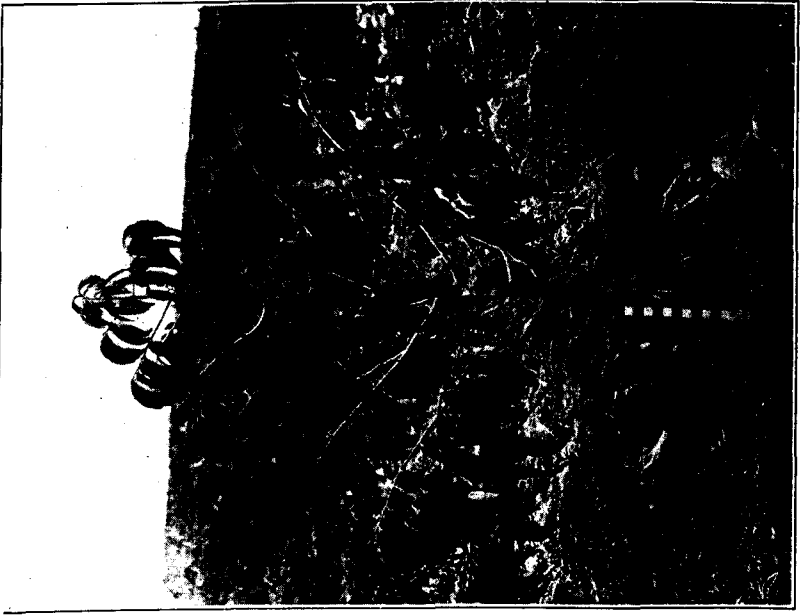
It appears, therefore, that the seeds should be given moist conditions under shade to secure maximum germination. The seeds from the whole fruits were sown separately under shade and gave a germination capacity of 97 per cent. in eight weeks from sowing, which is considerably in excess of that from the seeds separated from the fruits.

The seedlings raised in boxes were subsequently transplanted into small bamboo baskets and this method of planting was found to be more satisfactory as compared with transplanting the young trees direct from nursery beds into the field, even though a good ball of soil was allowed to adhere to the roots. (See fig. p. 55.)

The area selected for planting this species was similar to that in the arboretum already described. An experimental planting of kapok (*Eriodendron anfractuosum*) had been undertaken on the land and it was necessary to devise a system of interplanting.



Hydnocarpus Wighiana.
Young tree 1 year from planting in the field. The scale is 1 ft.



Taraktogenos Kurzii.
Young tree 2½ years from planting in the field. Height 7 ft. 9 ins.

[To face page 54.

PLATE VIII.



Fruiting *Hydnocarpus anthelmintica*; 3½ years from planting in the field.

To face page 55.]

A commencement was made to plant up the area at the end of November, 1925, at a planting distance of 40 by 20 feet, rectangular, requiring 54 plants per acre, alternating lines of *H. Wightiana* being planted between the kapok. Approximately 25 acres were planted in this way, but as indicated above a number of the young plants died off during dry weather. These were subsequently supplied and the whole area, excepting some ravines, is now fully planted and the trees are growing well. The average height of these trees in October, 1926, was 2 feet 6 inches.

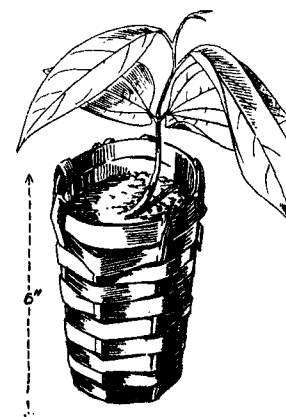
As in the case of *H. anthelmintica*, this species is being tested as a road-side tree and 50 trees were planted during May, 1926, on either side of one of the Plantation roads. The trees are planted in triangular fashion, the distance between the trees in the rows being 33 feet, the rows being 27 feet apart. The young trees are making good growth and in October, 1926, averaged 2 feet in height.

Though this species is not so far advanced on the Plantation as the previous one, a comparatively large area has been planted up and the trees are making rapid growth. Both species appear amenable to plantation conditions and are readily raised from seed.

Taraktogenos Kurzii King.

Six young trees labelled *Taraktogenos Kurzii* were received from the Botanic Gardens, Singapore, during August, 1923. Mr. R. E. Holttum in sending these plants stated that the seeds from which the trees were raised were obtained in the Upper Chindwin District, Upper Burma, by Dr. Rock and were received at Singapore in February, 1921.

The trees were planted out in the arboretum on rather low-lying land, during the latter part of May, 1924. The young trees then averaged 1 foot 10 inches in height. The heights of the trees have been recorded yearly and their growth is shown to be rather



Taraktogenos Kurzii.
Seedling three months old.

slow. In June, 1926, the height of the six trees varied from 2 feet 6 in. to 7 feet 9 in., averaging 5 feet. Two trees, however, have made comparatively good growth and it appears as if the soil conditions are not altogether suitable. So far no signs of flowering have been observed.

In June, 1926, a small parcel containing 32 seeds of this species was received from the Conservator of Forests, Utilization Circle, Burma. When forwarding the seeds the Conservator of Forests stated that they had been obtained by the Divisional Forest Officer, Thaunggin Division. The seeds were sown on the 26th June, 1926, and germination commenced a month later, continuing for three weeks. Fourteen seeds germinated in all, but actually only ten young plants were raised owing to damping off. These have been established in bamboo baskets and in October, 1926 averaged 7 inches in height, showing a pair of true leaves in addition to the cotyledons. The seedlings agree well in appearance with the illustration of the species on Plate XVI, in Bull. 1057 of the U.S.A. Department of Agriculture.

It will be seen that so far no very great progress has been made with this important tree. There appears, however, probability of obtaining further supplies of seed, and when these are forthcoming, it is anticipated that there should be no difficulty in planting up the proposed area according to the original planting programme.

The writers are indebted to Messrs. E. A. Curtler and J. Lambourne, Assistant Agriculturists at the Experimental Plantation, Serdang, who have jointly been in charge of the experimental records connected with the cultivation of the various species mentioned in this article.

VIII.—CONTRIBUTIONS TO THE FLORA OF SIAM* ADDITAMENTUM XX. W. G. CRAIB.

Indigofera pallida Craib [Leguminosae-Galegeae]; ab affini *I. Wightii* Graham, foliolis pro longitudine latioribus apice truncatis apiculatis recedit.

Frutex 60–90 cm. altus (ex Kerr); ramuli iuventute plus minusve angulati et sulcati, mox teretes et conspicue striati, pilis brevibus medifixis arcte adpressis persistentibus pro parte maxima albis paucis tantum brunneis tecti, primo cinerei, mox brunneo-cinerei. *Folia* (petiolo 10–15 mm. longo incluso) ad 8.5 cm. longa, et petiolo et rhachi supra canaliculatis indumento ei ramulorum simili tectis, stipulis parvis persistentibus; foliola usque ad 29, stricte opposita, saepissime elliptica vel obovato-elliptica, apice truncata, costa excurrente apiculata, basi late cuneata vel rotundata, matura saepissime 6.5 mm. longa et 4.5 mm. lata, sat rigida, pagina

utraq. pilis albis adpressis medifixis sed inferiore crassioribus sparsius tecta, petiolulo vix 1 mm. longo suffulta; stipellae petiolulis multo breviores. *Racemi* axillares, foliis saepissime breviores, pedunculo communi petiolo dimidio brevioribus suffulti, rhachi indumento ei ramulorum simili tecto; flores expansi haud visi; bractee alabastris breviores, deciduae; pedicelli fructus maturi ad 2 mm. longi; calyx et corolla ante anthesin pilis adpressis medifixis albis densius tecti; filamenta persistentia, 4 mm. longa. *Legumen* ad 2.8 cm. longum et 3 mm. diametro, apiculatum, cinereum, pilis albis adpressis brevibus tectum, seminibus circa 12.

Lampang, 300 m., deciduous forest, Kerr 3083.

Millettia fallax Craib [Leguminosae-Galegeae]; a *M. Wrightiana* Prain, et *M. pubinervi* Kurz, filamentis postico ab aliis libero et ovulis paucioribus recedit.

Arbor circa 8 m. alta (ex Kerr); ramuli primo crispatis fulvo-pubescentes, sulcati, mox glabri, cortice brunneo vel pallide brunneo obtecti, lenticellis vix conspicuis. *Folia* 5–7-foliolata, petiolo 2.5–3.2 cm. longo basi incrassato cum rhachi sparse crispatis fulvo-pubescente supra plus minusve canaliculato suffulta; stipulae deciduae; foliola opposita, oblongo-oblancoolata, rarius oblongo-lanceolata vel oblonga, apice acuminata, costa excurrente breviter apiculata, basi cuneata vel rotundato-cuneata, lateralibus praesertim inferioribus saepe parum inaequaliter, 2.5–6 cm. longa, 1.6–2.6 cm. lata, chartacea vel rigide chartacea, sicco viridia, subtus parum pallidiora, supra sparse adpresse pubescentia, subtus ad costam nervosque laterales breviter fulvo-pubescentia et aliter pilis albis adpressis inconspicuis sparse instructa, nervis lateralibus utrinque 7–9 intra marginem ipsam anastomosantibus pagina utraque conspicuis vel fere prominulis, petiolulo circa 4 mm. longo supra parum canaliculato sparse breviter fulvo-pubescente suffulta; stipellae deficientes. *Racemi* axillares, solitarii vel gemini, saepe e nodis infra folia evoluta vel e ramulis omnino defoliatis orti, pedunculo communi ad 2.5 cm. longo incluso ad 10 cm. longi, pedunculo cum rhachi crispatis pubescente; flores viridi-albi (ex Kerr), fasciculati, nodis floriferis sessilibus; pedicelli 4 mm. longi, breviter adpresse pubescentes; bractee 3 mm. longae, 1.5 mm. latae, deciduae; bracteolae 2, minutae, ad pedicelli apicem posita. *Calyx* circa 4 mm. longus, lobis posticis fere obsoletis, lateralibus et antico brevibus, extra sparse adpresse pubescens, sicco fuscescens. *Vexillum* ovato-rotundatum, apice parum emarginatum, basi subcordatum, bicallosum, ungui sat lato circa 1 mm. longo incluso 9.5 mm. longum, 8 mm. latum, glabrum; alae oblongae, basi latere uno rotundato-auriculatae, ungui 2 mm. longo incluso 9 mm. longae, 2.5 mm. latae, glabrae; carinae petala ungui 3 mm. longo incluso 9 mm. longa, 3 mm. lata, glabra. *Stamen* vexillare ab aliis omnino liberum, antheris oblongis. *Ovarium* adpresse pubescens, circa 4 mm. longum, stipite vix distincto, stylo glabro, ovulis 4. *Legumen* stramineo-brunneum,

* Continued from K.B. 1926, p. 363.

styli basi persistente apiculatum, basi cuneatum, 8-9 cm. longum, ad 2.3 cm. latum, haud alatum, glabrum, pedicello 4 mm. longo suffultum; semina fusca, compressa, ambitu oblongo-elliptica, ad 1.5 cm. longa et 1 cm. lata, hilo parvo.

Prê, Den Chai, 150 m., *Kerr* 3163.

Millettia kangensis *Craib* [Leguminosae-Galegeae]; species floribus inter maiores cum foliis iuvenilibus orientibus, vexillo basi calloso extra sericeo, ovario pubescente distinguenda.

Arbor circa 10 m. alta (ex *Kerr*); ramuli iuventute densius breviter crispatis fulvo-pubescentes, mox glabri, cortice brunneo vel cinereo-brunneo obtecti, lenticellis numerosis prominentibus. *Folia* 7-9-foliolata, petiolo circa 4 cm. longo incluso circa 17 cm. longa, et petiolo et rhachi subteretibus vel hoc superne late canaliculato indumento ei ramulorum iuvenilium simili obtectis; stipulae lineares, circa 3 mm. longae; foliola opposita, oblonga, oblongo-oblancoolata vel terminali obovato, apice breviter subito acuminata, summo apice costa excurrente apiculata, basi cuneata vel rotundato-cuneata, lateralia saepissime parum inaequilateralia, ad 8 cm. longa et 4.2 cm. lata, chartacea, supra primo sericea, mox adpresse pubescentia, subtus breviter molliter pubescentia, nervis lateralibus utrinque 8-10 supra conspicuis subtus prominulis, reticulatione gracili sub oculo armato subtus conspicua, petiolulo circa 3 mm. longo suffulta, terminali a lateralibus fere 2 cm. distante, stipellis filiformibus pubescentibus circa 3.5 mm. longis. *Paniculae* partiales in paniculas terminales paucifoliatas vel efoliatis ad 15 cm. longas et 12 cm. latas dispositae, ipsae ad 7 cm. latae; flores e ramusculis lateralibus ad 3 cm. longis racemosim orti; bracteae angustae, circa 4 mm. longae, deciduae; bracteolae binae, ad pedicelli apicem positae, circa 3 mm. longae, angustae, deciduae; rhachis, ramuli, et pedicelli densius fulvo-tomentelli vel etiam parce pubescentes; pedicelli ad 1 cm. longi, breviter pubescentes. *Calyx* extra pubescens, ad 6.5 mm. longus; lobi postici approximati, breves, laterales et anticus deltoidei, acuti, 1.5 mm. longi, 2 mm. lati. *Vexillum* oblongum, basi cordatulum, bicallosum, 1.5 cm. longum, 0.8 cm. latum, dorso sericeum, ungui 3 mm. longo suffultum; alae 14 mm. longae, 4 mm. latae, basi auriculatae, apicem versus angustatae, obtusae vel rotundatae, extra apicem versus sparse sericeae, ungui 5 mm. longo suffultae; carinae petala basi auriculata, 12 mm. longa, 4.5 mm. lata, extra apice sericea, ungui 5 mm. longo suffulta. *Stamina* monadelphae, vexillari basi tantum ab aliis libero. *Ovarium* 1 cm. altum, subsessile, sericeum, stylo basi sericeo apicem versus glabro, ovulis 7.

Chawm Tawng, Mê Kang, 300 m., mixed forest by stream, *Kerr* 5355.

Millettia Kityana *Craib* [Leguminosae-Galegeae]; a *M. nitida* Benth., cui maxime affinis foliolis basi cordatulis, legumine iuvenili glabro recedit.

Ramuli lignosi, alte scandentes, cito glabri, straminei vel brunneo-straminei, striati. *Folia* 9-foliolata, petiolo 6-8.5 cm. longo incluso 23-30 cm. longa, petiolo basi conspicue incrassato cum rhachi longitudinaliter striato et supra anguste canaliculato glabro; stipulae saepe diutius persistentes, subulatae, 6-8 mm. longae; foliola oblongo-oblancoolata, apice acuminata, apiculata, basi rotundata, cordatula, 5.5-12 cm. longa, 2.3-4.5 cm. lata, coriacea vel subcoriacea, supra glabra, sicco plumbea, subtus sparse inconspicue adpresse hirsuta, sicco pallide viridia, nervis lateralibus utrinque circa 10 aliis paululo minus conspicuis additis intra marginem anastomosantibus pagina utraque conspicuis, nervulis rete gracile pagina utraque conspicuum efficientibus, incrassato-marginata, petiolulo 4-5 mm. longo transverse corrugato glabro suffulta; stipellae persistentes, subulatae, petiolulis subaequilongae, vel iis paululo longiores. *Inflorescentia* e racemis axillaribus foliis paulo longioribus, e paniculis axillaribus pauciramosis foliis duplo longioribus, vel e paniculis terminalibus copiose ramosis ad 40 cm. longis et 30 cm. diametro, iuventute adpresse ferrugineo-pubescentia, mox glabra; bracteae cito deciduae, alabastra iuvenilia longe superantes, adpresse ferrugineo-pubescentes; flores ad nodos solitarii, pedicellis ad 4 mm. longis adpresse ferrugineo-pubescentibus suffulti. *Calyx* 6.5 mm. longus, subtruncatus, extra iuventute dense adpresse ferrugineo-pubescentia, maturus sparse pubescens, intra superne adpresse ferrugineo-pubescentia. *Vexillum* 2 cm. longum, 1.6 cm. latum, basi bicallosum, breviter unguiculatum, dorso adpresse ferrugineo-pubescentia; alae ungui lato 3 mm. longo incluso 21 mm. longae, 4 mm. latae, basi longius auriculatae; carina ungui lato 3 mm. longo incluso 15 mm. alta, apice 15 mm. lata, basi conspicue truncato-auriculata. *Stamen* vexillare liberum, aliis alternatim longioribus et brevioribus. *Pistillum* glabrum; ovarium stipite brevi lato incluso 14 mm. longum, stylo 4.5 mm. longo, stigmate capitato, ovulis 10.

Chiengmai, 300 m., by village, *Kerr* 3347.

Millettia venusta *Craib* [Leguminosae-Galegeae]; species nova *M. Cubitii* Dunn, similis, sed foliolis basi latis, ovario sparse adpresse pubescente haud sericeo differt.

Frutex ad 2.5 m. altus (ex *Kerr*); ramuli iuventute hic et illic parcissime pubescentes, cito glabri, cortice brunneo mox cinereo obtecti, lenticellis paucis inconspicuis. *Folia* petiolo 4.5-7.5 cm. longo excluso 17-29 cm. longa, et petiolo et rhachi supra canaliculatis et in sulco breviter crispatis pubescentibus; stipulae breves, deciduae; foliola ad 19, opposita, oblonga, late oblonga vel subovata, apice acuminata, obtusa, basi lateralia truncata rotundatae, saepissime parum inaequilateralia, terminali cuneato, 4-8.5 cm. longa, 2.5-3.5 cm. lata, terminali lateralibus saepissime longiore, chartacea, sicco pagina utraque viridia, inferiore parum pallidiora, ad costam supra breviter crispatis pubescentia, aliter glabra, nervis lateralibus utrinque 8-10 supra subconspicuis subtus

prominulis, nervulis rete gracile pagina utraque subconspicuum efficientibus, petiolulo 3-4 mm. longo sicco fusco supra subplano vel parum canaliculato breviter parce pubescente suffulta, terminali a lateralibus 4-6 mm. distante; stipellae persistentes, subulatae, circa 2.5 mm. longae. *Racemi* axillares, pedunculo communi 1-9 cm. longo incluso 13-24 cm. longi, et pedunculo et rhachi glabris; flores e ramusculis 3-5 mm. vel mox ad 2 cm. longis orti, purpurei, ad vexilli basem luteo-maculati (ex *Kerr*), pedicellis 3 mm. longis glabris suffulti; bracteae parvae, cito deciduae; bracteolae binae, ad pedicelli apicem positae, parvae, ante anthesin deciduae. *Calyx* sicco fuscus, apice ciliatus, aliter glaber, 6-7 mm. longus, lobis posticis fere obsoletis, lateralibus et antico late deltoideis subacutis circa 1.5 mm. longis et 2.5 mm. latis. *Vexillum* subquadratum, 11 mm. longum, 10 mm. latum, basi bicallosum, extra sericeum, intra glabrum, ungui 4 mm. longo suffultum; alae oblongae, apice rotundatae, basi semicordatae, 11 mm. longae, 3.75 mm. latae, ungui 5 mm. longo suffultae, extra apicem versus pilis paucis adpressis instructae; carinae petala basi truncata, 9 mm. longa, 4 mm. lata, ungui 5.5 mm. longo suffulta, extra apicem versus parce sericea. *Ovarium* circa 6 mm. longum, stipite circa 2 mm. longo suffultum, sparse adpresse pubescens, stylo glabro, ovulis 3. *Legumen* juvenile 11 cm. longum, 1.6 cm. latum, sicco fuscum, acuminatum.

Mûang Lôi, 200 m., scrub jungle, *Kerr* 8787.

***Fordia fruticosa* Craib** [Leguminosae-Galegeae]; species nova foliolis chartaceis pagina utraque adpresse pubescentibus, stipellis evolutis, floribus breviter pedicellatis distincta.

Suffrutex ad 40 cm. altus; caules primo sulcati, sparsius adpresse crispatis pubescentes, mox subteretes. *Folia* 15-17-foliolata, petiolo 2.5-3.5 cm. longo incluso 14-17 cm. longa, petiolo cum rhachi supra canaliculato subtus angulato densius subadpresse crispatis pubescente; stipulae diutius persistentes, lineares, acutae vel subobtusae, interdum paulo falcatae, 7 mm. longae, dorso indumento ei caulium simili tectae, intra glabrae, nervis intra subprominentibus; foliola opposita vel mediana hic et illic alterna, oblonga, lanceolata vel ovata, apice acuminata et costa excurrente apiculata, basi rotundata truncatave, saepe cordatula et parum inaequalia, 2-4 cm. longa, 1.3-2 cm. lata, chartacea, pagina utraque sed inferiore densius adpresse albo-pubescentia, sicco inferiore pallida, costa supra conspicua subtus prominente, nervis lateralibus utrinque 5-8 intra marginem anastomosantibus supra subconspicuis subtus prominulis, nervulis paucis pagina utraque subconspicuis, margine adpresse ciliata, petiolulo 1-2 mm. longo subterete pubescente suffulta; stipellae angustae, petiolulis subaequilongae. *Racemi* axillares, petiolis subaequilongi, pedunculo communi 5-15 mm. longo ima basi bibracteato cum rhachi crispatis pubescente suffulti; bracteae deciduae, circa 3 mm. longae; bracteolae duae, circa 2 mm. longae, ad pedicelli apicem

paulo infra calycem positae; flores purpurei (ex *Kerr*), pedicellis circa 3 mm. longis breviter pubescentibus suffulti. *Calyx* dorso subsparse adpresse pubescens, 3 mm. longus, dentibus 2 posticis approximatis brevissimis, lateralibus cum antico posticis duplo longioribus. *Vexillum* rotundato-ellipticum, apice emarginatum, basi cordatum, bicallosum, ungui brevi lato incluso 11 mm. longum, 10 mm. latum, dorso sparse sericeum; alae oblongae, basi biauriculatae, apice obtusae, ungui 2.5 mm. longo incluso 11 mm. longae, 4 mm. latae; carinae petala apice obtusa, basi latere altero truncata, ungui vix 3 mm. longo incluso 10 mm. longa, 4 mm. lata, apice pilis paucis adpressis instructa. *Stamina* monadelphica, vexillari ima basi tantum ab aliis libero, antheris ovatis. *Ovarium* adpresse hirsutum, biovulatum.

Mê Hawng Sawn, Mê Cha, 400 m., bank of stream in mixed forest, *Kerr* 5468.

***Padbruggea pubescens* Craib** [Leguminosae-Galegeae]; a *P. atropurpurea* (Wall.), calyce dense breviter adpresse brunneo-vel subferrugineo-pubescente recedit.

Arbor circa 10 m. alta (ex *Kerr*); ramuli (inflorescentes) iuventute densius ferrugineo-tomentosi, mox glabri, sulcati, cortice sub-brunneo plus minusve longitudinaliter fissi obtecti. *Folia* 9-foliolata, petiolo 6-7.5 cm. longo basi incrassato cum rhachi 12-18 cm. longo puberulo vel fere glabro supra plus minusve canaliculato subtus carinato suffulta; foliola opposita vel subopposita, oblongo-lanceolata vel ovato-lanceolata, rarius lanceolata vel oblonga, apice subacuminata, acuta vel obtusa, basi truncata vel cuneata, terminalia aequalia, lateralibus saepissime inaequalia, 7-12 cm. longa, 2.5-5.7 cm. lata, rigide chartacea vel chartaceo-coriacea, matura glabra, nervis lateralibus utrinque 7-8 praesertim superioribus intra marginem anastomosantibus supra conspicuis vel paululo prominulis subtus prominentibus, nervulis rete gracile pagina utraque conspicuum vel subprominulum efficientibus, petiolulo sat valido 4-7 mm. longo glabro suffulta. *Panicula* terminalis, ad 25 cm. longa et 20 cm. diametro, et rhachi et ramulis densius ferrugineo-tomentosis; bracteae deciduae, circa 3 mm. longae; flores subsessiles. *Calyx* 6 mm. longus, postice truncatus, lobo antico brevi lateralibus duplo longiore, extra densius breviter pubescens. *Vexillum* late ovatum, 15 mm. diametro, basi subcallosum, ungui lato 4 mm. longo suffultum, glabrum; alae oblongae, apice rotundatae, basi auriculatae, 16 mm. longae, 5 mm. latae, breviter unguiculatae; carina 15 mm. longa, 6 mm. lata, basi auriculata, ungui 5 mm. longo suffulta. *Ovarium* stipite circa 6 mm. longo crispatis pubescente suffultum, 4 mm. altum, ovulis 3, stylo glabro circa 5 mm. longo.

Nakawn Panom, Ta Uten, 200 m., evergreen forest, *Kerr* 8457.

***Shuteria siamensis* Craib** [Leguminosae-Phaseoleae]; ab affini *S. ferruginea* Baker, inter alia calyce multo longiore distinguenda.

Caules herbacei, iuventute pilis arcte reflexis ferrugineis dense recti, canaliculati. *Folia* trifoliolata, petiolo usque ad 8 cm. longo pilis ferrugineis reflexis instructo supra canaliculato suffulta; stipulae persistentes, oblongo- vel ovato-lanceolatae, acutae, ad 8 mm. longae et 4 mm. latae, extra adpresse pubescentes, intra glabrae, striatae; foliola lateralialia inaequilateralialia, latere altero dimidio ovata, basi rotundata truncatave, altero dimidio lanceolata vel oblanceolata, basi rotundata, terminali subrhombeo basi late cuneato, omnibus apice longius acute attenuatis vel acuminatis ad 6 cm. longis et 3·6 cm. latis firme chartaceis pagina utraque sed inferiore mollius adpresse hirsutis, nervis lateralibus utrinque circa 6 ad marginem currentibus supra conspicuis vel subconspicuis subtus prominentibus nervis transversis subtus prominulis, petiolulo 3 mm. longo sat valido densius adpresse ferrugineo-hirsuto suffultis, terminali a lateralibus circa 1 cm. distante; stipellae lineares, striatae, petiolulos subaequantur vel iis paululo longiores. *Racemi* axillares, simplices vel pauci-ramosi, maturi foliis subaequilongis, breviter pedunculati, rhachi indumento ei caulium simili sed pallidior tecto; flores purpurei (ex *Kerr*), pedicellis circa 3 mm. longis suffulti, ad nodos solitarii vel saepius gemini; bractee conspicuae, sub anthesin persistentes vel deciduae, obovatae, apice breviter acuminatae, 7 mm. longae, 5 mm. latae, extra adpresse pubescentes, intra glabrae, striatae; bracteolae angustae, 4 mm. longae, ad apicem pedicelli positae; alabastra longe acuminata. *Calycis* extra pilis paucis albis adpressis sparse instructi tubus 6 mm. longus, lobi postici in unum deltoideum apice attenuatum acutum 3·5 mm. longum et latum connati, laterales lanceolati, apice attenuati, acuti, 3 mm. longi, 1·5 mm. lati, antico lateralibus simili nisi angustiore et postico subaequilongis, antico et lateralibus basi imbricatis. *Vexillum* sublyratum, basi anguste auriculatum, ecallosum, apice subtruncatum, ungui sat lato 3 mm. longo incluso 15 mm. longum, 7·5 mm. latum; alae oblongae, apice rotundatae, basi cordato-auriculatae, ungui 1 cm. longo incluso 1·6 cm. longae, 3 mm. latae; carinae petala basi truncata vel rotundato-truncata, ungui 1 cm. longo incluso 1·6 cm. longa, 3·5 mm. lata. *Stamen* vexillare ab aliis liberum, filamentis alternatim longioribus et brevioribus, antheris brevibus. *Ovarium* circa 3 mm. longum, ad suturas sericeum, stipite circa 2 mm. longo suffultum, disco tubulari stipitis basem cingente; stylus inferne gracilis, apicem versus incrassatus, glaber, stigmatibus parvo capitato, ovulis 3. *Legumen* ad 2·7 cm. longum et 7 mm. latum, stipitatum, styli basi persistente apiculatum.

Doi Angka, 1600–2000 m., *Kerr* 6305.

***Spatholobus compar* Craib** [Leguminosae-Phaseoleae]; a *S. Harmandii* Gagnep., calycis lobis posticis paululo altius connatis, vexillo latiore basi truncato, ovarii indumento conspicue sparsiore recedit.

Frutex volubilis; ramuli iuventute breviter adpresse ferrugineo-

pubescentes, mox glabri, cortice cinereo vel brunneo-cinereo obtecti, lenticellis vix conspicuis. *Folia* trifoliolata, petiolo 5–8 cm. longo basi incrassato adpresse ferrugineo-pubescente aliter glabro inferne et superne supra parum canaliculato aliter subterete suffulta; stipulae deciduae, 3 mm. longae, basi incrassatae; foliola symmetrica vel lateralialia parum inaequilateralialia, oblonga vel oblongo-oblanceolata, apice acuminata, summo apice obtusa vel retusa, basi rotundata vel cuneato-rotundata vel terminali late cuneato, ad 12 cm. longa et 4·7 cm. lata, coriacea, supra glabra, subtus ad costam adpresse ferrugineo-pubescentia, aliter pilis inconspicuis ferrugineis adpressis sparse instructa, nervis lateralibus utrinque circa 8 intra marginem anastomosantibus pagina utraque sed praesertim inferiore prominulis, nervulis rete laxum pagina utraque prominulum efficientibus, petiolulis incrassatis 5 mm. longis adpresse ferrugineo-pubescentibus suffulta, terminali a lateralibus ad 1·5 cm. distante; stipellae ad 2 mm. longae. *Flores* albi (ex *Kerr*), in paniculas ramulis brevibus lateralibus foliatis vel efoliatis gestas ad 15 cm. longas dispositi; bractee parvae, deciduae; pedicelli ad 3 mm. longi, medio bracteolati, cum rhachi ramulisque breviter densius pubescentes. *Calyx* extra breviter pubescens, intra tenuiter sericeus; tubus 2·5 mm. longus; lobi oblongi, subacuti, 1·5 mm. longi, duo postici in unum apice emarginatum connati, ciliati. *Vexillum* subquadratum, apice emarginatum, basi truncatum, ungui 2·5 mm. longo excluso 5 mm. longum, 7 mm. latum; alae basi truncatae, ungui 2·5 mm. longo excluso 4·75 mm. longae, 2·5 mm. latae; carina basi obtuse auriculata, ungui 3·5 mm. longo excluso 4 mm. longa, 2 mm. lata. *Stamen* vexillare ab aliis liberum. *Ovarium* sessile, adpresse pubescens, stylo inferne sparse adpresse pubescente superne glabro.

Kaw Chang, Klawng Nonsi, under 10 m., evergreen by stream, *Kerr* 9167.

***Spatholobus dimorphus* Craib** [Leguminosae-Phaseoleae]; caule basi ramulos prostratos paniculas gerentes emittente distinguendus.

Frutex volubilis, ad basem ramulos prostratos inflorescentiam vel etiam folia gerentes emittens (ex *Kerr*); ramuli primo breviter adpresse pubescentes, mox glabri, angulati vel striati. *Folia* trifoliolata, petiolo 7–13·5 cm. longo primo pilis fulvis adscendentibus sat longis dense tecto mox sparse adpresse hirsuto vel fere glabro basi incrassato subterete vel superne supra parum complanato suffulta; stipulae saepissime fugaces, oblongae, obtusae, 9 mm. longae, 2·5 mm. latae, dorso adpresse fulvo-hirsutae, intra superne glabrae, basi parce adpresse hirsutae, ciliatae; foliola lateralialia inaequilateralialia, latere inferiore dimidio ovata vel ovato-oblonga, basi rotundata vel rotundato-cuneata, superiore dimidio oblonga vel oblanceolata, basi cuneata, terminali oblongo-obovato vel fere obovato basi cuneato, omnibus apice breviter acuminatis obtusis vel apiculatis ad 18 cm. longis et 8·8 cm. latis rigide chartaceis

sicco supra plus minusve plumbeis subtus subviridibus pagina superiore maturis glabris inferiore primo dense adpresse fulvo-hirsutis mox ad costam nervosque laterales sparse hirsutis vel glabris, nervis lateralibus utrinque 8-10 intra marginem anastomosantibus cum costa supra prominulis subtus prominentibus, nervulis pagina utraque sed praesertim inferiore prominulis, petiolulis 5 mm. longis sparse hirsutis suffultis, terminali a lateralibus 2.5-4.5 cm. distante; stipellae petiolulis fere duplo longiores. *Paniculae* ex axillis foliorum delapsorum ortae, basi bracteatae, rhachi iuventute plus minusve breviter pilosae, ramulis pubescentibus; pedicelli graciles, 3-4 mm. longi; bracteae fugaces. *Calyx* extra densius fulvo-pubescentis, intra adpresse albo-pubescentis; tubus 1.5 mm. longus; lobi inter se subaequilongi, suboblongi, apice obtusi, 2 mm. longi, postici inter se saltem ad medium connati. *Vexillum* suboblatum, apice emarginatum, basi truncatum, ecallosum, ungui 2 mm. longo excluso 6 mm. longum, 8 mm. latum; alae oblongae, apice rotundatae, basi biauriculatae, ungui 3.75 mm. longo excluso 5.5 mm. longae, 2.5 mm. latae; carina basi truncata vel subauriculata, ungui 4 mm. longo excluso 4 mm. longa, 2.5 mm. lata. *Stamen* vexillare sub anthesin ab aliis liberum, antheris apiculatis. *Ovarium* adpresse hirsutum, sessile, stylo inferne parce hirsuto superne glabro.

Lôi, Kao Krading, 1000 m., evergreen forest, *Kerr* 8744, 8744A.

***Spatholobus floribundus* Craib** [Leguminosae-Phaseoleae]; a *S. suberecto* Dunn, alae carinaeque petalis basi truncatis vel paululo auriculatis haud conspicue auriculatis recedit.

Frutex volubilis; ramuli primo densius fulvo-pubescentes, striati, cito fusci, conspicue pallide lenticellati, mox brunneo-corticati. *Folia* trifoliolata, petiolo 3.5-7.5 cm. longo basi incrassato supra parum canaliculato sparse adpresse hirsuto suffulta; stipulae fugaces; foliola lateralia inaequilateralia, latere inferiore dimidio ovata, basi truncata, superiore dimidio oblonga vel oblongo-lanceolata, basi rotundata vel cuneata, terminali elliptico vel late elliptico basi rotundato, omnibus apice acuminatis mucronulatis usque ad 13.5 cm. longis et 8 cm. latis chartaceis pagina utraque primo pilis adpressis sparse instructis maturis fere glabris inferiore in nervorum axillis saepe pilosis, nervis lateralibus utrinque 8-10 intra marginem anastomosantibus cum costa supra conspicuis vel subprominulis subtus prominentibus, nervulis rete sub oculo armato gracile subtus conspicuum supra subconspicuum vel saepe parum impressum efficientibus, petiolulis circa 5 mm. longis sparse pubescentibus supra carinatis apice canaliculatis suffultis, terminali a lateralibus ad 2 cm. distante; stipellae petiolulis saltem dimidio breviores. *Flores* albi (ex *Kerr*), in paniculam terminalem inferne foliatam ad 40 cm. longam dispositi ramuli primarii inferiores ad 18 cm. longi, pedunculo communis ad 4 cm. longi suffulti; ramuli secundarii 9-10 cm. longi, flores in ramulos circa 3 mm. longos dispositos gerentes; et rhachis e

ramuli primo densius fulvo-pubescentes, cito plus minusve glabrescentes; bracteae et bracteolae parvae, deciduae; pedicelli circa 1.5 mm. longi. *Calyx* extra breviter sparse sericeus, intra sericeus; tubus 2 mm. longus; lobi inter se aequilongi, postici in unum oblatum apice retusum connati, 0.75 mm. longi. *Vexillum* subquadratum, apice emarginatum, basi truncatum, ungui sat lato 2.5 mm. longo excluso 5.5 mm. longum, 6 mm. latum, glabrum, ecallosum; alae basi truncatae vel cordatulae, ungui 3 mm. longo excluso 4.5 mm. longae, 2-2.5 mm. latae; carina basi truncata vel cordatula, ungui 3 mm. longo excluso 3.5 mm. longa, 2.5 mm. lata. *Stamen* vexillare ab aliis liberum. *Ovarium* sessile, adpresse albo-pubescentis, stylo ima basi sparse adpresse pubescente aliter glabro.

Doi Sutep, 1560 m., evergreen forest, *Kerr* 1826.

***Atylosia siamensis* Craib** [Leguminosae-Phaseoleae]; ab affini *A. barbata* Baker, bracteis floribusque conspicue longioribus facile distinguenda.

Ramuli volubiles, iuventute pilis longiusculis fulvis et brevioribus albis ambobus adpressis et reflexis pilis longioribus cito divaricatis instructi, mox sparse pilosi et puberuli. *Folia* trifoliolata, petiolo 2-5.5 cm. longo sulcato indumento ei ramulorum simili tecto suffulta; stipulae persistentes, lanceolatae vel anguste lanceolatae, apice attenuatae vel acuminato-attenuatae, circa 8 mm. longae, dorso sparse pilosae et puberulae, longe ciliatae; foliola lateralia inaequilateralia, latere altero dimidio lanceolata, basi rotundata, altero dimidio ovata vel subrhombico-ovata, basi rotundata truncatave, omnibus apice subacuminatis apiculatis ad 7.5 cm. longis et 4.3 cm. latis chartaceis vel rigide chartaceis sicco viridibus subtus pallidioribus nervulosque molliter pubescentibus subtus ad costam nervos nervulosque molliter pubescentibus et glandulis parvis instructis trinerviis nervis lateralibus utrinque 4-5 cum costa supra conspicuis subtus prominentibus nervis transversis inter se parallelis subtus prominulis ciliatis petiolulis ad 3 mm. longis pilosis et puberulis suffultis, foliolo terminali a lateralibus 1-1.5 cm. distante; stipellae persistentes, filiformes, 4 mm. longae, pubescentes. *Racemi* axillares, pedunculo communi incluso mox ad 34 cm. longi, et pedunculo et rhachi mox validis indumento ei ramulorum simili tectis; flores lutei (ex *Kerr*), ad nodos gemini, pedicellis 7-10 mm. longis pilosis et puberulis suffulti; bracteae deciduae, ovato-lanceolatae, caudato-acuminatae, vix 12 mm. longae, 4 mm. latae, dorso adpresse pubescentes, ciliatae; alabastra acuminata. *Calycis* extra pilosi et intra sparse adpresse pilosi tubus 4 mm. longus, lobi 5, duo postici vix ad medium connati, lanceolati, acuti, 4.5 mm. longi, 1.5 mm. lati, laterales postici similes sed breviores et angustiores, antico lanceolato acuminato 12 mm. longo 3 mm. lato, omnibus ciliatis. *Vexillum* oblato-rotundatum, apice emarginatum, 2.3 cm. longum, 2.5 cm. latum, ungui 5 mm. longo suffultum, glabrum, basi auriculatum et paulo

supra basem bicallosum; alae basi auriculatae, supra auriculam constrictae, ungui 6 mm. longo incluso 2.5 cm. longae, 1 cm. latae; carinae petala basi dimidio late cuneata, haud auriculata, ungui 6 mm. longo incluso 2 cm. longa, 1 cm. lata. *Stamen* vexillare liberum. *Ovarium* dense sericeum, 1 cm. longum, stylo basi pilis paucis adpressis instructo inferne gracili superne incrassato rigido, stigmatibus capitato terminali. *Legumen* iuvenile longe pilosum praeterea pubescens.

Saraburi, Muak Lek, 200 m., scrub, *Kerr* 10004.

***Rhynchosia calcicola* Craib** [Leguminosae-Phaseoleae]; ab affini *R. nummularia* DC., foliolis acuminatis facile distinguenda.

Caules herbacei, graciles, sulcati, primo pilis paucis divergentibus instructi, mox glabri. *Folia* trifoliolata, petiolo usque ad 6 cm. longo basi incrassato supra anguste canaliculato pilis longiusculis divergentibus hic et illic instructo suffulta; stipulae lanceolatae, 2.75 mm. longae, cito deciduae, longius ciliatae, aliter pilis perpauca instructae, parce glandulosae; foliola lateralia inaequilateralia, latere altero dimidio ovata vel subrhombea, basi truncata vel rotundato-truncata, altero dimidio lanceolata vel ovato-lanceolata, basi rotundata, terminali ovato late ovato vel rotundato-ovato basi truncato, omnibus apice longius subacute acuminatis sicco viridibus subtus pallidioribus supra ad costam nervosque breviter pubescentibus aliter setulis brevibus et paucis longioribus instructis subtus setulis ad costam nervos nervulosque hic et illic instructis praeterea aureo-glandulosis, nervis lateralibus utrinque circa 8 supra plus minusve conspicuis subtus prominulis, nervis transversis subtus subprominulis, margine longius ciliatis; petioluli 2 mm. longi, puberuli, foliolo terminali a laterali 1-1.3 cm. distante. *Inflorescentia* axillaris e floribus 2-3 ad apicem pedunculi brevis positus vel ad nodos rhacheos subaphylli fasciculatis constituta; flores lutei (ex *Kerr*), pedicellis 3 mm. longis breviter pubescentibus suffulti; bractae parvae, cito deciduae. *Calyx* extra sparse pubescens et glandulosus, intra glaber; tubus 2 mm. longus; lobus anticus deltoideus, apice attenuatus, acutus, 2.5 mm. longus, 2 mm. latus; lobi laterales deltoidei, acuti, 1 mm. longi, postici in unum apice bicuspidatum 1.25 mm. longum, 2.5 mm. latum connati, omnibus ciliatis. *Vexillum* stipite incluso 1 cm. longum, lamina ovata 7 mm. lata basi auriculata haud callosa in unguem latum circa 2 mm. longum angustata; alae 6 mm. longae, 2.5 mm. latae, basi latere uno auriculatae, ungui 2.5 mm. longo suffultae; carina pro magnitudine longius rostrata, 6.5 mm. longa, ungui 2.5 mm. longo suffulta. *Stamen* vexillare ab aliis liberum, filamentis alternatim longioribus et brevioribus, antheris parvis. *Ovarium* 1.5 mm. longum, stipite brevi basi disco cincto suffultum, glabrum, bi-ovulatum; stylus vix 3 mm. longus, glaber, inferne aequaliter teres, supra medium incrassatus et complanatus, stigmatibus terminali capitato. *Legumen*

circa 10 mm. longum et 9 mm. latum, apiculatum, conspicue nervosum.

Korat, Chantûk, Kao Sisiat A, 500 m., crevices of limestone rocks, *Kerr* 9105.

***Rhynchosia distans* Craib** [Leguminosae-Phaseoleae]; species ramulis lignosis, foliolo terminali a lateralibus longe distante, floribus inter maiores, legumine brevi fulvo, seminibus cyaneis exarillatis distincta.

Frutex volubilis; ramuli primo fulvo-pilosi, striati, mox glabri, lignosi, ad 5 mm. diametro. *Folia* trifoliolata, petiolo 6-11 cm. longo indumento ei ramulorum simili instructo sulcato suffulta; stipulae parvae, fugaces; foliola lateralia inaequilateralia, latere inferiore dimidio ovata, basi truncata, superiore dimidio lanceolata vel late lanceolata, basi rotundata, terminali late rhomboideo basi truncato vel rotundato-truncato, omnibus apice longius acute acuminatis ad 8 cm. longis et 6.5 cm. latis chartaceis sicco viridibus subtus pallidioribus supra parce pubescentibus et pilis longioribus hic et illic instructis subtus praesertim ad costam nervosque pubescentibus et parce aureo-glandulosis trinerviis, nervis secundariis (e costa ortis) utrinque 4-6 intra marginem anastomosantibus cum basalibus et costa supra conspicuis subtus prominulis, nervis transversis subtus subprominulis, ciliatis petiolulo 3-4 mm. longo densius fulvo-pubescente suffultis, terminali a lateralibus 3-3.5 cm. distante; stipellae deficientes. *Racemi* axillares, simplices, solitarii vel gemini, petiolos subaequantes, breviter pedunculati; pedunculus cum rhachi et pedicellis densius fulvo-pubescentibus; bractae deciduae; pedicelli ad nodos solitarii vel gemini, 5 mm. longi; flores lutei, rubro-lineati (ex *Marcant*). *Calyx* extra densius fulvo-pubescentibus, intra sparse sericeus; tubus 2-2.5 mm. longus; lobi postici ad medium connati, laterales postici subaequilongi, lineari-lanceolati, 4 mm. longi, antico lineari-lanceolato 6 mm. longo, omnibus acutis ciliatis. *Vexillum* elliptico-obovatum, apice emarginatum, basi auriculatum, haud callosum, ungui 3 mm. longo excluso 1.3 cm. longum, 1 cm. latum, dorso pilosum; alae suboblongae, basi latere altero auriculatae, altero paulo superius dentatae, ungui 3 mm. longo excluso 10 mm. longae, 3.5 mm. latae, superne medio parce pubescentes; carinae petala basi subtruncata, ungui 6 mm. longo excluso 9 mm. longa, 4.5 mm. lata. *Ovarium* dense sericeum, stylo inferne pubescente. *Legumen* fulvum, styli basi persistente acuminatum, ad 2 cm. longum, pilosum et densius breviter pubescens; semina 1-2, ambitu oblonga, nitida, cyanea, exarillata.

Pak Chawng, 400 m., evergreen jungle, *Marcant* 1562.

***Rhynchosia Marcanii* Craib** [Leguminosae-Phaseoleae]; ab affini *R. viscosa* DC., floribus maioribus, calycis lobo antico multo longiore, petalorum unguibus pro rata longioribus, ovario sericeo distinguenda.

Caules annui (?), volubiles, primo pilosi et pubescentes, mox pubescentes, striati, pallide corticati. *Folia* trifoliolata, petiolo 6-7.5 cm. longo piloso supra canaliculato suffulta; stipulae cito reflexae, mox deciduae, lanceolatae vel lanceolato-deltoideae, basi haud productae, ad 8 mm. longae et 3 mm. latae, costatae, pagina utraque pilosae, ciliatae; foliola lateralia inaequilaterialia, latere inferiore dimidio late ovata, basi truncata, superiore lanceolata vel oblongo-lanceolata, terminali oblato-rhomboideo basi rotundato vel fere truncata, omnibus apice acuminatis acutis usque ad 6 cm. longis et 5.5 cm. latis chartaceis pagina superiore viridibus inferiore pallide viridibus superiore parce pilosis inferiore ad costam nervosque laterales et transversos pubescentibus glandulosis trinerviis, nervis secundariis (e costa ortis) utrinque 3-4 cum basalibus ad marginem currentibus supra conspicuis vel subconspicuis subtus prominulis, ciliatis petiolulo circa 2 mm. longo suffultis, terminali a lateralibus 1.5-1.8 cm. distante; stipellae filiformes, petiolulis subaequilongae vel iis dimidio breviores, interdum deciduae, interdum persistentes. *Racemi* axillares, pedunculo communi ad 2 cm. longo incluso inflorescentes ad 10 cm. infructescentes ad 15 cm. longi, pedunculo cum rhachi et pedicellis piloso et pubescente; bractae lanceolatae, acuminatae, 5-6 mm. longae, pilosae, deciduae; flores lutei (ex *Marcan*), breviter pedicellati. *Calyx* extra pilosus et glandulosus, intra subsericeus; tubus 2.5-3 mm. longus; lobi postici in unum ad 4 mm. longum vix ad medium bilobatum connati, laterales lineari-lanceolati, 3-4 mm. longi, 1.25 mm. lati, infimo lineari-lanceolato 7 mm. longo 1.25 mm. lato, omnibus ciliatis apice acutis. *Vexillum* subellipticum, apice rotundatum, basi auriculatum et medio bicallosum, ungui 3 mm. longo excluso 1.2 cm. longum, 1 cm. latum, dorso pilosum et glandulosum; alae suboblongae, basi latere altero longius auriculatae, altero paulo superius parvi-auriculatae, ungui 2.5 mm. longo excluso 10 mm. longae, 4 mm. latae; carinae petala basi cuneato-truncata, ungui 4 mm. longo excluso 10 mm. longa, 5 mm. lata. *Stamen* vexillare sub anthesin ab aliis omnino liberum, antheris oblongis. *Ovarium* dense sericeum, sessile, 4 mm. longum, stylo inferne gracili piloso superne incrassato indurato glabro, stigmate terminali. *Legumen* vix 3 cm. longum, apiculatum, brunneum, pilosum, parce glandulosum; semina 1-2, marmorata, exarillata.

Saraburi, Muak Lek, 200 m., clearing, *Marcan* 1856.

***Flemingia brevipes* Craib** [Leguminosae-Phaseoleae]; a *F. sootepense* Craib, petiolis haud alatis, petalorum unguibus pro rata brevioribus recedit.

Frutex ad 2 m. altus (ex *Kerr*); ramuli primo sericei, trigoni, mox plus minusve glabrescentes, 3-4 mm. diametro. *Folia* trifoliolata, petiolo 5-9 cm. longo basi incrassato supra saltem superne canaliculato subtus plurisulcato indumento ei ramulorum simili instructo suffulta; stipulae saepissime cito deciduae, lanceolatae, apice

longe acute attenuatae, 1.5 cm. longae, dorso sericeae; foliola lateralia inaequilaterialia, latere inferiore dimidio ovato-lanceolata, basi rotundata vel truncata, superiore dimidio lanceolata vel oblanceolata, basi cuneata, terminali late lanceolato vel oblongo-lanceolato basi cuneato, omnibus apice angustatis vel subacuminatis acutis usque ad 19 cm. longis et 6.5 cm. latis chartaceis supra viridibus ad costam nervosque laterales adpresse pilosis plus minusve glabrescentibus aliter sparse brevissime setulosis subtus pallidioribus ad costam nervosque laterales pilosis ad nervulos sparse pilosis rubroglandulosis, e basi 3-4-nerviis, nervis secundariis (e costa ortis) utrinque 7-10 obliquis rectis intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis subtus prominulis, petiolulo 4-7 mm. longo supra canaliculato dense adpresse piloso suffultis, terminali a lateralibus ad 7 mm. distante. *Racemi* axillares, petiolis dimidio breviores, subsessiles, simplices vel pauci-ramosi; bractae deciduae, lanceolato-ovatae, acuminatae, 3 mm. longae; pedicelli 3 mm. longi, sericei. *Calycis* extra sericei intra breviter sparse adpresse pubescentis tubus 2 mm. longus, lobus anticus lineari-lanceolatus, 6 mm. longus, 1.25 mm. latus, lobi laterales 4 mm. longi, postici lateralibus similes nisi paululo longiores, omnibus acutis ciliatis. *Vexillum* late ellipticum, basi auriculatum, ungui 1.5 mm. longo incluso 9 mm. longum, 7 mm. latum; alae basi longius auriculatae, ungui 2 mm. longo incluso 6.5 mm. longae, 2 mm. latae; carina basi subtruncata, ungui 3 mm. longo incluso 10 mm. longa, 3 mm. lata. *Stamen* vexillare sub anthesin ab aliis liberum. *Legumen* sessile, ad 12 mm. longum, puberulum et sparse aureo-glandulosum.

Krat, Kao Saming, under 20 m., edge of evergreen forest, *Kerr* 9406.

***Flemingia sarmentosa* Craib** [Leguminosae-Phaseoleae]; ab affini *F. paniculata* Wall., calyce multo longiore recedit.

Frutex sarmentosus, circa 1 m. altus (ex *Kerr*); ramuli teretes, primo plus minusve sulcati, pilis longiusculis divaricatis instructi praeterea puberuli, cito plus minusve glabrescentes, mox cortice rubro obtecti, lenticellis haud conspicuis. *Folia* unifoliolata, petiolo 1.2-2.3 cm. longo piloso supra planiusculo subtus carinato suffulta; stipulae fugaces, cicatricibus angustis conspicuis ramulos fere cingentibus; foliola oblongo-ovata vel lanceolato-ovata, saepe parum inaequilaterialia, apice acute acuminata, basi cordatula vel truncata, 9-17 cm. longa, 4-10.5 cm. lata, chartacea, supra ad costam nervosque plus minusve pubescentia, subtus sparse molliter pilosa vel pubescentia et aureo-glandulosa, e basi 5-nervia, nervis secundariis (e costa ortis) utrinque 6-8 rectis obliquis intra marginem ipsam anastomosantibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis sat approximatis supra subconspicuis vel fere obscuris subtus prominulis, margine apicem versus saepissime parum undulata. *Inflorescentia* axillaris, subsessilis,

e basi ramosa, petiolo duplo longior, basi bracteis brunneis costatis deciduis instructa; flores subalbidi, alis purpureis (ex *Kerr*), pedicellis 3-4 mm. longis suffulti; bracteae cito deciduae, circa 1 cm. longae, lineares, apice longe acute attenuatae, pilosae; rhachis cum ramulis pedicellisque plus minusve pilosus et puberulus. *Calyx* extra pilosus, intra breviter adpresse pubescens; tubus 2 mm. longus; lobi postici 7 mm. longi, laterales cum antico posticis paulo breviores, omnibus nisi antico lineari-lanceolato linearibus apice longius acute attenuatis ciliatis. *Vexillum* late ellipticum, apice emarginatum, basi auriculatum, 5 mm. longum et latum, ungui 1.5 mm. longo suffultum; alae basi latere uno auriculatae, ungui 1.5 mm. longo excluso 4.5 mm. longae, 2 mm. latae; carinae petala basi latere uno subtruncata, ungui 1.75 mm. longo excluso 5.5 mm. longa, 3 mm. lata. *Stamen* vexillare sub anthesin ab aliis liberum. *Pistillum* generis, ovario piloso et glanduloso. *Legumen* stramineum, 13 mm. longum, pilosum et glandulosum. Mé Kammi, 360 m., evergreen forest, *Kerr* 2380.

Flemingia wangkae Craib [Leguminosae-Phaseoleae]; a *F. Kerrii* Craib, foliis maioribus longius petiolatis, floribus longioribus inter alia recedit.

Frutex circa 4 m. altus (ex *Kerr*); ramuli sparse adpresse hirsuti, mox plus minusve glabrescentes, sulcati, parce glandulosi, mox ad 7 mm. diametro, lenticellis parvis conspicuis. *Folia* trifoliolata, petiolo 4-11 cm. longo sparse pubescente et glanduloso superne alato subtus carinato et sulcato suffulta; stipulae fugaces; foliola lateralia inaequilateralia, latere inferiore dimidio ovata, basi rotundata truncatave, superiore dimidio oblanceolata, basi cuneata, terminali oblongo-obovato vel subrhombeo basi cuneato, omnibus apice acuminatis acutis usque ad 16 cm. longis et 9 cm. latis chartaceis supra sicco viridibus ad costam nervosque laterales breviter pubescentibus mox fere glabris aliter sparse breviter setulosis subtus pallidioribus ad costam nervosque laterales pubescentibus vel pilosis ad nervulos parce pubescentibus aureo-glandulosis, e basi 3-5-nerviis, nervis lateralibus basalibus obliquis elongatis, nervis secundariis (e costa ortis) utrinque 6-8 rectis obliquis intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis subtus prominulis, petiolulis 5-7 mm. longis crispatis pubescentibus glandulosis supra canaliculatis suffultis, terminali a lateralibus ad 8 mm. distante. *Racemi* e foliorum axillis orti vel etiam ramulis defoliatis gesti, simplices vel e basi pauci-ramosi, subsessiles; bracteae deciduae, ovatae, 2 mm. longae, costatae, dorso sericeae et glandulosae; pedicelli 1.5 mm. longi, cum rhachi sericei et parce glandulosi. *Calycis* extra adpresse albo-pubescentis et glandulosi intra breviter adpresse pubescentis tubus vix 2 mm. longus, lobus anticus oblongo-lanceolatus, subacutus, 5 mm. longus, 1.75 mm. latus, lobi laterales lanceolati, 2.5 mm. longi, 0.75 mm. lati, postici basi breviter connati, lateralibus subaequilongi, omnibus apice acutis. *Vexillum* viridi-album, purpureo-venosum (ex *Kerr*), obovatum,

basi auriculatum, ungui 2 mm. longo excluso 10 mm. longum, 9 mm. latum; alae purpureae (ex *Kerr*), basi breviter auriculatae, ungui 2 mm. longo excluso 7 mm. longae, 3 mm. latae; carina viridi-alba, purpureo-venosa (ex *Kerr*), basi rotundato-cordatula, ungui 3 mm. longo excluso 9 mm. longa, 4 mm. lata. *Stamen* vexillare sub anthesin ab aliis liberum.

Kanburi, Wangka, 200 m., bamboo forest, *Kerr* 10303.

Sophora dispar Craib [Leguminosae-Sophoreae]; peraffinis *S. Dunii* Prain, ex descr., sed foliolis angustioribus recedit.

Frutex ad 2 m. altus (ex *Kerr*); ramuli dense fulvo-tomentosi, saepe mox pallescentes. *Folia* 19-25-foliolata, petiolo 10-15 mm. longo incluso 15-25 cm. longa, et petiolo et rhachi indumento ei ramulorum simili tectis; foliola opposita vel alterna, lanceolata vel anguste oblonga, apice subacuta, longius apiculata, basi parum inaequilateralia, truncato-cordatula, ad 5 cm. longa et 1.4 cm. lata, chartacea, supra glabra, sicco fusca, subtus dense plus minusve adpresse ferrugineo-pubescentia, nervis lateralibus utrinque circa 6 obscuris, nervulis omnino obscuris, ciliata, petiolulo circa 1 mm. longo dense ferrugineo-pubescente suffulta; stipulae angustae, diutius persistentes, 8 mm. longae, pubescentes. *Racemi* terminales, pedunculo communi brevi incluso 10-18 cm. longi; flores purpurei (ex *Kerr*); pedicelli sub anthesin 4 mm. longi, post anthesin ad 1 cm. longi; bracteae angustae, pedicellis fere duplo longiores; rhachis et pedicelli indumento ei ramulorum simili tecti. *Calyx* extra adpresse pallide vel ferrugineo-pilosus, intra glaber, 9 mm. longus; lobi postici breves, laterales 1.75 mm. longi, 3 mm. lati, breviter acute acuminati, antico lateralibus simili nisi paululo longiore, omnibus ciliatis. *Vexillum* cuneatum, 13 mm. longum, 5.5 mm. latum, apice emarginatum, basi in unguem vix distinctum angustatum, inferne puberulum; alae oblongae, apice obtusae, basi latere altero auriculatae, altero vix auriculatae, ungui sat lato circa 5 mm. longo incluso 13 mm. longae, 3.5 mm. latae; carina basi auriculata, apice rotundata, ungui 5 mm. longo incluso 13 mm. longa, 4 mm. lata. *Stamina* basi inter se breviter cohaerentia, inferne puberula. *Ovarium* 5 mm. longum, sericeum, stipite 2 mm. longo glabro suffultum. *Legumen* generis, ad 15 cm. longum, indumento ei ramulorum simili tectum.

Doi Chiengdao, 1600-2000 m., common in open savannah, *Kerr* 5578.

Sophora exigua Craib [Leguminosae-Sophoreae]; species *S. violaceae* Thw., habitu similis sed foliis subtus ad costam tantum pubescentibus inter alia facile distinguenda.

Suffrutex circa 0.5 m. altus (ex *Kerr*); ramuli primo densius pallide vel fulvo-pubescentes, angulati, mox teretes, cortice cinereo vel stramineo obtecti, glabri, lenticellis conspicuis. *Folia* 13-15-foliolata, petiolo 3.5-9 cm. longo incluso 15-30 cm. longa, petiolo cum rhachi supra canaliculato indumento ei ramulorum simili tecto; stipulae minutae, deciduae; foliola inferiora subrotundata,

intermedia oblonga, superiora oblongo-oblancoolata, terminali oblongo-obovato vel obovato, apice rotundata, rarius truncata, saepe emarginulata, basi inferiora truncato-cordatula, superiora cuneata, ad 3 cm. longa et 1.6 cm. lata, subcoriacea, sicco viridia, subtus pallidiora, supra glabra, subtus ad costam pubescentia, aliter glabra, costa supra plus minusve immersa subtus prominente, nervis lateralibus utrinque 6-8 bene intra marginem anastomosantibus supra fere obscuris subtus conspicuis, nervulis pagina utraque obscuris, ciliata, petiolulo circa 2 mm. longo indumento ei ramulorum juvenilium simili tecto suffulta. *Racemi* terminales, pedunculo communi 3.5-6.5 cm. longo incluso 11-20 cm. longi; flores purpurei (ex *Kerr*), pedicellis 5 mm. longis suffulti; bracteae angustae, 3 mm. longae; rhachis, pedicelli et bracteae indumento ei ramulorum simili tecti. *Calyx* extra parce hirsutus, basi postice parum gibbosus, campanulatus, 6 mm. longus, lobis brevibus. *Vexilli* reflexi lamina rotundato-oblonga, apice emarginata, basi cuneata, 8 mm. longa, 7 mm. lata, nervis conspicuis bene intra marginem anastomosantibus, ungui 1 cm. longo basi puberulo suffulta; alae oblongae, apice rotundatae, basi biauriculatae, ungui 3 mm. longo incluso 13 mm. longae, basi 4 mm. latae; carinae petala oblonga, apice breviter obtuse acuminata, basi acuminato-subtruncato-auriculata, ungui 3 mm. longa incluso 10 mm. longa, 3 mm. lata. *Filamenta* ima basi inter se cohaerentia, complanata, ad 9 mm. longa, antheris parvis. *Ovarium* dense pubescens, 7 mm. longum, stipite 2 mm. longo suffultum, stylo pallido pilis perpaucis divergentibus instructo, ovulis 7.

Udawn, Nawng Bua, 200 m., open deciduous forest, *Kerr* 8427a.

IX.—NOTES ON AFRICAN GRASSES, IV.* O. STAPF AND C. E. HUBBARD.

Rhytachne minor Pilger in Engl. Jahrb. LIV. 280. (1917).

An amplified description of this rare and interesting grass has been made possible by the addition of recent material from Sierra Leone.

Loosely tufted, glabrous annual. *Culms* very slender, erect or geniculately ascending, up to 30 cm. high, slightly compressed below, terete above, smooth, usually branched from about the middle, 3-4-noded, with the uppermost internode long exserted. *Leaf-sheaths* smooth, the lowermost more or less compressed and keeled, 1.5-2 cm. long, loose, persistent, the remainder narrow, tight, terete, shorter than the internodes; ligules truncate, about 0.5 mm. long, subauriculate, minutely ciliolate; lower and intermediate blades filiform, straight or flexuous, erect or spreading, tightly folded, 5-11 cm. long, up to 1 mm. wide when unfolded, smooth, the upper setiform and very short, sometimes reduced to

a small bristle on the sheath. *Racemes* solitary, very slender and fragile, erect, straight or slightly flexuous, 3-6 cm. long, 1-2 mm. wide, joints linear, about 2 mm. long, clavate and hollowed above, rounded on the back, slightly concave on the inner face, minutely and obscurely scaberulous, disarticulating horizontally, glabrous at the upper end; pedicels narrowly lanceolate-oblong, flattened, contiguous with the joint, obscurely nerved, margins minutely scaberulous. *Sessile spikelets* ovate-oblong, acute, 2-2.5 mm. long without the bristles, pale yellow. *Lower glume* transversely and very obscurely rugulose below the middle, 8-9-nerved, chartaceous, keels minutely scaberulous; bristle solitary, up to 2 mm. long; upper glume equalling the lower or very slightly shorter, boat-shaped, narrowly ovate when flattened, 3-nerved, thinly membranous, with a fine terminal bristle 2-3 mm. long. *Lower floret* empty; lemma narrowly ovate, obtuse, 1.8 mm. long, hyaline, obscurely 2-nerved, palea of similar shape and texture, but smaller. *Upper floret* ♀; lemma ovate-oblong, obtuse, 1.5 mm. long, hyaline, palea similar in shape and texture, but smaller. *Pedicelled spikelet* reduced to a bristle 2-3 mm. long.

TROPICAL AFRICA. Sierra Leone: Freetown, Nov., 1889, W. H. and A. H. Brown 71 (type); Brookfields, "Foni Flats," Deighton 2159!

Vern. Name: Foni (*Mendi*).

This very graceful species is nearest to *R. gracilis* Stapf, but differs from that species in having more slender, 3-4-noded culms, eciliate joints of the rhachis, smaller ovate-oblong spikelets and a typically single-awned lower glume. We have not seen Pilger's type, but his description agrees perfectly with Deighton's plant.

Triraphis longipes Stapf & Hubbard, sp. nov.; affinis *T. mada-gascariensi* Hook. f., sed multo minor, culmis laminisque brevibus gracilibus, paniculis parvis, spiculis purpureis differt.

Gramen perenne, caespitosum, 30-80 cm. altum. *Culmi* erecti, graciles, teretes, glabri et laeves, simplices, 3-4-nodi, nodis obscuris glabris. *Foliorum* vaginae tenuiter striatae, firmae, laeves, glabrae vel ore hirsutae, internodiis paulo longiores brevioresve, inferiores solutae, breves, persistentes, superiores arctae; ligulae brevissimae, truncatae, minute ciliolatae; laminae filiformes, convolutae vel involutae, 10-25 cm. longae, ad 0.75 mm. latae, paulo flexuosae, firmae, glabrae et laeves vel supra puberulae. *Panicula* ovata vel ovato-oblonga, 10-16 cm. longa, 4-8 cm. lata, effusa, valde laxa, purpurea; rhachis teres, scaberula; rami 1-2-nati, filiformes, stricti vel flexuosi, scaberuli; ramuli et pedicelli flexuosi, capillares, scaberuli; pedicelli 4-10 mm. longi. *Spiculae* solitariae, ovatae vel oblongae, 6-10 mm. longae, 2-3 mm. latae. *Gluma* inferior lanceolata, acuta vel acutissima, 1-1.3 mm. longa, enervia, glabra, hyalina; gluma superior lanceolata vel ovato-lanceolata, acuta vel acutissima, 1.9-2.2 mm. longa, glabra, enervia vel 1-nervia, hyalina. *Anthoecia* 4-7, laxe imbricata;

* Continued from *K.B.*, 1926, p. 446.

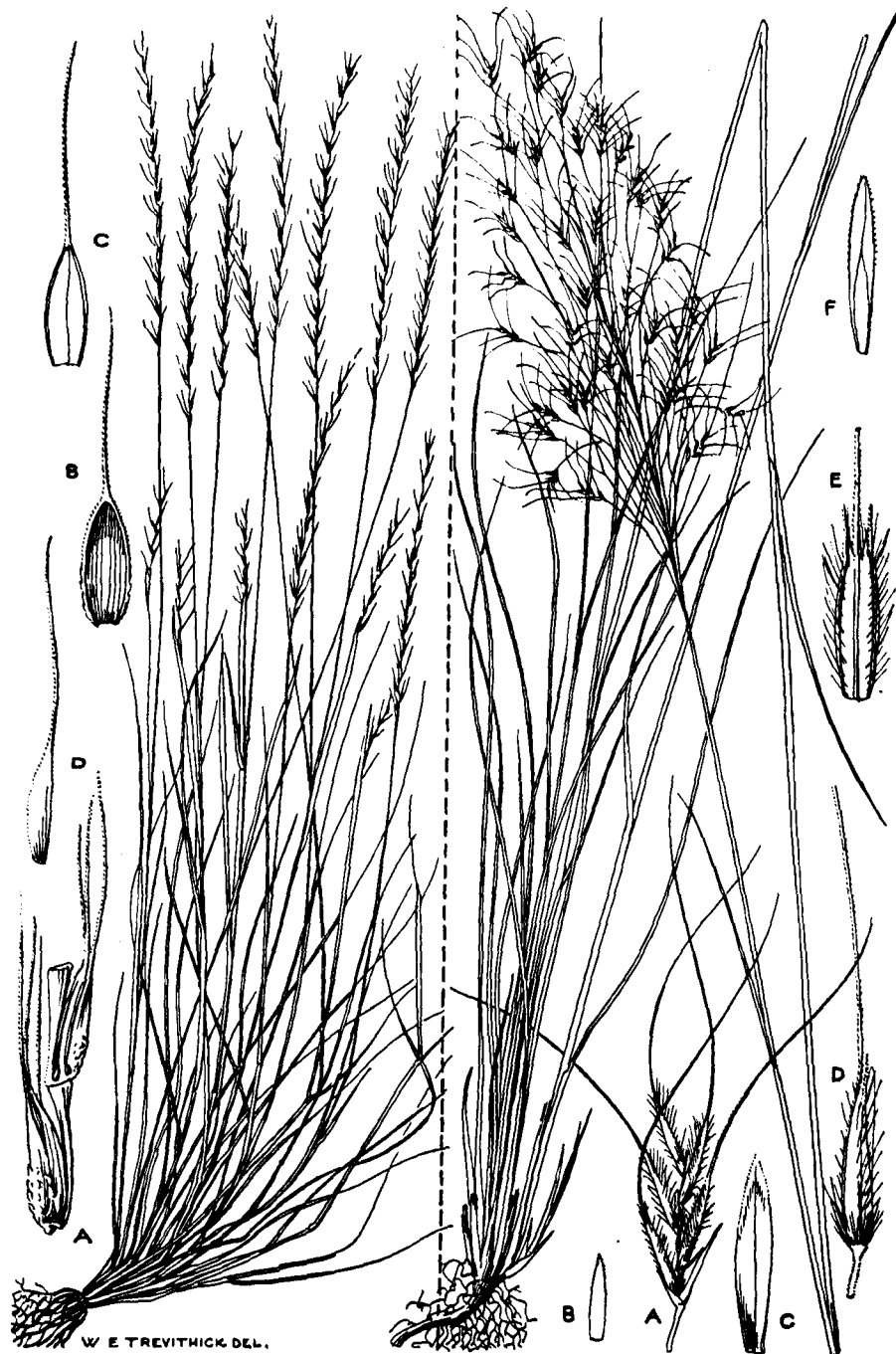


Fig. 1.

Fig. 1 *Rhytachne minor* Pilger, showing habit. A. Portion of raceme ($\times 8$). B. Lower glume ($\times 8$). C. Upper glume ($\times 8$). D. Pedicel with bristle-like rudimentary spikelet ($\times 8$).

Fig. 2.

Fig. 2. *Triraphis longipes* Stapf & Hubbard, showing habit. A. Spikelet ($\times 3$). B. Lower glume ($\times 10$). C. Upper glume ($\times 10$). D. Floret ($\times 7$). E. Lemma ($\times 7$). F. Palea ($\times 7$).

rhachillae internodia ad 1 mm. longa minute puberula; lemma ovato-oblongum, 3.5-4.3 mm. longum, bilobum et e sinu aristatum, lobis obtusis vel ob nervum breviter excurrentem brevissime mucronatis, arista gracili flexuosa patente vel recurva scaberula 8-13 mm. longa, tenuiter membranaceum, 3-nervium, e callo et versus margines longe albido-pilosum; palea lanceolata, obtusa vel truncata, 3-3.5 mm. longa, hyalina, carinis minute scaberulis. *Antherae* lineares, 1.8-2 mm. longae, purpureae.

TROPICAL AFRICA. Rhodesia: Salisbury, 1440 m., Eyles 2167 (type), 1555.

X.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATORUM. DECAS CXVI.

1151. *Erythrocephalum microcephalum* Dandy [Compositae]; ob capitula parva circiter 1 cm. longa et flores omnes regulares facile distinguendum.

Herba erecta, ad 30 cm. alta; caulis parce ramosus, griseo-lanatus. *Folia* sessilia, anguste elliptico-lanceolata, basi subpandurata amplexicaulia, apice acuta, margine denticulata, majora 6-9 cm. longa et 1.5-2 cm. lata, tenuiter chartacea, supra setulis parce vestita et praesertim basi araneosa, subtus densissime griseo-lanata, nervis lateralibus adscendentibus. *Capitula* solitaria, ad 1 cm. longa et 0.8-0.9 cm. diametro; pedunculi 2-6 cm. longi, lanati. *Involucri* bractae lanceolatae, acutae, lanatae, circiter 0.6-0.7 cm. longae, exteriores margine omnino interiores apicem versus pectinatae. *Receptaculi* paleae lanceolatae, 0.7-0.8 cm. longae, membranaceae, apice breviter fimbriatae. *Flores* omnes regulares, 9-10 mm. longi. *Corolla* flava, tubulosa, superne abrupte dilatata profunde 5-loba, circiter 7 mm. longa, lobis linearibus circiter 2 mm. longis. *Antherae* circiter 2 mm. longae. *Ovarium* fere 2 mm. longum, pubescens; styli rami circiter 1 mm. longi. *Pappi* squamae anguste lineares, acutae, 3.5-4 mm. longae, breviter ciliatae, caducissimae.

TROPICAL AFRICA. Tanganyika: Mwanza, Davis 210.

1152. *Daphne Shillong* Banerji [Thymelaeaceae]; affinis *D. Sureil* Smith et Cave (vide Records of the Botanical Survey of India Vol. VI. No. 2), autem ab illa quod discus hypogynus est minor differt (hic enim in *D. Sureil* maximus, quamquam in commentariis l.c. nulla eius fit mentio neque in tabula subiecta ostenditur); praeterea quod folia sunt angustiora, breviora, paulo magis coriacea, prope flores conferta denique quod pedunculi sunt breviores crassioresque, perianthium longius.

Etiam a *D. papyracea* Decne., bracteis minoribus magisque caducis, perianthio multo longiore, multo minus piloso differt.

Suffrutex parva, cortice lento, lenticulato, siccitate subfusca et rugosa; ramulis florentibus 2-3 cm. latis. *Folia* punctulata, coriacea, siccitate subfusca, alterna et parvis intervallis per

ramulos, fasciculata, ad pedunculum stipata, anguste lanceolata, 5-6.5 cm. longa, 1.3 cm. lata, petiolis circa 0.8 cm. longis, basi atque apice acuta, basi obliqua, apice paullulum emarginata; supra et infra admodum glabrata, nervis satis manifestis. Flores albo-virides, parum odoriferi, parce capitati pedunculis brevissimis puberulis, terminalibus frondosis. Bractee plus minus carinatae, sericeae, caducissimae, ita ut florum capita paene ebracteata videantur. Perianthium tubulosum, elongatum, 2.5 cm. longum, supra tenuiter canescens, lobis 4 extensis, late deltoideis, circa 0.8 cm. longis. Scalae 0. Stamina 8, duplici serie disposita; superiora ad perianthii fauces proxima, lobis opposita; inferiora altius inclusa, cum lobis alternantibus; antherae lineares, filamentis brevibus. Ovarium glabrum, uniloculare, uniovulatum; stylus brevissimus; stigma magnum, capitatum; ovula funiculata, anatropa, de summa cella pendula. Discus hypogynus, paene cupuliformis.

INDIA. Shillong, near Spread Eagles Falls, Sept., Banerji 465 (type), (in Herb. Kew., Calc., and Presidency College, Calcutta) Khasi Hills, October 1890, Collett without number (in Herb. Calc.).

The species was found growing at an altitude of 4550 ft. (by aneroid) in dense bush along a deep but narrow water-course running down a forest of *Pinus Khasya* Royle.

1153. *Pilea Kingii* Fischer [Urticaceae]; adhuc *P. Wightii* Wedd. var. *macrophylla* Hook. f., Fl. Brit. Ind., v. 555; *Urtica obesa* Wall. Cat. 4587; species a *P. Wightii* Wedd., satis distincta est: distinguitur foliis attenuato-cuspidatis, nec basi subcordatis, supra parce hirsutis, nec subtus punctatis, marginibus late dentatis, et enim sepalis obtusis, et acheniis rotundatis, obtusis.

Herba fere glabra. Folia opposita, per paris aequalia, membranacea, subrotunda vel ovato-lanceolata, attenuato-cuspidata, basi 3-costata acuta vel rotundata vel truncata sed nullo modo emarginata nec subcordata, 3-18 cm. longa, 2-11 cm. lata, supra parce hirsuta, subtus glabra, utrinque cystolithis admodum numerosis notata, marginibus valde late-dentata; costae laterales arcuatae, paullulo supra mediam partem laminarum incurvatae et deinde evanescentes; petiolis 1-8 cm. longi. Stipulae parvae, triangulari-lanceolatae. Flores monoeci, in cymis axillaribus foliis brevioribus compositi. Sepala 3, libera, aequalia, orbicularia vel suborbicularia, apice rotundata; 2, basi connata, inaequalia, dorsali longissimo, omnia rotundata. Stamina floris masculini 4. Pistilloda minuta, conica. Staminodia flores foeminei nulla. Ovarium rectum. Achaenium lateraliter compressum, ambitu orbiculare, apice rotundatum, laeve vel aliquo modo granulatum. Semina late ellipsoidea.

INDIA. Tinevelly, Courtallam, R. Wight 2684 (type); Nepal, Wallich Cat. 4587; Nilgiri Hills, Ochterlony Valley, Aug., G. King, Nedivattam, 6000 ft., June, J. S. Gamble 12091; S. Malabar,

Varadimalai, 4000 ft., Oct., C. E. C. Fischer 2371; Travancore, Kulkundal, Dec., A. Meebold 13100.

1154. *Cyperus Smithii* McClean [Cyperaceae]; affinis *C. albo-striato* Schrad., sed foliis bracteisque angustioribus crassioribus durioribus, spiculis angustioribus, et glumis ochraceis distinguitur.

Planta glabra. Stolones 0. Culmi 5-6 dm. longi, 2-3 mm. lati; triangulares acute robusti, costati, glabri, basi bulbacei, rhizomate obliqua conferti. Folia 1-4 dm. longa, 4-8 mm. lata, plana vel plicata, costata, marginibus scabridis, et venis tenuis transversis, carina distincta, prominente scabrida, glabra. Vaginae persistentes, scariosae, basi fibrosae. Inflorescentia umbellata, 12 cm. longa, 12 cm. lata; bractee circa 9-10, foliis consimiles, ad 40 cm. longae; radii primarii circa 30, breves, simplices, 1-paucis spiculis terminati, vel ad 8 cm. longi, radios secundarios breves vel longes ferentes; radii secundi, breves 1-3 spiculis vel elongati et radios tertianos ferentes; radii tertii 1-4 spiculis. Spiculae solitariae et pedicellatae vel 2-4 digitatae, 0.5-1 cm. longae, compressae, rufo-fuscae; glumae 10-30, imbricatae naviculares, ochraceae, lineis inaequalibus discolores basi truncatae, acuminatae, vel subacuminatae, carinis in mucro brevi acuto productis. Rhachilla compressa, non alata, marginibus crassis. Nux trigona. Stylus brevissimus; deciduus rami subsessiles nuce longiores.

TRANSVAAL. Pretoria District; on left bank side of Pienaars River in Baviaanspoort, growing between rocks, very common, about 400 ft. above river surface, Smith 347; growing in sheltered spots in Onderstepoort near Wonderboom, in damp soils, very common, forming patches, Smith 1748.

Belongs to subgenus *Pycnostachys* and is closely related to *C. albostriatus* Schrad. Differs from this species in having the leaves and bracts narrower, much thicker and tougher. Also the spikelets are narrower and the glumes are of a different colour.

1155. *Isachne gracilis* C. E. Hubbard [Gramineae]; affinis *I. polygonoidi* Doell, sed culmis erectis, panícula valde effusa, spiculis minoribus differt.

Gramen annum. Culmi erecti, gracillimi, teretes, simplices vel inferne ramosi, glabri et laeves, 4-5-nodi, nodis glabris. Foliorum vaginae solutae, leviter striatae, internodiis breviores, membranaceae, glabrae et laeves vel sparse hirsutae, pilis e tuberculis minutis ortis indutae; ligulae nullae; laminae ovatae, acutae vel sub-acuminatae, basi rotundatae, 0.75-4 cm. longae, 2-13 mm. latae, planae, molles, pallide virides, glabrae, utrinque et ad margines minute asperulae. Panícula ovata vel oblonga, 1.5-7.5 cm. longa, 0.6-4 cm. lata, valde effusa, gracillima, viridis; rhachis glabra, laevis; rami solitarii, ad 2 cm. longi, patentes, stricti vel leviter flexuosi, filiformes, laeves; pedicelli capillares, glabri et laeves, 1-2.5 mm. longi. Spiculae solitariae, globosae, 1 mm. longae, virides. Glumae similes, delicate membranaceae, sparse

setosae; inferior elliptico-ovata, obtusa, 0.8-1 mm. longa, obscure subquinenervia; superior late elliptica, rotundato-obtusa, obscure 5-nervia. *Anthoecium inferum* vacuum; lemma ellipticum, obtusum, 1 mm. longum, membranaceum, obscure 7-nervium, glabrum; palea ovata, subacuta, 1 mm. longa. *Anthoecium superum* breviter stipitatum; lemma orbiculatum, plano-convexum, 0.75 mm. longum, coriaceum, pubescens, pilis brevibus adpressis obtusis albis indutum; palea late elliptica, coriacea. *Caryopsis* plano-convexa, 0.6 mm. longa.

INDIA. Mysore: Baba Budan Hills, Santaveri, 4000 ft. in deep shade on rocks, *Meebold* 10781.

1156. *Panicum Kerrii* C. E. Hubbard [Gramineae]; affinis *P. obscuranti* Stapf, sed culmis altioribus erectis, foliorum vaginis multo longioribus latioribusque flaccidis, laminis longioribus convolutis differt.

Gramen annuum. *Culmi* 1.3-1.8 m. alti, validi, teretes, glabri et laeves, simplices, 3-4-nodi, nodis glabris et internodiis inferioribus turgidis. *Foliorum vaginae* inferiores ad 38 cm. longae, persistentes, internodiis longiores, latae, solutae, flaccidae, glabrae, laeves et nitidae, superiores angustiores et tenuiores, striatae, sparse hirsutae, pilis albis erectis e tuberculis fuscis ortis indutae; ligulae ad seriem ciliatorum reductae, pilis densis albis ad 5 mm. longis; laminae convolutae, cylindricae, 50-80 cm. longae, applanatae 5-6 mm. latae, fere glabrae, firmae, costa media valida, supra prominente nervosae, nervis asperulis, marginibus sparse scaberulis. *Panicula* amplissima, 70-100 cm. longa, 15-25 cm. lata, oblonga, valde laxa; rhachis unisulcata, glabra, inferne laevis, superne scaberula, internodiis inferioribus 20-28 cm. longis, nodo infimo piloso; rami 1-3-nati, ad 30 cm. longi, erecti vel patentes, angulati, scaberuli; ramuli flexuosi, filiformes, scabridi, purpurei; pedicelli 2-nati vel solitarii, 1-3 mm. longi. *Spiculae* oblongae vel ovato-oblongae, 3.5-4 mm. longae, pre anthesin tenuiter acuminatae, demum hiantes, glabrae. *Gluma inferior* 3-3.2 mm. longa, ovata, acuminata, cuspidata, cuspe scaberula ad 0.75 mm. longa, 5-7-nervia, membranacea. *Gluma superior* 3.3-3.5 mm. longa, late ovata, acuta, breviter cuspidata, 5-7-nervia, membranacea. *Anthoecium inferum* sterile; lemma elliptico-ovatum, obtusum, 2.8-3 mm. longum, tenuiter membranaceum, 9-nervium; palea ovato-oblonga, obtusa, 2.3 mm. longa, hyalina, carinis scaberulis. *Anthoecium superum* ♀; lemma late ovatum, rotundato-obtusum, 2 mm. longum, 1 mm. latum, crustaceum, pallide luteum, nitidum, laeve; palea lemma similis sed angustior.

SIAM. Chantabun, Makām, 60 ft., in tufts at edge of open marshy grounds, *Kerr* 9581.

1157. *Leptaspis angustifolia* Summerhayes & Hubbard [Gramineae]; affinis *L. Banksii* R.Br., sed omnibus speciebus foliis linearibus satis distinguenda.

Gramen perenne ad 60 cm. altum. *Culmi* caespitosi e rhizomate brevi, erecti, simplices, enodi, modice graciles, teretes, tenuiter striati, leviter scaberuli. *Folia* radicalia; vaginae compressae, satis arctae, laeves, glabrae, nitidae, firmae, marginibus hyalinis, carinatae, carinis incrassatis; ligulae truncatae, brevissime ciliolatae; laminae breviter petiolatae, lineares, basi attenuatae, longe tenuiterque acutae, apice pungentes, 20-45 cm. longae, 4-10 mm. latae, glabrae, utrinque scaberulae, tenuiter venosae, inter venas transverse venulosae, glauco-virides; petiolus ciliatus. *Panicula* angustissima, 10-13 cm. longa, pauciramosa, erecta, stricta; rhachis teres, tenuiter striata, uno latere canaliculata, leviter scaberula; rami erecti, adpressi, 1.5-2.5 cm. longi, leviter scaberuli, paucispiculati. *Spiculae* remotae, brevissime pedicellatae; glumae ovatae, mucronatae, concavae, carnosulae, minute pubescentes, marginibus hyalinis, inferior 2 mm. longa, superior 3 mm. longa. *Spiculae* ♂; lemma, palea et stamina desunt. *Spiculae* ♀; lemma membranaceum, circiter 3 mm. longum, asymmetricum, dorsaliter gibbosum, minute subtomentosum, 9-costatum, album vel rubicundum, costis albis (Greenwood); palea linearis, obtusa, ad 2 mm. longa, carinis minute puberulis; ovarium pilosum.

FIJI ISLANDS. Vanua Levu: Lambasa, about 270 ft., Oct., *Greenwood* 550 (type); in mountains at about 1080 ft., Oct., *Greenwood* 548.

1158. *Pollinia Hendersonii* C. E. Hubbard [Gramineae]; affinis *P. sumatrensi* Ridley, sed laminis linearibus vel lineari-lanceolatis, panicula longa, articulis longioribus fere glabris et laevibus, arista lemmatis longiore differt.

Gramen annuum (?). *Culmi* ascendentes, ad 1.2 m. longi, teretes, glabri et laeves, inferne ramosi, 3-6-nodi, nodis fere glabris. *Foliorum vaginae* moderate solutae, tenuiter striatae, glabrae et laeves, internodiis longiores; ligulae truncatae, 1.5 mm. longae, rufescendo-membranaceae; laminae lineares vel lineari-lanceolatae, acuminatae, e basi attenuatae, ad 22 cm. longae et 1 cm. latae, patulae, firmae, utrinque appresse puberulae, marginibus scaberulis. *Racemi* 7-12, graciles, flexuosi, ad 15 cm. longi, pallide fusci, fere glabri; articuli spiculis longiores, circiter 6-7 mm. longi, fere glabri, marginibus obscure scaberulis. *Spiculae* sessiles lanceolatae, acutae, 4.8-5 mm. longae, callo brevissime hirsuto. *Gluma* inferior lanceolata, acuta, integra, carinis rigide ciliatis, dorso glabra et laevis sulcata; gluma superior ovata, acuta, subtrinervia, nervis lateralibus tenuissimis, carina rigide ciliata, marginibus superioribus hyalinis ciliatis. *Anthoecium inferum* nullum. *Anthoecium superum* ♀; lemma ovatum, 1 mm. longum, hyalinum, 3-nervium, ex apice integro arista capillare ad 3.5 cm. longa instructum; palea lanceolata, obtuse acuminata, 1.8 mm. longa, enervia, hyalina. *Antherae* lineares, 2 mm. longae. *Spiculae pedicellatae* spiculis sessilibus similes. *Pedicelli* circiter 3 mm. longi, breviter ciliati. *Gluma* inferior 5-nervia. *Anthoecium*

inferum ad lemma reductum; lemma oblanceolatum, obtusum, 3.6 mm. longum, hyalinum, ciliatum, 1-nervium.

MALAY PENINSULA. Pahang: Cameron's Highlands, Tanah Rata clearing, 4320 ft., Henderson 17940.

1159. *Iseilema siamense* C. E. Hubbard [Gramineae]; affinis *I. anthephoroidei* Hack., sed carinis spatharum propriarum dense tuberculatis, racemis fere glabris, spiculis involucrentibus oblique oblongo-lanceolatis, glumis inferioribus fere laevibus haud prominente costatis differt.

Gramen annuum (?). *Culmi* geniculato-ascendentes, circiter 15-18 cm. alti, graciles, inferne compressi, ramosi, glabri, laeves vel prope nodos minute tuberculati, multinodi, nodis glabris, internodiis exsertis. *Foliorum vaginæ* solutæ, breves, glabrae, membranaceae, carinatae, carinis tuberculatis; ligulae breves, truncatae, membranaceae, glabrae; laminae lineares vel lineari-oblongae, obtusae, 2-4 cm. longae, 4-5 mm. latae, patulae vel reflexae, glabrae, glaucescentes, marginibus sparse tuberculatis. *Panícula* angusta, 6-9 cm. longa, fere simplex; spathae propriae ovato-lanceolatae, 15-18 mm. longae, glabrae, carinis dense et minute tuberculatis; pedunculi 8-12 mm. longi, filiformes, glabri, apice minute tuberculati. *Spiculae involucrentes* 4, breviter pedicellatae, pedicellis inaequalibus 1.5 mm. et 2 mm. longis glabris laevibus; gluma inferior oblique oblongo-lanceolata, tenuiter acuta, 6-7 mm. longa, 1.5-1.75 mm. lata, chartacea, flavescenti-viridis vel purpureo-suffusa, glabra, inferne laevis, superne leviter 12-costata, costis et carinis minute scaberulis; gluma superior oblique lanceolata, circiter 6 mm. longa, acuminata, laevis, 5-nervia, firme membranacea, marginibus inflexis hyalinis; anthoecium sterile vel absens; lemma et palea oblanceolata, obtusa, circiter 1.6 mm. longa, delicate hyalina, enervia; lemma bilobum. *Spiculae pedicellatae* ♂ 2; pedicelli filiformes, 4-6 mm. longi, sparse scaberuli, pilis paucis albis e pallide tuberculis ortis hirsuti; spiculae lineares vel lineari-lanceolatae, acutae, 5-6 mm. longae, glabrae; gluma inferior multinervia, membranacea, carinis sparse tuberculatis; gluma superior 5-nervia, tenuiter membranacea; antherae lineares, 1.5 mm. longae. *Spicula subsessilis* ♀, basi pilosa, pilis albis 2.5 mm. longis induta, oblique lateque oblongo-lanceolata, 9 mm. longa, circiter 2.5 mm. lata; gluma inferior acuminata, 12-nervia, membranacea, inferne laevis, superne et ad carinas scaberula; gluma superior oblonga, longe acuminata, 3-sub-5-nervia, tenuiter membranacea, marginibus late inflexis hyalinis; lemma 3 mm. longum, bilobum, hyalinum, enervium; palea linearis; arista gracilis, 2-2.5 mm. longa; caryopsis obovata, 3-3.5 mm. longa, 1.5-1.75 mm. lata, pallide fusca.

SIAM. Chaibadān, Menam Pasak, 150 ft., in bamboo jungle, Kerr 7980.

1160. *Stipa nitida* Summerhayes & Hubbard [Gramineae]; affinis *S. variabilis* Hughes, et *S. Drummondii* Steud., ab utraque specie

oribus vaginarum lanatis; ab illa panicula densiore ramis multispiculatis, spiculis minoribus, ab hac vaginis extra glabris, laminis tenuioribus, columna aristae scaberula haud pubescente differt.

Gramen perenne. *Culmi* caespitosi, erecti, usque ad 50 cm. alti, teretes, uno latere canaliculati, modice graciles, laeves, glabri, simplices, 2-3-nodi, nodis glabris rarius exsertis. *Foliorum vaginæ* arctae, praeter os dense lanatum et margines sparsissime lanatos glabrae, scaberulae, tenuiter striatae, subauriculatae; ligulae ad seriem ciliorum reductae; laminae fere filiformes, in acumen longe attenuatae, 10-20 cm. longae, 0.5-1.0 mm. diametro, subrigidae, involutae vel convolutae, scabridae vel scabrido-puberulae. *Panícula* recta, stricta, 15-30 cm. longa, usque ad 2 cm. lata, pallide viridis, nitida; rhachis compressa, laevis, exceptis nodis inferioribus lanato-pilosis glabra; rami erecti, adpressi, 2-3-nati, e basi ramosi, tenues, minute scaberuli, usque ad 6 cm. longi, spiculis numerosis; pedicelli erecti, scaberuli, 1-8 mm. longi. *Spiculae* lineari-lanceolatae, 10-12 mm. longae, pallide virides, nitidae. *Glumae* subaequales, tenuiter membranaceae, superne hyalinae, carinis scaberulis; inferior lineari-lanceolata, apice breviter aristata, plus minusve tridentata vel subintegra, subtrinervia, nervis lateralibus fere obsoletis; superior lanceolata, tenuiter acuminata, subquiquenervia. *Lemma* cylindricum, 4-5 mm. longum, sparse albo-pilosum, apice integro breviter ciliatoque, callo acuminato sericeo-piloso 1.5 mm. longo; arista falcata, in toto 4-6 cm. longa, nitida, columna scaberula, 7-10 mm. longa; palea linearis, obtusa, 3-3.5 mm. longa, dorso linea pilorum instructa; antherae lineares, 1.3 mm. longae.

SOUTH AUSTRALIA. Finnis Springs (S. of Lake Eyre), Aug. 25th, 1926, F. D. Warren.

Local Name: "Balcarra Grass."

XI.—CONTRIBUTIONS TO THE FLORA OF BURMA: II.* C. E. C. FISCHER.

Shorea Buchananii Fischer [Dipterocarpaceae].

Since the publication of the original description (K.B. 1926, p. 458) fruits have come to hand.

Fruit subglobose, densely silky-tomentose, 6-7 mm. in diam.; wings subequal, ligulate or subspathulate, apex obtuse or acute, 1.6-2.5 cm. long, 0.4-0.6 cm. wide, ciliate, stellate-hairy (more densely so at the base) without, glabrous or nearly so within.

Myitkyina District, Pidaung Reserve, 500 ft., Jan., Maung Mya per C. E. Parkinson 2238.

Shorea farinosa Fischer [Dipterocarpaceae].

Since the publication of the original description (K.B. 1926, p. 461) fruits have been received.

* Continued from K.B., 1926, p. 468.

Fruit ovoid, apiculate, about 2 cm. long, minutely puberulous; wings slightly mealy; 3 longer linear-lanceolate, narrowed to a blunt apex, about 11 cm. long, 1.4-1.8 cm. wide, nerves prominent 13-15; smaller wings linear, acute, 6-7 cm. long, 0.5 cm. wide, nerves 7-9.

South Tenasserim. Thekyu chaung, Jan., *Maung Law Tek* per C. E. Parkinson 1381.

Vernacular name: *Uban* (Burmese).

***Walsura glauca* Fischer** [Meliaceae]; affinis *W. hypoleuca* Kurz, foliis majoribus nervis pluribus, petiolis costatis, floribus pedicellatis, ovariis glabris, stylis columnaribus differt.

Tree 80 feet high; young twigs compressed, fuscous pubescent. *Leaves* 5-foliate; petiole minutely pubescent or glabrescent, 5-8 cm. long, flat above with sharp edges which are almost winged at the base, terete and striate between the two pairs of lateral leaflets, enlarged and subamplexicaul at base, swollen and rugose at the insertions of the leaflets. *Leaflets* opposite, narrowly elliptic to broadly oblong, obtuse or apiculate, base rounded or acute, 11-20 cm. long, 3.5-7 cm. wide, the apical leaflet the largest, the basal pair the smallest, glabrous and shining above, glaucous below, midrib slightly raised above, prominent and yellowish- or reddish-brown below, primary nerves 10-11 pairs, distinct above, prominent below, secondary nerves transverse, margin slightly revolute, narrowly cartilaginous, more or less undulate, petiolules terete, minutely pubescent or glabrescent, swollen and rugose at both ends, of the lateral 1-1.5 cm. long, the apical 2-3.5 cm. long. *Inflorescence* in terminal panicles, about as long as the upper leaves; rhachis sulcate, fuscous pubescent, bracts at the main divisions early deciduous (not seen) leaving scars, bracteoles at the ultimate divisions linear, blunt, 1.5 mm. long, whitish silky-pubescent without, glabrous within, ciliate. *Flowers* about 5 mm. long and wide. *Pedicels* 2-3 mm. long, slightly angled, fuscous-pubescent. *Sepals* shortly united at the base, triangular-ovate, subacute, 2 mm. long, fuscous-pubescent without, glabrous within. *Petals* 5, narrow-oblong, obtuse, 4-5 mm. long, whitish- or fuscous-pubescent on both sides, white. *Stamens* 10, subequal, about 3 mm. long; filaments linear, flat, shortly united at base, densely white-hairy; anthers subglobose, glabrous, connective not produced. *Disk* annular, fleshy, glabrous. *Ovary* short, imbedded in the disk, glabrous; style columnar, slightly angled, 2 mm. long, glabrous; stigma capitate. *Fruit* not seen.

South Tenasserim, Kalin kwan chaung, 200 ft., Feb., C. E. Parkinson 1686.

***Xerospermum ferrugineum* Fischer** [Sapindaceae]; a *Xerospermis* reliquis foliis 4-jugatis differt.

Tree 60 feet high and 3-4 feet in girth, with dense foliage; twigs terete, densely villous with long, ferruginous, stellate hairs and linear and elliptic, corky lenticels. *Leaves* alternate, paripinnate,

4-jugate; rhachis terete, 8-20 cm. long, indumentum as of the twigs, base enlarged, semi-amplexicaul; leaflets opposite or subopposite, sometimes almost alternate, elliptic or elliptic-lanceolate, acutely acuminate, base inequilateral, rounded, sometimes emarginate on one side, lowest pair smallest and enlarging upwards, 6.5-14 cm. long, 2.5-5 cm. wide, glabrous above except the fuscous stellate-villous midrib, softly villous with stellate ferruginous and simple fulvous hairs on the nerves and veinlets below, midrib impressed above, prominent below, primary nerves 13-20 pairs, subprominent below, regular, nearly horizontal, secondary nerves reticulated, margins narrowly cartilaginous, slightly undulate; petiolules terete, 3-4 mm. long, villous like the rhachis. *Inflorescence* of terminal dense panicles as long as the leaves, main rhachis stout, striate, densely villous with golden-ferruginous stellate hairs, bracts linear, densely ferruginous-villous on both sides. *Flowers* aggregated on short branchlets, shortly pedicelate, 5 mm. long and wide. *Sepals* 5, imbricate in 2 rows, subequal, rotund-oblong, slightly concave, about 3 mm. long, 2.5 mm. wide, densely brown stellate-tomentose on both sides. *Petals* 5 (rarely 6), spathulate or obovate, shortly clawed, about 5 mm. long, densely shaggy with long whitish hairs except the claws and a glabrous area at the rounded apex outside, white. *Stamens* 8 (rarely 9), inserted within the disk, 4-5 mm. long; filaments filiform, densely villous with long whitish hairs; anthers sagittate, apiculate, nearly 1 mm. long, glabrous. *Disk* annular, fleshy, somewhat lobed, thicker on one side, densely villous with brownish stellate and simple hairs. *Pistil* villous, minute, sunk in the disk and concealed by the hairs; ovary 2-lobed, 2-celled, cells 1-ovuled; style central, stout, about as long as the ovary-lobes stigma 2-toothed. *Fruit* not seen.

South Tenasserim, Kyein chaung forests, 200 ft., Feb., C. E. Parkinson, 1671.

Vernacular name: *Mai Kasan* (Shan).

***Guioa spathulata* Fischer** [Sapindaceae]; affinis *G. fusciculata* (Kurz) Radlk., sine tomento ferrugineo, foliolis majoribus glabris, floribus majoribus, petalis spathulis differt.

Tree 80 feet high; stem much buttressed; twigs pale-brown, minutely puberulous. *Leaves* alternate, paripinnate; rhachis 7-10 cm. long, terete below, 2-costate or very narrowly 2-winged upwards, striate, glabrous or nearly so, petiole swollen and rugose at the base; leaflets 2-3 pairs, opposite or subopposite, membranous, elliptic or oblanceolate-elliptic, slightly falcate, acuminate, apiculate, base acute, inequilateral, 7-16 cm. long, 3-6 cm. wide, the terminal pair the largest, glabrous, minutely and copiously pellucid-punctate, midrib raised on both sides, primary nerves 5-6 pairs prominent below, ascending, curved, reticulations distinct below; petiolules 3-5 mm. long, more or less rugose. *Inflorescence* of axillary or extra-axillary racemes or racemose cymes, subtended by 1-several minute, grey-puberulous bracts; rhachis angled,

3-4 cm. long, thinly grey-puberulous, with small grey-puberulous bracteoles at the divisions. *Flowers* pedicelled, about 6 mm. long and wide, greenish, each subtended by an ensiform, densely grey-pubescent bracteole about 2 mm. long; pedicels 0.8-1.3 cm. long, jointed well below the middle, slightly enlarged below the flower, thinly grey-puberulous. *Sepals* 5, imbricate in 2 rows, free, sub-orbicular or oblong, the outer wide, about 4 mm. long, thinly grey-pubescent outside, the 2 inner and the apices of all rather more densely so, glabrous within, grey ciliate. *Petals* 4, broadly spatulate, nearly as long as the sepals, with fine silky, whitish hairs on the claw and the lower half of the blade outside, glabrous within, the inner face bearing a large, 2-crested scale nearly as long as the petal and adnate to it for about half its length, the scale thinly whitish hairy below and ciliate and with a dense brush of long, white hairs along the upper margin, the crests glabrous. *Disk* disciform, slightly thicker anteriorly, densely short-hairy. *Stamens* 7, inserted within the disk, 3-3.5 mm. long; filaments subulate or subulate-ensiform, tapering to a filiform apex, densely whitish, silky-hairy except the filiform tail; anthers minute, cordate, bluntly apiculate, glabrous. *Ovary* sessile, ovoid, sub-trigonal, subgibbous anteriorly, about 5 mm. long (including the subulate style), grey felted, 3-celled, cells 1-ovuled; stigma undivided, glabrous. *Fruit* (not seen) "fleshy, 3-angled" (fide Parkinson).

South Tenasserim, Ngawun Valley, 300 ft., Jan., C. E. Parkinson 1618.

Vernacular name: *Ka Pu Oung Ret* (Shan).

***Mangifera Parkinsonii* Fischer** [Anacardiaceae]; affinis *M. pentandrae* Hook. f., ramulis nigris, foliorum nervis pluribus, paniculis glabris, petalis non costatis differt.

A large tree; twigs nearly black when dry, sulcate, glabrous. *Leaves* alternate, crowded near the ends of the branchlets, chartaceous, linear-oblong, tapering to a blunt apex, base acute, sometimes inequilateral, 10-23 cm. long, 2.5-6.5 cm. wide, quite glabrous, olivaceous above, pale below when dry, midrib stout, prominent and blackish below, primary nerves 15-25 pairs, slightly raised above, distinctly so below, forming a wide angle with the midrib, slightly curved, terminating at the margin, ultimate reticulations fine, distinct on both faces, margins narrowly cartilaginous; petioles terete, wrinkled when dry, slightly swollen and rugose at the base, 3-5 cm. long, glabrous. *Inflorescence* in axillary cymes and terminal panicles; rhachis slender, wrinkled when dry, glabrous, dark; bracts and bracteoles deciduous. *Buds* sub-globose. *Flowers* pedicelled, polygamous; pedicels 1-1.5 mm. long, glabrous, jointed near the base. *Calyx* campanulate, about 1.5 mm. long in ♂, 3 mm. long in the ♀, glabrous, lobes 5, imbricate, sub-orbicular, shorter than the tube, margins subhyaline and minutely, sparsely ciliate. *Petals* 5, attached to the lobes of the disk,

oblanceolate to obovate, 3 mm. long in ♂, 4 mm. long in the hermaphrodite, with crisped, whitish hairs on both faces, especially near the apex, ciliate, veins indistinct, without thickened ribs. *Disk* deeply 5-lobed in the ♂, indistinctly so in the ♀, glabrous. *Stamens* 5, all perfect, inserted on the lobes of the disk, about $\frac{1}{2}$ the length of the petals in the ♂, smaller in the ♀. *Pistil* rudimentary. *Ovary* seated on the disk, dome-shaped, slightly compressed, 1 mm. long, sparsely hairy, 1-celled, ovule single, basal; style lateral, short, stout; stigma capitate. *Fruit* not seen.

South Tenasserim, Kyein chaung forests, 200 ft., Feb., C. E. Parkinson 1674.

Vernacular name: *Mai Ka Peep* (Shan).

***Bauhinia sulphurea* Fischer** [Caesalpiniaceae]; affinis *B. bracteatae* Grah., foliorum nervis pluribus, lobis obtusis, floribus sulphureis differt.

A cirrhose climber; young twigs slightly zigzag, sulcate, densely velvety with chocolate-coloured tomentum, later becoming greyish-brown. *Leaves* suborbicular to ovate-oblong, but little narrowed upwards, bilobed to about half way down or a little more with a very narrow sinus or sometimes with the lobes overlapping, lobes rounded, base shallowly cordate, 6-9 cm. long, 5.5-8 cm. wide, 11-13 ribbed, glabrous above with dark basal areoles (midrib above long-hairy when young), more or less densely red-brown hairy below, especially on the ribs and nerves. *Petioles* terete, densely grey- or chocolate-brown tomentose, 2-4.5 cm. long. *Tendrils* slender, opposite or alternate from the lower floral bracts, circinnate, densely chocolate-tomentose, becoming woody and grey-brown, up to 10 cm. long. *Inflorescence* in axillary racemes and terminal panicked racemes, rhachis densely chocolate-velvety, many-flowered, each flower subtended by a chocolate-velvety, lanceolate bract, 6-7 mm. long. *Buds* ovoid, blunt, 1-2 cm. long, 0.6-0.7 cm. wide. *Pedicels*, slender, 6-8.5 cm. long, densely greenish-yellow tomentose, with a pair of opposite or subopposite, shaggy, linear bracteoles about 6 mm. long. *Flowers* about 4 cm. in diam. *Calyx* thick, tube very short, lobes 2, oblong, rounded, densely greenish-yellow tomentose without, glabrous within, about 1 cm. long. *Petals* clawed, the lamina broadly hastate-ovate, apex and basal angles rounded; margins crisped, the claws and outer faces of the blades, except the margins, shaggy with long, silky, greenish-yellow hairs, blades within glabrous, yellow, palmately veined with fine purple lines, 2.5-3.5 cm. long, about 1 cm. wide, the claws of the 2 anterior petals up to 2.5 cm. long, the rest somewhat shorter. *Stamens* 9, 2 anterior alone perfect, with somewhat flattened, curved or nearly straight filaments, rather longer than the claws of the corresponding petals; filaments yellow-pubescent below, glabrescent above; anthers versatile, elliptic, glabrous, 3-4 mm. long; 7 posterior stamens with flattened, usually straight, glabrous filaments 0.5-1 cm. long, with imperfect, rounded or oval

anthers. *Gynoecium* curved, densely shaggy with long, silky, brownish hairs, 1.8 cm. long, the gynophore 6 mm. long; ovary flattened, about 5 mm. long; ovules 5, subglobose; style subulate, about 6 mm. long, hairy to just below the small, capitate stigma. *Legume* (immature) flat, oblanceolate or oblanceolate-oblong, apex acute or truncate, cuspidate, base narrowed into a stout stalk about 1 cm. long, 10-13 cm. long, 3-3.5 cm. wide, densely chocolate to ferruginous-tomentose at first, glabrescent, finely reticulately veined.

South Tenasserim, Theinkun chaung banks, 100 ft., Feb., C. E. Parkinson 1918 (type); Swe Daw, banks of the Tenasserim River, about sea-level, Feb., C. E. Parkinson 1951.

Vernacular name: *Swe Daw* (Burmese).

***Bauhinia fusifera* Fischer** [Caesalpiniaceae]; affinis *B. polycarpae* Wall., alabastris anguste fusiformis acuminatis, petalis angustioribus apice basique acuminatis, venulis ascendentibus differt.

An erect or climbing *shrub* or *undershrub*, ecirrhose. *Leaves* suborbicular, more or less deeply cordate, lobed nearly half way down, lobes obtuse, quite glabrous above, more or less puberulous beneath, especially on the nerves, 9-ribbed, midrib prolonged beyond the blade into a seta 2-4 mm. long, 5-11 cm. in diam. *Petioles* 3-5 cm. long, channelled above, with scattered pubescence, apical portion terete and more or less densely pubescent. *Stipules* narrow-ensiform or setaceous, 3-4 mm. long. *Inflorescence* of leaf-opposed racemes longer than the petioles, many-flowered; rhachis terete, puberulous, an ensiform bract subtending each flower. *Buds* narrowly fusiform, acuminate at both ends, apex minutely 5-toothed, 5-angled, sparsely pubescent. *Flowers* about 1 cm. long; pedicels short, pubescent, with 2 minute, ovate bracteoles at the apex. *Calyx* spathaceous, splitting down one side, tubular portion 3-4 mm. long, limb 7 mm. long, sparsely pubescent without, glabrous within. *Petals* 5, inserted on the rim of the calyx-tube, spathulate with an inflexed acute point, quite glabrous, 8-9 mm. long, 2.5-3 mm. wide, white. *Stamens* 10, all fertile, long; anthersequal, versatile, oblong, about 2 mm. long, connective very minutely produced. *Ovary* borne on a terete, glabrous gynophore about 3 mm. long arising from near the base of the calyx-tube, linear, sparsely hairy, about 2 mm. long, shorter than the shortest stamen; style short; stigma capitate; ovules 6. *Legume* (immature) strap-shaped, acuminate at both ends, glabrous, finely reticulate, about 8 cm. long, 1 cm. wide, 6-seeded, carpophore and pedicel each 5 mm. long, the latter pubescent.

Mandalay District, Maymyo Road, 1500 ft., July, C. E. Parkinson 1571 (type); Gokteik Gorge, 1800 ft., August, J. H. Lace, 4146 (type for fruit); Northern Shan States, "Zinbingyi to Thondang," 1500-2400 ft., July, J. H. Lace 5379.

A bud in Lace 5379 was found to have no anthers, 6 filaments being present with a normal gynoecium.

***Bauhinia Parkinsonii* Fischer** [Caesalpiniaceae]: affinis *B. polycarpae* Wall., pedicellis longis, calyce glanduloso, petalis unguiculatis differt.

A scandent, ecirrhose *shrub*; twigs zigzag, slightly angular, sulcate, minutely brown-pubescent. *Leaves* broader than long, deeply cordate with a wide sinus, 2-lobed nearly half way down, lobes rounded, 11-ribbed, the lowest pair very close to the margin, midrib prolonged beyond the blade into a brown arista about 3 mm. long, glabrous above with scattered, minute, white hairs and dotted with red-brown or dark-brown glands below, 5-9 cm. long, 6-11 cm. wide. *Petioles* channelled above except at the base and apex which are terete and minutely brown-pubescent, 1.5-2.5 cm. long. *Stipules* minute, setaceous, early deciduous. *Inflorescence* of leaf-opposed racemes longer than the petioles, minutely brown-pubescent; rhachis with fine decurrent ribs from the insertions of the flowers, an ensiform, finely aristate, brown-tomentose bract 1 mm. long at the base of each pedicel. *Pedicels* terete brown-pubescent, about 9 mm. long in flower. *Bud* broadly clavate, obtuse, up to 6 mm. long. *Calyx* spathiform, splitting into 2 broadly ovate lobes, spreading in flower, saccate at the base, tubular portion funnel-shaped with thick walls and thickened mouth, 2 mm. long, lobes 3 mm. long, apices blunt, glabrous within, brown-silky without and dotted with minute, red-brown glands. *Petals* 5, lanceolate to broadly spathulate above, clawed below, apex rounded, 6-7 mm. long, 3 mm. wide, claw about 2 mm. long, glabrous, white. *Stamens* 10, all fertile, in 2 rows on the mouth of the calyx-tube within the petals, glabrous; filaments filiform, tapering, 5-6 mm. long, the inner five shorter; anthers versatile, subequal, oblong, about 1 mm. long. *Gynoecium* shorter than the stamens, brown-silky and dotted with red-brown glands; gynophore from the base of the calyx-tube and about equalling it in length; style short; stigma small, capitate; ovules 3-4. *Fruit* not seen.

Mandalay District, Maymyo Road, 1500 ft., July, C. E. Parkinson 1572.

***Bauhinia velutina* (Wall.) J. G. Baker** in Fl. Brit. Ind. ii, 280.

Baker's description of this species is rather meagre and the presence of glands is not mentioned though they occur in the type (Wall. Cat. 5781) and in all others in the Kew Herbarium. It seems advisable, therefore, to publish an amplified description. Baker states that it has the "habit of *B. purpurea* and *B. variegata*", i.e. a middle-sized, erect tree. The evidence for this is not stated and there is nothing in the type or other specimens to support the statement except the absence of tendrils. On the other hand, Mr. Parkinson definitely states that his specimens are from a climber.

A *climber*; branchlets brown, sulcate, with scattered, small, rounded, corky warts, grey or fuscous-pubescent with numerous small, reddish- or yellowish-brown glands. *Leaves* coriaceous,

broader than long, lobed from $\frac{1}{4}$ – $\frac{1}{3}$ of the way down, lobes rounded and well separated, base shallowly to deeply cordate with a wide sinus, 9–11-ribbed, 5–10 cm. long, 6.5–11.5 cm. wide, primary nerves rather regular, transverse between the ribs, reticulations obscure, thinly grey-pubescent, sometimes glabrescent, above (more densely so and fuscous on the basal areolas), whitish pubescent (fuscous on the ribs, nerves and basal areolas) below, dotted more or less thickly with reddish- or yellowish-brown glandular papillae. *Petioles* subquadrangular in section, 1.5–3 cm. long, densely fuscous pubescent, with or without glands. *Inflorescence* in leaf-opposed and terminal racemes up to 15 cm. long; rhachis rather stout, slightly angled, fuscous pubescent, sometimes glandular; bracts and bracteoles small, broadly ovate, acute; pedicels short. *Buds* linear, obtuse. *Calyx* densely grey-pubescent and reddish- or yellowish-brown glandular papillose without, tubular portion linear, 5-angled upwards, about 2 cm. long, lobes 5, linear, reflexed, 3–4 cm. long. *Petals* elongate-spathulate, apex rounded, tapering into a softly hairy, ciliate claw, the rest of the petal glabrous or with a few scattered hairs, 4.5–5 cm. long, about 1 cm. wide, claw broad, about 2.5 cm. long; petals reddish-pink with yellow bases and margins. *Stamens* 3 perfect, glabrous, filaments linear, finely acuminate, 3.5–4.5 cm. long; anthers linear, about 1.2 cm. long, versatile, apex obtuse, shortly sagittate at base, ventrally with long, scattered white hairs. *Gynoecium* 5–6 cm. long, densely grey-tomentose with scattered reddish-brown glandular papillae above; gynophore from the base of the calyx-tube, grey-brown tomentose and glandular; ovary about 1.2 cm. long with a stalk 1.7 cm. long; ovules 6, flat, ovate in outline; style narrow-ensiform, 1.5–2.5 cm. long; stigma not enlarged. *Legume* strap-shaped, widened a little below the apex, acute at both ends, terminated by the persistent style, sutures slightly thickened, tomentose and densely reddish-brown glandular-papillose, about 13 cm. long, 2 cm. wide, stalk about 2 cm. long.

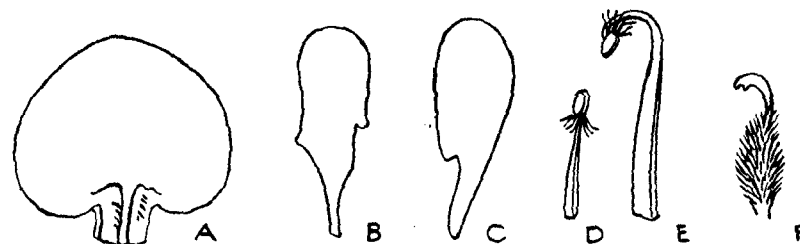
South Tenasserim, Ngawun chaung forests, 300 ft., Jan., C. E. Parkinson 1631.

Vernacular name: *Tang Daw* (Shan).

***Ormosia Watsonii* Fischer** [Papilionaceae]; similis *O. robustae* Wight sed foliolis obtusis minoribus, calycis crassi lobis latis subacutis, petalis lateralibus angustis, antheris brevibus basi barbellatis differt.

Tree 80 feet or more high; twigs thick, sulcate, densely brown-tomentose. *Leaves* alternate or subopposite, imparipinnate; petioles 3.5–4 cm. long, swollen at the base, densely brown-tomentose; rhachis about 9 cm. long, shortly produced beyond the apical pair of leaflets, densely brown-tomentose; stipules deciduous (not seen). *Leaflets* 9, chartaceous, olivaceous when dry, oval or ovate, narrowed slightly to the rounded or retuse apex, base rounded, 6–11 cm. long, 3.5–5 cm. wide, glabrous and shining above, brown-

pubescent or tomentose on the nerves below, midrib channelled above, prominent below, primary nerves about 9 pairs, distinct above, prominent below, reticulations fine, distinct on both faces; petiolules stout, about 5 mm. long, the terminal somewhat longer, brown-tomentose; stipels 0. *Inflorescence* in terminal, pyramidal, paniced racemes about 12 cm. long; rhachis and its branches stout, densely brown-tomentose; bracts lanceolate, 3–4 mm. long, densely brown-tomentose. *Flowers* about 1.3 cm. long and nearly as wide; pedicels about 5 mm. long with 2 minute, opposite, medially fixed, lanceolate bracteoles, all densely brown-tomentose.



Ormosia Watsonii Fischer. A. standard; B. lateral petal; C. keel petal; D. short stamen; E. long stamen; F. pistil (all $\times 2$).

Calyx thick, leathery, campanulate, about 1 cm. long, 5-lobed about $\frac{1}{4}$ way down, densely brown-tomentose on both sides except on the margins, lobes triangular, subacute, the 2 upper connate to just below the apices. *Petals* 5, about equal in length, white; standard orbicular-reniform, about 1.3 cm. long, with 2 fleshy callosities at the base and a short, very broad claw, quite glabrous; lateral petals oblong-spathulate, subauricled, clawed, with a few scattered white hairs on the back, keel petals free, inequilateral, obovate, auricled on one side, clawed, with a line of brownish hairs down the back. *Stamens* 10, free, unequal, 0.8–1.3 cm. long, filaments subulate, glabrous, enlarged at the base, somewhat quadrangular; anthers small, oval, versatile, longitudinally dehiscent, more or less bearded at the base. *Ovary* ellipsoid, very shortly stipitate, about 7 mm. long, densely brown-villous; ovules 2; style flattened and usually twisted in flower, about 5 mm. long, glabrous, curved and bent over at the apex with 2 stigmatic papillae on the face turned downwards. *Fruit* not seen.

South Tenasserim, Victoria Point, 300 ft., March, C. E. Parkinson 2063.

Vernacular name: *Le-zin* (Burmese). Named in honour of Mr. H. C. Watson, Conservator of Forests, Burma, at the request of Mr. Parkinson.

***Barringtonia cymosa* Fischer** [Lecythidaceae]; species sectioni *Stravidio* congruit sed ab aliis specibus differt inflorescentia erecta cymosa foliis brevioribus, ovulis medio dissepimento insertis.

Tree 30–40 ft. high; branchlets slender, terete, at first minutely

brown-puberulous, later glabrous and pale-brown to grey. *Leaves* elliptic or oblong-lanceolate, acutely acuminate, base tapering into the 1-1.5 cm. long petiole, quite glabrous, 15-35 cm. long, 5-10 cm. wide, midrib prominent below, primary nerves 12-19 pairs (according to length of the leaf), regular, arching and anastomosing near the margin, prominent below, secondary nerves obliquely transverse between the primary, ultimate reticulations fine, indistinct, margins minutely sinuate-denticulate. *Inflorescence* terminal, erect, of simple or branched cymes 6-11 cm. long; rhachis and its branches striate, minutely brown- or fuscous-puberulous, becoming tomentose at the extremities; bracts at the divisions small, ovate, puberulous, deciduous. *Flowers* aggregated towards the ends of the cyme-branches. *Buds* subglobose, about 1 cm. in diam. just before expansion. *Pedicels* 6-10 mm. long, fuscous-tomentose, medially articulated, with a minute bracteole at the articulation. *Calyx* clavate, 5-6 mm. long, fuscous-tomentose without, lobes semi-circular, ciliate, glabrous within, 2 mm. long. *Petals* broadly ovate to orbicular, about 1.2 cm. long, glabrous, deep pink, not firmly adhering to the staminal tube. *Stamens* very many, all antheriferous, glabrous, tube short, filaments deep pink, up to 2.7 cm. long; anthers yellow. *Ovary* 2-celled (becoming 1-celled); ovules 2 in each cell, attached to the middle of the dividing partition, only 1 of the 4 maturing; style filiform, as long as the stamens, glabrous, deep pink; stigma small, clavate. *Fruit* not seen.

South Tenasserim, near Negya Daung Pass, 600 ft., Feb., C. E. Parkinson 1682.

Vernacular name: *Le Ku Maw* (Karen).

***Greenea Parkinsonii* Fischer** [Rubiaceae]; affinis *G. Wightianae* W. & A., floribus pedicellatis, gemmis clavatis obtusis, corollis brevioribus sed latioribus differt.

A small tree. *Leaves* chartaceous, oblanceolate, apex long acuminate or subcaudate, acute, base tapering, more or less decurrent on the petiole, margins entire, sometimes sinuate towards the apex, glabrous above, pubescent on the midrib, nerves and veins beneath, midrib strong and prominent, especially below, primary nerves 20-25 pairs, prominent, parallel, arching near the margin, secondary nerves curving transversely between the primaries, venules finely reticulate, upper surface dark green, lower paler (at least when dry), up to 32 cm. long and 8 cm. wide. *Petioles* slender, more or less densely short-hairy, slightly incrassate at the base, 1.5-3 cm. long. *Stipules* interpetiolar, lanceolate, apex blunt or acute, densely grey-brown hairy without with more or less appressed short hairs, glabrous within except at the base, corners of the base of the opposite pairs in contact, 1-1.5 cm. long. *Inflorescence* terminal of paniced scorpioid cymes, up to 25 cm. long and broad; rhachis densely appressed grey-pubescent, bracts at furcations linear, densely pubescent, 5-7 mm. long but occasionally at the primary divisions leaflike and 6 cm. or more long

including the petiole. *Flowers* regularly spaced, bracteole one, minute, linear; often at a little distance from the pedicel. *Pedicels* about 1 mm. long, pubescent. *Buds* clavate, obtuse. *Calyx* subglobose, hispid pubescent, teeth 5, equal, triangular, subacute, about $\frac{2}{3}$ length of tube. *Corolla* wide funnel-shaped, about 3 times longer than the calyx, white, 6-7 mm. long and nearly as wide at the mouth, thinly mealy without, glabrous within except on the lobes; lobes 5, short, broadly triangular, obtuse, more or less densely mealy-pubescent within. *Stamens* 5, included, filaments short, filiform, inserted about the middle of the corolla-tube; anthers versatile, linear-oblong. *Ovary* 2-celled; ovules crowded on a rounded placenta; style filiform, glabrous, stigmas 2 revolute, very slightly exserted. *Capsule* subglobose, hispid, surmounted by the persistent calyx teeth, crown flat, 3 mm. in diameter; seeds very many, flat, in outline anvil-shaped with 2 sides straight and at right angles to each other.

Myitkyina District, Nawraw chaung, Dec., C. E. Parkinson 404.

The shapes of the buds and open flowers are strikingly different in this species and in *G. Wightiana* W. & A., but when not in flower the two must be very alike, the former probably is more robust.

***Vernonia hyalina* Fischer** [Compositae]: affinis *V. scandenti* DC., foliis subtus lepidotis, bracteis internis hyalinis, achaeniis 5-costatis differt.

Climber; branchlets striate, brown-mealy between the striae. *Leaves* ovate, acuminate, base cuneate, slightly inequilateral, dark-brown above when dry and glabrous, beneath paler, shortly pubescent on the nerves and between them covered with minute whitish or translucent, orbicular scales, 7-8.5 cm. long, 2.5-3.7 cm. wide, margins minutely, irregularly denticulate, primary nerves 5-6 pairs, sometimes forked near the midrib, ultimate reticulations fine. *Petiole* slender, slightly widened at the base, brown-puberulous, 0.6-1 cm. long. *Inflorescence* terminal, corymbose, about 1 dm. in diam., capitula numerous, about 1 cm. in diam.; rhachis and peduncles striate, brown-puberulous, the peduncles bearing a linear, brown-puberulous bract about 5 mm. long near the middle. *Involucral bracts* in 4 series, ligulate, obtuse or apiculate, more or less erose at the apex, 2-4.5 mm. long, increasing in length inwards, outermost hairy without, inwards the hairiness tending to be confined to the midrib and apex, the rest of the bract becoming chaffy with hyaline margins. *Receptacle* convex, naked, papillose. *Flowers* all tubular, about 6 mm. long. *Pappus* of about 35 equal, minute, ascendingly-barbellate hairs 5 mm. long. *Corolla* very narrowly funnel-shaped, about 4.5 mm. long, sparsely hairy, lobes erect, linear-lanceolate, acute, 1.3 mm. long, margins thickened, the thickening of adjacent lobes merging into 5 ribs that run down to the slightly swollen base of the corolla-tube. *Stamens* very slightly exserted; filaments filiform, 1.5 mm. long; anthers narrowly linear, 1 mm. long, apex acute, basal lobes very short, subacute. *Ovary* narrowly linear-clavate, sparsely hairy, 5-ribbed, 1.5 mm.

long; stigmas subulate, shortly hairy without, 1-1.3 mm. long. *Achene* strongly 5-ribbed, sparsely hairy, about 1.5 mm. long.
Maymyo, One Tree Hill, 3700 ft., June, C. E. Parkinson 1164.

***Vernonia tavoyana* Fischer** [Compositae]; a *V. scandenti* DC., foliis angustioribus, corollis glandulosis, achaeniis teretibus differt.

A twining shrub; branchlets brown, with scattered, corky lenticels, minutely verrucose; flowering twigs terete, smooth, brown-pubescent. *Leaves* narrowly lanceolate, acuminate, tapering to the base, 8-13 cm. long, 2.8-4 cm. wide, glabrous and pitted above, with short, scattered hairs below, margins shallowly and distantly crenate with minute teeth at the indentures, primary nerves about 7, arched and anastomosing. *Inflorescence* in terminal, leafy panicles of capitula; rhachis and peduncles terete, brown-pubescent, often with reduced leaves below the lowest capitulum of the divisions and 1-4 linear, brown-pubescent bracts on the peduncles. *Capitula* many-flowered, 1.2-1.5 cm. long. *Involucral bracts* in 4 rows, 2-9 mm. long, increasing in length inwards, ciliate, outermost ovate, acute, hairy outside, innermost elliptic-lanceolate, obtuse at both ends, hairy only at the apex outside and somewhat chaffy below. *Receptacle* naked. *Pappus* of many minutely, ascendingly barbellate equal hairs about 9 mm. long, yellowish when dry. *Corolla* cylindric, abruptly but narrowly expanded above the middle, 9 mm. long, with scattered, globose white glands, lobes linear-lanceolate, sub-acute, reflexed, 3 mm. long. *Stamens* glabrous, 2 mm. long; anthers linear, acute with rounded bases, 5 mm. long; stigmas rather thick, 4.5-5 mm. long, minutely pubescent without. *Achenes* brown, linear-oblong, very slightly enlarged upwards, slightly expanded at the base, truncate at both ends, terete or obscurely ribbed, about 2.5 mm. long, grey-hairy.

Tavoy, Nwalabo, 3150 ft., Dec., R. N. Parker 2306. "An extensive twining shrub, growing with grass and shrubs."

***Diospyros Wallichii* King & Gamble** [Ebenaceae].

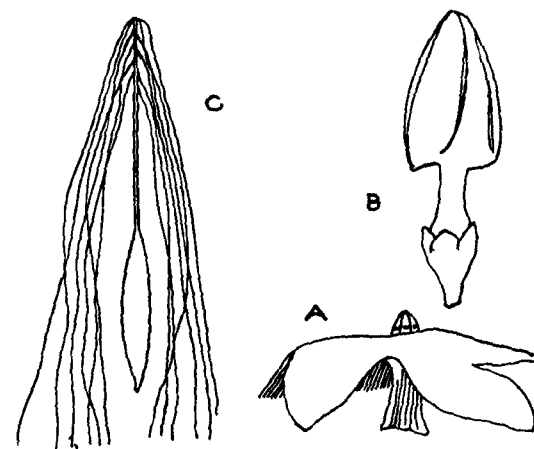
Hitherto reported only from Siam and the Malay Peninsula.

Mergui, Letpanthaung, Dec., R. N. Parker 2337.

***Vallaris arborea* Fischer** [Apocynaceae]; affinis *V. Maingayo* Hook f., foliis majoribus, floribus pluribus et majoribus, disco annulare differt.

Tree 40 feet high; twigs thick, 2-keeled by the decurrent petioles, brown, striate, lenticelled, grey-puberulous. *Leaves* opposite, pairs often unequal, rigidly chartaceous, oblong-lanceolate, acute or shortly acuminate, base acute, often slightly inequilateral, 10-35 cm. long, 4-11 cm. wide, entire, glabrous, dark-brown when dry and shining above, paler and softly grey-puberulous below, midrib channelled above, prominent below, primary nerves distant, 5-13 pairs, secondary nerves distant, irregular reticulations obscure; petioles channelled above, grey-puberulous, 1-1.5 cm. long. *Inflorescence* in axillary racemes much shorter than the leaves; peduncles about as long as the petioles, with the stout rhachis

grey-puberulous; bracts and bracteoles small, deciduous. *Flowers* few to many, fascicled, pedicelled, 2.5-3 cm. in diam. *Pedicels* slender in flower, stout in fruit, grey-puberulous, up to 2 cm. long.



Vallaris arborea Fischer. A. expanded corolla; B. bud; C. seed
(All about nat. size.)

Calyx fleshy, 5-partite almost to the base, 4-5 mm. long, lobes suborbicular, rounded, imbricate, each with 2-3 small, triangular-ovate, acute or apiculate glands at the base within, grey-puberulous without, glabrous within. *Corolla* fleshy hypocrateriform, yellowish-white, tube cylindric, slightly swollen at the base, about 1 cm. long, 2-3 mm. in diam. above the swelling, glabrous without and in the lower half within, densely white-hairy inside on the upper half, lobes 5, spreading, overlapping to the right in bud, broadly ovate to ovate-lanceolate, subacute, 1.5-1.7 cm. long, grey- or brown-puberulous without on the part exposed in bud, more or less grey- or brown-puberulous all over with a few brownish bristles at the base within. *Anthers* 5, sessile on the mouth of the corolla-tube, exserted, conniving in a cone round the stigma, about 4 mm. long, narrowly sagittate, acuminate, base with 2 short empty subulate spurs, hairy with grey bristles without with a large reniform gland at the base without. *Disk* a fleshy, sub 5-partite, lobulate ring nearly as long as the ovary. *Ovary* of 2 separate, hemispheric carpels about 1 mm. in diam., greyish-brown setose; styles 2, separate below, united above, filiform, glabrous; stigma swollen. *Fruit* of 2 divergent, linear-fusiform, compressed, slightly falcate follicles about 18 cm. long, 1.1 cm. wide and 0.6 cm. deep, brown and striate when dry, glabrous. *Seeds* many, very narrowly fusiform, flattened, with a long filiform, fragile beak, finely acuminate below, 5-5.5 cm. long (including the beak), pale-brown, glabrous, striate, the apical portion of the beak furnished with a thin coma of fine silky white hairs longer than the whole seed.

South Tenasserim, Ngawun chaung forests, 300 ft., Jan., C. E. Parkinson 1632.

Vernacular name : *Non Kai Tong* (Shan).

XII.—MISCELLANEOUS NOTES.

We note with pleasure, in the recent New Year's Honours List, the following appointments to Companionships of the Most Eminent Order of the Indian Empire, Mr. R. D. ANSTEAD, Director of Agriculture, Madras, and Mr. DAVID MILNE, Director of Agriculture, Punjab.

CURTIS GATES LLOYD.—By the death of Dr. C. G. Lloyd at Cincinnati on November 11th, 1926, Kew has lost a frequent and welcome visitor.

Dr. Lloyd was born in 1859, and, according to the few biographical details which he himself has published, was interested in the study of plants from his boyhood. It was not until he was nearly 40 years of age that he took up mycology, which thenceforth became his sole study. His interest was first aroused by A. P. Morgan, and he received much assistance from such men as Ellis, Bresadola and Patouillard. When in 1905 he was set free from the obligations of a business career, he began to travel extensively, and set out to study the existing type specimens of the larger fungi. He became a frequent visitor at all the larger herbaria of Europe, and his fortunate possession of means and leisure thus enabled him to acquire a knowledge of existing mycological collections which was unique. Had it been backed by a scientific training he might have gone far. In his earlier days he was an energetic collector, both at home and abroad, while in later years he had developed an extensive correspondence with numerous collectors in different parts of the world, so that he had gradually amassed a valuable collection of the larger *Basidiomycetes* and *Pyrenomycetes*. This collection is housed in a small museum at Cincinnati, and it is to be hoped that provision has been made for the proper care of the specimens and for rendering them available for students. A similar building contains the Lloyd Library, founded by Dr. Lloyd and his two brothers, John Uri and Nelson Ashley Lloyd. The Library contains over 52,000 volumes, mainly on materia medica and mycology, and has been endowed, so that it will be continued after the decease of the founders.

The Lloyd Library published several series of bulletins, of which Dr. C. G. Lloyd's own special publication, "Mycological Notes" is best known to botanists. This work began in 1898, and continued till No. 10 of Vol. 7 in 1925. It is of value chiefly for its excellent and well-reproduced photographs of fungi. Dr. Lloyd was an expert photographer, and no doubt did much to popularise the subject by his numerous illustrations of typical and interesting species.

Lloyd was a man of strong personality. He was intolerant

of work which to him seemed careless or superficial and he held extreme views as to what he dubbed the "advertising" system, namely the citation of authorities for names. His own early work was careful and reliable, but in later years he was less accurate, partly through his having attempted too much and partly through failing health. The latter misfortune no doubt accounted also for an element of bitterness which crept into some of his later publications; it was absent entirely from the good-natured pleasantry to which readers of his earlier work were accustomed.

To those who had most to do with him in his work Lloyd's chief characteristic was that of intense sincerity. He spared no time or trouble in examining the original specimens and older literature for the names of his fungi, and derived more satisfaction from the correct recognition of an old species than from the discovery of a dozen new ones. This trait also was apt to be carried to extremes, and like all extremists he sometimes fell into inconsistencies and absurdities.

He was very appreciative of assistance afforded him, and generous in return. For Kew he apparently had always a warm affection, and the Herbarium is indebted to him for many valuable specimens, and latterly for help given by his clerical assistant, whom he freely loaned during his absence.

In a wider sphere he has rendered valuable services to science by the conservation of four tracts of land in the United States, including an area of virgin forest near his native village of Crittenden, Kentucky, and the well-known McLean swamp near Cornell University. All these he placed in the keeping of a board of trustees for the benefit of the public.

In June last the University of Cincinnati recognised his services to science by granting him the honorary degree of Doctor of Science.

Diseases of Citrus.*—A useful addition to special monographs such as Petch's "Diseases of the Tea Bush", and "Diseases and Pests of the Rubber Tree", is the present volume, which deals with Citrus diseases occurring in all parts of the world where the economic species of Citrus are grown. The first part of the book gives general information as to the species and varieties of Citrus grown, the types of citrus diseases, their geographical distribution, and conditions affecting their incidence, cultural operations in relation to disease, and principles of disease control and prevention.

The second part of the book deals in detail with the various diseases, including effects of environment and nutrition as well as those of parasitic organisms. This portion is divided into 3 sections, namely (1) diseases of root and trunk, (2) diseases of branches, twigs and leaves and (3) fruit diseases, including problems of decay and deterioration in marketing. Each section is provided

* "Citrus Diseases and their Control." Howard S. Fawcett. With sections on Oriental Citrus diseases by H. Atherton Lee. Pp. 582+xii, 205 figs., incl. 15 col. pl. McGraw Hill Book Co. Inc., New York, 1926, price 20s.

with a key based on symptoms, similar to the keys in Cunningham's "Fungous Diseases of Fruit Trees", a feature which should be particularly useful to growers. The book is illustrated by numerous photographs and line drawings, and contains 15 coloured plates illustrating some of the principal diseases. A good bibliography and index add to its value as an up-to-date summary of all the information available on the problems encountered in citrus cultivation.

E. M. W.

The Aspergilli.*—The Aspergilli and their allies are only too familiar to everyone as the "green moulds" which attack foodstuffs, fabrics, leather, etc., under damp conditions. To the systematic mycologist they have always been a cause of much tribulation, as the multiplicity of species (often imperfectly described), their powers of adaptation to varying conditions, and their frequent occurrence in mixed growth, renders their determination by ordinary herbarium methods almost impossible. Dr. Thom has been engaged for over 20 years in the study of the moulds which occur in all stages of food handling, and his experience with this particular group has now been put together in a volume which will be welcomed by technical and systematic mycologists alike.

The book is described by the authors as "frankly biological and primarily taxonomic." It opens with a brief historical sketch and notes as to the characters of the various genera in question. Following this is a chapter on the morphology of the group, a discussion of the basis of description and the difficulties encountered in the identification of any given form, and a description of culture methods.

The authors have not attempted to cite every reference to Aspergilli in the voluminous literature on physiological, biochemical and medical studies of fungi, but summaries of the results of many such investigations are given in three chapters headed respectively "Physiological and Biochemical Studies", "Enzymic and Fermentative Activities of Aspergilli", "Aspergilli and Animal Disease".

The remainder of the book, about two-thirds, is occupied by a critical taxonomic survey of all known species, with keys to groups and to species within the groups. This part of the work is based on the authors' own cultural studies, together with a careful study of all available literature, not only for original descriptions, but also for any information from investigations in widely separate fields which would provide a basis for identification and description. Last, but not least, there is included a full and representative citation of references to literature, and a good general index.

E. M. W.

* "The Aspergilli," by Charles Thom and Margaret B. Church. Pp. ix + 272, 4 pl., 14 text fig. London: Bailliere, Tindall & Cox, 1926, price £1 2s. 6d.

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BULLETIN OF MISCELLANEOUS INFORMATION

No. 3 1927

ROYAL BOTANIC GARDENS, KEW.

XIII. — HYDNOCARPUS, TARAKTOGENOS, AND ASTERIASTIGMA FROM BURMA. C. E. C. FISCHER.

Notes on several species of Flacourtiaceous plants, the seeds of which yield Chaulmoogra oil, were published in *Kew Bulletin* 1926, p. 17 and 1927 p. 49. Recently a series of 60 dried specimens of such species has been received from Mr. C. E. Parkinson, Forest Botanist, Burma, for determination in connection with an enquiry into the oil value of the seed. These proved to belong to four distinct species, of which one (represented by a single specimen without flowers and only some pieces of the epicarp of the fruit) could not be identified. The other three belong to three separate genera: *Hydnocarpus*, *Taraktogenos* and *Asteriastigma* (united by Warburg under *Hydnocarpus* in *Pflanzenreich* III. 6a. 21). The affinities of these plants, which, indeed, have many obvious points of resemblance, are recognised by the Burmese, for all three are named *Kalaw* with or without qualifying suffix.

Hydnocarpus anthelmintica *Pierre* is now recorded for the first time outside Siam and Cambodia. The five specimens sent were collected with flowers in the month of April in the Myitkyina District in Northern Burma at an elevation of about 550 feet. The flowers are said to be fragrant and the bark and root to be used medicinally. The local name is *Kalaw*.

Taraktogenos Kurzii *King*. All but thirteen of the specimens are this species, which was first described by King in 1890 (*Jour. As. Soc. Bengal* lix. ii. 123) as from Burma and Chittagong. The specimens under consideration were collected in various parts of Burma at varying elevations:

Myitkyina District, 900 ft., fl. June, bark brownish-grey with white patches, vernacular name 'Kalaw-sai.'

Insein District, fl. Ap. and Nov., a tree 30 ft. high, vernacular name 'Kalaw.'

Mawlaik (Upper Chindwin) District, 500–600 ft., fl. Ap. to July, fr. May, evergreen tree 40–70 ft. high in evergreen forest; new leaves appearing just prior to or during flowering; seeds 14–19, pulp edible when ripe, vernacular name 'Kalaw' or 'Kalaw-thein.'

Tenasserim District, West of the Dawna Hills, 3000 ft., fl. Mar., vernacular name 'Kalaw-na,' 'Kalaw-ni' or 'Kalaw-pyu.'

(1044). 55—7. 1000. 4/27. Wy. & S., Ltd. Op. 55 (4).

97

There are slight differences in the size of leaves, in the amount of pubescence of the flowers, especially on the filaments of the stamens and staminodes, and the size of the fruit, but these are inconstant and do not indicate even local varieties.

As the present specimens offer a wider range than was available at the time of the original description and also contain ♀ flowers which were then unknown a note on the variations and a description of the ♀ flowers seem desirable.

In the specimens from Tenasserim some of the ♂ pedicels are unusually long, attaining 0.6 in. The stamens vary in number from 15-29 and also in the amount of pubescence, but are always more or less pubescent, this applies also to the amount of indumentum in other parts of the flowers. The fruit varies from 2.25 to 4 inches in diameter.

Female flower 0.6 in. in diam. *Sepals* 4, very shortly united at the base, suborbicular, concave, more or less rusty puberulous without, glabrous within, usually minutely ciliate, at least apically. *Petals* 8, smaller than the sepals, unequal, rotund, glabrous, ciliate with long crisped whitish hairs, each with a fleshy densely hairy and ciliate scale about $\frac{2}{3}$ its size attached to the base of its inner face. Some of the petals or scales often more or less connate in pairs or threes (this applies also to the ♂ flowers). *Staminodes* 10-14, nearly as long as the ovary, sometimes shortly connate at the base; filaments long, more or less densely white crisped-hairy, all bearing broadly sagittate anthers devoid (always?) of pollen. *Ovary* globose or ellipsoid, densely rufous-tomentose, 1-celled, ovules numerous on 3 parietal placentas, style very short or 0; stigmas 3-5; stellately spreading, flabelliform, 2 or more lobed at the apex.

***Asteriastigma macrocarpa* Bedd.** The remaining specimens are of this species, which was originally described by Beddome (Flora Sylvatica t. 266) from specimens obtained in the Travancore Hills of Southern India and until 1926 had not been reported from elsewhere. In the latter year Mr. Parkinson sent specimens from the Myitkyina District and when determining them a similar specimen without flowers was found in the Kew herbarium which had been sent in 1921 by Mr. R. S. Hole from the Hukong Valley.

The present specimens are as follows:—

Mawlaik (Upper Chindwin) District, 1000 ft., fl. and fr. June, tree 70 ft. high confined to evergreen forest; fruit 5-7 in. in diam., seeds 42-49, vernacular name 'Kalaw-ma' or 'Kalaw-chaukse.'

Hkamti State District, 1200 ft., fl. June, moderate to big evergreen tree confined to evergreen forest, vernacular name 'Kalaw-ma' or 'Kalaw-chaukse.'

Myitkyina District, 500-600 ft., fl. and fr. Feb., tree 40 ft. high, vernacular name 'Kalaw-ni.'

All these localities (including the Huking Valley) adjoin each other in the North of Burma.

Beddome described the flowers as hermaphrodite, and though they may be so occasionally it is probable that the stamens of the ♀ are rarely polleniferous. As the original description is limited a fuller one is here supplied.

Asteriastigma macrocarpa Bedd. a moderate sized to large tree, shoots densely aureo- or rusty-pubescent. *Leaves* narrowly to broadly oblong, abruptly acutely cuspidate, base rounded or somewhat narrowed, slightly unequal, up to 14 in. long and 5 in. wide, glabrescent above (always somewhat rusty-pubescent at least near the base on the rib and nerves), brown and furnished with minute white dots below and rusty strigose-pubescent on the rib and nerves which are very prominent, primary nerves 7-10 on either side, usually 1 more on one side than on the other, regular, ascending, secondary nerves raised, regular, parallel, transverse between the primaries, ultimate reticulations fine but distinct; petioles 0.5-0.9 in. long, rusty-pubescent. *Flowers* fascicled or in short cymes (up to 2 in. long) on the older branches; rhachis stout, rusty-pubescent; pedicels short, rusty-pubescent. *Buds* globose. *Flowers* ♂ about 1 in. in diam. *Sepals* 4, imbricate, coriaceous, orbicular, concave, minutely ciliate, about 0.4 in. long. *Petals* 12, smaller than the sepals, suborbicular, unequal, glabrous, ciliate, each furnished with a thick, rufous-tomentose scale about $\frac{1}{2}$ of its size attached to the base. *Stamens* 50-60, quite glabrous; filaments long, somewhat flattened; anther large, oblong-cordate to broadly-sagittate, basal lobes rounded. *Rudimentary pistil* ovoid, shorter than the filaments, densely rufous-tomentose. *Flowers* ♀ about 1.2 in. in diam. *Sepals* 4, orbicular, concave, 0.5-0.6 in., in diam., inner 3 at least minutely ciliate. *Petals* 12, suborbicular or obovate, much smaller than the sepals, glabrous, fringed with long fuscous silky hairs, each with a thick densely fuscous or rufous silky-tomentose scale about $\frac{2}{3}$ its size attached to its base. *Staminodes* 45-60, glabrous, filaments long, all with small cordate or sagittate anthers. *Ovary* globose, densely fuscous or rufous silky-tomentose, 1-celled, ovules many; style very short or 0; stigmas 6-8, stellately spreading, coriaceous, large, flabelliform, apex deeply 2-lobed, lobes rounded, glabrous above, densely fuscous or rufous silky-tomentose below. *Berry* globose, 5-7 in. in diam., pubescent, pericarp woody, fibrous, 0.4-0.6 in. in diam. (when dry); seeds numerous, embedded in pulp, oblong-ovate, more or less angled by compression, about 1.3 in. long.

The number of sepals and petals in each of the three genera mentioned appears to be constant (5 each in *Hydnocarpus*, 4 sepals and 8 petals in *Taraktogenos*, 4 sepals and 12 petals in *Asteriastigma*) and it seems, therefore, quite justifiable as well as more convenient to maintain them rather than merge them in *Hydnocarpus*.

XIV.—CONTRIBUTIONS TOWARDS A PHYLOGENETIC CLASSIFICATION OF FLOWERING PLANTS: VI.*

J. HUTCHINSON.

A. THE GENERA OF HYDRANGEACEAE. By J. HUTCHINSON.

B. THE GENERA OF SAXIFRAGACEAE (p. 107). By J. E. DANDY.

In my preliminary paper† on a proposed new classification of the dicotyledonous plant-families, and also in my recent book‡, I pointed out the desirability of segregating the "Saxifragaceae" of Bentham and Hooker's *Genera Plantarum* into several families. It was shown that the true *Saxifragaceae*, as typified by *Saxifraga* and allied genera, were entirely herbaceous, whilst the remaining groups were almost wholly woody. These woody groups, the *Cunoniaceae*, *Escalloniaceae*, *Grossulariaceae*, and *Hydrangeaceae*, to which were added the *Brunelliaceae* and *Greyiaceae*, were associated to comprise the new order *Cunoniales*, which in general showed considerable affinity with *Dilleniaceae*, and which might conceivably have been derived from the same basal stock as that family. It was postulated that the *Cunoniales*, as so constituted, had no real close phylogenetic affinity with the *Saxifragales*, but that the apparent relationship was due to parallelism which had resulted in the evolution of a somewhat similar floral type.

The *Cunoniales*, with the possible exception of part of *Hydrangeaceae* (see p. 103), have probably been derived from ancestors which were also woody, e.g. from the phylum whose basal stock is *Magnoliaceae*, and the *Saxifragales* from herbaceous ancestors such as *Ranunculaceae*. This view receives considerable support from the fact that in the *Saxifragaceae*, as here defined, there is the same tendency towards the development of commissural stigmas as there is in the *Papaveraceae* (see p. 112), a family generally regarded as having also been derived from *Ranunculaceae*. The *Saxifragaceae*, as so restricted, are a smaller, more homogeneous, and apparently very ancient family, which has probably not been the centre of much further development.

In the present contribution I have had the valuable co-operation of my colleague Mr. J. E. Dandy, who has made a very careful morphological and geographical study of the *Saxifragaceae*, in which he has endeavoured to reduce the conflicting views regarding the limits to be ascribed to the genera to reasonable concepts.

A. The Genera of Hydrangeaceae.

KEY TO THE SUBFAMILIES AND TRIBES OF HYDRANGEACEAE.

Herbs with simple stems from a woody rhizome, or softly woody plants with broad pith; leaves alternate, opposite, or rarely

* Continued from *Kew Bull.* 1925: 168.

† *Kew Bull.*, 1924: 114.

‡ The Families of Flowering Plants. I. Dicotyledons (1926).

verticillate; flowers in cymes or flattish corymbs, rarely in panicles of cymes, showing a strong tendency towards the abortion and enlargement of the outermost flowers with petaloid calyx; placentas parietal to axile.....

Subfamily I. HYDRANGEOIDEAE.

Tribe 1. **Kirengeshomeae**. Herbs with simple stems arising from a creeping rhizome; petals contorted or imbricate; stamens numerous, 15 or more; ovary semi-inferior to quite inferior.

Tribe 2. **Hydrangeae**. Softly woody plants with branched stems, or rarely climbers; petals valvate; ovary inferior.

Shrubs or small trees mostly with fairly tough wood, or rarely (by reduction) decumbent shrubs; leaves opposite or verticillate; flowers all fertile; calyx not petaloid; placentas axile

Subfamily II. PHILADELPHOIDEAE.

Tribe 3. **Carpenterieae**. Ovary superior or subsuperior; stamens numerous or definite; leaves opposite.

Tribe 4. **Philadelphae**. Ovary inferior or almost so (at least $\frac{2}{3}$ -inferior); stamens numerous or definite; leaves opposite or verticillate.

KEY TO THE GENERA.

SUBFAMILY I. HYDRANGEOIDEAE.

Tribe 1. KIRENGESHOMAE.

Ovary semi-inferior; petals contorted; stamens 15, in 3 series; flowers few in a terminal lax leafy cyme, none sterile; leaves opposite*.....1. **Kirengeshoma**.

Ovary quite inferior; petals imbricate†; stamens numerous; flowers in spreading corymbose cymes, the outer flowers sterile with enlarged petaloid calyx-lobes:

Leaves alternate, scattered on the stem, not lobed, coarsely serrate; styles 3, rather short; flowers small, numerous.....

2. **Cardiandra**.

Leaves opposite or subverticillate, mostly bilobed; styles connate high up.....3. **Deinanth**.

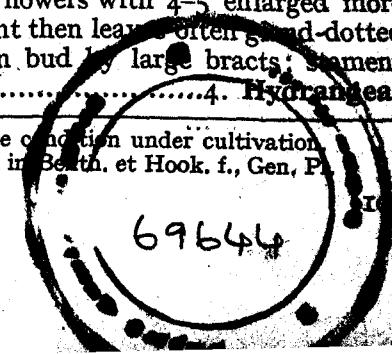
Tribe 2. HYDRANGEEAE.

Styles 4-5, free or connate only at the base; capsule opening at the top between the styles; sterile flowers with 4-5 enlarged more or less petaloid sepals, or if absent then leaves often gland-dotted and the inflorescence enclosed in bud by large bracts; stamens 8-10 (very rarely 15)4. **Hydrangea**

* Sometimes reverting to an alternate condition under cultivation.

† Not valvate in *Cardiandra* as stated in *Benth. et Hook. f., Gen. Pl.*

JL



Style 1; sterile flowers absent, or if present then with only 1 enlarged ovate sepal; capsule opening at the sides between the ribs:
 Stamens 20-30; leaves deciduous; creeping or climbing shrubs; petals 7-10; no sterile flowers present5. **Decumaria**.
 Stamens 8-10; petals 4-5:
 Leaves evergreen; petals cohering into a cap; no sterile flowers present.....6. **Pileostegia**.
 Leaves deciduous; petals valvate; sterile flowers with 1 enlarged ovate white sepal.....7. **Schizophragma**.

SUBFAMILY II. PHILADELPHOIDEAE.

Tribe 3. CARPENTERIEAE.

Styles 3-5, free to the base or nearly so; anther-connective usually not produced at the apex or only slightly so:
 Sepals and petals 5; filaments not divided at the top:
 Shrubs with opposite serrate leaves whitish-pubescent below; flowers white, in terminal cymose panicles; stamens 10; ovules and seeds numerous; petals imbricate* ...8. **Jamesia**.
 Low shrubs with opposite thinly pubescent leaves; flowers white, very small, in terminal head-like long-pedunculate racemes; stamens 4-12; ovule solitary in each loculus; petals imbricate9. **Whipplea**.
 Low shrubs with small opposite entire leaves; flowers very small, in compact head-like cymes; petals clawed; stamens 10; ovules several in each loculus.....10. **Fendlerella**.
 Sepals and petals 4; filaments divided at the top and produced beyond the anther; styles 4, separate; ovules numerous in each loculus; seeds few; shrubs with opposite entire leaves and few terminal whitish flowers.....11. **Fendlera**.
 Styles united, with 5-7 stigmas; stamens 20 or more; filaments not divided at the apex; anther-connective not produced at the apex; petals contorted; ovules numerous; shrub with quadrangular branches, opposite leaves, and handsome white cymose flowers; indumentum of leaves of two kinds, of long appressed hairs and short strigose hairs.....12. **Carpenteria**.
 Style simple, with undivided stigma; stamens 15, connate at the base; anther-connective produced at the apex; ovules 5-7 in each of the 3 loculi, erect; tree with opposite lanceolate leaves and small cymose flowers13. **Kania**.

Tribe 4. PHILADELPHAEAE.

Fruit a capsule:

Stamens numerous (20 or more; 15 in only one sp.); capsule obconic or obovoid; styles free or connate at the base:
 Petals imbricate.....14. **Philadelphus**.
 Petals 4, valvate; style 2, slender; prostrate or creeping shrubs.....15. **Platycrater**.

* Not convolute as described in various works.

Stamens 12-15; capsule globose; filaments narrowed from the base to the apex, not toothed; petals imbricate16. **Neodeutzia**.

Stamens 10; capsule subglobose; styles 3-4, free; filaments often expanded or trifold at the apex; petals imbricate or induplicate valvate17. **Deutzia**.

Fruit a berry:

Styles free, clavate; shrubs with opposite leaves and numerous hermaphrodite flowers in terminal panicles.....18. **Dichroa**.

Styles connate; small trees with opposite or verticillate serrate leaves and terminal corymbs of rather small polygamodioecious flowers19. **Broussaisia**.

Taxonomic References.—DC., Prodr. 4: 13-16 (1830) (under *Saxifragaceae*). Endl., Gen. Pl.: 820-822 (1839) (as suborder of *Saxifragaceae*). Lindl., Veg. Kingd.: 569-570 (1846). Benth. et Hook. f., Gen. Pl. 1: 640-644 (1865). Baill., Hist. Pl. 3: 432-436 (1872) (under *Saxifragacées*). Engl. & Prantl, Nat. Pflanzenf. 3, 2A: 69-77 (1890) (under *Saxifragaceae*). C. K. Schneider, Ill. Handb. Laubholz. 1: 360-395 (1904) (under *Saxifragaceae*). Small & Rydb. in N. Amer. Fl. 22: 159-178 (1905).

Characters occurring in relatively few genera or species.—Stems: herbaceous and simple from an underground rhizome in Tribe *Kirengeshomeae*. Leaves: palmately nerved in *Kirengeshoma*; alternate in *Cardiandra* and (under cultivation) in *Kirengeshoma*; subverticillate in *Deinanthæ caerulea* Stapf; deeply bilobed in *Deinanthæ*; evergreen in *Pileostegia*; gland-dotted in some Philippine and S. American spp. of *Hydrangea*. Indumentum: stellate in *Hydrangea* spp., *Neodeutzia*, *Deutzia* spp., *Philadelphus*. Inflorescence: subcapitate in *Whipplea* and *Fendlerella*; covered in bud by large imbricate bracts in certain Philippine and S. American spp. of *Hydrangea*. Flowers: polygamodioecious in *Broussaisia*; outer flowers sterile with petaloid calyx in *Cardiandra*, *Deinanthæ*, and most spp. of *Hydrangea*; one calyx-lobe much enlarged and petaloid in *Schizophragma*. Corolla: petals cohering into a cap in *Pileostegia*; valvate in Tribe *Hydrangeae*, *Platycrater*, *Deutzia* spp., *Dichroa*, and *Broussaisia*. Stamens: numerous (15 or more) in Tribe *Kirengeshomeae*, *Carpenteria*, *Neodeutzia*, *Philadelphus*, *Platycrater*, *Cardiandra*; filaments divided at the apex into two long arms overtopping the anther in *Fendlera*; with two lateral lobes in *Deutzia* spp. Fruit: a capsule opening between the ribs in *Decumaria*, *Pileostegia*, and *Schizophragma*; a berry in *Dichroa* and *Broussaisia*.

NOTES ON PHYLOGENY AND CLASSIFICATION.

The *Hydrangeaceae*, as defined in the present paper, seem to be a group which has arisen from two different sources. For example it appears possible that *Hydrangea*, a softly woody genus, has had

a different phylogenetic history from that of such genera as *Deutzia* and *Philadelphus*. The progenitor of *Hydrangea* was probably a type similar to *Kirengeshoma*, a rare Japanese monotypic genus. In habit this plant resembles some members of the *Ranales* and also the herbaceous *Berberidaceae*, being a herb with a simple stem arising from a creeping rhizome. The ovary is only partly inferior, the styles are free, the stamens are 15 in three series, the flowers are few in lax leafy cymes in which the outer are not sterile, and the petals are contorted. An apparently advanced character is the opposite leaves, but it should be noted that under cultivation they revert to the alternate* condition.

The next genus in order of advancement is *Cardiandra*, again a herb, with alternate leaves scattered on the stem and the flowers more numerous, and, in common with the next genus *Deinanth* (with opposite or subverticillate leaves), it has the outer flowers sterile with enlarged petaloid calyx-lobes.

So there seem to be still preserved three genera which show the path of development from a herbaceous habit right up to the genus *Hydrangea*, familiar to everyone as being softly woody with branched stems, opposite leaves, valvate petals, few stamens, completely inferior ovary, and with nearly always a considerable number of the flowers sterile with petaloid sepals.

Further modifications on different lines have also occurred in this small and interesting group. For instance in the advanced genus *Decumaria* the habit has become creeping or climbing, and the styles have become consolidated into one as in *Pileostegia* and *Schizophragma*. The fruit is remarkable in these three genera in that it opens, not at the top as in *Hydrangea*, but at the sides between the ribs. In *Pileostegia* the petals cohere into a cap, and in *Schizophragma* the sterile flowers have only one enlarged sepal such as we find in the remarkable genus *Mussaenda* in *Rubiaceae*. It is interesting to note that another case of mimicry of *Rubiaceae* (with *Oldenlandia*) is shown by *Vahlia* in the true *Saxifragaceae* (see p. 113).

The second and generally more advanced subfamily *Philadelphoideae* seems to have had quite a separate origin from the *Hydrangeoideae*, and such similarity as exists is revealed mainly by their floral diagrams and is due probably to convergent evolution. In habit they are shrubs or small trees, or very rarely and then clearly by reduction in growth-form, decumbent shrubs. The leaves are always opposite or verticillate, and there is a gradation in the gynaecium from quite superior to completely inferior. The affinity of the most primitive members of this subfamily is clearly with the *Rosaceae*, and perhaps the origin of these two families is to be looked for in the *Dilleniales*, which have free carpels and the same general *facies* as the *Rosaceae*. I have begun the classification of this subfamily with the tribe *Carpenterieae*, with superior or

subsuperior ovary and sometimes numerous stamens. *Jamesia* is decidedly 'rosaceous' in appearance and affinity; it has free styles and 5 sepals and petals, the latter imbricate. Three other small genera differ but slightly (see key), *Fendlera* being tetramerous. *Carpenteria* is probably just as primitive as *Jamesia*, but it has united styles and it seems to lead up to the tribe *Philadelphae*, especially to *Philadelphus*, which appears to be the basal genus for most of the remaining genera, particularly *Deutzia*. Although the gap seems considerable, I do not consider *Carpenteria* to be very far removed from *Crossosoma*, formerly included in the *Dilleniaceae*, and retained by me as an allied separate family. It is noteworthy that both genera are Californian.

The capsular fruit of the above-mentioned genera gives place to a berry in *Dichroa* and *Broussaisia*, the latter with flowers tending to become unisexual. The great resemblance of some of these

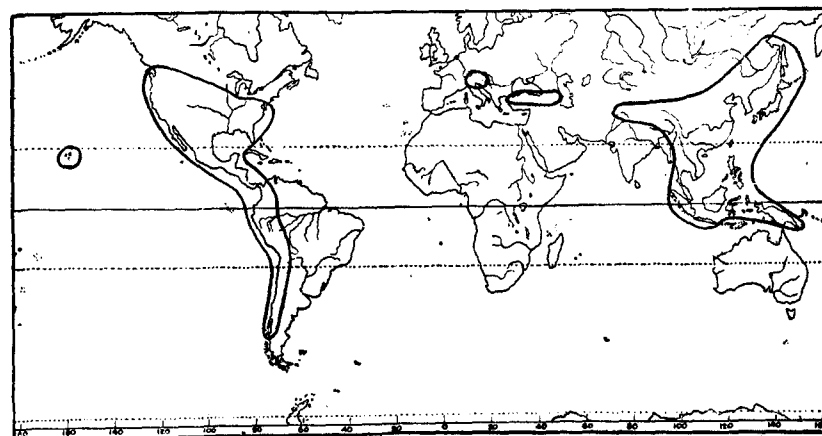


Fig. 1. Range of *Hydrangeaceae*.

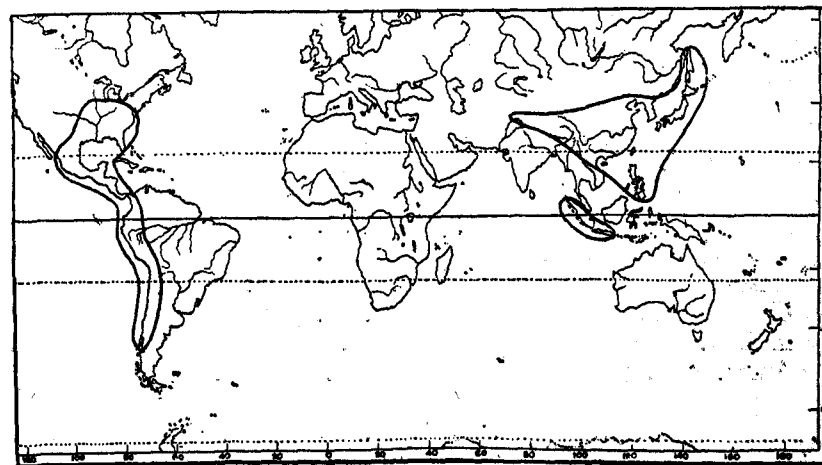


Fig. 2. Range of *Hydrangea*.

* This is another interesting case in which the apparently fixed character of the opposite leaves reverts readily to the alternate condition. The same thing occurs in *Clematopsis Stanleyi* Hutch. (See *Kew Bull.* 1920 : 21).

latter genera to *Viburnum* (Caprifoliaceae) and to some *Araliaceae* is perhaps more than superficial. Then may not the section *Opulus* of *Viburnum* be a counterpart of *Hydrangea*? Finally the new genus from Mexico recently described by Small as *Neodeutzia* is very interesting in that it supplies a link between *Philadelphus* (with numerous stamens) and *Deutzia* (with definite stamens), although from a phylogenetic standpoint the name is not appropriate, for the plant is an *ancient* and not a *new* type of *Deutzia*.

GEOGRAPHICAL DISTRIBUTION.

The most noteworthy fact about the distribution of *Hydrangeaceae* (see fig. 1) is their entire absence from Africa, Australia, and New Zealand. They are found in considerable abundance in the United States of North America, and in Central and Western China, where *Hydrangea* (see fig. 2), *Deutzia* (China only), and *Philadelphus* are represented by a large number of species. In Japan there are some very peculiar and probably very ancient types, such as *Kirengeshoma*, *Cardiandra*, and *Deinanthé*, the latter two also in Central China. The larger and more recently evolved genera are also the more widely spread, *Hydrangea* extending from India through Eastern Asia and Malaya to America (North and South); *Philadelphus* has a similar range, but occurs also in South Europe and Orient. *Deutzia* extends from South Central and Eastern Asia to the Philippines. Besides *Philadelphus* and *Hydrangea*, one small genus, *Decumaria*, shows the link between the floras of China and the Eastern States of North America. *Kania* is in New Guinea, and *Broussaisia* is endemic to the Sandwich Islands.

GENERA OF HYDRANGEACEAE.

1. **Kirengeshoma** Yatabe in Bot. Mag. Tokyo 5: 1 (1890).—1 sp., *K. palmata* Yatabe, Japan.
2. **Cardiandra** Sieb. & Zucc.—3 spp.; type-sp. *C. alternifolia* Sieb. & Zucc., Japan; *C. sinensis* Hemsl., C. China; *C. formosana* Hayata, Formosa.
3. **Deinanthé** Maxim. in Mem. Acad. Imp. Sc. St. Petersburg, Ser. 7, 10: n. 16, 2 (1867).—2 spp.; type-sp. *D. bifida* Maxim., Japan; *D. caerulea* Stapf, C. China.
4. **Hydrangea** L. (incl. *Cornidia* Ruiz & Pav.).—About 75 spp., India to Japan, Malay Archip., N. Amer., W. S. Amer. (see fig. 2); type-sp. *H. arborescens* L., New York to Florida and Missouri.—Rehder in Sarg., Pl. Wilson. 1: 34 (1911) (key to Chinese spp.); Small in N. Amer. Fl. 22: 159 (1905); Briquet in Ann. Conserv. Jard. Bot. Genev. 20: 393 (1916) (C. and S. Amer. spp.); C. K. Schneider, Ill. Handb. Laubholz. 1: 384 (1904) (cultivated spp.).
5. **Decumaria** L.—2 spp.; type-sp. *D. barbara* L., Virginia to Florida and Louisiana; *D. sinensis* Oliv., W. and C. China.—Small in N. Amer. Fl. 22: 175 (1905).

6. **Pileostegia** Hook. f. & Thoms.—2 spp.; type-sp. *P. viburnoides* Hook. f. & Thoms., E. Himal. to S. C. China; *P. urceolata* Hayata, Formosa.
7. **Schizophragma** Sieb. & Zucc.—4 spp., China and Japan; type-sp. *S. hydrangeoides* Sieb. & Zucc., Japan; *S. hypoglaucum* Rehd., Szechuan; *S. integrifolium* Hemsl., Szechuan and Hupeh; *S. Fauriei* Hayata, Formosa.
8. **Jamesia** Torr. & Gray* (*Edwinia* Heller).—3 spp., N. Amer.; type-sp. *J. americana* Torr. & Gray, S. C. U. States.—Small in N. Amer. Fl. 22: 175 (1905) (as *Edwinia*).
9. **Whipplea** Torr.—1 sp., *W. modesta* Torr., C. Calif.—Small in N. Amer. Fl. 22: 178 (1905).
10. **Fendlerella** Heller in Bull. Torr. Bot. Club 25: 626 (1898).—1 sp., *F. utahensis* (S. Wats.) Heller, Utah to New Mexico.—Small in N. Amer. Fl. 22: 176 (1905).
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12. **Carpenteria** Torr.—1 sp., *C. californica* Torr., Calif.—Small in N. Amer. Fl. 22: 177 (1905).
13. **Kania** Schltr. in Engl., Bot. Jahrb. 52: 118, fig. 1 (1914).—1 sp., *K. eugenoides* Schltr., New Guinea.
14. **Philadelphus** L.—About 70 spp., S. Europe, Asia, N. and C. Amer.; type-sp. *P. coronarius* L., S. Europe.—Koehne in Gartenfl. 1896: 450; C. K. Schneider, Ill. Handb. Laubholz. 1: 362 (1904), and 2: 929 (1912); Rydberg in N. Amer. Fl. 22: 162 (1905).
15. **Platycrater** Sieb. & Zucc.—1 sp., *P. serrata* (Thunb.) Makino, Japan.—Makino in Bot. Mag. Tokyo 26: 387 (1912).
16. **Neodeutzia** Small in N. Amer. Fl. 22: 161 (1905).—2 spp., Mexico; type-sp. *N. mexicana* (Hemsl.) Small.
17. **Deutzia** Thunb.—About 70 spp., S. C. and E. Asia, Philipp.; type-sp. *D. scabra* Thunb., Japan.—Rehder in Sarg., Pl. Wilson. 1: 14 (1911) (key to Chinese spp.); C. K. Schneider in Mitth. Deutsch. Dendrol. Ges. 1904: 172, and Ill. Handb. Laubholz. 1: 376 (1904).
18. **Dichroa** Lour.—5 spp., India, China, Malay Archip., Philipp., New Guinea; type-sp. *D. febrifuga* Lour., Nepal to China.—Schlechter in Engl., Bot. Jahrb. 52: 121 (1914).
19. **Broussaisia** Gaud.—2 spp., Sandwich Is.; type-sp. *B. arguta* Gaud.

B. The Genera of Saxifragaceae. By J. E. DANDY.

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Stigmas dorsal to the carpels; stamens not alternating with staminodes (very rarely all staminodial):

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* *Jamesia* Torr. & Gray (1840) is tenable under International Rules. *Jamesia* Raf. (1832) is synonymous with *Dalea* L. (*Papilionaceae*).

Ovules numerous or several on each placenta; capsule septicidal
Subfamily I. SAXIFRAGOIDEAE.

Tribe 1. **Saxifrageae**. Placentas parietal, axile, or almost basal; perennial or annual, often scapigerous herbs with alternate or rarely opposite leaves; ovary superior to inferior.

Tribe 2. **Vahliaeae**. Placentas apical, pendulous; annual herbs with opposite leaves; ovary inferior.

Ovules solitary on each of 2 basal placentas; capsule loculicidal
Subfamily II. EREMOSYNOIDEAE.

Stigmas commissural; stamens alternating with as many staminodes:
Placentas parietal; stamens as many as the sepals; capsule loculicidal; flowers 5-merous, solitary.

Subfamily III. PARNASSIOIDEAE.
Placentas axile; stamens twice as many as the sepals; capsule septicidal; flowers normally 4-merous, in racemes.....

Subfamily IV. FRANCOOIDEAE.

KEY TO THE GENERA.

SUBFAMILY I. SAXIFRAGOIDEAE.

Tribe 1. SAXIFRAGEAE.

Inflorescence cymose or racemose, or flowers solitary; leaves simple, 3-foliolate, palmate, or pinnate; flowers usually bisexual; ovary 1-5-locular:

Carpels almost free or united; flowers usually bracteate; leaves simple (rarely 3-foliolate); receptacle flat to tubular; stamens 3-10:

Ovary 1-locular with parietal (rarely almost basal) placentas:
Flowers 5-merous, in racemes or panicles with inconspicuous bracts; petals usually present:

Carpels equal or subequal; placentas usually parietal:

Inflorescence racemose; petals often divided:

Carpels 3 (rarely more or 2 and then receptacle turbinate):

Stamens 10; petals divided or entire

1. **Lithophragma**.

Stamens 5; petals entire.....2. **Conimitella**.

Carpels 2; receptacle patelliform, campanulate, or tubular:

Receptacle patelliform or shallowly campanulate; capsule not or abruptly beaked.....3. **Mitella**.

Receptacle deeply campanulate or tubular; capsule gradually beaked:

Receptacle not split; stamens 5 or 10; sepals equal; petals not filiform:

Stamens 10; petals usually pinnatifid

4. **Tellima**.

Stamens 5; petals entire or 3-5-cleft.....

5. **Elmera**.

Receptacle split down the anterior side; stamens

3; sepals unequal; petals filiform...6. **Tolmiea**.

Inflorescence paniculate, sometimes spiciform; petals entire (sometimes absent); stamens 5...7. **Heuchera**.

Carpels unequal, especially in fruit; placentas almost basal; stamens 10.....8. **Tiarella**.

Flowers 4-5-merous, solitary or in small cymes with conspicuous foliaceous bracts; petals absent.....

9. **Chrysosplenium**.

Ovary 2-5-locular with axile (rarely almost basal) placentas:

Carpels free except at the very base; inflorescence cymose; stamens 10; leaves undivided or peltate:

Anthers 2-locular; petals broad:

Leaves not peltate, dotted with sunken glands; receptacle free from the carpels; sepals erect.....

10. **Bergenia**.

Leaves peltate, without sunken glands; receptacle united with the carpels; sepals reflexed at maturity

11. **Peltiphyllum**.

Anthers 1-locular; petals narrow, small

12. **Leptarrhena**.

Carpels more or less united:

Receptacle flat to cupular, completely united with the ovary:

Stamens 10 (rarely 8):

Petals sharply differentiated from the receptacle, narrowed at the base (rarely absent):

Petioles, if present, not articulated at the top.....

13. **Saxifraga**.

Petioles slender, articulated at the top; leaves flabelliform; sepals and petals reflexed.....

14. **Saxifragopsis**.

Petals like the sepals not differentiated from the receptacle, broad at the base, shorter and narrower than the sepals; leaves long-petioled, cordate, 3-7-lobed.....15. **Zahlbrucknera**.

Stamens 5:

Petals 5, acute, shorter than the sepals; flowers in cymes.....16. **Hieronymusia**.

Petals absent or 2-3, unequal; flowers solitary, axillary.....17. **Saxifragella**.

Receptacle cupular or campanulate, free at least above from the ovary:

Ovary free from the receptacle:

Stamens 10; petals oblong or ovate, clawed.....

18. **Jepsonia**.

Stamens 5; petals narrowly linear-lanceolate.....

19. **Bolandra**.

Ovary partially united with the receptacle:

Receptacle united in the lower half with the ovary:

Seeds wingless; stamens 5 or 10.....

20. **Boykinia**.

Seeds winged; stamens 5.....21. **Sullivantia**.

Receptacle almost completely united with the ovary;
stamens 5.....22. **Suksdorfia**.

Carpels united; flowers ebracteate, small, in a dichotomous
panicle; leaves simple, palmate, or pinnate, long-petioled;
receptacle shallow; stamens 6-14:

Panicle small; leaves simple, not peltate; stamens 6-14:

Stamens 10-14; petals absent; sepals petaloid

23. **Oresitrophe**.

Stamens 6; petals present, shorter than the sepals.....

24. **Aceriphyllum**.

Panicle large; leaves palmate, pinnate, or peltate; stamens 10:

Leaves simple, peltate; petals present.....25. **Astilboides**.

Leaves palmate or pinnate; petals usually absent

26. **Rodgersia**.

Inflorescence a pyramidal panicle composed of spikes or racemes;
leaves 2-3-ternate (rarely simple, slender-petioled); flowers
bracteate, very small, often unisexual; receptacle shallow;
petals small and narrow or absent; ovary 2-3-locular with
axile placentas:

Carpels usually almost free; leaves 2-3-ternate (rarely simple,
cordate); petals present or absent; stamens 5 or 10.....

27. **Astilbe**.

Carpels united; leaves simple, not cordate; petals absent;
stamens 10; flowers unisexual.....28. **Tanakaea**.

Tribe 2. VAHLIEAE.

Stamens 5; ovary 1-locular; flowers axillary (only genus).....

29. **Vahlia**.

SUBFAMILY II. EREMOSYNOIDEAE.

Stamens 5; ovary 2-locular (only genus).....30. **Eremosyne**.

SUBFAMILY III. PARNASSIOIDEAE.

Petals usually longer than the sepals; basal leaves long-petioled;
flowers mostly conspicuous and long-peduncled; perennial.....

31. **Parnassia**.

Petals shorter than the sepals, sometimes deficient or absent;
leaves spathulate; flowers inconspicuous, shortly peduncled;
annual, minute.....32. **Lepuropetalon**.

SUBFAMILY IV. FRANCOOIDEAE.

Petals equal; leaves lyrate.....33. **Francoa**.

Petals unequal, the 2 anterior much smaller or absent; leaves
cordate-orbicular.....34. **Tetilla**.

Taxonomic References.—Juss., Gen. Pl.: 308-309 and 245 (*Parnassia*,
under *Capparides*) (1789). DC., Prodr. 4: 17-54 (1830) and
1: 320 (1824) (*Parnassia*, under *Droseraceae*). Endl., Gen. Pl.:
813-817, 812 (*Francoaceae*, under *Crassulaceae*), and 908
(*Parnassiaeae*, under *Droseraceae*) (1839). Lindl., Veg. Kingd.:
567-568, 406 (*Parnassia*, under *Hypericaceae*), and 451 (*Fran-*
coaceae) (1846). Benth. & Hook. f., Gen. Pl. 1: 629-640 (1865).
Baill., Hist. Pl. 3: 424-430 and 431-432 (*Parnassiaeae* and
Francoeae) (1872). Engl. in Engl. & Prantl, Nat. Pflanzenf.
3, 2, A: 41-69 (1890).

Selected Literature.—Payer, Traité d'Organogénie: 183 and t. 39,
15-29; 374 and t. 82, 21-39; 381 and t. 82, 1-20 (1857).
Baillon, "Observations sur les Saxifragées", Adansonia 5:
282 (1865). Engler, Monogr. Gatt. *Saxifraga* (1872). Eichler,
Blüthendiagr. 2: 421 (1875). Drude, "Ueber die Blüthen-
gestaltung und die Verwandtschaftsverhältnisse des Genus
Parnassia", in Linnaea 39: 239 (1875). Rosendahl, "Die
nordamerikanischen *Saxifraginae* und ihre Verwandtschafts-
Verhältnisse in Beziehung zu ihrer geographischen Verbreitung",
in Engl., Bot. Jahrb. 37, Beibl.: 1 and tt. 4-5 (1905). Juel,
"Studien über die Entwicklungsgeschichte von *Saxifraga*
granulata", in Nov. Act. Reg. Soc. Sci. Upsal., Ser. 4, 1, 9
and tt. 1-4 (1907). Eichinger, "Beitrag zur Kenntnis und
systematischen Stellung der Gattung *Parnassia*", in Beih.
Bot. Centralbl. 23, 2: 298 (1908). Pace, "*Parnassia* and some
allied Genera", in Bot. Gaz. 54: 306 and tt. 14-17 (1912).
A. Arber, "On the Structure of the Androecium in *Parnassia*
and its bearing on the Affinities of the Genus", in Ann. Bot.
27: 491 (1913). Rosendahl, "A revision of the genus *Mitella*
with a discussion of geographical distribution and relationships",
in Engl., Bot. Jahrb. 50, Suppl.: 375 and t. 8 (1914). Mur-
beck, "Über die Organisation und verwandtschaftlichen
Beziehungen der Gattung *Lepuropetalon*", in Ark. för
Bot. 15, 10 (1918). Engler, "Saxifraga (Pars generalis)",
Pflanzenr. 4, 117 (1919). Gäumann, "Studien über die
Entwicklungsgeschichte einiger *Saxifragales*", in Rec. Trav.
Bot. Neerl. 16: 285 (1919).

Characters occurring in relatively few genera or species.—Leaves:
palmate or pinnate in *Rodgersia*; 2-3-ternate in *Astilbe* (except
A. simplicifolia); 3-foliolate in *Tiarella trifoliata* and *T. laciniata*;
peltate and large in *Peltiphyllum*, *Astilboides*, and *Boykinia*
tellimoides; solitary, basal, and developed after the flowering-

III

axis in *Oresitrophe*; dotted with sunken pluricellular glands in *Bergenia*; petioles articulated at the top in *Saxifragopsis*. Flowers: zygomorphic in *Tolmiea*, *Saxifraga* sect. *Diptera*, *Tetilla*, and *Heuchera* spp. Receptacle: split down the anterior side in *Tolmiea*. Petals: filiform in *Tolmiea*; not differentiated from the receptacle in *Zahlbrucknera*. Stamens: 3 in *Tolmiea*; 5 opposite the petals in *Mitella* spp.; anthers 1-locular in *Leptarrhena*. Carpels: unequal in *Tiarella*; placentas apical and pendulous in *Vahlia*; ovules solitary and basal in each loculus in *Eremosyne*. Capsule: loculicidal in *Eremosyne*, *Parnassia*, and *Lepuropetalon*.

NOTES ON PHYLOGENY AND CLASSIFICATION.

The family *Saxifragaceae* as considered here is an entirely herbaceous group limited to the tribes *Saxifrageae* and *Francoceae* of the *Genera Plantarum*. To these two tribes Bentham and Hooker allocated 21 genera. More recently *Donatia* has been transferred to the *Stylidiaceae**. Of the genera proposed or revived since the publication of the *Genera Plantarum*, 14 appear to be worthy of retention. The number of genera is thus brought up to 34, comprising nearly 600 species.

The genera fall into four well-marked subfamilies, of which one, the typical *Saxifragoideae*, is very much larger than the others. The subfamilies show little close affinity with each other, and each has some claim to family rank; the *Parnassioideae* and *Francooideae* have in fact been separated as families by some authors.

The *Parnassioideae* and *Francooideae* stand isolated from the other subfamilies on account of their commissural stigmas. This unusual character also occurs in the *Papaveraceae*; these and the *Saxifragaceae* may have had immediate and parallel descent from the *Ranales*†. *Lepuropetalon*, placed in the *Saxifrageae* by Engler, is better associated with *Parnassia* in the *Parnassioideae* on account of its commissural stigmas, whorl of staminodes, and loculicidal capsule‡. Besides the position of the stigmas, the *Parnassioideae* and *Francooideae* resemble each other and differ from the remaining subfamilies in the possession of a whorl of staminodes, but otherwise they have little in common. These two subfamilies are on the whole better retained within the *Saxifragaceae*, though it has been stated that *Parnassia* has affinities with the *Droseraceae* and *Hypericaceae*§.

Eremosyne, the single and monotypic genus of *Eremosynoideae*, is exceptional in the family, not only on account of its solitary ovules, but also in its geographical range (S.W. Australia); it differs from the *Saxifragoideae* also in having a loculicidal capsule. In spite of these differences, however, the genus is conveniently retained within the *Saxifragaceae*.

* F. von Mueller, *Fragm. Phytogr. Austral.* 8: 41 (1873); Mildbraed in *Engl., Pflanzenr.* 4, 278: 15 (1908).

† Hutchinson, *Fam. Flowering Pl.* 1: 8, diagr. (1926).

‡ Murbeck in *Ark. för Bot.* 15, 10: 12 (1918).

§ See Selected Literature (p. 111).

In the *Saxifragoideae*, *Vahlia* is quite distinct in its type of placentation, "rubiaceous" habit with opposite leaves (showing a remarkable resemblance to *Oldenlandia*), and tropical distribution; it seems worthy of tribal rank. The remaining genera form a very natural group, amongst which *Tanakaea* is closely related to *Astilbe* through *A. simplicifolia*, while *Oresitrophe*, *Aceriphyllum*, *Astilboides*, and *Rodgersia* are allied in their habit and type of inflorescence and flower. The large and successful genus *Chrysosplenium*, with its distinct habit and apetalous flowers, has advanced into an isolated position somewhat remote from the other genera. The antiquity of the subfamily is evident from the occurrence of almost free carpels in several genera. The androecium is limited to one or two whorls of stamens, but in other floral organs the subfamily shows progressive stages in the fulfilment of several evolutionary tendencies, e.g. union of carpels, hollowing of the receptacle and its union with the ovary, and development of axile from parietal placentation. In certain genera special developments have taken place, such as the zygomorphic flower with reduced number of stamens in *Tolmiea*, and the compound inflorescence with tendencies towards unisexuality and apetalous active in *Astilbe* and fulfilled in *Tanakaea*. It is possible that in some genera, e.g. *Tanakaea*, a bilocular ovary with axile placentas has arisen by direct union of the carpels by their ventral faces. In others a bilocular ovary has been formed by the intrusion and meeting of the parietal placentas of an unilocular ovary. This is undoubtedly the case in the *Rodgersia* group, where the placentas often separate again in fruit. In *Aceriphyllum* the ovary is not completely bilocular, for the placentas meet only in the upper part of the ovary*.

It is probable that the *Saxifragoideae* found a direct origin in a Ranalean Stock, for like the *Ranunculaceae* they have seeds with copious endosperm and minute embryo. In this point they differ from the *Rosaceae*, their supposed affinity with which on account of a general evolutionary tendency (i.e. *perigyny*), has possibly been unduly emphasised. The resemblances between the *Saxifragoideae* and *Rosaceae* are probably due to parallel development. In one case, i.e. *Astilbe* ("Spiraea" of some authors) and *Aruncus* (*Rosaceae*), the similarity in habit is so very striking that it has led to considerable confusion between the two genera, especially in gardens.

GEOGRAPHICAL DISTRIBUTION.

The *Saxifragaceae* are predominantly plants of the North Temperate and Arctic regions, where the frequently discontinuous type of distribution of the genera emphasises the antiquity of the group but at the same time renders difficult the tracing by its aid of the paths of evolution within the family. The only truly tropical genus is *Vahlia*; other genera occur within the tropical zone, but

* Engler in his original description of the genus states that the ovary is as in *Saxifraga*, to which genus Oliver referred the plant in the first place.

only on the mountains. Except for an isolated monotypic genus in South Western Australia and one species of *Astilbe* in Western New Guinea, *Saxifragaceae* are absent from Australasia and Polynesia.

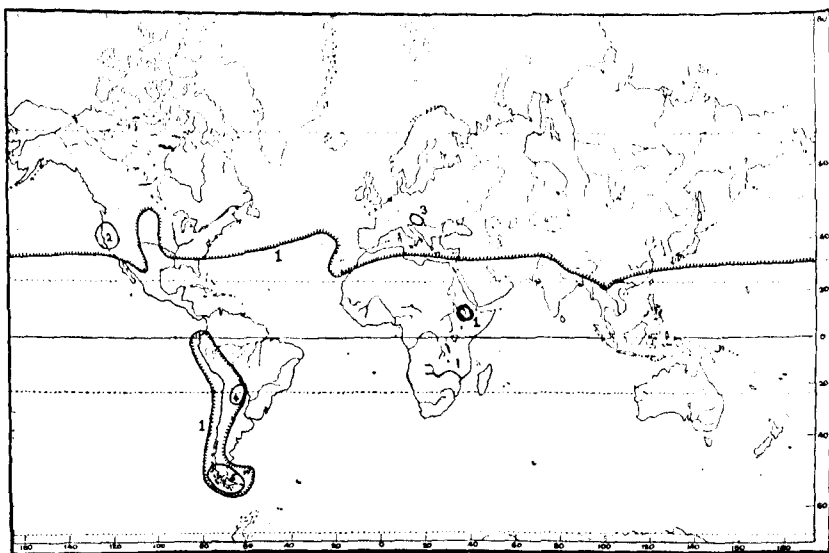


Fig. 3. Range of *Saxifraga* and allied genera.—1, *Saxifraga*; 2, *Saxifragopsis*; 3, *Zahlbrucknera*; 4, *Hieronymusia*; 5, *Saxifragella*.

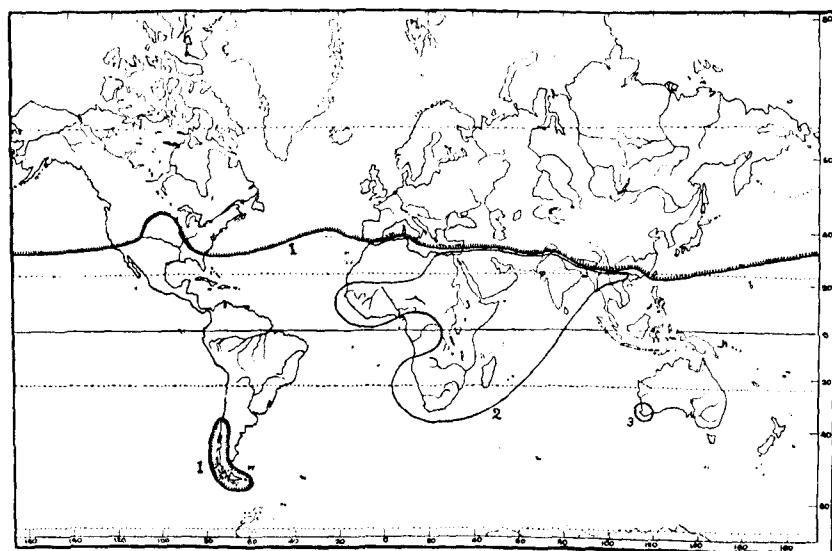


Fig. 4. 1, Range of *Chrysosplenium*; 2, *Vahlia*; 3, *Eremosyne*.

Saxifragoideae.—With the exception of *Vahlia*, the plants of this large subfamily are characteristic of the Arctic and Alpine floras of the Northern Hemisphere, while a few species inhabit the

Andes, Java, and Western New Guinea. *Saxifraga* (see fig. 3) and *Chrysosplenium* (see fig. 4) are circumboreal, and both have representatives in the Andes; one species of *Saxifraga* occurs in N. Siam, while another is confined to the mountains of Abyssinia. Twelve genera are exclusively North American, and of these ten are peculiar to the Rocky Mountains region. Central and Eastern Asia has six genera, of which three are confined to the Manchurian and Korean region, while one is endemic to Japan. *Zahlbrucknera* is restricted to the mountains of Austria, and *Hieronymusia* and *Saxifragella* to the Andes (see fig. 3). The floras of North America and Eastern Asia are connected by *Mitella*, *Tiarella*, *Leptarrhena*, *Boykinia*, and *Astilbe* (see fig. 5). *Astilbe* also has species in the Philippines, Java, and Western New Guinea. *Vahlia* has a tropical and subtropical distribution throughout the Old World (fig. 4); it is a recent type, whose species, being annuals, have probably spread rapidly over the region. Eastern Asia and the Rocky Mountains have been the chief centres of evolution of the genera.

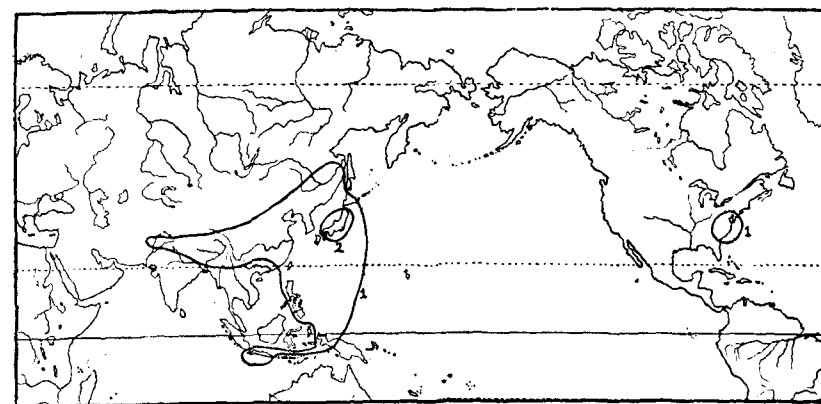


Fig. 5. 1, Range of *Astilbe*; 2, *Tanakaea*.

Eremosynoideae.—The solitary genus *Eremosyne* is confined to South Western Australia, and is thus isolated geographically from the rest of the family (see fig. 4). Its distribution is almost identical with that of the monotypic *Cephalotaceae* (*Cephalotus*).

Parnassioideae.—The range of this subfamily bears a general resemblance to those of *Saxifraga* and *Chrysosplenium* in the *Saxifragoideae*. *Parnassia*, unlike those two genera, is absent from the Andes (see fig. 6); *Lepuropetalon*, however, has been recorded from Chile and also from Uruguay. This genus has a remarkable distribution, being found in three relatively small areas, two of them in South America, the other in South Eastern North America (see fig. 6).

Francooideae.—The two genera of this subfamily are endemic to Chile, where *Francoa*, the more primitive in floral characters, has a wider range than *Tetilla*.

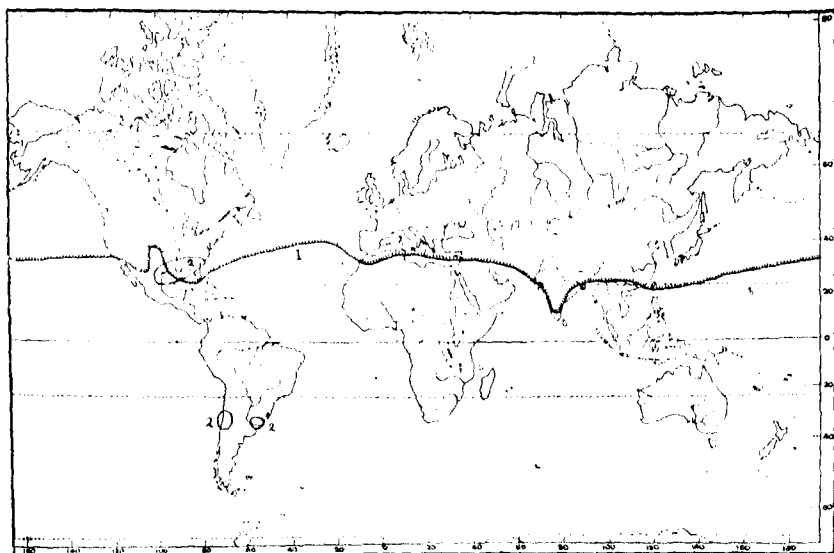


Fig. 6. Range of Parnassioideae.—1, *Parnassia*; 2, *Lepuropetalon*.

GENERA OF SAXIFRAGACEAE.

1. **Lithophragma** Nutt. in Journ. Acad. Philad. 7: 26 (1834) (under *Tellima* in Gen. Pl.).—9 spp., W.N. Amer. from Brit. Columbia and Alberta to Calif., Arizona, and New Mexico; type-sp. *L. parviflorum* (Hook.) Nutt., Brit. Columbia to Colorado.—Rosendahl in Engl., Bot. Jahrb. 37, Beibl.: 85 (1905); Rydberg in N. Amer. Fl. 22: 84 (1905) recognises 20 spp.
2. **Conimitella** Rydb. in N. Amer. Fl. 22: 96 (1905).—1 sp., *C. Williamsii* (D.C.Eaton) Rydb., Montana, Idaho, and Wyoming.
3. **Mitella** L. (incl. *Mitellastra* Howell, *Ozomelis* Raf., *Pectiantia* Raf.).—13 spp., N. Amer., N.E. Asia, Japan, and Formosa; type-sp. *M. diphylla* L., E.N. Amer.; *M. nuda* L., N.E. Asia and N. Amer.; *M. japonica* Miq., Japan and Formosa.—Revision by Rosendahl in Engl., Bot. Jahrb. 50, Suppl.: 375 (1914).
4. **Tellima** R. Br.—1 sp., *T. grandiflora* (Pursh) Dougl., Pacif. N. Amer. from S. Alaska to N. Calif.—Rydberg in N. Amer. Fl. 22: 90 (1905) recognises 3 spp.
5. **Elmera** Rydb. in N. Amer. Fl. 22: 97 (1905).—1 sp., *E. racemosa* (S. Wats.) Rydb., Washington.
6. **Tolmiea** Torr. & Gray (*Leptaxis* Raf.).—1 sp., *T. Menziesii* (Pursh) Torr. & Gray, Pacif. N. Amer. from Brit. Columbia to N. Calif.
7. **Heuchera** L.—About 30 spp., Temp. N. Amer. and southwards into S. Mexico; type-sp. *H. americana* L., E.N. Amer.—Rosendahl in Engl., Bot. Jahrb. 37, Beibl.: 76 (1905); Rydberg in N. Amer. Fl. 22: 97 (1905) multiplies the spp. to 72.

8. **Tiarella** L.—5 spp.; *T. polyphylla* D. Don in E. Himal., China, and Japan, others in Pacif. and E.N. Amer.; type-sp. *T. cordifolia* L., E.N. Amer.—*T. trifoliata* L. and *T. laciniata* Hook. have 3-foliolate leaves.
9. **Chrysosplenium** L.—About 85 spp., all Arctic and N. Temp. except *C. valdivicum* Hook. and *C. macranthum* Hook. in Temp. S. Amer.; type-sp. *C. oppositifolium* L., Europe.—Monogr. by Franchet in Nouv. Arch. Mus. Hist. Nat., Ser. 3, 2: 87 (1890), and 3: 1 (1891).
10. **Bergenia** Moench, Meth.: 664 (1794) (under *Saxifraga* in Gen. Pl.).—8 spp., C. and E. Asia, excl. Japan; type-sp. *B. crassifolia* (L.) Fritsch, C. Asia; *B. pacifica* Komarov, Maritime Prov.; *B. coreana* Nakai, Korea.
11. **Peltiphyllum** Engl. in Engl. & Prantl, Nat. Pflanzenf. 3, 2, A: 61 (1890).—1 sp., *P. peltatum* (Torr.) Engl., Oregon to C. Calif.
12. **Leptarrhena** R. Br.—1 sp., *L. pyrolifolia* (D. Don.) R. Br., Kamschatka and Pacif. N. Amer. from Alaska to Washington.
13. **Saxifraga** L.—About 320 spp., all Arctic and N. Temp. except *S. hederifolia* Hochst. in Abyssinia and 4 spp. in Andes, 1 sp. extending southwards into N. Siam; type-sp. *S. granulata* L., Europe and Morocco.—*S. nana* Engl. has 4-merous apetalous flowers and opposite leaves; sect. *Diptera* has unequal petals.—Monogr. by Engler and Irmscher in Engl., Pflanzenf. 4, 117 (1916 and 1919).
14. **Saxifragopsis** Small in Bull. Torr. Bot. Club 23: 19 (1896).—1 sp., *S. fragarioides* (Greene) Small, S. Oregon and N. Calif.
15. **Zahlbrucknera** Reichenb.—1 sp., *Z. paradoxa* (Sternb.) Reichenb., Austria.
16. **Hieronymusia** Engl. in Notizbl. Bot. Gart. Berl. 7: 265 (1918).—1 sp., *H. alchemilloides* (Griseb.) Engl., Andes of S. Bolivia and N. Argentina.
17. **Saxifragella** Engl. in Engl. & Prantl, Nat. Pflanzenf. 3, 2, A: 61 (1890).—2 spp., Tierra del Fuego region; type-sp. *S. bicuspidata* (Hook. f.) Engl.; *S. Albowiana* (Kurtz) Engl.
18. **Jepsonia** Small in Bull. Torr. Bot. Club 23: 18 (1896).—3 spp., Calif.; type-sp. *J. Parryi* (Torr.) Small, C. and S. Calif.; *J. malvifolia* (Greene) Small, S. Rosa and S. Cruz Is.; *J. neonuttalliana* Millsp., S. Catalina I.—Rosendahl in Engl., Bot. Jahrb. 37, Beibl.: 60 (1905); Small in N. Amer. Fl. 22: 120 (1905).
19. **Bolandra** A. Gray in Proc. Amer. Acad. 7: 341 (1868).—2 spp., Pacif. U. States; type-sp. *B. californica* A. Gray, Calif.; *B. oregana* S. Wats., Washington and Oregon.—Rosendahl in Engl., Bot. Jahrb. 37, Beibl.: 59 (1905); Rydberg in N. Amer. Fl. 22: 119 (1905).
20. **Boykinia** Nutt. (incl. *Therophon* Raf., *Telesonix* Raf.).—9 spp.; *B. lycoctonifolia* (Maxim.) Engl. and *B. tellimoides*

- (Maxim.) Engl. in Japan, others in N. Amer.; type-sp. *B. aconitifolia* Nutt., E. U. States; *B. Richardsonii* (Hook.) A. Gray, Arctic N. Amer.—*B. tellimoides* has peltate leaves.
21. **Sullivantia** Torr. & Gray.—2 spp., U. States; type-sp. *S. Sullivantii* (Torr. & Gray) Britton, Minnesota to Ohio; *S. oregana* S. Wats., Oregon, and Montana to Colorado.—Rosen-dahl in Engl., Bot. Jahrb. 37, Beibl.: 60 (1905); Small in N. Amer. Fl. 22: 121 (1905) recognises 4 spp.
 22. **Suksdorfia** A. Gray in Proc. Amer. Acad. 15: 41 (1880) (incl. *Hemicera* Raf.).—2 spp., W.N. Amer. from S. Brit. Columbia and Alberta to Oregon and Montana; type-sp. *S. violacea* A. Gray; *S. ranunculifolia* (Hook.) Engl.—Rosen-dahl in Engl., Bot. Jahrb. 37, Beibl.: 60 (1905).
 23. **Oresitrophe** Bunge.—1 sp., *O. rupifraga* Bunge, N. China (Chihli).
 24. **Aceriphyllum** Engl. in Engl. & Prantl, Nat. Pflanzenf. 3. 2. A: 52 (1890).—1 sp., *A. Rossii* (Oliv.) Engl., S. Manchuria and Korea.
 25. **Astilboides** Engl., Pflanzenr. 4, 117: 675 (1919) (nomen).—1 sp., *A. tabularis* (Hemsl.) Engl., S. Manchuria and Korea.
 26. **Rodgersia** A. Gray.—5 spp., E. Asia; type-sp. *R. podophylla* A. Gray, Korea and Japan; others in China.
 27. **Astilbe** Buch.-Ham.—About 24 spp.; *A. biternata* (Vent.) Britton, E. U. States; *A. speciosa* Jungh., Java; *A. papuana* Schltr., W. New Guinea; 2 spp. in Philipp.; others Himal. and E. Asia; type-sp. *A. rivularis* Buch.-Ham., Himal. to W. China and N. Siam.—*A. simplicifolia* Makino (Japan) has simple leaves.
 28. **Tanakaea** Franch. & Sav., Enum. Pl. Jap. 2: 352 (1879).—1 sp., *T. radicans* Franch. & Sav., Japan.
 29. **Vahlia** Thunb.—7 spp.; *V. viscosa* Roxb. and *V. oldenlandioides* Roxb. in Trop. and Subtrop. Asia and Africa, others in Africa; type-sp. *V. capensis* Thunb., S. Africa.
 30. **Eremosyne** Endl.—1 sp., *E. pectinata* Endl., S.W. Australia.
 31. **Parnassia** L.—About 47 spp., Arctic and N. Temp., extending southwards into India; type-sp. *P. palustris* L., widely distributed.—Drude in Linnaea 39: 239 (1875).
 32. **Lepuropetalon** Elliott (*Pyxidanthera* Muhl.).—1 sp., *L. spathulatum* (Muhl.) Elliott, S.E. N. Amer., C. Chile, and Uruguay.
 33. **Francoa** Cav.—3 spp., Chile; type-sp. *F. appendiculata* Cav.
 34. **Tetilla** DC.—1 sp., *T. hydrocotylifolia* DC., C. Chile.

Excluded Genera.

ARUNCUS Adans. (Rosaceae-Spiraeaceae).
 DONATIA Forst. (Stylidiaceae-Donatioideae).
 FAURIA Franch. (Gentianaceae-Menyantheae).
 KIRENGESHOMA Yatabe (Hydrangeaceae-Kirengeshomeae).
 LUETKEA Bong. = *Eriogynia* Hook. (Rosaceae-Spiraeaceae).

XV.—NEW SPECIES FROM PANAMA, COIBA AND COCOS ISLANDS. L. A. M. RILEY.

("St. George" Pacific Expedition, 1924-25*)

The following eleven new species form part of the collection of plants made in 1924 by the writer in Panama, and by other members of the Expedition in the islands of Taboga and Coiba, in the Pearl Islands, and in Cocos Island.

With the exception of a few common species collected in the neighbourhood of Colon, the whole of the Panama collection was made within ten miles of the city of Panama. It is somewhat notable that so many new species (eight) should have been obtained in what is now a well-worked area botanically. The islands of Coiba and Cocos are less known.

Of the complete collection the first set has been presented to Kew, and the second set to the British Museum.

Odontocarya nitida Riley, sp. nov. [Menispermaceae-Tinosporeae]; affinis *O. tamoidi* Miers, sed foliis pro rata angustioribus sinu basali multo minori et angustiori, petiolis et inflorescentiis pilosis haud glabris differt.

Caules volubiles, graciles, leviter striati, glabri vel sparse pilosi; novelli 0.5-2 cm. longi, sub folio infimo 1.25-1.5 mm. diametro, dense pubescentes. *Folia* suboblique cordato-ovata, 4-12 cm. longa, 3.5-6 cm. lata, obtuse acuminata vel obtusa, integra, palmatim 5-nervia, nervis inferioribus brevibus patentibus, superioribus acute ascendentibus, supra sparse et brevissime pilosa, primo visu glabra, subtus glabra, costa et nervis maioribus et interdum venulis molliter et sparse pilosis, utrinque laete viridia, nitida, nervis et rete venularum iucunde conspicuis; petioli 2-5 cm. longi, breviter pilosi. *Racemi* ♂ axillares, ob breviter novellorum subcongesti, basi breviter ramosi, 3-6 cm. longi, satis dense pilosi. *Bractae* lineares, circiter 1 mm. longae; bracteolae 0.5 mm. longae. *Tepala* 24, 8-seriata, ovata, acuta vel subacuta, pubescentia, plerumque 1.5-1.75 mm. longa, 1-1.5 mm. lata, extimis et intimis minoribus 1 mm. longis 0.75 mm. latis. *Stamina* 6, vix basi connata, 0.75 mm. longa, filamentis e basi in antheras subtetrathecas 0.25 mm. latas gradatim dilatatis. *Inflorescentia* ♀ haud visa.

PANAMA: Cocoli, fl. June, Riley 136 (type in Herb. Kew.).

Elsota chrysotricha Riley, sp. nov. [Polygalaceae]; affinis *E. molli* (H.B.K.) Kuntze, alis extra fulvo-sericeis haud glabris, fructu haud vel vix cristato differt.

Caules scandentes, 3-4 m. attingentes. *Ramuli* teretes, flexuosi, fulvi, pilis pallidioribus crispulis obtecti. *Folia* ovata vel oblongo-ovata, 3.5-8 cm. longa, 2-4 cm. lata, basi plerumque rotundata nonnunquam obtusa vel truncata rarissime submarginata, apice

* See Kew Bull. 1925, 26-33, 133-142, 216-231; 1926, 51-56.

cuneatim vel simpliciter obtuso rarissime emarginato ob fasciculum pilorum e costa productum obtuse quasi-mucronulato, marginibus subrevolutis brevissime ciliatis, supra nitidula, breviter pilosa, reticulata, costa impressa, nervis lateralibus utrinsecus 10-13 elevatis, subtus pubescentia, costa fulva pilis pallidioribus obtecta cum nervis lateralibus elevata; petioli 1.5-2 mm. longi, incrassati, glandulis binis centro cavatis infra articulum in ramulo dispositis. *Racemi* terminales, simplices, 5-8 cm. longi; bracteae lanceolatae, acutae, vix 2 mm. longae, mox deciduae; pedicelli 7-9 mm. longi, ut bracteae sepala et alae extra fulvo-pilosi. *Sepala exteriora* late ovata, 4 mm. longa, 3.5 mm. lata, obtusissima; alae, ungue 3 mm. longo excluso, 9 mm. longae, 8.5 mm. latae, apice rotundato emarginato, basi margine postico rotundata margine antico truncata. *Carina* cucullata, 1.1 cm. longa, ungue 2 mm. longo incluso, minute cristata, ciliata; petala superiora obovata, 1 cm. longa, 7 mm. lata, in basim attenuata, rotundata, vix emarginata. *Vagina staminea* ad fissuram ciliata, extra glabra, intus pilosa. *Ovarium* ovatum, 1.75 mm. altum, 1 mm. latum, hirsutum; stylus glaber, 1.1 cm. longus. *Fructus immaturus* stipitatus, ala margine dorsuali curvato ventrali recta, dense fulvo-pilosa. *Fructus maturus* (e specimine Seemannii descriptus) ovoideus, 8-9 mm. altus, 6-8 mm. diametro, valde rugosus, fulvo-pilosus, ala circiter 4 cm. longa leviter pilosa, margine dorsuali apice curvato ventrali subrecto. *E. coriacea* Blake in N. Am. Fl. xxv. 374, partim. *Securidaca tomentosa* Seemann, Bot. Herald, 81; Hemsl. Biol. Centr.-Am., Bot. i. 63; non St. Hilaire.

PANAMA: in secondary growth at sea level near Old Panama, fl. June, Riley 148 (type in Herb. Kew.); near the city of Panama, fr. Nov. Seemann; in open shrubby places about Panama, fl. June, Sutton Hayes 722. TRINIDAD: Fort St. George's Hill, fl. June, Johnston 112.

Characterized especially by the golden hairs on the outside of the alae. Seemann's and Johnston's specimens have shorter and denser racemes than in the case of the type.

I have compared the above specimens with the description of *Securidaca mollis* in H.B.K. Nov. Gen. v. 421, and I have concluded that they cannot be referred to that species on account of the sericeous alae and the almost complete absence of any crest on the fruit. I have not seen the type-specimen of *S. mollis*, which was collected in Peru on the Upper Amazon. Provisionally I have accepted as typical a specimen collected by Matthews at Chachapoyas in the same district, and which agrees with the description except that the leaves are proportionately somewhat narrower.

The species *Securidaca mollis* described in H.B.K. l.c. was originally published as *S. coriacea* Bonpl. in Ges. Nat. Freunde Berlin Mag. ii. 47 (1808). The name was changed to *S. mollis* with the description in Nov. Gen. et. Sp. v. 421 (1823). [See also Kunth, Syn. Pl. Æq. iii. 323 (1824).] The description of *S. coriacea* is simply "caule scandente, foliis oblongo-ovatis, subtus mollis-

sime tomentosis." This, while sufficient to render valid the combination *Securidaca coriacea*, is hardly adequate as a working description. That of *S. mollis* is long and complete, and presumably drawn up from the same material.

Erythrochiton incomparabilis Riley, sp. nov. [Rutaceae-Cuspariaceae]; nullae speciei generis adhuc descriptae notabiliter affinis, foliis oppositis breviter petiolatis, inflorescentiis vix vel brevissime pedunculatis bifloris tantum, lobis corollae longe et anguste unguiculatis cognoscetur.

Frutex debilis, 2.4 m. altus. *Ramuli* robusti, 3.5 mm. diametro 15 cm. infra apicem, flexuosi, sulcati, cicatricosi, cinerei, iuventute appresso-pilosi, mox glabrescentes. *Folia* opposita, obovata vel elliptica, 5-20 cm. longa, 2.5-7.5 cm. lata, acuminata acumine obtuso, vel obtusa, interdum rotundata et emarginata, basi in petiolum acute angustata, integra vel leviter undulata, subcoriacea, utrinque obscura, glabra, pellucide punctata, costa valida cum nervis lateralibus utrinque elevata glabra sed in foliis iunioribus versus basin subpilosa, nervis lateralibus utrinsecus circiter 9-11 utrinque conspicuis subpatenter arcuatis anastomosantibus, rete venularum satis manifesta; petioli 4-7 mm. longi, incrassati, rugulosi, subpilosi. *Inflorescentiae* terminales, biflorae; pedunculus subnullus vel usque ad 5 mm. longus; bracteae subulatae, acutae, 3.5-4 mm. longae, pilosae, bracteolis oppositis forma et indumento ut bracteis vix 3 mm. longis pilis longioribus fulvis in axillis fasciculatis; pedicelli 7-9 mm. longi, pubescentes cum pilis longioribus paucis intertextis. *Alabastra* longe ovata, 1.8 cm. longa, 0.7 cm. diametro, apiculata. *Calyx* ad 1.9 cm. longa, basi subtumida, extra sparse pilosa, punctata, inaequaliter 5-lobata, lobis triangulatis acute acuminatis 6-9 mm. longis basi 3-3.5 mm. latis. *Petala* rosea, recurva, longe unguiculata, in tubum coalita, lamina ovata 3 cm. longa 1.4 cm. lata obtusa sparse pilosa in unguem circiter 0.8 cm. longum angustata, tubo 2.5 mm. longo intus pubescenti 5 mm. a basi barbato-annulato. *Staminodia* 5, summo tubo inserta, filiformia, interdum in lamina minuta membranacea complanata, 0.8-1 cm. longa. *Discus* annulatus, 2.5 mm. altus, 5-laciniatus, glaber. *Carpella* 4, fere libera, uniovulata, oblique conica, 1.5 mm. alta, 1 mm. diametro, angulata, rugulosa, nigra; stylus admirabiliter gracilis, filiformis, 3.8 cm. longus, patenter pilosus; stigma capitatum. *Fructus* haud visus.

PANAMA: Coiba island, in thick jungle, fl. Sept., Collette in Riley 470 (type in Herb. Kew.).

A very distinct species with no obvious affinity with any of those previously described. The opposite leaves, much abbreviated inflorescences, long-clawed petals, and the one-ovuled carpels are particularly noteworthy.

Eugenia antiquae Riley, sp. nov. [Myrtaceae-Myrteae]; affinis *E. guayaquilensi* (H.B.K.) DC., ramulis glabris haud hirtellis,

foliis oblanceolatis nec oblongis utrinque glabris, inflorescentiis petiolos superantibus laxioribus floribus maioribus differt.

Arbuscula 9 m. alta. *Ramuli* robusti, 2 mm. diametro 15 cm. infra apicem, teretes, vel iuniores subcompressi, nodis tumidis, ascendentes, glabri, cinerei, iuniores subfusci. *Folia* plerumque oblanceolata, interdum obovata vel elliptica, 5-8.5 cm. longa, 2-4 cm. lata, cuspidato-acuminata, acuta vel subobtusata, basi cuneatim acuta, glabra, obscura, concoloria, costa supra impressa subtus elevata, nervis lateralibus utrinsecus 12-14 ascendentibus elevatis; petioli 4.5-6 mm. longi, verrucosi. *Inflorescentiae* axillares, oppositae, 4-13-florae, rhachi primaria brevissima vix 0.5 mm. longa, secundariis 0.1-1.2 cm. longis plerumque circiter 0.5-0.6 cm. longis, pedicellis 4-7 mm. longis puberulis; bracteae ovatae, obtusae, 0.25 mm. longae; bracteolae proxime infra ovarium geminae, saepe connatae, late ovatae, 0.25 mm. longae, rotundatae. *Lobi calycis* 4, ovati, fere 0.75 mm. alti, fere 1 mm. lati, obtusi vel rotundati, ciliati vel sparsissime ciliati, extra subpuberuli. *Petala* 4, ovata, 3.5 mm. longa, 2.5 mm. lata, obtusa. *Stamina* 20-25; filamenta 5.5-6 mm. longa; antherae subglobosae, circiter 0.25 mm. diametro. *Ovarium* globosum, vix 1 mm. diametro, minute puberulum; stylus valde arcuatus, circiter 6 mm. longus, apice truncatus. *Fructus* haud visus. *E. guayaquilensis* Seemann Bot. Herald, 125; Benth. Bot. Sulph. 98; nec DC.

PANAMA: Old Panama, fl. June, Riley 142 (type in Herb. Kew); Sabanas, Riley 110; Santiago de Veraguas, fl. March, Seemann; near the city of Panama, Seemann 280.

Undoubtedly closely related to *E. guayaquilensis* (H.B.K.) DC., but the more elongated and larger-flowered inflorescences and the absence of indumentum, even from the youngest leaves almost, serve well as distinctive characters. I have not seen the type of *E. guayaquilensis*, but material in the Kew Herbarium collected at Guayaquil by Jameson and Hartweg agrees with the description of that species in H.B.K. Nov. Gen. vi. 147 (*Myrtus guayaquilensis*).

***Alibertia longistipulata* Riley, sp. nov.** [Rubiaceae—Gardenieae]; affinis *A. eduli* A. Rich., a qua foliis maioribus nervis lateralibus pro rata paucioribus, stipulis multo longioribus caudato-acuminatis, tubo corollae femineae longiori cum pubescentia breviori et lobis corollae caudato-acuminatis haud ovato-acutis differt.

Arbuscula ad 4.5 m. alta. *Ramuli* teretes, glabri, fusci vel cinereo-fusci, 2.5-3 mm. diametro 15 cm. infra apices. *Folia* elliptica vel oblongo-elliptica, 10-20 cm. longa, 2.5-7 cm. lata, integra, valde acuminata acumine saepe curvato, basi in petiolum cuneatim angustata, membranacea vel subcoriacea, utrinque glabra, supra nitidula, subtus pallidiora et obscura, costa supra versus apicem elevata versus basin plana vel impressa subtus omnino elevata, nervis lateralibus utrinsecus 9-15 saepe subpatentibus sed versus marginem quem haud attingunt valde arcuatis

anastomosantibus utrinque elevatis; petioli 0.3-1 cm. longi. *Stipulae* anguste triangulares, in acumen caudatum attenuatae, 0.9-1.8 cm. longae, basi 2-3 mm. latae. *Flores masculi* desunt. *Flores feminei* solitarii, sessiles, ad summos ramulos inter folia paris terminalis dispositi. *Calyx* cupulatus vel subcampanulatus, 4.5 mm. altus, 6 mm. diametro, 6-dentatus, extra puberulus, intus glaber, ciliatus. *Corolla* alba, extra breviter pubescens, intus lobis et fauce supra medium tantum pubescentibus, tubo 1.1 cm. longo basi 4 mm. apice 5.5 mm. diametro, lobis 5 ovato-lanceolatis 1.8 cm. longis 0.6 cm. latis caudato-acuminatis. *Stamina abortiva* 5; filamenta 0.75 mm. longa; antherae 5.5 mm. longae, 0.75 mm. latae, apice apiculatae, basi obtusae. *Ovarium* obovoideum, 5.5 mm. altum, 4.5 mm. diametro, puberulum; stylus glaber, usque ad ramos 8 mm. longus, ramis quatuor 6.6 mm. longis acutis. *Fructus* haud visus.

PANAMA: Old Panama, fl. June, Riley 145 (type in Herb. Kew.). ***Alibertia panamensis* Riley, sp. nov.** [Rubiaceae—Gardenieae]; affinis *A. eduli* A. Rich., a qua foliis vix coriaceis obscurioribus, stipulis multo longioribus caudato-acuminatis, floribus minoribus differt; ab *A. longistipulata* Riley foliis minoribus membranaceis vix coriaceis, floribus femineis multo minoribus, ovario truncato-globoso haud obovoideo recedit.

Frutex diffusus. *Ramuli* teretes, 2-3 mm. diametro 15 cm. infra apicem, glabri, brunnei. *Folia* elliptica vel lanceolata, 5.5-17.5 cm. longa, 2-6.5 cm. lata, integra, acuminata, basi in petiolum cuneatim angustata, membranacea, utrinque glabra, obscura, subtus pallidiora, costa supra versus apicem elevata versus basin plana vel subimpressa subtus omnino elevata, nervis lateralibus utrinsecus 10-14 arcuatis marginem haud attingentibus anastomosantibus utrinque elevatis; petioli 4-9 mm. longi. *Stipulae* anguste triangulares, interdum ovatae, caudato-acuminatae, 0.7-1.5 cm. longae, 1.5-5 mm. latae. *Flores masculi* 1-5-fasciculati, ad summos ramulos inter folia paris terminalis umbellatim dispositi, subsessiles. *Calyx* cupulatus, 4 mm. altus, 4 mm. diametro, minute 5-dentatus, extra subpuberulus, intus glaber. *Corolla* extra puberula, alba, tubo 1.6 cm. longo basi 2 mm. apice 3.5 mm. diametro, lobis 5 ovato-lanceolatis caudato-acuminatis 1.2 cm. longis 0.5 cm. latis. *Stamina* supra medium tubi inserta; filamenta minutissima; antherae lineares, 8.5 mm. longae, 0.5 mm. latae, apice acutae, basi subtruncatae, glabrae. *Stylus abortivum* 1.5 cm. longum, integrum. *Flores feminei* solitarii, pedicellati, pedicello 1.5 mm. longo, ut flores masculi dispositi. *Calyx* cupulatus, 3.5 mm. altus, 4.5 mm. diametro, minute 6-dentatus, extra inferne puberulus superne subpuberulus, ciliatus. *Corolla* extra et intus puberula, tubo 9 mm. longo apice et basi 3 mm. medio 2.75 mm. diametro, lobis 5 ovato-lanceolatis caudato-acuminatis 1.3 cm. longis 3.25 mm. latis. *Stamina abortiva* 5; filamenta 0.75 mm. longa; antherae fusiformes, 5 mm. longae. *Ovarium* truncato-globosum, 3 mm. diametro, puberulum;

stylus glaber, usque ad ramos 6.6 mm. longus, ramis tribus 5 mm. longis acutis. *Fructus* haud visus.

PANAMA: between Panama and Sabanas, fl. June, Riley 111 (type in Herb. Kew.)

Psychotria bimea Riley, sp. nov. [Rubiaceae—Psychotricae]; affinis *P. albae* Ruiz et Pav., a qua foliis plerumque basi cordatis rarissime in petiolum angustatis, petiolis multo brevioribus puberulis haud glabris, inflorescentiis minoribus, calycis lobis conspicuis valde acuminatis differt.

Frutex debilis. *Ramuli* ascendentes, graciles, subcompressi, 2 mm. diametro 15 cm. infra apicem, cinerei, glabri. *Folia* plerumque elliptica, interdum ovata, rarius obovata, 5–10 cm. longa, 1.7–5 cm. lata, cuspidata, acuta vel obtusa, basi cordata vel rotundata, interdum cuneata, glabriuscula, obscura, subtus pallidiora, costa supra caniculata glabra subtus elevata puberula, nervis lateralibus utrinsecus 7–10 arcuatis anastomosantibus supra subelevatis saepe mesophyllo pallidioribus subtus valde elevatis minute puberulis; petioli 1.5–4 mm. longi, puberuli. *Stipulae* ovatae, acutae, rarius obtusae, 5–6.5 mm. longae, 2–4 mm. latae. *Inflorescentiae* terminales, umbellatim 5-ramosae, minute puberulae, rhachi primaria 2–3.2 cm. longa, secundariis 0.5–1.1 cm. longis; bractee ovatae, acutae, 1.5 mm. altae, fere 2 mm. latae; pedicelli 0.5–0.75 mm. longi. *Tubus calycis* brevissimus, 0.25 mm. altus, lobis 5 anguste triangulato-acuminatis fere 0.75 mm. longis sparse ciliatis. *Tubus corollae* circiter 3 mm. longus, lobis triangulatis 1.5 mm. altis 1 mm. latis obtusis. *Antherae* subellipticae, 0.75 mm. longae, 0.25 mm. latae. *Ovarium* ovoideum, 1.5 mm. altum, 1 mm. diametro, puberulum; stylus flexuosus, 2 mm. altus, puberulus, sursum incrassatus, bifurcatus, ramulis 0.25 mm. longis. *Fructus* haud visus.

PANAMA: between Panama and Sabanas, fl. June, Riley 112 (type in Herb. Kew.); Empire Station, fl. Oct., Sutton Hayes 339.

Rauwolfia multiflora Riley sp. nov. [Apocynaceae—Plumeriaceae]; affinis *R. canescenti* var. *glabrae* Muell. Arg., sed foliis maioribus late obovatis vel subrhomboideis haud ellipticis vel oblongo-ellipticis, inflorescentiis 20–50-floris nec 1–5-floris, laciniis calycis haud ciliatis differt.

Frutex. *Ramuli* teretes, satis robusti, fere 3 mm. diametro 15 cm. infra apicem, viridi-brunnei lenticellis pallidioribus conspicuis. *Folia* terna vel quaterna, verticillata, valde inaequalia, late obovata vel subrhomboidea, maiora 6–10 cm. longa, 3–5.5 cm. lata, minora 2–3 cm. longa, 1–2.5 cm. lata, valde acuto-cuspidata, basi cuneata, omnino glabra, supra obscura, subtus aliquanto pallidiora, costa et nervis lateralibus supra impressis subtus elevatis, illis in foliis maioribus utrinsecus 10–12 in minoribus 6–7 arcuatis rete venularum subtus forte conspicuo; petioli 2–7 mm. longi, glabri, supra caniculati, foliis minoribus nonnunquam subsessilibus. *Inflorescentiae* axillares, oppositae, pluries ramosae, 20–50-florae,

glabrae, axibus primariis 1–2.3 cm. longis; bractee subulatae vel anguste triangulatae, acutae, circiter 1 mm. longae; pedicelli 2–2.5 mm. longi. *Calyx* late cupulatus, 1 mm. altus, 2.5 mm. diametro lobis rotundatis integris. *Corolla* alba, hypocrateriformis, 3.25 mm. longa, 5-loba; tubus 2 mm. longus, 2.25 mm. diametro, 10-nervius; lobi ovati, subacuti, integri, 1.25 mm. longi. *Stamina* 5, in faucem corollae inserta; filamenta minutissima; antherae liberae, sagittatae, apiculatae, 0.75 mm. longae. *Ovarium* subrhomboideum, disco 0.5 mm. alto cinctum, circiter 0.75 mm. diametro; stylus fere 1.5 mm. longus, capitatus, bilobus, acutus. *Fructus* haud visus.

PANAMA: Coccolí, opposite Balboa, 15 m., fl. June, Riley 125 (type in Herb. Kew.).

I have not seen the type of *R. canescens* var. *glabra*, but from the description that is evidently the affinity of *R. multiflora*. From it and from the other Central American material to which I have had access, the many-flowered inflorescences of *R. multiflora* are particularly distinctive.

Cordia panamensis Riley sp. nov. [Borraginaceae—Cordiaceae]; affinis *C. umbraculiferae* DC., sed ramulis et petiolis et pedunculis grosse hirsutis et scabris nec subpubescentibus, foliis maioribus plerumque longe acuminatis supra scabris nervis lateralibus pro rata pluribus petiolis brevioribus, floribus multo minoribus differt.

Arbor 6 m. alta. *Ramuli* satis robusti, sulcati, scabri et hirsuti. *Folia* inter maiora ovata vel elliptica (rarius fere rotunda), 20–27 cm. longa, 9–13 cm. lata, plerumque longe et graciliter acuminata, basi oblique rotundata vel cuneata, marginibus subundulata, supra scaberrima, subtus molliter pilosa, nervis lateralibus utrinsecus 11–13 supra cum costa tantum conspicuis subtus cum rete venularum valde manifestis; folia rotunda circiter 10 cm. diametro, apiculata vel breviter cuspidato-acuminata; petioli 0.8–1.2 cm. longi. *Inflorescentiae* laxae et dichotome ramosae, circiter 10–15 cm. longae, 15 cm. latae, rhachi primaria 2.5–5.5 cm. longa. *Alabastra* ad apicem rhachillarum conferta, obovoidea 2.5 mm. longa, molliter ferrugineo-pubescentia. *Flores* subsessiles, viridialbi. *Calyx* 3.5 mm. altus lobis triangulatis acutis vel subobtusis 1 mm. altis basi 1.25 mm. latis inclusis. *Corollae* tubus 3 mm. altus, glaber; lobi 2 mm. longi, basi 1.5 mm. lati, subtruncati, emarginati, reflexi. *Filamenta* 2 mm. longa, basi barbata; antherae 0.75 mm. longae, 1 mm. latae. *Ovarium* ovoideum, 1.5 mm. altum, 1 mm. diametro, glabrum; stylus 1.5 mm. altus ramulis inclusis, stigmatibus vix capitatis. *Fructum* non vidi.

PANAMA: secondary growth at sea-level near Old Panama, fl. June, Riley 143 (type in Herb. Kew.); Panama, fl. June, Sutton Hayes 89.

Solanum Coibae Riley, sp. nov. [Solanaceae—Solaneae]; affinis *S. tristi* Jacq., foliis plerumque brevioribus, inflorescentia

longius pedunculata, pedicellis longioribus et gracilioribus, corolla
 maiori lobis acuminatis glabris haud puberulis inter alia differt.
Frutex robustus, 2-4 m. altus. *Ramuli* subflexuosi, teretes,
 3-25 diametro 15 cm. infra apicem, fuscii, glabri. *Folia* mem-
 branacea, elliptica, interdum inaequaliter gemina, maioribus
 5-15 cm. longis 2-5-6 cm. latis, minoribus 1-4-6-5 cm. longis
 0-9-4 cm. latis, breviter cuneatim acuminata, basi acute cuneata, in
 petiolum oblique angustata, margine subrevoluta leviter undulata,
 utrinque nitidula, glabra, fasciculis minutis pilorum subtus in
 axillis nervorum lateralium exceptis, costa valida supra impressa
 vel applanata subtus elevata, nervis lateralibus utrinsecus
 8-12 forte arcuatis anastomosantibus, rete venularum supra haud
 conspicuo subtus satis manifesto; petioli 0-8-1-5 cm. longi, glabri.
Inflorescentiae foliis oppositae, 8-17-florae, glabrae; pedunculus
 1-6-4-5 cm. longus, parte inferiori nuda 0-8-1-6 cm. longa; pedicelli
 graciles, arcuati, dellexi, 0-7-1-9 cm. longi. *Alabastra* ovato-
 elliptica, obtusa, 1-1 cm. longa, 0-6 cm. lata, lineis 5 fuscis notata.
Calyx rotata, subcarnosa, fere integra sed vero dentibus callosis
 minute 5-dentata, 4 mm. diametro, glabra. *Corolla* alba, ad basin
 divisa, lobis 5 anguste triangulato-ovatis 1-2 cm. longis fere 0-5
 cm. latis subacutis carnis marginibus submembranaceis. *Stamina*
 5, in tubo brevissimo circiter 0-25 mm. alto connata; filamenta
 vix 0-25 mm. longa, fere 0-5 mm. lata; antherae oblongae, 5-5 mm.
 longae, 2 mm. latae, obtusae, poris apicalibus 1 mm. longis.
Ovarium bilobum, ovatum, 1-75 mm. altum, 1-25 mm. diametro;
 stylus erectus, cylindricus, 7 mm. longus, 0-5 mm. diametro, apice
 integro. *Fructus* haud visus.
 PANAMA: Coiba Island, fl. Sept. *Colletette* in Riley 473 (type
 in Herb. Kew.).

***Acalypha Hicksii* Riley sp. nov.** [Euphorbiaceae-Crotoneae];
 forsitan affinis *A. Wilkesianae* Muell. Arg., sed foliis tenuiter mem-
 branaceis cordatis, stipulis 6 mm. longis haud 15 mm. longis
 omnino filiformibus nec lineari-lanceolatis, petiolis 6 cm. longis
 nec 1-3-5 cm. longis gracilibus haud validis differt.

Frutex circiter 1 m. altus. *Ramuli* graciles, 2-5 mm.
 diametro 10 cm. infra apicem, sulcati, cinerei, molliter pubescentes.
Folia tenuiter membranacea, ovata, 11-14 cm. longa, 6-9 cm. lata,
 acute acuminata, saepe mucronata, leviter cordata, obtuse dentata,
 dente quoque saepius apice unisetoso, parte marginis quinta in-
 feriori undulata tantum, costa supra applanata vel versus apicem
 subelevata subtus elevata, nervis lateralibus utrinsecus saepissime
 8 interdum 9 basi palmatim dispositis superne penninerviis
 ascendentibus utrinque elevatis anastomosantibus cum rete venu-
 larum fortiter conspicuis nervo quoque basali externe arcuato-ramoso,
 supra sparsissime setosa, nitidula, viridia, in sicco utique albo-
 marginata, subtus glabra, costa inferne puberula excepta, utrinque
 crebro elevato-punctata; petioli graciles, 4-5-7 cm. longi, pubes-
 centes. *Stipulae* filiformes, 6 mm. longae, minute setulosae.

Inflorescentiae femineae axillares, graciles, laxae 4-6-florae, rhachi
 circiter 5-5-5 cm. longa pubescenti; bractea late ovata, 7 mm.
 longa, 1 cm. lata (ad apices dentium mensuris), subhastata,
 inaequaliter 12-dentata, dentibus anguste triangulatis acutis
 plerumque 2 mm. longis basi 1 mm. latis, palmatim 9-nervia, utrinque
 sparsissime setosa. *Ovarium* globosum, 1-25 mm. diametro, dimidio
 superiori albido-setoso; styli 3, circiter 7 mm. longi, glabri, stylo
 quoque circiter 16-ramoso ramis filiformibus interdum iterum
 ramosis 3-5 mm. longis, ramulis 0-75-2 mm. longis. *Fructus*
 haud visus.

COCOS ISLAND: in marshy ground near the sea shore, fl. Aug.,
Hicks in Riley 458 (type in Herb. Kew.).

I have suggested a possible affinity with *A. Wilkesiana* Muell.
 Arg. but material of that species from Fiji (the type locality)
 exhibits considerable difference both in general facies and in detail.
 I consider, however, that *A. Hicksii* must be referred to the same
 section, viz. *Palminerviae* Muell. Arg. in the series *Pantogynae-
 Pleurogynae* Muell. Arg. (Pax et Hoffm. in Engl. Pflanzenr.
 Euphorb.-Acalyphin. 13, 142: 1924).

Only one other species of *Acalypha* has been recorded from
 Cocos Island, *A. bisetosus* Bertero, collected by Stewart in 1906.
 (Proc. Calif. Acad. Ser. 4, i. 391: 1912). I have not seen any
 of this material but *A. bisetosus* belongs to quite a different
 section of the genus, viz. *Cuspidatae* Muell. Arg. of the series
Oligogynae Muell. Arg.

XVI.—NEW SPECIES OF STRYCHNOS FROM TROPICAL AMERICA. T. A. SPRAGUE AND N. Y. SANDWICH.

The genus *Strychnos*, which includes the plants yielding nux-
 vomica and curare, comprises several hundred species described
 and undescribed. The only general account of *Strychnos* in Tropical
 America is Progel's revision in Martius, Flora Brasiliensis, vol. vi.
 pars 1, pp. 269-284, published in 1868. This includes descriptions
 of 31 species, of which 29 are natives of Brazil and Guiana, the two
 others being from Costa Rica and Amazonian Peru respectively.
 Since that date about 40 additional species of *Strychnos* have been
 described from Tropical America, and a new revision is now very
 much needed. Ten Brazilian species have been described by Bar-
 bosa Rodrigues alone (Vellozia, ed. 2, pp. 33-44: 1891) and thirteen
 (one from Guiana) by Gilg (Engl. Jahrb. xxv. Beibl. lx. pp. 36-42:
 1898).

Over 60 species of *Strychnos* are now known from Brazil and
 Guiana. The genus is apparently much less richly represented in
 other parts of Tropical America, only 20 species being known, of
 which five are now described for the first time. Their distribution
 is as follows:—

MEXICO: *tepicensis* (West Coast) and *tabascana* (East Coast).

CENTRAL AMERICA: *longissima* (Guatemala), *Peckii* (British Honduras), *chlorantha* (Costa Rica), *darienensis* and *panamensis* (Panama).

WEST INDIES: *Grayi* (Cuba), *trinitensis* (Trinidad).

VENEZUELA: *Bredemeyeri* (nomen subnudum), *Curare*, *Fendleri*, *Gubleri*, *syntoxica*.

COLOMBIA: *hachensis*, *yapurensis*.

PERU: *brachiata*, *Poeppigii*, *Ruizii*, *tarapotensis*.

Most of these species have been collected only once, and their areas of distribution appear to be very limited. The apparent rarity of some of them, however, may be due to the difficulty experienced by collectors in obtaining flowering or fruiting material; as specimens in a sterile condition are as a rule insufficient for identification, they have not been collected except where they were supposed to be of economic importance. Detailed botanical investigation of these countries may be expected to increase the present total by at least 50 per cent.

The morphology of the vegetative members in *Strychnos* is interesting. Two homologous kinds of specially modified short-shoots are known. One type is a spirally-coiled tendril which arises in the axil of a foliage leaf or of a cataphyll, and the other, which appears to be confined (so far at any rate as the Tropical American species are concerned) to the Section *Breviflorae*, is a straight or curved spine. Both tendrils and spines are said to be present in a few species, e.g. *S. Castelnaei*, *S. nigricans* and *S. brasiliensis*. Of the new species described below, *S. syntoxica* (§ *Longiflorae*) has tendrils only, and *S. tarapotensis* (§ *Breviflorae*) has spines only. As might be expected, those species which bear spines but no tendrils assume the form of low much-branched bushes, whereas those which have both spines and tendrils appear to be partly straggling over other plants and partly climbing.

SPECIES MEXICANA.

***Strychnos* (§ *Longiflorae*) *tabascana* Sprague et Sandwith** sp. nov.; affinis *S. triplinerviae* Mart., e Brasilia, a qua foliis minus coriaceis longius acuminatis, corollis longioribus gracilioribus sparsius indutis, staminibus longius exsertis filamentis manifestis, fauce glabra differt; a *S. longissima* Loes., corollae indumento valde diversa.

Frutex verisimiliter scandens; ramuli hornotini gracillimi, pubescentes; ramuli annotini pubescentes, 2-3 mm. diametro; internodia 3-4.5 cm. longa. *Folia* ovata, ovato-lanceolata vel elliptico-lanceolata, acutissime acuminata, basi cordata rotundata vel etiam cuneata, 5-11.5 cm. longa, 2.7-4.8 cm. lata, utrinque costa nervisque lateralibus breviter pilosa, mesophyllo marginibusque pilis raris induta, nitidula, quintuplinervia, nervis tertiariis conspicuis subparallelis; petioli dense pubescentes, 3-5 mm. longi. *Inflorescentiae* ramulos breves paria foliorum 1-3 gerentes termin-

antes, et terminales et in axillis foliorum summorum corymboso-thyrsoideae; pedunculi pubescentes, cymarum terminalium 3-9 mm. longi, axillarium 8-12 mm. longi; cymulae ultimae triflorae, flore medio subsessili, lateralibus cum pedicellis dense pubescentibus 2-3.5 mm. longis; bracteae lineari-subulatae, dense pubescentes, 2-3.5 mm. longae. *Calycis segmenta* subulato-lanceolata, extra pilosa, longe ciliata, circiter 3 mm. longa. *Corolla* gracilis; tubus fulvus, pilis patulis adscendentibusque extra dense vestitus, intus albo-lanatus, parte suprema vix 3 mm. longa glabra excepta, 1.5-1.7 cm. longus, ad 1 mm. diametro; lobi dimidio superiore reflexi, lineari-oblongi, obtusi, extra pilosi, intus cinereo-pulverulenti, ad 4 mm. longi. *Stamina* summo tubo inserta, conspicue exserta; filamenta 1.5-2 mm. longa, glabra; antherae 1 mm. longae. *Ovarium* glabrum, 0.75 mm. diametro; stylus glaber, cum stigmate capitato 2-2.1 cm. longus, igitur fere ad 4 mm. e corollae fauce exsertus.

MEXICO. Tabasco; San Sebastian, fl. Feb. 16, 1889, *Rovirosa* 61 (type in Herb. Kew.).

SPECIES VENEZUELANAE

***Strychnos Fendleri* Sprague et Sandwith** sp. nov.; species foliis late ellipticis vel suborbicularibus breviter cuspidatis tantum subsessilibus supra nitidulis valde reticulatis, inflorescentia terminali dignoscitur.

Ramuli satis dense breviter pilosi, nodis incrassatis suberosis, internodiis 2.5-4.5 cm. longis. *Folia* fere sessilia plerumque late elliptica vel suborbicularia, rarius rhomboideo-elliptica, breviter acute vel obtuse cuspidata, basi rotundata vel obtusa, chartacea, quintuplinervia, supra laete viridia nitidula valde crebre reticulata, subtus paullulo pallidiora, utrinque nervis marginibusque sparse breviter fulvo-pilosa, ceterum fere glabra, 3.5-6.8 cm. longa, 2-5.5 cm. lata; petiolus latus crassus dense breviter pilosus, 1-2 mm. longus, saepe 1.5-2 mm. latus. *Inflorescentiae* terminales, breviter thyrsoideae, ut ramuli dense breviter pilosae. *Sepala* vetusta sub fructu persistentia, triangulari-ovata, pubescentia, ad 1 mm. longa. *Bacca* laevis, brunnea, compressa, ad 2.3 cm. diametro; semina solitaria, late elliptica, 1.5 cm. longa, 1.2-1.3 cm. lata, 0.5 cm. crassa.

VENEZUELA. Miranda: Colonia Tovar, 1856-7, *Fendler* 2314 (type in Herb. Kew.).

The shape and reticulation of the leaves serve to distinguish *S. Fendleri* from all other Tropical American species known to us. *S. Bredemeyeri*, which comes from the same region, is practically a nomen nudum, all that is known of it being that the throat of the corolla is glabrous.

***Strychnos* (§ *Longiflorae*) *syntoxica* Sprague et Sandwith** sp. nov.; affinis *S. toxiferae* Schomb., foliis ovato-lanceolatis longius acuminatis multo minus hirsutis, utrinque costa nervisque lateral-

ibus pilis antrorsis subappresse hirsutis, marginibus ciliatis, ceterum glabriusculis differt.

Frutex scandens cirrhifer; rami ramulique teretes, annotini pilis ferrugineis patulo-ascendentibus dense hirsuti, hornotini graciles multo sparsius vestiti; internodia 2.5-5 cm. longa. *Folia* membranacea, ovato-lanceolata, satis longe (ad 1 cm.) acuminata, basi obtusa vel rotundata, 3.5-8.5 cm. longa, 1-3.2 cm. lata, utrinque nitidula, quintuplinervia, rete venularum conspicuo atque inter venulas minutissime punctulata, indumento ut supra descripto, pilis in costa faciei superioris atque in petiolo praecipue conspicuis; petioli 2.5-3.5 mm. longi; cirrhi ad 3 cm. longi, pilis ferrugineis subappressis dense vestiti.

VENEZUELA. Cassiquiare region: Rio Pacimoni; in woods at the foot of Cerro Imei, *Spruce* sine numero (type in Herb. Kew.). "One of the species used by the Cunipusana Indians in the fabrication of Curare".

Although neither flowers nor fruit are known, *S. syntoxica* is well-marked by its vegetative characters, and it has seemed desirable to describe it in view of the fact that it is used in the manufacture of Curare. It appears to be closely related to *S. toxifera*.

A description of Spruce's visit to the Cerro Imei is given in his "Notes of a Botanist on the Amazon and Andes" (ed. A. R. Wallace, 1908), vol. i. pp. 429-431. The locality does not appear to have been visited by any other botanist. It is marked on the map facing p. 486 in vol. i. of Spruce's "Notes of a Botanist".

SPECIES PERUVIANAE.

Strychnos (§ Longiflorae) Ruizii *Sprague et Sandwith* sp. nov.; affinis *S. brachiatae* Ruiz et Pav., petiolis gracilibus, foliis supra opacis rete venularum occulto, corolla longiore gracili differt.

Frutex ramulis subquadrangularibus pubescentibus 1.5-2.5 mm. diametro; internodia 3.5-4.7 cm. longa. *Folia* laevia, membranacea, ovato-lanceolata, acuminata, basi angustata, 5.5-8 cm. longa, 2.3-3.1 cm. lata, utrinque punctulis multis albis elevatis, nervis pilis subappressis sparsiuscule induta, ceterum glabra, quintuplinervia, supra opaca nervis et rete venularum occultis, subtus opaca pallidiora subtiliter reticulata; petioli satis dense pubescentes, 4-6 mm. longi. *Inflorescentiae* terminales, cymis dense corymboso-thyrsoideis, pedunculis pedicellisque brevibus pubescentibus; pedunculi circiter 1.5 cm. longi; bracteae subulato-lanceolatae, pubescentes atque ciliatae, 2-5 mm. longae, *Calycis segmenta* lineari-lanceolata, acuta, 2.5-2.75 mm. longa, extra pubescentia, ciliata. *Corollae tubus* hypocateriformis, extra densissime appresse fulvo-pilosus, intus subappresse villosus, 1.2 cm. longus, 1-1.5 mm. diametro; lobi anguste oblongo-lanceolati obtusi, extra sparse pilosi, intus cinereo-pulverulenti, ad 3 mm. longi. *Stamina* in fauce haud lanata fere sessilia; antherae e fauce exsertae, oblongae, 1.3 mm. longae. *Ovarium* glabrum, 0.5-0.8 mm.

diametro; stylus glaber, cum stigmate capitato ad 1.25 cm. longus, igitur e corollae fauce exsertus.

PERU. Without locality, *Ruiz* (type in Herb. Kew.).

Strychnos (§ Brevisflorae) tarapotensis *Sprague et Sandwith* sp. nov.; affinis *S. brasiliensi* Mart., forma calycis segmentorum necnon nervis foliorum subtus glabris differt; a *S. Poeppigii* Prog., quae folia similia habet, inflorescentia laxiore floribus pedicellatis facile distinguitur.

Frutex spinosus, "tenuis, decussatim ramosus, ramis subsarmentosis haud volubilibus" (*Spruce*); ramuli tenues brevissime pubescentes, hornotini breves e nodis incrassatis surgentes 1.5-3 cm. longi, circiter 0.4 mm. diametro, pari foliorum atque inflorescentia una terminati; spinae nodis ramulorum annotinorum axillares, rectae, graciles, 0.5-1.3 cm. longae, basi 0.4-0.8 mm. diametro. *Folia* chartacea, ovata, abrupte longe obtuse acuminata, interdum apiculata, basi obtusa rotundata vel etiam subcordata, 1.5-5.4 cm. longa, 1-3 cm. lata, quintuplinervia, supra opaca olivacea nervis medio et lateralibus impressis breviter inconspicue pilosis, tertiariis linea punctorum elevatorum tantum notatis, ceterum glabra, subtus pallidiora glaberrima nervis satis prominentibus et rete venularum vel occulto vel subtilissimo leviter impresso fusco; petioli brevissime pubescentes, 1-1.5 mm. longi. *Inflorescentiae* pedunculo communi gracili flexuoso brevissime pubescente 0.7-1.4 cm. longo, 3-30-florae, majores corymboso-thyrsoideae, 0.3-0.7 cm. longae, 0.5-1.2 cm. latae; bracteae indumento simili, lineari-lanceolatae, ad 1.5 mm. longae. *Flores* virides (*Spruce*); pedicelli ad 1 mm. longi. *Calycis segmenta* ovato-lanceolata, 1 mm. longa, extra pubescentia, ciliata. *Corolla* infundibularis, extra minute puberula; tubus ad 1.5 mm. longus, 2 mm. diametro, intus glaber; lobi triangulares vel ovato-oblongi, 1-1.2 mm. longi atque lati, intus apice marginibusque dense lanati. *Stamina* apice tubi inserta, filamentis brevissimis; antherae 0.7 mm. longae, basi sparse lanatae. *Ovarium* globosum, 0.5 mm. diametro, glabrum; stylus basi parce brevissime pilosus, ceterum glaber, cum stigmate capitato circiter 8 mm. longus.

PERU. Amazons basin: Tarapoto, in thickets, fl. Oct. 1856, *Spruce* 4889 (type in Herb. Kew.).

SPECIES BRASILIANAE.

Strychnos (§ Longiflorae) asperula *Sprague et Sandwith* sp. nov.; affinis *S. rondeletioidei* Spruce, corollis haud pulverulentis fauce haud lanata, foliis minus coriaceis supra subtilissime tantum reticulatis nervis tertiariis inconspicuis differt.

Frutex scandens; ramuli hornotini ascendentes, graciles, glabri; annotini quadrangulares lenticellati cortice cinereo. *Folia* ovata vel elliptica, breviuscule acuminata, basi rotundata vel cuneata, 8-10 cm. longa, 3.8-5 cm. lata, tenuiter coriacea, utrinque vix nitidula, glabra, quintuplinervia, nervis tertiariis inconspicuis

sed rete venularum praesertim supra subtilissimo, supra punctulis elevatis creberrimis asperula; petioli graciles, 4-8 mm. longi, 0.75-1 mm. lati. *Inflorescentiae* terminales, cymis dense corymboso-thyrsoideis; pedunculi 1.5-2.5 cm. longi; rhachis ejusque rami pubescentes, floribus fere sessilibus; bracteae connatae, ciliatae, 1-2.5 mm. longae. *Calyx* segmentis rotundato-ovatis obtusis ciliatis 0.75 mm. longis. *Corolla* ochroleuca; tubus hypocrateriformis, utrinque glaber, fauce haud lanata, 8.5 mm. longus, 0.5-0.75 mm. diametro; lobi patentes vel subreflexi, lineari-lanceolati, 2.5 mm. longi, obtusi, intus praesertim marginibus atque apicem versus cinereo-pulverulenti. *Stamina* in fauce inserta, filamentis brevissimis; antherae e fauce exsertae, 1.75 mm. longae. *Ovarium* glabrum, circiter 0.5 mm. diametro; stylus glaber, cum stigmate capitato 1 cm. longus. *Fructus* ignoti.

BRAZIL. Amazons basin: Rio Acre; Seringal San Francisco, fl. Sept. 1911, *Ule* 9838 (type in Herb. Kew.).

Strychnos (§ Longiflorae ?) panurensis *Sprague et Sandwith* sp. nov.; a *S. cogente* Benth., ramulis minutissime tantum pilosulis, foliis plerumque revere lanceolatis atque longioribus supra nitidis pulcherrime et minus subtiliter reticulatis mesophyllo epunctato differt; a *S. smilacina* Benth., forma foliorum, rete venularum subtiliore, primo visu distinguitur.

Frutex scandens; ramuli quadrangulares inconspicue costati sub lente minutissime pilosuli vel glabrati densiuscule lenticellati 2-3 mm. diametro; internodia 2.5-4.5 cm. longa; nodi incrassati ad 7 mm. lati. *Folia* lanceolata vel ovato-lanceolata, obtusiuscule acuminata, basi rotundata, 12.5-15.5 cm. longa, 3.8-5.8 cm. lata, coriacea, supra nitida, valde quintuplinervia, rete venularum conspicuo, mesophyllo epunctato, utrinque glabra; petiolus crassus 6-7 mm., longus, circiter 2 mm. latus. *Inflorescentiae* axillares, thyrsoideae, dense minute pubescentes, 1.8-4.5 cm. longae; bracteae ovatae vel lineari-lanceolatae, dense pubescentes, 2-5 mm. longae; pedicelli 2-3.5 mm. longi, sub fructu sursum incrassati. *Flores* post lapsum corollae tantum visi. *Calycis segmenta* sub ovario vetusto ovato-lanceolata, ad 1.6 mm. longa, ciliata, extra pubescentia, intus glabra. *Ovarium* glabrum, ad 1.5 mm. diametro. *Bacca* laevis, siccitate ochracea, 1.3-1.5 cm. diametro; semina solitaria, suborbicularia, circiter 1.3 cm. longa, 1.1 cm. lata, circiter 3 mm. crassa.—*S. cogens* Prog. in Mart. Fl. Bras. vi. pars 1, 275 (1868), partim, non Benth.

BRAZIL. Rio Negro basin: near Panure by the Rio Uaupes, in "gapo", October 1852, *Spruce* 2634 (type in Herb. Kew.). "Twiner and climber; fruits yellowish, succulent."

Strychnos gigantea Barb. Rodr. (Vellozia, ed. 2, i. 37: 1891) from near Moura, Rio Negro, which was based on material without flowers or fruits, may be nearly related. It seems to differ, however, in having elliptic-oblong leaves, apparently not shining on the upper surface (a character mentioned by Barbosa Rodrigues for other

species described by him at the same time), and with much less regular and parallel tertiary nerves according to his figure.

XVII.—MA HUANG OF CHILI. (*Ephedra sinica* Stapf). O. STAPF.

The term Ma huang (hemp-yellow,* apparently in allusion to the yellowish male flowers), was applied to species of *Ephedra* as early as the 2nd century B.C. if not earlier. That it was a general term is evident from the fact that the references to Ma huang in the Chinese literature cover a wide area with more than one species. Recently, however, a plant of a definite northern origin, namely Chili, has come into the market under that name. To this plant various scientific names have been applied such as *Ephedra helvetica*, *E. intermedia*, *E. equisetina* etc. So far no verification of these determinations has been possible as the material obtained consisted merely of fragments of stems. More recently, however, a good supply of complete plants, though without flowers or fruits, was received at Kew from Messrs. Parke, Davis and Co., Detroit, Mich., U.S.A. They represented small shrublets of very uniform habit and of a facies which is not compatible with any of the known species of *Ephedra*. They were so characteristic that I did not hesitate to give them a provisional new name, viz. *E. sinica*. Immature and mature galbules together with fragments of stems, conforming to the original samples, have now come to hand from the same source, and they leave no doubt as to the specific distinctiveness of the specimens, an all but complete description of which is given below. Only the male flowers remain unknown; but these are not likely to yield any important diagnostic characters.

F. Porter Smith, in his "Contributions towards the Materia Medica and Natural History of China" p. 93 (1871) has already referred to Ma huang and proposed for it the name *Ephedra flava*; but as this name is not accompanied by a description and was, in the first place, intended for a Honan plant, undocumented by any specimens, it is very doubtful and it should therefore not be used. As the Ma huang of Honan has from early times had the reputation of being the best of its kind, it seems desirable to ascertain its identity. A search in the hilly districts immediately south of the Hoangho from the Shensi frontier towards Kai feng fu, the capital of the province, would no doubt soon reveal the nature of the valued drug.

***Ephedra sinica* Stapf** spec. nov.; cum *E. distachya* L., (praecipue eius f. *monostachya* cui habitu similior) et cum *E. equisetina* Bunge, comparanda, sed ab utraque ramorum internodiis infimis eximie ancipitibus, foliorum laminis subulatis saepe recurvis distat; praeterea ab *E. distachya* differt ramis laevibus, galbulorum bracteis inferioribus intermediisque acutioribus summis in utriculorum

* Bretschneider, Bot. Sin. iii. 180 (1895).

oblongo-ellipticum minus alte fissum connatis, ab *E. equisetina* habitu et galbulis 2-floris vel 2-spermis paulo minoribus.

Frutex ad 30 cm. altus, rarius altior, e basi ipsa caespitose multiramosus; rami simplices vel sparse divisi, ramulis basi per internodium primum vel altius conspicue ancipitibus longis erectis; rami ramulique tactu laeves, tenuiter striati, internodiis 3-5 cm. longis 1-1.5 mm. diametro. *Foliorum vaginae* ad 2 mm. altae, tenues, ad commissuras membranaceae et mox secundum eas fissae, basi circumeirca incrassatae, hic vel fere totae brunnescentes, caeterum albidae; *laminae* rudimentariae, subulatae, recurvulae, 1-3.5 mm. longae, virides vel brunnescentes. *Spicae* ♂ ignotae. *Galbuli* ♀ 2-flori, uno flore interdum hebetato, subsessiles, pedunculo 1-1.5 mm. longo, juniores ovoidei, bractearum paribus 3 vel 4, raro 5. *Bractaeae* infimae et intermediae ovatae, acutae vel subacutae, infimae 1-3 mm. longae, basi connatae, intermediae latiores et saepe ad vel ultra tertiam partem connatae, ad margines membranaceae, caeterum pallide vel luride virides, summae in utriculū oblongo-ellipsoideum per tertiam partem fissum connatae. *Tubillus* rectus, 1-2 mm. longus, exsertus. *Galbuli maturi* ellipsoideoglobosi, 6-8 mm. longi, bracteis carnis rubris. *Semina* oblonga, 4.5 mm. longa, 2 mm. lata, subacuta, atro-brunnea, dorso laevissima, convexa, facie applanata vel subconcava, ad latera acute angulata.

CHINA borealis: Chili; Tanhwa, *F. N. Meyer* 1095; without exact locality, comm. *B. E. Read*; without exact locality, comm. Parke, Davis & Co. sub nomine "Ma Huang" (name-type).

In addition to the external characters described in the Latin description, I may say that the anatomical examination of the green branches shows the presence of (normally) 8 vascular strands and the complete absence of circummedullary fibres. Intercortical fibres may be present or absent, and tanin-sacs if present altogether, exhibit only a small amount of tanin, but as to this further observations are desirable. Cross-sections through branches of *E. sinica* resemble more those of *E. distachya*, than of *E. equisetina*.

XVIII.—ATYLOSIA OR CANTHAROSPERMUM. T. A. SPRAGUE.

The genus in question is assigned to the *Leguminosae*, tribe *Phaseoleae*, and comprises about 40 species from Tropical Asia, Australia, Madagascar and Mauritius. As it is currently known under two generic names, *Atylosia* Wight et Arn. and *Cantharospermum* Wight et Arn., it seems desirable to ascertain which of these is the correct name under International Rules.

The name *Atylosia* was adopted in the following works among others: Miq. Fl. Ned. Ind. (1855); Benth Fl. Austral. (1864); Benth. & Hook. f. Gen. Pl. (1865); Baill. Hist. Pl. (1870); Hook. f. Fl. Brit. Ind. (1876); Baker, Fl. Maurit. (1877); Boerl. Handl. Fl. Ned. Ind. (1890); Trimen, Fl. Ceylon (1894); Cooke, Fl.

Bombay (1902); Perkins, Fragm. Fl. Philipp. (1904); K. Schum. & Lauterb. Nachtr. Fl. Deutsch. Schutzgeb. Südsee (1905); Koord. Exkursionsfl. Java (1912); Lecomte, Fl. Gén. Indo-Chine (1916); Gamble, Fl. Madras (1918); Ridley, Fl. Mal. Penins. (1922); Domin in Biblioth. Bot., Heft 89, 227 (1926).

The name *Cantharospermum* has been adopted by Taubert in Engl. & Prantl. Nat. Pflanzenfam. (1894); Dalla Torre & Harms, Gen. Siphonog. (1901); Thonner, Blütenpfl. Afr. (1908); Merrill in Philipp. Journ. Sc., Bot. v. 127 (1910); Merrill, Fl. Manila (1912), Species Blancoanae (1918), Enum. Philipp. Fl. Pl. (1923).

The two competing names were published in the same work and at the same date by Wight and Arnott (Prodr. Fl. Pen. Ind. Or. 255, 257: 1834), *Cantharospermum* being on p. 255 and *Atylosia* on p. 257. Taubert apparently chose *Cantharospermum* because of this "priority of place". Merrill (Philipp. Journ. Sc. Bot. v. 128: 1910) remarked that "the generic name *Cantharospermum* W. & A. has only page preference over *Atylosia* W. & A., and the latter is by far the more commonly used one. The fact that *Atylosia* was not included in the list of *nomina conservanda* of the Vienna Botanical Congress is an excellent illustration of the inconsistency of that list". This appears to have been written under a misapprehension. "Priority of place" is not recognized in the International Rules. Under Art. 46, the first author who united *Atylosia* and *Cantharospermum* was at liberty to choose either of the names, and his choice cannot be modified by subsequent authors. Bentham (Pl. Jungh. ii. 242: 1852) appears to have been the first to unite the two genera, and he adopted the name *Atylosia*. Hence *Atylosia* is the correct name under the Rules (unless it can be proved that the two genera were united previously by an author who chose *Cantharospermum*), and it is therefore unnecessary to place it on the list of *nomina conservanda*.

XIX.—MISCELLANEOUS NOTES.

MR. A. G. TANSLEY, M.A., F.R.S., Trinity College, Cambridge, has been elected to the Sherardian Professorship of Botany in the University of Oxford.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. T. McEWEN, B.Sc., to be Senior Agricultural Research Officer, Northern Rhodesia; Mr. J. W. NICHOLSON, to be Adviser of Forestry, Kenya and Uganda.

MISS MATILDA SMITH.—This lady, whose death on December 29, in the 73rd year of her age, it is our sad duty to announce, was the well-known botanical artist who for 44 years was intimately associated with the Royal Botanic Gardens, Kew.

Miss Smith was born in Bombay on July 30, 1854, and came to England in her infancy. She was the second daughter of the late Mr. James Smith, of Sydenham, and her mother was the youngest of the many children of Edward Rigby, M.D. (1747-1821), of Norwich, a distinguished physician and evidently a public spirited man of considerable ability and many interests. Dr. Rigby's second wife, Miss Smith's grandmother, was the sister of Mrs. Dawson Turner, the wife of the antiquary and botanist. Maria, a daughter of Dawson Turner, married William Jackson Hooker. It will be seen, therefore, that Miss Smith was second cousin to Sir Joseph Dalton Hooker.

The beginning of Miss Smith's career as an artist may be traced to the loss which Sir J. D. Hooker, as editor of "Curtis's Botanical Magazine," had sustained in the withdrawal, in 1877, of the services of his draughtsman, the talented Walter Hood Fitch, who had prepared most of the plates for the Magazine since 1834.

Hooker invited his young cousin, who, he knew, was fond of and possessed some skill in drawing, to come to Kew, with the view of being suitably trained to take Fitch's place. The invitation accepted, Hooker himself, a draughtsman of real ability, undertook the direction and supervision of her studies. Both tutor and pupil could be congratulated on the results. The difficult situation that arose in consequence of Fitch's secession was eventually overcome, though, perhaps, never entirely to Miss Smith's satisfaction, for in later years in expressing, as she often did, her admiration of her predecessor's work she regretfully spoke of her inability to emulate it.

Miss Smith's first contribution to the "Botanical Magazine" appeared as plate 6386 in October, 1878. This was a drawing of *Hedysarum Mackenzii*. Two other plates by her were published later in the same year. To the volume for 1879 she contributed 18 plates, to that of 1880, 26, and so on, each year her share of the work increasing, till in 1887 all the 60 plates in the volume were prepared from her drawings. From 1887 Miss Smith was practically sole artist of the "Botanical Magazine," and continued so till its temporary suspension at the end of 1920. After the resumption of publication in 1922 five of her drawings were issued, the last being on plate 8948 (*Malus toringoides*), published in February, 1923. It is estimated that Miss Smith contributed about 2300 plates to the Magazine, Fitch, 2900, and Sydenham Edwards, about 1700; the three of them, therefore, made the drawings for 6900 out of the total of 9055 plates so far published. Fitch's and Miss Smith's connection with the Magazine covered in all about 88 years, this long period being shared nearly equally between them.

Another publication with which Miss Smith's name has for many years been associated is "Hooker's Icones Plantarum," which contains drawings and descriptions of plants selected from the Herbarium. Her earliest contribution to this was plate 1354

(*Indigofera trachyphylla*). Bentham showed his appreciation of Miss Smith and her work by placing in the hands of trustees a sum of money destined for the purpose of carrying on the Icones and of employing Miss Smith as artist for the publication so long as she cared to fill that post. With the exception of 100 plates of ferns, by John Allen, contained in vol. xvii, and a few in the last part issued, Miss Smith was artist and lithographer for all the 1747 plates published in the Icones since October, 1881.

Among the other publications for which Miss Smith supplied all or part of the illustrations the more important are:—Hemsley's "Report on the scientific results of the voyage of H.M.S. 'Challenger' Botany," 1885 (most of the 65 plates in vol. i, pts. 1-3); Oliver's "Botany of the Roraima Expedition," 1887, in Trans. Linn. Soc. ser. 2, ii. (16 plates); Balfour's "Botany of Socotra," 1888 (57 plates); Aitchison's Botany of the Afghanistan Delimitation Commission," 1888, in Trans. Linn. Soc. ser. 2, iii. (39 plates); Collett's "Flora Simlensis," 1902 (200 pen-and-ink drawings in the text); Johnston's "Liberia," 1906 (24 full-page illustrations); Watt's "The wild and cultivated cotton plants of the world," 1907 (21 plates); Hemsley's "On the Julianaceae: a new natural order of plants," 1907, in Phil. Trans. R. Soc. Lond. ser. B, cxcix. (7 plates); and Cheeseman's "Illustrations of New Zealand plants," 1915 (251 plates). A large number of the plates are of quarto size and with two exceptions all are uncoloured. Amongst them there is much excellent work. Miss Smith was fortunate in having many of her drawings put on stone by some of the best lithographers of the time, including Mr. John Nugent Fitch.

Plates or text-figures bearing the familiar "M.S. del." or "M. Smith del." may be met with in numerous other publications, botanical or horticultural, independent or periodical. She also prepared a great number of drawings of living or dried plants which were not intended for publication but for preservation in the collection of plant portraits in the Herbarium.

On many occasions Miss Smith made facsimiles of plates required to complete imperfect volumes in the library. Her skill in doing this was remarkable. She supplied in facsimile a missing plate in Miss Mary Lawrance's valuable work: "A collection of Roses from Nature," 1799, and 9 missing plates in Trew's "Hortus nitidissimis. . . floribus," 1750-72, as well as many other plates, usually coloured. Her neat penmanship was often employed in making copies of titles and pages of text in which certain rare volumes were deficient.

Miss Smith had a taste for authorship which, however, could be exercised but to a very small extent in her official capacity. It gave her much gratification to contribute to the *Kew Bulletin* (1916, pp. 164-168) some notes on botanical artists, specimens of whose work were exhibited in a room of the North Gallery.

Though intimately associated with the Royal Botanic Gardens, Kew, for little short of half a century, and during this long period

usually regarded as the artist of the establishment, which depended almost entirely on her pencil for the illustrations it required, Miss Smith was not appointed official artist till April 1, 1898. Even then she was officially employed for only two days a week. This arrangement enabled her to continue her work on the "Botanical Magazine" and "Hooker's Icones Plantarum," and to undertake commissions for many unofficial publications, some of which have already been mentioned. It gave her opportunities also to afford help of various kinds, often representing the sacrifice of much of her time, to many who visited the Herbarium, and to take an active part in local affairs. She was a much valued member of the Richmond Board of Guardians and was Treasurer and Sub-editor of the Kew Parish Magazine, which she managed most successfully.

It is a fitting occasion to recall a few of the many expressions of praise of Miss Smith's drawings that have been elicited from authors by whom she was employed. Sir Henry Collett refers to her "beautiful and characteristic illustrations" and "the great pains she has taken to produce artistic and accurate representations." Sir George Watt wrote: "I take the opportunity to acknowledge the untiring efforts of Miss Smith to secure accuracy in detail combined with artistic delineation." The late Dr. W. Botting Hemsley, from 1899 to 1908 Keeper of the Herbarium and Library, under whose direction a considerable part of Miss Smith's drawing was done, commenting on her work for "Hooker's Icones Plantarum" said: "The excellence of these drawings, with very full floral analyses, is generally acknowledged, and they present a permanent record of Miss Smith's skill in re-animating dried, flattened specimens, often of an imperfect character." The late Mr. Thomas Cheeseman expressed his appreciation of Miss Smith's drawings in his "Illustrations of New Zealand plants" in the remark: "I think that all capable judges will agree with me in saying that the plates contained in these volumes will enhance her already well-earned reputation."

In 1916 Miss Smith was President of the Kew Guild, an organisation to which belong all who are, or have been, employed in positions of responsibility in the Royal Botanic Gardens, Kew. The President is elected from among the more distinguished of its members. So far Miss Smith has been the only lady who has filled the office, which she accepted not only as an honour but as an opportunity to render further service to the Guild, in which she was always keenly interested.

In November, 1921, Miss Smith was elected an Associate of the Linnean Society of London. Only one lady, a resident of South Africa, had previously been given this distinction. The announcement that the Council of the Royal Horticultural Society had awarded her one of the Silver Veitch Memorial Medals, with a sum of £25, "for her botanical draughtsmanship, especially in connection with the Botanical Magazine," was published in the "Gar-

deners' Chronicle" bearing the date on which the funeral took place (January 1).

Two genera of plants have been named in compliment to Miss Smith. *Smithiantha* Kuntze (*Rev. Gen.* p. 977, 1891) was proposed in place of *Naegelia* Regel (*Gesneraceae*), as the latter name had previously been appropriated by Rabenhorst for a genus of Fungi. *Smithiella* Dunn (*Kew Bull.* 1920, p. 211, with fig.) is a genus of *Urticaceae* from the Abor Hills, Eastern Himalaya. The name of the only species, *myriantha*, "refers to its innumerable flowers as well as to the very large number of beautiful drawings and paintings with which Miss Smith has for so many years decorated the 'Botanical Magazine,' the 'Icones Plantarum,' and the 'Kew Bulletin.'"

We cannot in the space here available attempt even to mention all Miss Smith's activities or anything like all the interesting events of her life at the Herbarium and in Kew village. Her charm of manner, her quick and practical sympathy, freely given to all who sought it, and her rich store of knowledge of many kinds, which it delighted her to use for the benefit or pleasure of others, attracted around her a host of friends.

Miss Smith, like Miss Marianne North, might have written from her own experiences other charming "Recollections of a happy life." The happiness she sought she found in service to others, in devotion to duty, in going about doing good; and abundantly, we are sure, she found it.

Since her retirement, which took place on July 29, 1921, Miss Smith had two long and serious illnesses, the latter in the spring of last year. She recovered so far that she could resume much of her work. Her final illness was of short duration; thus, happily, she was spared a further prolonged period of suffering, inactivity and helplessness.

The great esteem in which Miss Smith was held found expression at her funeral on New Year's Day, when a service in Kew Church, preceding burial in Richmond Cemetery, was attended by a large number of local residents and others, representatives of the Richmond Board of Guardians, and many of the past and present members of the staff of the Royal Botanic Gardens, Kew.

A portrait of Miss Smith was published as a frontispiece to the "Journal of the Kew Guild" for 1916.

Botanic Gardens for Canada.—Except for the small and interesting Botanic Garden which is being developed in connection with the new University buildings of the University of British Columbia on the outskirts of Vancouver, B.C., the great Dominion of Canada unfortunately does not possess a Botanic Garden. Such an omission in this great country, where the Universities have attained a world-wide reputation, especially in the domains of

Science, is a matter of deep concern and regret to the Botanists of the Empire no less than to those of the Dominion itself.

Canada does not appear to have realised the importance of Botanic Gardens not only for their educational value for the proper display of the great wealth of the vegetable resources of the Dominion but also as centres where researches in the sphere of genetics and in the introduction and improvement of economic plants can be prosecuted.

It is to be hoped that the importance of this aspect of botanical knowledge has only been overlooked, owing to the rapid developments which have been taking place in so many other directions, and that the time is now approaching when the assistance which the science of Botany can render to a country will be more fully appreciated, and that time and opportunity will be found to consider the urgent needs of the science in order that she may fulfil her proper functions. The formation of one or many Dominion Gardens is one of the most pressing needs, and all the more urgent, in order that land suitable for the purpose may be secured before it can be irretrievably seized by the ever-spreading march of building operations near the University centres.

The Director when he visited Toronto in September, 1926, had the privilege of discussing the subject of Botanic Gardens with the President of the University, Sir Robert Falconer, K.C.M.G., and was able to emphasise the suitability of Toronto for a Botanic Garden, in connection with the School of Botany, worthy of the Dominion. It is gratifying to find that the President in his Report for the year 1925-26 makes special reference to the matter in the following terms:—

“In an annual survey it is only right that mention should be made of the special needs of the University. Of all the departments Botany is that which has been waiting longest for better equipment. For many years the great need of a Botanic Garden for this University and Province has been emphasised. In the neighbourhood of Toronto a suitable site may be obtained in which the national treasures may be displayed and their economic possibilities set forth. Recently the Director of the Royal Botanic Gardens at Kew has visited the city, and once again it has been brought to our attention that such a Garden is a necessity for the study of native vegetation, the preservation of native flora, and the promotion in the Dominion of economic developments similar to what has been so effectively done for years by Kew Gardens.”

The fulfilment of the President's aspirations will be eagerly awaited both by Botanists in Canada and in Great Britain, since in the chain of Botanic Gardens which exists throughout the British Empire the one and only link which is missing is that of the Dominion of Canada.

The Journal of the Botanical Society of South Africa.—Part xii, 1926, contains an interesting review of the National

Botanic Gardens, Kirstenbosch. There is a welcome indication of steady and increasing public support both in membership of the Botanical Society and in private subscriptions. The annual attendance of visitors at the Gardens also shows a steady increase. It is gratifying, therefore, to notice the encouragement promised by the Union Government, who have now undertaken to contribute, on the pound for pound basis, to every gift and legacy donated to the Gardens. The Society is fortunate to be able to announce under this scheme the bequest of £2000 under the will of the late Dr. de Korte, of Cape Town. It is notified that the Harold Pearson Memorial Hostel, which was opened in 1925 for the benefit of women working at Kirstenbosch, is now generally able to provide accommodation for visitors to the Gardens. Progress in the development of the Karoo Garden at Whitehill is recorded and botanists have already visited the Garden and explored the surrounding country.

Besides the accounts of the Gardens and the work of the Botanical Society of South Africa there are several articles of local interest, and the illustrations show the Harold Pearson Memorial Hostel and typical views of the vegetation and flowers of South Africa.

The Flora of South Africa*.—The two parts into which volume ii. of Dr. Marloth's monumental work has been divided have now been received at Kew, and the opportunity is here taken to comment on the work, of which another volume (vol. iii. *Sympetalae*) has still to be published.

Dr. Marloth's first volume appeared in 1913, and dealt with the *Thallophyta*, *Archegoniatae*, *Gymnospermae*, and the first part of the *Dicotyledones*. Volume iv., containing the *Monocotyledones*, was published in 1915.

Dr. Marloth shows by a diagram on p. 118 of vol. i. his views as to the best phylogenetic arrangement of the principal groups of flowering plants. In this table he shows disagreement with the Engler and Prantl system by placing the *Monocotyledones* at the end. The sequence of the orders and families of the *Dicotyledones*, however, is after Engler and Prantl. Dr. Marloth retains the artificial group *Monochlamydeae*, determined by the presence of only one perianth-whorl, and may thus cause some confusion in the mind of the student, for in that group he includes such a petaliferous family as *Caryophyllaceae*, whilst he places the mostly apetalous family *Euphorbiaceae* in the *Dialypetalae*. Dr. Marloth's further views on the phylogeny of the families would have been welcome, as he evidently considers the *Euphorbiaceae* have no direct connection with any family of the *Geraniales*, as suggested by Engler and Prantl (see vol. ii. Sect. ii. p. 123).

* The Flora of South Africa, with Synoptical Tables of the Genera of the Higher Plants, by Rudolf Marloth. Cape Town: Darter Bros. & Co. (1925). Vol. ii, pp. 272, plates 52 + 28, figs. 162. Price £5 5s.

The two parts of vol. ii. are well up to the high standard of the earlier volumes, and like them contain a wealth of beautiful photographs, coloured plates and other illustrations of the remarkable vegetation of South Africa. Dr. Marloth is to be warmly congratulated on the near completion of a work of marked originality which, while not claiming to be a complete "flora," should be the best possible basis for an introductory study.

J. H.

Sikkim Orchids.*—Professor Brühl's handy Guide to the orchids of Sikkim should prove to be a very useful book for those who desire to study the orchids of this much visited region. King and Pantling published their admirable monograph of the orchids of Sikkim over 25 years ago, but, largely on account of its size and cost, this important work is not readily available for general use. Dr. Brühl's book removes these difficulties and places in the hands of orchid lovers a condensed account of a popular nature which will be widely appreciated.

The text is arranged on the "key system" and technical terms are reduced to a minimum; keys are provided both for the genera and for the species, and they are both very fully drawn up and commendably clear. A few typographical errors have unfortunately escaped attention and the taxonomy is not always in accordance with modern practice; it is also to be regretted that a new genus *Cleistocentron* should be first described in a popular work. Otherwise this book can be warmly commended to the notice of orchid lovers, and it is to be hoped that Prof. Brühl's useful guide will stimulate a careful study of the orchid flora of Sikkim and that collections of ample material may be made for critical determination by orchidologists. For it must not be construed from the statements on pages v and vi of the Foreword that our knowledge of this group is in any way complete. In many of the genera much critical work yet remains to be done and the status of many of the so-called species is still extremely doubtful.

Enzymes†.—The biological importance of enzymes is now fully recognized, and this text-book should be of great use to all students of living plants and animals. It is a concise, well-arranged compilation. In their preface the authors state they have consulted over two thousand references, and in the Bibliography there are 1323 items, many of them giving more than one paper. The parts of special interest to botanists are those dealing with enzymes in biological processes, plant enzymes, enzymes of micro-

organisms, and the details concerning the occurrence, action, and preparation of the enzymes acting upon the various groups of organic substances which form the chemical basis of plant life. The chapter on the uses of enzymes indicates how, in many ways unknown to the general public, scientific research in biochemistry is closely linked with all aspects of modern civilization.

W. B. T.

A Manual of Plant Breeding for the Tropics.*—This volume constitutes, as pointed out in the foreword, the first of a series of agricultural science texts for use in the Philippines and in the Tropics, prepared by the College of Agriculture of the University of the Philippines. The first few chapters are devoted to the general principles of and the methods employed in plant breeding, after which a special chapter is devoted to the genetics of each of the main crops of the Philippines, such as Rice, Abaca (Manila Hemp), Sugar Cane, Maize, Tobacco and Coconuts. This is followed by a general account of the improvement of minor Philippine crops, which include Cassava, Coffee, Rubber, Cocoa, Cotton, Sweet Potato and others. In addition to crops, fruits and ornamental plants are dealt with. Under the former heading interesting accounts of recent work on the banana and pawpaw (*Carica Papaya* L.) are given; other tropical fruits, including Citrus, are dealt with in less detail. In the discussion on ornamental plants work done on the various ornamental *Hibisci* receives special attention, and interesting information on the production of new seedling varieties of the common Croton (*Codiaeum variegatum* (L.) Blume) and on the results of Rosal (*Gardenia florida* L.) breeding in the Philippines is included.

The book, consisting of 265 pages with numerous illustrations, should be extremely useful to all engaged in plant breeding work in the Tropics. For though intended primarily as a student text-book the field covered is so wide, and the most recent information concerning many of the crops is presented in such detail, that the book is likely to have a far wider range than that claimed for it by the author. As tropical plant breeding is dealt with exclusively the work is quite one of the pioneers of its kind, and should be appreciated as a botanical and agricultural text-book for use in colleges throughout the Tropics. A useful bibliography is incorporated at the end of the work.

Conifers, Junipers and Yews: Gymnosperms of British Columbia.†—This is the first of a contemplated series of six volumes

* A Guide to the Orchids of Sikkim, by Paul Brühl. Thacker, Spink & Co., Calcutta and Simla, 1926. Pp. xvi+208, one text figure. Pocket size.

† Enzymes, by S. A. Waksman and W. C. Davison. Baillière, Tindall and Cox, 7 & 8, Henrietta Street, Covent Garden, London, 1926. Pp. xii+364, figs. 10. Price 25s.

* A Manual of Plant Breeding for the Tropics, by N. B. Mendiola, Bureau of Agriculture. Published by the Bureau of Printing, Manila, Philippines, 1926, pp. 365, numerous ill.

† Conifers, Junipers and Yews, by John Davidson, with drawings by Miss Ivy Abercrombie. T. Fisher Unwin Ltd., (Ernest Benn Ltd.), Bouverie House, Fleet Street, London, 1927; pp. xvii+72, price £1 1s. net.

designed to describe and illustrate the flora of British Columbia, for the service of nature lovers, teachers and students, the author being Professor John Davidson of Vancouver, and the artist Miss Ivy Abercrombie. The book begins with a review of the characters determining the divisions and sub-divisions into which the Vegetable Kingdom is separated. Then come brief descriptions of the several groups of *Gymnosperms* with a more comprehensive résumé of the characters determining the *Coniferales*. The various genera and species found in British Columbia are then dealt with. Instead of keys, such as are often given with monographs of genera or descriptions of groups of species, the author gives very clear and useful analytical tables. He follows with a good description of each species, which includes scientific and common names, synonyms when necessary, and uses of the timber. There are 37 coloured or black and white drawings illustrating the 23 species of the 10 genera described. The drawings are very well done and they give full details of shoots, cones, and floral structure. Unfortunately the descriptive legends do not appear on the plates with the drawings but on thin covering sheets, which is certainly a disadvantage. The book is expensive for its size, and a less elaborately produced work would be just as useful and should meet with a wider sale, for a book designed for students and teachers should be reasonably cheap.

Bibliography of the Woods of the World.*—This bibliography is based on one prepared by Professor Samuel J. Record, of the Yale Forest School, the second edition of which appeared in 1923, and it is even now only a preliminary edition of a larger book that is to follow. It includes references to 1341 works on Trees and Timber, which are grouped in six divisions, General, Tropical America, Europe, Asia and Oceania, Africa, and an Index to Special Woods and Subjects. The Divisions Tropical America and Asia and Oceania are each divided into nine sub-divisions, the references to each division or sub-division being numbered. The Books are referred to under first the Author, then the date of publication, followed by title, publisher and number of pages. A limited number of copies has been published chiefly for distribution to institutions and individuals willing to assist in furnishing additional references for the fuller edition that is to follow.

* Bibliography of the Woods of the World (Exclusive of the Temperate Region of North America), with Emphasis on Tropical Woods. Prepared by the Tropical Plant Research Foundation for the Main Research Committee of the American Society of Mechanical Engineers, 1350 B. Street S.W., Washington, D.C.; A Revision and Extension by Major George P. Ahern and Miss Helen K. Newton of a Bibliography compiled in 1923 and 1924 by Prof. Samuel J. Record, Yale Forest School, Washington, D.C.

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BULLETIN OF MISCELLANEOUS INFORMATION

ROYAL BOTANIC GARDENS,



XX.—THE FLORA OF WEST TROPICAL AFRICA

The publication of a new Flora relating to West Tropical Africa from the Royal Botanic Gardens requires some explanation as to the history of this new enterprise and as to its purpose. These matters have been fully explained in the Preface and it therefore seems fitting to reproduce it in this announcement of the publication of the first part of Volume I of the new Flora.

PREFACE

When the first volume of the "Flora of Tropical Africa" was published in 1868, under the Editorship of Prof. D. Oliver, the interest of Great Britain in the Economic possibilities of the West African Colonies in respect to the vegetable kingdom was but in its infancy, nor at that early date did we possess a very extensive knowledge of the Tropical African flora. Volumes II and III, published in 1871 and 1877 respectively, which included the Families as far as the end of the *Ebenaceae*, suffered from the same limitations. Since their issue so much new material has been collected in all parts of Tropical Africa, and particularly in the Western Colonies, that these early volumes are now quite out of date, especially in relation to the trees and shrubs, many of which, as for example the West African "Mahoganies," yield timber of great economic importance.

The publication of the "Flora of Tropical Africa" was continued, after an interval of twenty years, under the Editorship of Sir W. T. Thiselton-Dyer, when Vol. VII, *Hydrocharideae-Liliaceae*, was published in 1897, and in the Preface to that volume Sir William gives the history of the renewal of the undertaking.

Further volumes have been published from time to time since that date, and only the final parts dealing with the rest of the *Gramineae* now remain to be published.

The approaching completion of this great work, only the latter portions of which are now fairly abreast of modern knowledge, has relieved Kew of a great and laborious task, and has allowed attention to be directed to the particular needs of our Colonies situated on the western and eastern sides of the African Continent.

The "Flora of Tropical Africa" is so large a work, and covers so wide an area, that it cannot be used for the determination of plants in the field with any facility; it was felt, therefore, that the best interests of scientific workers could be served by the publication of

regional Floras dealing with some one district and exhibiting a fairly homogeneous floral character.

Our West African Colonies of the Gambia, Sierra Leone, the Gold Coast and Nigeria, including the British sphere of the Cameroons and the adjacent French and Portuguese possessions, were considered to afford a very suitable region for such a local or regional Flora; the project was, therefore, brought to the notice of the Secretary of State for the Colonies, the history of the present undertaking being given in the following letters :—

Royal Botanic Gardens, Kew,
November 25th, 1922.

SIR,

FLORA OF TROPICAL AFRICA

In the year 1909 the Secretary of State for the Colonies authorised the employment of an Assistant for Tropical Africa in the Herbarium at Kew, and the appointment was in the first instance for a period of five years, as from 1st April, 1909, and was renewed for a further period of three years up to 31st March, 1917. . . .

The impending completion of the "Flora of Tropical Africa" induces me to bring to the notice of the Secretary of State a project which for some years has occupied the attention not only of my predecessors and myself, but of the Governors and Scientific Officers of our West African Colonies, and that is the urgent need of a Handbook dealing with the Floras of West Africa, which would form a valuable and most useful work of reference for the Botanical, Forestry and Agricultural Officers in Nigeria, the Gold Coast, Sierra Leone, and the Gambia.

The position of affairs with regard to the Tropical African Flora is closely paralleled by the case of the "Flora of British India," which was also compiled at Kew, under the Editorship of Sir Joseph Hooker.

On the completion of that work the need of Floras dealing with special areas was at once realised, and as a result the Government of India arranged for the preparation of the Floras of Bombay, Madras, the Gangetic Plain, etc., which are now either wholly or very nearly completed.

These "local" Floras have been or are being written by distinguished Indian Botanists, and the work has been done almost entirely at Kew, the Government of India finding the necessary funds for the purpose.

I may, perhaps, also refer to the case of the Dictionary of the Economic Products of India by Sir George Watt, Reporter on Economic Products to the Government of India, and to the concise Handbook based upon the Dictionary of the Commercial Products of India which was prepared by him mainly at Kew, as well as to the analogous "Useful Plants of Nigeria" prepared at Kew by one of our Assistants, who had previously served as an official in Nigeria, which has been found of so much value in our West African Colonies

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as a work of reference dealing with the Economic Products of West Africa.

This latter work, however, useful as it is, is only of full value provided the plants are known and can be easily identified by those who wish to consult it.

The need in West Africa now is a concise and easily workable "Handbook of the Flora" on the lines of one of the Indian Floras to which I have referred, which could be used by anyone who had a reasonable knowledge of plants—though not necessarily a Botanist by profession. Such a Handbook would provide information as to the plants of value as foods, drugs, fibres, timber, and minor forest products, and would also include the local fodder grasses, which should be easily available for use by veterinary officers.

The "Flora of Tropical Africa," essential though it is for the study of the Tropical African Flora as a whole, is not an easy work of reference in the field owing to its magnitude, and it also suffers in value owing to the fact that since the earlier volumes were written so much new material has come to hand, especially from Nigeria, the Gold Coast and Sierra Leone, that there is a great deal of supplementary matter unavailable to workers in the field, which it is most desirable, in the interests of these Colonies, should be published.

I venture to bring the need of a Flora of West Africa or Upper Guinea to the notice of the Secretary of State at the present moment, partly because the "Flora of Tropical Africa" is so nearly completed, but more especially because I learn that there is an officer available to undertake the preparation of a "local" Flora of exactly the type which would be of the greatest service to our West African Colonies.

The officer to whom I refer is Dr. J. M. Dalziel, M.D., B.Sc., F.L.S., whose Hausa Botanical Dictionary is so well known and has proved of so much value in our West African Colonies. . . .

I beg to request, therefore, that if my proposal should meet with the favourable consideration of the Right Honourable the Secretary of State, the Governors of the West African Colonies may be approached and asked whether they would be prepared to provide the necessary funds for the preparation of the Flora of the West African Colonies on the lines I have indicated.

Since a work of this kind would be of so great value to our West African Colonies I hope the Secretary of State may feel disposed to commend the proposal to their earnest consideration.

I am, etc.,
ARTHUR W. HILL,
Director.

The Under-Secretary of State,
Colonial Office, S.W. 1.

Downing Street,
26th January, 1923.

SIR,

I am directed by the Duke of Devonshire to acknowledge the receipt of your letter of the 25th of November relative to the prepar-

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ation of a Handbook of the Flora of West Africa, and to inform you that copies have been forwarded to the Governors of the West African Colonies for their consideration.

2. A further communication will be addressed to you when their replies have been received.

I am, etc.,
(Sd.) H. J. READ.

The Director,
Royal Botanic Gardens.

Downing Street,
12th June, 1923.

SIR,

With further reference to your letter of the 25th of November, I am directed by the Duke of Devonshire to inform you that the replies which he has received to his despatch indicate that the West African Governments agree to your proposal that provision should be made for the compilation of a "Flora of West Africa" by a retired West African officer.

2. His Grace would accordingly be glad if you make the necessary arrangements for this project to be put into effect, and approves of your employing Dr. J. M. Dalziel or any other person who would in your opinion be able satisfactorily to undertake the work.

I am, etc.,
(Sd.) H. J. READ.

The Director,
Royal Botanic Gardens.

On receipt of the Colonial Office letter sanctioning the proposal Dr. J. M. Dalziel was duly appointed Assistant for West Africa at Kew and the work on the "Flora of West Africa" was commenced in September, 1923.

Mr. J. Hutchinson, a member of the Kew staff, who has for many years made a special study of the West African Flora, was appointed by the Director to take charge of the work and write the Flora in collaboration with Dr. Dalziel.

The combination of a botanist possessing a wide knowledge of the systematic principles of the science with one familiar with the general aspect of the vegetation in the field has proved to be very useful, and it is hoped that the resulting Flora will be found of value by professional botanists, foresters, agriculturists, and by all who take an intelligent interest in the plant life of West Africa.

In due course it is hoped that it will be made possible to provide a similar work dealing with the Floras of our Tropical East African Colonies as the second in this series of handy regional Floras.

The present work differs in three important respects from all those of the long series of Colonial Floras which previously have emanated from the Royal Botanic Gardens, Kew.

In the first place it is arranged on a new system of classification ; secondly, it is provided with illustrations of the Families, as represented by the more important genera, which should considerably enhance its value ; and thirdly, the descriptions of the actual plants are reduced to a minimum and the text is mainly in the form of a descriptive "key," in order to facilitate easy and rapid determination of the species.

The system of classification adopted in this Flora is that published by Mr. Hutchinson in his recent book "The Families of Flowering Plants," which, while it follows the main lines of Bentham and Hooker's "Genera Plantarum," differs in some important respects from that classic work, which is the standard of the arrangement in the Kew Herbarium.

The changes involved in the new system seem desirable and worthy of being followed in this Flora, since they embody the results of the new light that recent research has thrown on the inter-relationships of the various Families of the Flowering Plants. The system has also been followed in Burt Davy's "Flora of the Transvaal," now in course of publication.

The carefully compiled Key to the Families should enable students to determine the position of any particular plant with ease and rapidity, and having ascertained the Family, the brief descriptions drawn up in Key form should enable the species to be determined with equal ease.

The Key principle adopted in this Flora has been found eminently satisfactory in the late Mr. J. S. Gamble's "Flora of Madras" and other Indian regional Floras.

The illustrations with which the Flora is provided have all been prepared especially for the purpose and give all those details which should be of value both to the botanist and the amateur.

Kew is indebted to the numerous botanists, agricultural, forest and medical officers and other Government officials in our West African Colonies for many of the specimens which are recorded in the Flora. Many political officers, amateur botanists and travellers have also enriched our collections, and reference is made to the principal collectors in the opening pages of the Flora, under the heading Botanical Exploration in West Africa.

Kew is particularly indebted to Prof. H. Lecomte, Director, Muséum d'Histoire Naturelle, and to Dr. A. Chevalier, Director, Laboratoire d'agronomie coloniale, Paris, for the loan of specimens, especially from the French Possessions in West Africa, and for the facilities given for the study of the collections in Paris, and to Dr. L. Diels, Director of the Botanic Garden and Museum, Dahlem, Berlin, for the loan of many type specimens.

To these botanists, and to the many others who have generously assisted Kew in supplying specimens and information, I wish to

record my sincere thanks, as without their aid the work would have lacked the measure of completeness which it has been possible to achieve.

ARTHUR W. HILL.

Royal Botanic Gardens, Kew,
January, 1927.

This first part, which consists of 246 pages, contains the families *Cycadaceae* *Tiliaceae*, inclusive. The work opens with a short introduction dealing with the geographical area covered, which is also illustrated by a sketch map of West Tropical Africa. This is followed by an account of botanical exploration in West Africa, which commenced with the work of Adanson (1749-54), whose name is commemorated in the frontispiece of *Adansonia digitata*. A bibliography of works dealing with West African Botany is also given.

A glossary of botanical terms is followed by a key to the families of Dicotyledons represented in the Flora, and the families contained in Volume I are then set out in the Phylogenetic sequence adopted in the Flora. The descriptive matter, or Flora proper, commences on p. 45 and opens with the Gymnosperms, which are represented in West Tropical Africa by the single Cycad *Encephalartos Barteri* and by *Gnetum Buchholzianum*. The Angiosperms then follow, commencing with the *Anonaceae*.

As has been stated in the Preface the descriptions are concise and arranged on the key system, so that it should be possible for workers in the field to determine their plants with a minimum of trouble. It is also hoped that the numerous and clear text-figures will considerably enhance the value of the Flora.

The work is published by the Crown Agents for the Colonies, the first part being priced at 8s. 6d.

XXI.—TROPICAL AFRICAN PLANTS: I. J. HUTCHINSON and J. M. DALZIEL.

In order to preserve uniformity and avoid the use of Latin descriptions in the "Flora of West Tropical Africa" the new species and combinations included in the first part of that work were referred to the *Kew Bulletin*. These will appear at intervals under the above title, together with supplementary notes for which there was no place in the *Flora*. The sequence of the families will be the same as that adopted in the *Flora*.

ANONACEAE.

Uvaria Mannii Hutch. et J. M. Dalz., sp. nov., affinis *U. angustifoliae* Engl. et Diels, sed foliis elongato-ellipticis basi obtusis apice acuminatis nervis lateralibus utrinsecus 14 infra prominentibus differt.

Ramuli glabri, leviter flexuosi, internodiis circiter 1.5 cm. longis. *Folia* elongato-elliptica, basi obtusa vel rotundata, breviter acuminata, circiter 16 cm. longa et 6.5 cm. lata, utrinque glabra, supra nitida; nervi laterales utrinsecus circiter 14, supra prominuli, infra prominentes, marginem versus conspicue conjuncti; petioli 5-10 mm. longi, supra profunde canaliculati. *Flores* in ramis efoliatis subsessiles. *Sepala* triangularia, 5 mm. longa, extra appresse pilosa. *Petala* 6, aequilonga, ovata, extra et intra apicem versus tomentella, circiter 1.5 cm. longa et 1.3 cm. lata.

Fernando Po: "shrub 5-7 m. high, calyx green, corolla white with four dark purple spots at the base inside"; Mann 257 (type).

Uvaria Farquharii Hutch. et J. M. Dalz., sp. nov., ramulis reflexis reticulato-areolatis, foliis ellipticis emarginatis distincta.

Ramuli mox reflexi, conspicue reticulato-areolati, patule rufo-pubescentes vel hirsuti, internodiis circiter 2 cm. longis. *Folia* elliptica, apice rotundata et emarginata, basi subcordata, 4-6.5 cm. longa, 2.5-4 cm. lata, supra leviter pustulata, infra tenuiter fusco-pubescentia; nervi laterales utrinsecus circiter 6, arcuati, marginem versus evanidi; petioli 2-3 mm. longi, dense hirsuti. *Sepala* late triangularia, 2.5 mm. longa, extra tomentosa. *Petala* lata, 1.5 cm. longa, extra stellato-tomentella. *Carpella* fructifera juniora elliptica, stipitata, glabra.

Nigeria: Southern Provinces; Ukete, Sept., Farquhar 73 (partly) (type).

Pachypodanthium Barteri Hutch. et J. M. Dalz., comb. nov. *Anona Barteri* Benth. in Trans. Linn. Soc. 23: 477 (1862); Oliv. Fl. Trop. Afr. 1: 17.

Nigeria: Southern Provinces; Onitsha; "tree 50 ft.; leaves bright shining; fruit size of a peach"; Barter 445 (type).

The above was included by Oliver (l.c.) amongst the imperfectly known species of *Anona*. Engler and Diels make no mention of it in their monograph.

Piptostigma giganteum Hutch. et J. M. Dalz., sp. nov., foliis magnis, sepalis ovato-triangularibus petalis interioribus late lanceolatis nervosis distincta.

Arbor; ramuli teretes, rufo-tomentosi. *Folia* magna, late elliptica, basi rotundata, usque ad 35 cm. longa et 25 cm. lata, infra glauca et parce pubescentia; costa infra prominens et tomentosa; nervi laterales utrinsecus circiter 30, patuli, infra prominentes, nervis tertiariis numerosis parallelis gracilibus. *Inflorescentia* usque ad 20 cm. longa, tomentosa. *Sepala* et petala exteriora subaequalia, ovato-triangularia, acuminata, 7-8 mm. longa, extra dense appresse villosa; petala interiora late lanceolata, circiter 5 cm. longa, extra conspicue nervosa et villosa-pubescentia, intra molliter stellato-pubescentia. *Carpella* fructifera stellate disposita, sessilia, obtuse rostrata, costata, circiter 2.5 cm. longa.

Nigeria: Southern Provinces; Oban, Talbot 1336 (type).

Hexalobus glabrescens Hutch. et J. M. Dalz., sp. nov., affinis *H. monopetalus* Engl. et Diels, sed foliis mox glabrescentibus apice obtusis vel rotundatis, ramulis glabrescentibus differt. *H. monopetalus* var. *parvifolius* Bak. f. in Cat. Talb. Nig. Pl. 5 (1913).

Arbor usque ad 12 m. alta; ramuli flexuosi, foliosi, purpurescentes, primum appresse pubescentes, demum glabri et verrucosi. *Folia* anguste oblonga, utrinque rotundata, apice interdum emarginata, usque ad 15 cm. longa et 4.5 cm. lata, plerumque 3 cm. longa, primum minute pubescentia, mox glabrescentia; nervi laterales supra prominuli, infra inconspicui; petioli 2-3 mm. longi, tomentelli. *Flores* sessiles, parvi, flavi. *Sepala* ovata, coriacea, 5 mm. longa et 4 mm. lata, extra dense flavido-tomentella. *Petala* basi connata, alabastro corrugata, late elliptica, circiter 1 cm. longa et 6-7 mm. lata, medio basin versus appresse villosa, ubique minute pubescentia. *Fructus* ovoideus vel cylindricus, aurantiaca, circiter 3.5 cm. longus et 1.5 cm. crassus, minute rufo-tomentellus.

Nigeria: Northern Provinces; Yola, "shrub or tree of 15 ft.", Dalziel 205; "tree 40 ft. high", Shaw 103. Cameroons: Jauja-Berge, about 900 m., Mildbraed 9716; Bosum, 700-800 m., Mildbraed 9728; Lere to Ham, Talbot 531 (type). Chad Region: around Lake Iro, Chevalier 9099. Upper Shari: Gribingui district, Chevalier 6486.

Xylopia Vallotii Chipp ex Exell in Journ. Bot. 1926, Suppl.: 8. *X. parviflora* Vallot in Bull. Soc. Bot. Fr. 29: 219; Engl. et Diels in Engl. Monogr. Afr. Anonac. 64, nec Spruce, nec Pierre.

Senegambia: Perrottet 7 (type). Sierra Leone: bank of Moa river at Koteimahun, Lane-Poole 347; near Port Lokko, Scott Elliot 5730; Laminaiya, Thomas 144. Dahomey: Ouémé river, Chevalier 23586. Nigeria: Southern Provinces; various localities, Vogel 103; Foster 99; Rowland. Northern Provinces; various localities, Barter 426; 1035; Dalziel 103; 713; Elliott 171. Belgian Congo: Smith; Bequaert 2281. Portuguese Congo: Sumba; Peco, Gossweiler 8658; 8937.

Popowia Dalzielii Hutch., sp. nov., affinis *P. Mannii* Baill., sed floribus solitariis vel geminatis, foliis late et subabrupte acuminatis differt.

Scandens; ramuli laterales basi interdum tendriformes, flexuosi, areolato-reticulati, glauco-purpurei. *Folia* elliptico-obovata, late et subabrupte acuminata, basi rotundata, 10-15 cm. longa, 3.5-5.5 cm. lata, glabra vel minute pubescentia, infra glauca et crebre reticulata; nervi laterales utrinsecus 6-7, arcuati, infra prominentes et brunnescentes; petioli 3-4 mm. longi, supra plani. *Flores* axillares, plerumque geminati; pedicelli graciles, 1 cm. longi, breviter pubescentes. *Sepala* late triangularia, 1.25 mm. longa, parce pubescentia. *Petala* exteriora ovata, crassa, 3 mm. longa, puberula.

Nigeria: Northern Provinces; Abinsi, July, Dalziel 712 (type). Southern Provinces; Olokemeji, Foster 312.

A specimen collected by Zenker (No. 2102A) from Bipinde, Cameroons, may also belong here. There are no flowers on the Kew sheet.

Oxymitra glaucifolia Hutch. et J. M. Dalz., sp. nov., foliis infra conspicue glaucis valde distincta.

Ramuli breviter pubescentes. *Folia* oblonga vel oblongo-obovata, basi cordata, apice longe acuminata, 10-25 cm. longa, 4-7 cm. lata, supra glabra, infra glauca, nervis lateralibus utrinsecus 8-12 puberulis, nervis tertiariis gracilibus parallelis; petioli 0.5-1 cm. longi, breviter pubescentes. *Flores* magni. *Sepala* late ovata, circiter 7 mm. longa, extra breviter ferrugineo-tomentella. *Petala* exteriora late ovata, velutino-tomentella, circiter 2 cm. longa, interiora paulo breviora glabra. *Fructus* breviter stipitatus, cylindricus, 1-2-spermus, medio leviter contractus, usque ad 2.5 cm. longus, breviter ferrugineo-tomentellus.

Nigeria: Southern Provinces; Oban, Talbot 403 (type); 1255.

Tetrastemma Bakerianum Hutch. et J. M. Dalz., sp. nov., foliis longe acuminatis basi late rotundatis et subcordatis, floribus brevissime pedicellatis valde distincta.

Ramuli leviter flexuosi, cortice cinereo longitudinaliter verrucoso obtekti, primum minute puberuli. *Folia* elongato-oblonga vel oblanceolata, basi rotundata et leviter cordata, satis longe acuminata, 15-27 cm. longa, 4-7 cm. lata, glabra, infra laxae reticulata; nervi laterales utrinsecus circiter 12, infra prominuli; petioli crassi, 3 mm. longi, puberuli. *Flores* solitarii, in ramulos breves pustulatos e trunco dispositi, extra rosei, intra carminei; pedicelli circiter 0.5 cm. longi. *Sepala* 2, parva. *Petala* lineari-lanceolata, acuta, crassa, 1.5-2 cm. longa, extra strigoso-pubescentia.

Nigeria: Southern Provinces; Oban, Talbot 1517 (type).

Monodora Unwinii Hutch. et J. M. Dalz., sp. nov., petalis aequilongis, interioribus late obovatis, distincta.

Arbor; ramuli foliosi brevissimi, flexuosi, glabri, glauci. *Folia* oblongo-oblanceolata, basi rotundata, apice obtusa, 6-12 cm. longa, 3-4.5 cm. lata, glabra, infra leviter glauca; nervi laterales circiter 15, ascendentes; petioli glauci. *Pedicelli* circiter 5 cm. longi. *Sepala* triangulari-ovata, 1.3 cm. longa. *Petala* interiora quam exteriora crispata aequilonga vel longiora, late obovata, circiter 2.5 cm. longa, marginem versus piloso-setosa. *Ovarium* ovoideum, glaucum.

Nigeria: Southern Provinces; Benin, Unwin 45 (type).

LAURACEAE.

Tylostemon macrophyllus Hutch. et J. M. Dalz., sp. nov., floribus minimis, foliis infra minutissime punctulata distincta.

Ramuli glabri. *Folia* alterna, elongato-obovato-elliptica, late acuminata, basi late cuneata, circiter 25 cm. longa et usque ad 11 cm. lata, tenuiter chartacea, utrinque laxè reticulata, infra minutissime punctulata; petioli circiter 1 cm. longi. *Inflorescentia* extra-axillaris, gracilis, laxè cymosa, ubique brevissime et parce pubescens; pedicelli graciles, 2.5 mm. longi. *Calyx* circiter 1.5 mm. longus, ad medium lobatus, lobis ovatis marginatis brevissime ciliolatis.

Nigeria: Southern Provinces; Oban, *Talbot* 2301 (type); 2302.

RANUNCULACEAE.

***Thalictrum Mannii* Hutch.**, sp. nov.; a *T. rhynchocarpo* Dillon. et A. Rich., staminibus 7-8 leviter exsertis differt. *T. rhynchocarpum* Oliv. in Fl. Trop. Afr. 1: 8, partim, non Dillon. et A. Rich.

Herba usque ad 4 m. alta, glabra. *Foliola* ambitu late ovata vel orbiculari-obovata, basi plus minusve cordata, profunde crenata vel sublobulata, usque ad 1.3 cm. longa et lata, venosa, supra venis impressis infra prominulis. *Panicula* laxissima, leviter foliosa, late pyramidata; pedicelli gracillimi, 2-3 cm. longi, fructu demum usque ad 10 cm. longi. *Sepala* parva, viridescens, obovata, 2 mm. longa. *Stamina* 7-8, leviter exserta. *Fructus* valde costatus, utrinque attenuatus, stylo persistente incluso circiter 1.5 cm. longo.

Nigeria: Southern Provinces; Cameroons Mt., 2400 m., fr. Nov., *Mann* 1999. Buea, *Deistel* 644. Fernando Po: 2000 m., *Mann* 293 (type).

***Clematopsis nigerica* Hutch.**, sp. nov., affinis *C. Oliveri* Hutch., sed foliolis minus dentatis, foliis superioribus simplicibus, floribus solitariis differt.

Herba erecta, usque ad 35 cm. alta; caules simplices, profunde sulcati, internodiis elongatis. *Folia* inferiora pinnata, usque ad 15 cm. longa, foliolis lateralibus oblongo-lanceolatis paucidentatis utrinque parce pubescentibus infra laxè nervoso-reticulatis, foliolo terminale obovato-oblanccolato plus minusve petiolulato. *Flores* solitarii, terminales, longe pedunculati, pedunculo usque ad 15 cm. longo sulcato pubescente. *Sepala* 4, late elliptica, circiter 3 cm. longa et 1.5 cm. lata, utrinque molliter tomentosa. *Filamenta* pubescentia; antherae 5 mm. longae. *Carpella* longe villosa.

Nigeria: Northern Provinces; Vom, Bauchi Plateau, 950-1400 m., *Dent Young* 1.

MENISPERMACEAE.

***Synclisia ferruginea* Hutch. et J. M. Dalz.**, comb. nov. *Synclisia scabrida* Diels in Engl. Pflanzenr. Menispermac. 87, partim, non Miers. *Anisocycla ferruginea* Diels l.c. 92 (1910).

Ramuli obscure costati, internodiis elongatis, pilis reflexis ferrugineis dense induti. *Folia* ovato-lanceolata, basi cordata, apice acuminata et pilis fasciculatis apiculata, 15-18 cm. longa,

circiter 7 cm. lata, basi 5-nervia, laxè transverse nervosa, costa nervis pilosis exceptis glabra, infra minute et crebre venulosa; petioli 2-3 cm. longi, patule hirsuti. *Flores* non visi. *Drupae* ellipsoideae, 2 cm. longae, 1.5 cm. latae, dense villosa-hispidae.

French Guinea: between Lola and Nyo, Mar., *Chevalier* 20989. Sierra Leone: Without definite locality, *Buckley* in *Scott Elliot* 5751. Liberia: Grand Bassa, fr. Aug., *Dinklage* 1686 (type). Ivory Coast: foot of Mt. Nouba, Apr., *Chevalier* 21134. Upper Nuon, Apr., *Chevalier* 21157.

***Rhigiocarya Chevalieri* Hutch. et J. M. Dalz.**, sp. nov., affinis *R. racemiferae* Miers, sed foliis ovato-ellipticis ad basin rotundatum leviter angustatis apice obtuse caudato-acuminatis 7-9 cm. longis 4-5 cm. latis basi 3-nervis, petiolo usque ad 6 cm. longo, infructescentia 5-6 cm. longa, pedicellis 7-8 mm. longis differt.

Ivory Coast: Soubré, May, *Chevalier* 16404. Guidéko, May, *Chevalier* 16463. Lower Cavally river, Tate village, Aug., *Chevalier* 19810. Lower Cavally, Aug., *Chevalier* 19846.

***Dioscoreophyllum fernandense* Hutch. et J. M. Dalz.**, sp. nov., caulibus pilis setosis, foliis parvis integris acute acuminatis distincta.

Scandens, usque ad 3 m. longa; caules graciles, pilis setosis induti, demum glabrati. *Folia* late ovata, basi aperte cordata et 5-nervia, apice abrupte caudato-acuminata, 6-7 cm. longa, 3-5 cm. lata, discoloria, utrinque nervis parce setosis exceptis glabra, infra pallidiora; petioli 3-4 cm. longi, basi spiraliter torti, parce setulosi. *Racemi* circiter 13 cm. longi, inferne setoso-pilosi; pedicelli patuli, usque ad 4 mm. longi, glabri; bractae lineares, demum reflexae, 1.5 mm. longae. Fl. ♂: *Sepala* elliptica, glabra, 2 mm. longa. *Petala* nulla. *Stamina* 6, in syndrium depressum connata. Fl. ♀ non visi.

Fernando Po: climbing plant 6 ft. long, calyx green, stamens light red, June, *Mann* 416.

***Tiliacora Dielsiana* Hutch. et J. M. Dalz.**, sp. nov., affinis *T. Lehmbachii* Engl., sed inflorescentiis axillaribus, foliis late ellipticis differt.

Ramuli crebre longitudinaliter sulcati, glabri. *Folia* late elliptica, basi rotundata, apice triangulari-acuminata, mucronata, 10-15 cm. longa, 5-7 cm. lata, basi 5-nervia, utrinque conspicue reticulata; petioli 1.5 cm. longi, apicem versus leviter incrassati. *Flores* cymosi, cymulis pedunculatis subcapitatis, pedunculis circiter 1 cm. longis tomentellis. Fl. ♂: *Sepala* exteriora bractei-formia, triangularia, ciliolata, interiora obovato-oblanccolata, sicco nigrescentia, 4 mm. longa, glabra. *Petala* minuta. *Stamina* 6, filamentis circiter ad medium connata. Fl. ♀ non visi.

Sierra Leone: Kuntara, June, *Thomas* 465 (type); *Thomas* 9899.

***Triclisia Dielsii* Hutch. et J. M. Dalz. ex Exell** in Journ. Bot. 1926, Suppl.: 13, in obs. (nomen); affinis *T. subcordatae* Oliv.,

sed foliis basi rotundatis infra longe villosis, petiolis brevioribus differt.

Ramuli leviter flexuosi, pilis reflexis flavidis dense induti. *Folia* late oblongo-elliptica, abrupte longe mucronato-acuminata, basi rotundata, 7-8 cm. longa, 4-5 cm. lata, supra nitido-reticulata, demum glabra, infra appresse villosa; nervi laterales utrinsecus circiter 3-4, infra prominentes; petioli 2-2.5 cm. longi, dense hirsuti. *Cymae* ♂ axillares, brevissime pedunculatae vel subsessiles, ubique adpresse tomentosae; flores in cymis subsessiles. *Sepala* exteriora minuta, bracteiformia, gradatim majora, ultima late elliptica, fere 3 mm. longa. *Stamina* 6, libera, arcuata, acuta. *Axis* breviter productus, vertice pilorum fasciculo hirsutus. *Flores* ♀ non visi.

Dahomey: near Lome, *Warnecke* 327 (type).

Syntriandrum cordatum *Hutch. et J. M. Dalz.*, sp. nov., ob folia simplicia basi cordata exauriculata satis distincta.

Caules glabri, sulcati. *Folia* simplicia, ovata, basi cordata, apice late acuminata et mucronata, circiter 12 cm. longa et 7-8 cm. lata, basi 5-nervia, nervis lateralibus utrinsecus 3-4, utrinque prominente reticulata; petioli 4.5-5 cm. longi, basi leviter torti, glabri. *Inflorescentia* elongata, gracillima, usque ad 35 cm. longa, glabra; ramuli laterales simplices, patuli vel leviter reflexi, usque ad 10 cm. longi. *Flores* minutissimi, glabri, juniores tantum visi.

Nigeria: Southern Provinces; Calabar, *Williams* 28 (type).

Kolobopetalum leonense *Hutch. et J. M. Dalz.*, sp. nov., affinis *K. ovato* Stapf, sed inflorescentiae axi brevissimo, foliis basi cordatis differt.

Frutex scandens; rami leviter spiraliter torti, glabri. *Folia* ovato-elliptica, basi cordata, abrupte acuminata, acumine mucronato, 12-15 cm. longa, 7-8 cm. lata, basi prominenter trinervia, glabra, nervis lateralibus utrinsecus circiter 3 marginem versus ramosis infra prominentibus; petioli 8-10 cm. longi, basi torti, apice incrassati et transverse rugosi. *Inflorescentiae* axillares, simpliciter ramosae, axibus primariis abbreviatis usque ad 2 cm. longis, ramis lateralibus elongatis usque ad 18 cm. longis glabris; pedicelli 2 mm. longi, apice demum articulati, persistentes. *Sepala* 3 exteriora minima, ovata, 3 interiora suborbicularia, 2 mm. lata, glabra. *Petala* 6, biseriata, exteriora truncato-emarginata, interiora apice late rotundata, subcarinosa. *Stamina* 6, exteriora 3 libera, interiora 3 connata. *Flores* ♀ non visi.

Sierra Leone: Without locality, *Thomas* 3858 (type).

Penianthus patulinervis *Hutch. et J. M. Dalz.*, sp. nov., nervis lateralibus supra elevatis distincta. *P. longifolius* A. Chev. Explor. Bot. Afr. Occ. Franç. 19, non Miers. *P. Zenkeri* Diels in Engl. Pflanzenr. Menispermac. 101, partim.

Frutex vel arbor parva; ramuli glabri. *Folia* obovato-oblanccolata, ad basin longe cuneata, subsensim caudato-acuminata, obtusa, 10-18 cm. longa, 3.5-9 cm. lata, chartacea, glabra, nervis lateralibus utrinsecus circiter 10 a costa angulo 45° abeuntibus utrinque elevatis marginem versus conspicue conjunctis nervis tertiariis paucis laxe reticulatis; petioli 1.5-4 cm. longi, basi et apice conspicue pulvinati. *Flores* non visi. *Drupae* anguste ellipsoideae, 3.5 cm. longae, 1-1.5 cm. latae, glabrae et nitidae, rubrae.

Sierra Leone: Kenema, fr. Jan., *Thomas* 7650a; 7991. Ivory Coast: various localities, *Chevalier* 15263; 15436; 15507; 15583; 16680; 16965; 17026; 17163; 17620; 17843; 17856; 17904; 17985; 19621; 22287. Gold Coast: Kumasi, fr. Jan., *Cummins* 169; 190 (type).

Penianthus fruticosus *Hutch. et J. M. Dalz.*, sp. nov., affinis *P. longifolio* Miers, foliis ellipticis basi obtuso rotundatis, nervis lateralibus utrinsecus 6-8 differt. *P. longifolius* Diels in Engl. Pflanzenr. Menispermac. 101, partim, non Miers.

Frutex circiter 1 m. altus; ramuli minute verruculosi. *Folia* elliptica, basi rotundata, apice obtuse caudato-acuminata, 10-18 cm. longa, 4.5-8 cm. lata, glabra, opaca, nervis lateralibus utrinsecus 7-8 supra impressis infra prominentibus prope marginem conjunctis; petioli usque ad 5 cm. longi, basi et apice pulvinati. *Inflorescentiae* ♂ e ramis ciliatis ortae, capituliformes, brevissime pedunculatae, circiter 7 mm. diametro. *Sepala* 5-6, glabra. *Stamina* 5-6. *Fructus* non visus.

Cameroons Mt.: 160 m., "small shrub about 3-4 ft. high," fl. Jan. *Mann* 1205 (type).

XXII.—THE VARIABILITY OF THE CAMPHOR TREE IN FORMOSA. F. N. HOWES.

For many years it has been known that the common camphor tree (*Cinnamomum Camphora* Nees) is very variable in its yield. In some areas a high proportion of solid camphor accompanied by only a small amount of camphor oil results on subjecting any part of the tree—root, stem, or leaves—to steam distillation. It may be found elsewhere that only a small percentage of solid camphor along with large quantities of camphor oil are derived from distillation, or possibly oil only with no sign of solid camphor may be obtained. In the island of Formosa, which produces the bulk of the world's supply of camphor, this variation in yield of solid camphor is well known, but has recently been shown to be of a more complex nature than was formerly thought to be the case. Apart from this variation in the percentage yield of solid camphor great variation has been found to exist in the nature of the oils produced. Investigations in Formosa have shown that the oil

obtained from camphor trees which yield no solid camphor may belong to any one of three or more distinct types of oil, distinct from one another in physical properties and chemical composition. The existence in British Possessions of trees which yield oil only, notably trees in Mauritius, Dominica and St. Vincent, was dealt with in *Kew Bulletin*, 1921, pp. 129-135. Here no mention was made of the nature of the oil from these trees, and it was generally assumed at that time that such oils were analogous with true camphor oil, i.e., that obtained along with solid camphor in camphor distillation.

Oil-Yielding Trees.

Discussion in the present article is centred on those strains or races of *Cinnamomum Camphora* which do not yield solid camphor. With the exception of one of these, the "Shô-Gyû," the separate specific identity of which has now been established, all these "forms" or ecads of *Cinnamomum Camphora*—if they may be so termed—exhibit no outward morphological differences, and are botanically undoubtedly *Cinnamomum Camphora* Nees. The different "forms" might almost be regarded as separate physiological strains, except that as yet the extent to which climatic factors may influence their behaviour and the extent to which they breed true to type is not thoroughly understood.

The "Shô-Gyû" Tree (*Cinnamomum Kanahirai* Hay.) and its Oil.

The one exception referred to above is the tree producing the oil known in Formosa as, and described by Nagai* under the name of, "Shô-Gyû." It was formerly regarded as being *Cinnamomum Camphora* Nees, but has now been separated and described by Hayata† as a new species, *Cinnamomum Kanahirai* Hay.

The "Shô-Gyû" tree is said to exist in Formosa in more or less isolated belts parallel to but distinct from the areas of the true camphor tree. It occurs in mountain areas at altitudes of, roughly, from 5000 to 6500 feet: above this altitude the tree is displaced by Conifers. It is thought that it may later be found to extend all along the Central Mountain Range which runs north and south through Formosa. According to Nagai the trunk of the "Shô-Gyû" tree usually attains to a height of 40 to 50 feet, with a circumference at the base of from 15 to 20 feet. The tree is of rapid growth, and the trunks are generally entwined by lianes and covered with epiphytes. The bark is of a more brownish-red colour than that of true camphor, and the heartwood is whiter, while the wood is softer and more sappy and can be worked and chipped with ease. Although floral differences exist between "Shô-Gyû" and true camphor the trees are said to be outwardly very similar. In

* Investigations of the Shô-Gyû and Yu-Ju Oils produced in Formosa, by Kazuo Nagai. Monopoly Bureau, Govt. of Formosa. 1914.

† Ic. Pl. Formosa, iii, 159.

discussing a means of distinguishing "Shô-Gyû" from true camphor, in the absence of flowers, Nagai states, "The leaves of the 'Shô-Gyû' tree have a bright deep-green colour upon the surface and are much thicker than those of the camphor tree (a large one often measuring about 13 cm. in length and 4.5 cm. in width), and are slender in form with a particularly pointed apex which frequently reaches a length of 1 cm." He points out further that the terminal leaf buds of "Shô-Gyû" (1 cm. by .5 cm. in diameter) are larger than those of true camphor. A test which can readily be accomplished and one commonly used by camphor-wood cutters in Formosa is to shave small pieces from the sap wood, especially from the root, when the distinctive odour of "Shô-Gyû" as compared with true camphor will be recognised.

The yield of "Shô-Gyû" oil is estimated to be on an average about 2.5 per cent. of the wood used. It is usually colourless or slightly yellowish, with optical rotation always dextro-rotatory. Regarding its components the existence, according to Nagai, of citronellol, geraniol, safrol, sabinene, dipentene, α and γ -terpinene, terpineol-4 and eugenol is definite, whilst linalool, cardinene and formaldehyde are probably also present. From this analysis the oil is stated to resemble cardamom oil and to possess features in common with savin, nutmeg and even juniper oil, indicating that the oil deserves recognition as a possibly important essential oil of the future.

The "Yu-Ju" Tree (*Cinnamomum Camphora* Nees) and its Oil.

This oil is yielded by a tree which, as already pointed out, is identical in external form with *Cinnamomum Camphora*. The tree is indigenous to southern Formosa, and is not found at all in the northern half of the island. Where it exists it is known to the natives as "Yu-chhiu" or "Yu-Ju," signifying "oil tree." It occurs in dense tracts in certain areas, one of the largest of which is situated just to the west of the Central Mountain Range and adjoining one of the most dense of the "Shô-Gyû" areas. In distinguishing "Yu-Ju" trees from those yielding true camphor the camphor workers rely, as in the case of "Shô-Gyû," solely upon the smell of shavings taken from the root. According to reports the existing stocks of true "Yu-Ju" trees in Formosa are not considered to be very large.

The percentage of oil obtained from the wood of "Yu-Ju" trees varies considerably, but generally ranges between 2 and 3 per cent., though yields as high as 5 per cent. and of less than 1 per cent. are recorded. "Yu-Ju" oil is generally of a light-yellow or golden colour or more rarely yellow-green. It resembles camphor oil closely in physical properties, but is weaker in optical activity. Amongst its components are numbered furfural, camphene, α -pinene, cineol, dipentene, α -terpineol, safrol and eugenol: probably other varieties of phenols and terpenes are also present. Richness in

cincol is the chief feature and characteristic of "Yu-Ju" oil and the main point of difference from camphor oil. An entire absence of linalool is another interesting feature and a strong point of contrast with "Shiu" oil, where linalool is always present.

Allied to true "Yu-Ju" is a form of "Yu-Ju" occurring in certain areas which yield small amounts of solid camphor with the "Yu-Ju" oil. It has been regarded as a distinct form and referred to as the "Yu-Ju Camphor Tree."

The "Shiu" Tree (*Cinnamomum Camphora*) and "Shiu" Oils.

The "Shiu" tree, identical botanically, as in the case of the "Yu-Ju" tree, with the true camphor tree, occurs in Formosa in broad-leaved forest areas, roughly from the centre to the north of the island. The word "shiu" is used in Formosa for both the tree and the oil, whilst it is commonly known to the Chinese as "Tswan Chiu," and to the Japanese as "Kusa-abura," signifying "ill-smelling oil," owing to its distinctive odour and the general idea held formerly that the oil was valueless. Outwardly "Shiu" and true camphor trees appear identical, and to distinguish between them when growing intermixed is a matter of difficulty, even for expert and experienced natives. Suggested points of dissimilarity are, that in the case of the "Shiu" trees there is a more open and ragged crown of leaves, giving the impression that the leaves would be less numerically per unit area, and that the leaves of "Shiu" fall earlier than do those of true camphor. However, the only sure method of distinction and the one used by natives is to crush the leaves and to distinguish by the odour, that of "Shiu" being peculiar and distinctive. This peculiar odour is attributed to the presence in "Shiu" oil of linalool and geraniol, substances never found in true camphor oil. Chips or shavings from the trunk or root can of course be distinguished in the same way.

"Shiu" trees and the fact that the wood yielded no camphor on steam distillation were well known to the old Chinese camphor workers, who being desirous of obtaining camphor left them entirely alone. Consequently in certain areas, owing to the continued cutting out of true camphor trees, the proportion of "Shiu" has become much greater than formerly. Some of the largest areas of "Shiu" are found in the mountainous areas in the extreme north of the island. Here "Shiu" trees are generally interspersed irregularly with a few trees of true camphor, and are most numerous in the lowermost slopes of the valleys.

The percentage of oil obtained from the tree may vary from 2 to as much as 9 per cent., being dependent upon what part of the tree is used in the distillation and the type of tree. It has been found that on an average the roots contain twice as much oil as does the trunk, whilst the oil distilled from the centre of the trunk is always heavier and less in quantity than that from the periphery. The greatest quantity of oil is obtained from the basal region of the trunk, the amount decreasing towards the branches, twigs and

leaves. The oil obtained from the leaves is reputed to be the finest-smelling and most fragrant.

"Shiu" oils exist in different forms according to the proportions of the various components present, but all possess the same characteristic odour. Linalool is always present in "Shiu" oils, but entirely absent in camphor oil. Although linalool is the chief constituent of most "Shiu" oils there are some, particularly those from the more southern limits of the "Shiu" areas, in which camphor may be present even to the extent of being in excess of the linalool. The presence of these two substances determines the optical activity of the oil, for those with a high proportion of linalool are strongly laevo-rotatory, whilst those with camphor in excess are dextro-rotatory. Laevo-rotatory "Shiu" oils are found mainly in the northern part of Formosa and dextro-rotatory ones in the centre of the island.

"Shiu" oils may vary in colour from pale-yellow to dark-brown, though they are almost colourless when pure. Besides linalool, and in less frequent cases camphor, other components of "Shiu" oil have been found to be pinene, cincol, dipentene, terpeneol, geraniol, safrol, eugenol, cardinene, and lower aliphate aldehydes. The possible uses of "Shiu" oil are dependent upon whether linalool or camphor predominates in the oil. Uses for those with linalool in excess are as a basis for making pure linalool, various organic acid estyls, and citral oil. Those with a large proportion of camphor may be used as a source of crystalline camphor, separation being effected by fractional distillation, whilst the resulting light and heavy oils would be of the same nature as "white" and "red" camphor oils.

Factors influencing Nature of Yield of *Cinnamomum Camphora*.

To what extent climatic conditions may be responsible for the varying behaviour of *Cinnamomum Camphora* as exemplified above has been a matter of conjecture since the phenomenon first became known, and the fact established that it was *Cinnamomum Camphora* and not other species of *Cinnamomum* that were being dealt with. A study of the climatic conditions prevailing in Formosa and its topography, whilst throwing much light on the subject, fails to explain entirely the occurrence of these various forms. And whilst the belief that the problem can be explained away entirely on the basis of climate and environment is strengthened by the results of recent planting experiments in Formosa, there are at the same time sound arguments in favour of the opinion that it is more a question of heredity that is responsible for the variety of products yielded. It is proposed merely to mention briefly and discuss facts which appear to have a bearing on the subject.

In Japan trees of *Cinnamomum Camphora* yield camphor throughout, the various oil-yielding forms of Formosa being

non-existent there. The southernmost areas of Japan are at a latitude of 32° N. as against 22°-23° N. for those of Formosa, the latter being therefore within the Tropics and decidedly tropical in nature. This contrast in the behaviour of the camphor tree in Japan and in Formosa, combined with the fact that in certain other areas in the Tropics (e.g., Mauritius, St. Vincent, and Dominica), the camphor tree was found to yield oil only, led to the belief that possibly tropical conditions for some reason or other were inimical to the production of solid camphor by the tree. This idea, however, is now rather discredited by the fact that in most tropical countries where the camphor-yielding tree has been grown solid camphor has now been obtained. In some of these countries solid camphor and oil-yielding forms have been found to be present, growing at the same altitudes and under apparently identical conditions.

In southern Formosa areas have of late years been planted up with young camphor trees grown from seed from known solid-camphor yielding trees in Japan. It is now being found apparently that of these trees some yield oil only, while others yield solid camphor, and the former if anything preponderate. This points to climatic factors being the cause of trees producing oil only, which would normally—under their home conditions—yield camphor. It does, however, appear strange that some and not all the trees should be so affected.

Recent information from Formosa indicates that considerable variation in the oil of an individual tree may be found to exist, and that two of the distinct oils already described might be found in different parts of the same tree. For instance trees which yield camphor from one side of the trunk and “Yu-Ju” oil from the other have been noted, also trees yielding “Yu-Ju” on the one side and “Shiu” oil on the other. That such should be the case is remarkable, and, together with the fact that true camphor and some of the oil-yielding trees grow side by side in parts of Formosa, can hardly be accounted for by climatic influence. In Formosa a far greater proportion of the trees yield solid camphor in the north and north-east than in the more southern areas. It is here interesting to note that there is a mean annual difference in temperature of 11 degrees between the extreme north and south of the Island, the northern portion being subject to a severe winter and under the influence of a strong north-east monsoon.

From tests made elsewhere with camphor under cultivation it is apparent that conditions ideal for growth—high rainfall, rich alluvial soil, sheltered position, etc.—frequently result in a low camphor yield compared with similar trees growing in less ideal and more exposed situations. In the same manner trees wholly or partly shaded have been found to yield less than those exposed to full sunlight. It would seem therefore that conditions of climate, rainfall, aspect and soil are all liable to influence the behaviour of *Cinnamomum Camphora* to a greater or less extent,

though it may also be that, in some cases, the genetical make up of the tree is such that its behaviour is not easily influenced by outside factors. In this case the various forms of the camphor tree already discussed might be regarded as distinct physiological strains. That these strains breed true within limits is suggested by the fact that the different forms are to be found growing side by side in Formosa, the forms having become in some way intermixed. On the other hand, that the strains are far from stable is indicated by what resulted from planting the seed of Japanese camphor-yielding trees in South Formosa, where, as already stated, some trees yielded camphor and some only oil. Here it would seem as though the young trees with a fairly stable constitution were the ones that continued to yield camphor, while those less stable had their hereditary tendencies overcome by the influence of climate and environment and yielded oil only in place of solid camphor.

The occurrence of two different oils, or an oil and solid camphor, on different sides of the trunk of the same tree cannot be readily explained, but is suggestive of hybridization between two of the more distinct forms having taken place. Another suggestion presenting itself is, that should such trees be growing in positions whereby a greater degree of exposure to the weather on the one side of the trunk than on the other be experienced, this irregularity of exposure may be the cause. Such disturbing factors, however, as continued and increased sunshine, or driving winds and the consequent lowering of temperature, are not unlikely to be responsible for physiological and chemical changes taking place in the tissues affected by these factors.

In Mauritius, where the camphor tree occurs abundantly, though introduced, it was found some years ago that all attempts at producing solid camphor met with failure. The trees yielded oil only. This was thought at first to be due probably to the effects of local conditions—to climate or elevation—under which the trees first experimented with were grown. Subsequent experiments, however, in which distillations were made from trees in various parts of the island and at various altitudes, still gave negative results. The trees were shown conclusively to be *Cinnamomum Camphora* Nees, and it was concluded that either the climate of Mauritius was generally unsuited to the camphor tree, in so far as yielding solid camphor was concerned, or that the Mauritius trees were all of common descent from ancestors which did not yield solid camphor. That the trees were all of common stock was shown to be extremely likely, the probability being that they were all descended from a consignment of seed introduced by Abbé Gallois from China and planted at the Pamplémousses Gardens and in the Le Reduit Grounds.

It is, however, interesting to record that further distillation tests conducted later on some thirty or more trees growing at Le Reduit and Curepipe disclosed the fact that one tree, “Curepipe

No. 6," yielded solid camphor in quantity, all the others yielding oil only as before. It was found that the crushed leaves of this tree bore a strong camphor-like smell, quite distinct from that of all the other trees examined.

Seed from this solitary camphor-yielding tree (Curepipe No. 6) was carefully collected and sown. From it some sixteen young trees, four to five years old, are now established in the Pamplemousses Gardens. Distillations have been made from a number of these trees, and it has been found that all without exception yield a greater or less quantity of solid camphor. It is interesting here to note that Pamplemousses is at an altitude of about 200 feet above sea level as against 1800 feet for Curepipe, with average temperatures two to three degrees warmer and rainfall about half that of Curepipe.

The variable behaviour of the camphor tree appears therefore to be controlled partly by climatic and environmental factors and partly by heredity, and until further information and the results of more detailed experiment and investigation become available the question must perforce remain an open one.

Thanks are due to Mr. W. R. Price, who has travelled extensively in Formosa, for information regarding "Shiu" trees, and to Dr. Tempany, Director of Agriculture, Mauritius, for details concerning investigations on camphor and on oil-yielding trees on that island.

XXIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXI. E. T. GEDDES.

Argostemma albovenatum Geddes [Rubiaceae-Hedyotideae]; ab *A. courtallense* Arn., foliis maioribus albo-venosis, pedicellis brevioribus differt.

Herba erecta, 7-14 cm. alta. *Folia* 4, verticillata, duo magna, petiolata, inter se inaequalia, duo parva, sessilia, maiora ovata, apice obtusa, basi lata, 2.5-9 cm. longa, 2.5 cm. lata, supra sicco viridia, glabra, venis costaeque alba, subtus sicco pallida, minute et sparse hirsuta, margine ciliata, nervis lateralibus utrinque 7-8, petiolis 2 mm. longis suffulta, minora lanceolata, 1-1.7 cm. longa, 0.5-0.8 cm. lata, supra minute, subtus albo-hirsuta, nervis lateralibus utrinque 4. *Inflorescentia* terminalis, pedunculo 1.5-4 cm. longo glabro suffulta, pedicellis 2-4 mm. longis hirsutis bracteolatis; bracteolae 4, verticillatae, ovatae, 5 mm. longae; flores pauci, umbellati. *Calyx* extra hirsutus, intra glaber, campanulatus; lobi 4, 2 mm. longi; tubus 1 mm. longus, 1.5 mm. diametro. *Corolla* alba (ex Kerr); lobi 4, valvati, glabri, 1 mm. longi, 1.5 mm. lati; tubus 1.5 mm. longus. *Stamina* 4, inter se libera, ad basem corollae tubi affixa; antherae obtusae, exsertae, 1 mm. longae; filamenta 0.75-1 mm. longa. *Stylus* brevis, fili-

formis, 1 mm. longus; stigma bifidum, lobis divaricatis 1.25 mm. longis. *Ovarium* 1 mm. diametro, glabrum.

Pattani, Bukit, 200 m., damp rock by stream, Kerr 7117.

Argostemma Craibianum Geddes [Rubiaceae-Hedyotideae]; ab *A. plumbeo* Craib, corollae tubo brevior differt.

Herba erecta, circa 6 cm. alta; caulis pallido-hirsutus, foliis duobus squamiformibus linearibus sessilibus 1.5 mm. longis instructus. *Folia* 4, verticillata, duo magna breviter petiolata, duo breviter sessilia, maiora inter se inaequalia, rotundato-ovata, apice brevissime acuta vel rotundata, basi lata et truncata, 4-8.5 cm. longa, 2.5-6 cm. lata, supra sicco fusca, valde hirsuta, marginibus etiam hirsuta, subtus sicco pallida, in nervis venisque hirsuta, nervis lateralibus utrinque circa 7, conspicuis, petiolis alatis hirsutis 2 mm. longis; folio minora ovata vel lanceolata, acuta, pagina utraque hirsuta, 0.5-1.5 cm. longa, 0.2-0.8 cm. lata, nervis lateralibus utrinque 3-4. *Inflorescentia* terminalis, pedunculo glabro 1.2-2.5 cm. longo suffulta; flores umbellati, 4-multi, 4-5 mm. longi, pedicellis 4-6 mm. longis bracteolatis suffulti; bracteolae 4, verticillatae, ovatae, glabrae, 3-4 mm. longae, sessiles. *Calyx* parvus; lobi 4, lati, venosi, margine minute dentati, 2.5 mm. longi, 2 mm. lati, extra puberuli, intra glabri; tubus 0.5 mm. longus. *Corolla* alba (ex Kerr); lobi 4, glabri, venosi, ovati, acuti, apicibus iuventute saepe reflexis, extra inconspicue hirsuti, 3 mm. longi; tubus 0.5-0.75 mm. longus. *Stamina* 4, libera; antherae 2 mm. longae, 0.5 mm. latae, apice obtusae, lineares; filamenta basi latiora, 1.5 mm. longa, 1 mm. supra basem corollae tubi inserta. *Stylus* basi latus, 2.5 mm. longus; stigma parvum, capitatum. *Ovarium* circa 1 mm. diametro, puberulum.

Pattani, Banang Sta, 100 m., on rocks by stream in evergreen forest, Kerr 7392.

Argostemma ebracteolatum Geddes [Rubiaceae-Hedyotideae]; ab affini *A. plumbeo* Craib, foliis angustioribus, floribus pentameris differt.

Herba erecta, 6-14 cm. alta, foliis pedunculis pedicellis calycibusque hirsutis. *Folia* 4, verticillata, ovata vel ovato-lanceolata, apice acuta, basi cuneata, 1.7-7 cm. longa, 0.5-2.5 cm. lata, sicco supra viridia, subtus pallide fusca, nervis lateralibus utrinque circa 4 pagina inferiore conspicuis, membranaceae; petioli hirsuti, 2-5 mm. longi; stipulae ovatae, hirsutae, integrae, 2 mm. longae. *Inflorescentia* terminalis, pedunculo hirsuto 0.7-2.5 cm. longo simplice vel dichotome cymoso suffulta; flores 3 vel numerosi, 4 mm. longi, ebracteolati, pedicellis hirsutis 1-4 mm. longis suffulti. *Calyx* extra hirsutus; lobi 5, lanceolati, 2 mm. longi; tubus 0.5 mm. longus. *Corolla* alba (ex Kerr), fere campanulata, lobis 5 triangularibus latis atque acutis 1 mm. longis marginibus hirsutis, tubo 2.5 mm. longo. *Stamina* 5, inter se libera, exserta, ad basem corollae tubi affixa; antherae oblongae, basi obtusae,

* Continued from K.B. 1927, p. 72.

apice acutae sed vix apiculatae, 1.75 mm. longae, 0.5 mm. latae; filamenta sicco nigra, 1.5 mm. longa. *Stylus* filiformis, 2.5 mm. longus; stigma parvum capitellatum; ovarium 0.75 mm. diametro, hirsutum, ovulis numerosis.

Chiengmai, Mè Chêm, 500 m., rocks by stream in evergreen forest, *Kerr* 6276 A.

Argostemma fragile *Geddes* [Rubiaceae-Hedyotideae]; ab *A. stellato* Craib, foliis ellipticis, pedunculis et pedicellis brevioribus, corollae lobis brevioribus, antheris in columnam brevioris conniventibus differt.

Herba fragilis, 11 cm. alta, radice brevi; caulis foliis duobus squamiformibus instructus. *Folia* 4, inter se inaequalia, verticillata, ovato-lanceolata vel lanceolata, apice acuminata, basi cuneata, 3.5–5 cm. longa, 1–1.3 cm. lata, membranacea, supra sicco viridia, prope marginem hirsuta, subtus sicco pallida, glabra, nervis lateralibus utrinque 9, sessilia; stipulae 4, verticillatae, 2.5 mm. longae, interdum deciduae. *Inflorescentia* terminalis, pedunculis solitariis vel tribus 1.5 cm. longis; flores tres, 4.5 mm. longi; pedicelli 6–12 mm. longi; bracteolae lineares, 2.5 mm. longae. *Calyx* glaber; lobi 5, triangulares, 1 mm. longi; tubus 0.5 mm. longus. *Corolla* glabra, alba (ex *Kerr*); lobi 5, valvati, acuti, 5 mm. longi; tubus 0.5 mm. longus. *Stamina* 5; antherae in columnam corollae paulo brevioris conniventes, 3 mm. altae; filamenta 1 mm. longa, basi corollae tubi affixa. *Ovarium* 0.5 mm. diametro, glabrum; stylus filiformis, 3.5 mm. longus stigmate capitellato.

Mè Hawng Sawn, Doi Pêpo, 900–1000 m., on trunks of trees in evergreen forest, *Kerr* 6179.

Argostemma laxum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. verticillato* Wall., caule ramoso, pedunculis longioribus, floribus maioribus differt.

Herba erecta, 7–15 cm. alta, gracilis; caules solitarii vel pauci, sicco nigri, glabri, tenues, foliis duobus squamiformibus linearibus ciliatis medium versus instructi. *Folia* 4–6, verticillata, ad caulis apicem evoluta, ovato-lanceolata vel lanceolata, apice acuta vel acuminata, basi cuneata et inaequalia, 1.5 cm. longa, 0.6–1.5 cm. lata, crasse membranacea, supra sicco fusco-viridia, pilis crassis brevibus ad costam et prope marginem instructa, subtus sicco pallide fusca, glabra, nervis lateralibus utrinque 5–10 vix conspicuis prope marginem arcuatis, aut sessilia aut petiolata; stipulae duae, ovato-rotundatae, 2–3 mm. longae, integrae, sessiles. *Inflorescentia* terminalis, umbellato-paniculata, laxa, pedunculo crasso glabro 2–4.5 cm. longo suffulta; bracteolae sessiles, lineares, 2 mm. longae; flores solitarii vel ad quatuor, 1 cm. longi, pedicellis glabris 0.6–1.8 cm. longis suffulti. *Calyceis* glabri lobi 5, triangulares, 0.75 mm. longi, tubus 0.75 mm. longus. *Corollae* albae medio rubicundae (ex *Kerr*) lobi glabri, lineares, apiculati, 5–7.5 mm. longi, venosi, margine revoluti, tubus 1.5 mm. longus.

Stamina 5, inter se libera, exserta; antherae magnae, fere lineares, basi obtusae, 5.5 mm. longae, 0.5 mm. latae; filamenta valida, 2 mm. longa. *Ovarium* 1 mm. diametro, glabrum; stylus filiformis, staminibus subaequaltus, 7 mm. longus; stigma parvum, capitellatum.

Doi Angka, 1500–1800 m., on mossy tree trunks, *Kerr* 6334.

Argostemma parvum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. verticillato* Wall., foliis 6-verticillatis differt.

Herba erecta, 5–10 cm. alta, fragilis, glabra. *Folia* 6, verticillata, lanceolata, apice obtusa, basi longe cuneata, 1–3.5 cm. longa, 0.3–0.7 cm. lata, supra sicco luteo-viridia, glabra, subtus ad marginem et ad costam hirsuta, nervis lateralibus obscuris, petiolis brevissimis. *Inflorescentia* terminalis, pedunculo 2–3.2 cm. longo medio bracteato suffulta; flores 2–3, pedicellis tenuibus 8–13 mm. longis basi bracteolatis suffulti. *Calyx* hirsutus; lobi 5, 0.25–4 mm. longi; tubus 1 mm. longus. *Ovarium* 1.5 mm. diametro, glabrum.

Kaw Chang, Salak Pet, 10 m., rocks by stream in evergreen forest, *Kerr* 9230.

Argostemma pubescens *Geddes* [Rubiaceae-Hedyotideae]; ab *A. picto* Wall., foliis angustioribus et minoribus, nervis paucioribus, calyce minore differt.

Herba erecta, parva atque tenuis, 5–11 cm. alta, inferne nuda. *Folia* 6, duobus inferioribus oppositis minoribus petiolatis, aliis verticillatis petiolatis vel sessilibus lanceolatis vel ovato-lanceolatis apice acutis basi cuneatis inaequilateralibus 1–3.7 cm. longis 0.6–1.8 cm. latis supra sicco fusco-viridibus hirsutis subtus pallide fuscis nervis costaque dense hirsutis, nervis lateralibus utrinque 7–10 prope marginem arcuatis, petiolis glabris, lamina decurrente. *Inflorescentia* terminalis, pedunculo hirsuto 2.5 mm. longo suffulta; flores 2–12, 4–5 mm. longi, bracteolati, pedicellis hirsutis 3–6 mm. longis suffulti. *Calyx* extra hirsutus, intra glaber; lobi 5, triangulares, 1.5 mm. longi; tubus 0.75 mm. longus. *Corolla* alba (ex *Kerr*), extra hirsuta; lobi 5, acuti, 1.5 mm. longi, basi 2 mm. lati; tubus 2 mm. longus. *Stamina* 5, inter se libera, exserta, ad basem corollae tubi affixa; antherae basi rotundatae, apice apiculatae, 2.25 mm. longae; filamenta 1.25 mm. longa. *Ovarium* 1 mm. diametro pubescens; stylus filiformis, 2.5 mm. longus; stigma minutim apice bifidum.

Chiengmai, Doi Sutep, damp rocks by stream, *Kerr* 3298.

Argostemma pulchellum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. stellato* Craib, foliis hirsutis, floribus numerosis, corollae lobis brevioribus differt.

Herba erecta, 4–8 cm. alta. *Folia* 4, verticillata, rotundato-ovata, apice minime acuta vel obtusa, basi lata vel cuneata, 1–2.75 cm. longa, 0.4–2 cm. lata, supra sicco fusco-viridia, hirsuta, subtus pallide fusca, haud forte hirsuta, nervis lateralibus utrinque

circa 5, pagina utraque conspicuis. *Inflorescentia* terminalis; flores 1-4, pedicellis bracteolatis hirsutis 6-8 mm. longis suffulti. *Calyx* extra hirsutus; lobi 5, late ovati, 4 mm. longi, 0.5 mm. lati; tubus 0.5 mm. longus. *Corolla* alba (ex *Rabil*); lobi 5, lanceolati, venosi, acuti, 4 mm. longi, 1.5-2 mm. lati; tubus 1 mm. longus. *Stamina* 5; antherae in columnam conniventes, 3.5-4 mm. longae; filamenta brevissima. *Stylus* tenuis; stigma columnam staminorum paulo superans, capitatum. *Ovarium* 1 mm. diametro, puberulum.

Kaw Chang, Salak Kawk, rocks above sea level, *Rabil* 35.

Argostemma repens *Geddes* [Rubiaceae-Hedyotideae]; ab *A. picto* Wall., foliis hirsutis, caule multo longiore, pedunculo glabro longiore differt.

Herba erecta, 11-25 cm. alta, radice repente 9 cm. longa; caulis glaber nisi prope apicem ubi hirsutus. *Folia* 4, verticillata, inter se fere aequalia, elliptica vel obovata, apice brevissime acuta vel apiculata, basi inaequalia, cuneata, 1.8-5.5 cm. longa, 0.9-3.5 cm. lata, supra sicco fusco-viridia, longis pilis instructa, subtus albo-viridia, ad nervos costamque hirsuta, margine hirsuta, nervis lateralibus utrinque circiter 9; folia duo petiolata, duo sessilia, petiolis hirsutis 2-4 mm. longis. *Inflorescentia* terminalis, pedunculo hirsuto 1.7-2.3 cm. longo suffulta; flores numerosi, bracteolati, 5 mm. longi, pedicellis 1-4 mm. longis suffulti; bracteolae 2 mm. longae. *Calyx* hirsutus; lobi 5, triangulares, glabri, venosi, 1 mm. longi, 0.75 mm. lati; tubus 0.5-0.75 mm. longus. *Corolla* alba (ex *Kerr*); lobi extra hirsuti, intra glabri, venosi, ovati, 1.5-2 mm. longi; tubus 2.5 mm. longus. *Stamina* 5, inter se libera, exserta, ad basem corollae tubi affixa; antherae basi rotundatae, apice cuneatae vel acutae, 2 mm. longae; filamenta sicco nigra, valida, 1-1.25 mm. longa. *Ovarium* 1 mm. diametro, puberulum; stylus filiformis, circa 3 mm. longus; stigma parvum, capitellatum.

Nakawn Sawan, Kao Pado, 800-900 m., rocks in evergreen forest, *Kerr* 6068.

Argostemma rotundifolium *Geddes* [Rubiaceae-Hedyotideae]; ab affini *A. picto* Wall., foliis maioribus subrotundatis differt.

Herba erecta, 15-25 cm. alta. *Folia* 4, verticillata, duo magna, duo parva, maiora inter se aequalia, rotundata, apice rotundata vel obtusa, basi lata vel vix cordata, 4.5-9 cm. longa, 5-9 cm. lata, supra sicco viridia, sparse hirsuta, nitentia, subtus sicco pallide viridia, fere glabra, dentibus parvis, petiolis latis alatis 2 mm. longis suffulta, nervis lateralibus utrinque 4-6 conspicuis albis, minora sessilia, lanceolato-ovata vel ovata, acuta, 1 cm. longa, 0.6-1 cm. lata, vix hirsuta. *Inflorescentia* terminalis, umbellata, pedunculo ebracteato glabro 3.5-6 cm. longo suffulta; flores 8-18, 6 mm. longi, pedicellis glabris bracteolatis 7-14 mm. longis suffulti; bracteolae 6, verticillatae, marginibus denticulatae, connatae, lanceolatae, 5-6 mm. longae, 2 mm. latae. *Calyx* denticulatus;

lobi 5, triangulares, extra hirsuti, intra glabri, 1 mm. longi, 0.75 mm. lati; tubus brevissimus, circa 0.25 mm. longus. *Corolla* alba (ex *Kerr*), extra hirsuta, intra glabra; lobi 5, valvati, lanceolati, 4 mm. longi; tubus 0.25 mm. longus. *Stamina* 4; antherae in columnam conniventes, mucronatae, 2.75 mm. longae; filamenta 1.25 mm. longa. *Stylus* filiformis, 4.5-5 mm. longus; stigma exsertum, capitatum, 0.25 mm. diametro; ovarium 1 mm. diametro, puberulum.

Pattani, Betong, 700 m., evergreen forest, *Kerr* 7470.

Argostemma setosum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. Curtisii* King, caule brevior, foliis lanceolatis brevioribus margine setoso-ciliatis differt.

Caulis 5-16 cm. longus, simplex, parte dimidia inferiore defoliatus. *Folia* opposita, inter se valde inaequalia, altero 2.5-3 cm. longo altero circa 0.8 cm. longo, lanceolata, apice acuta, basi cuneata, membranacea, supra sicco luteo-viridia, margine setoso-ciliata et ad costam setis 1 mm. longis instructa, subtus glabra, nervis lateralibus utrinque 8-9 nec conspicuis nec ad marginem pervenientibus; petioli 3 mm. longi, glabri; stipulae triangulares, acutae, 5 mm. longae, sessiles. *Inflorescentia* terminalis, pedunculis glabris 12 mm. longis; flores 2-5; alabastra 7 mm. longa, 3 mm. lata, pedicellis 7 mm. longis glabris medio-bracteolatis; bracteolae 2-3 mm. longae; bracteae 5 mm. longae. *Calyx* campanulatus; lobi 5, 2.5 mm. longi, acuti, glabri; tubus circa 0.5 mm. longus. *Corolla* alba (ex *Dr. Smith*); lobi 5, valvati, acuti, 7 mm. longi; tubus 1.5 mm. diametro. *Stamina* 5; antherae in columnam conniventes, acutae, 7.5 mm. longae, 1 mm. latae; filamenta corollae tubi basi affixa, 1.5 mm. longa. *Ovarium* 1 mm. diametro, glabrum; stylus tenuis, 6-7 mm. longus; stigma lineare, 0.5-1 mm. longum, columnam staminorum paulo superans.

Rawnpibun Hill, 830 m., on stone, *Dr. Eryl Smith* 449 (type); Kao Ram, 400 m., on stone in stream, *Dr. Eryl Smith* 561.

Argostemma umbellatum *Geddes* [Rubiaceae-Hedyotideae]; ab *A. plumbeo* Craib, foliis ovatis, floribus magis numerosis, caule longiore differt.

Herba erecta, 10-14 cm. alta. *Folia* 4, verticillata, membranacea, 2 maiora ovato-rotundata, apice acuta vel rotundata, basi lata, 2.5-7 cm. longa, 0.5-3 cm. lata, paulo inaequalia, supra viridi-olivacea et sparse hirsuta, subtus pallide viridia, dense atque pallide hirsuta in costa nervisque, nervis lateralibus utrinque 5-7, petiolis latis et hirsutis 2-2.5 mm. longis suffulta, 2 breviora sessilia vel subsessilia, aequalia, lanceolato-ovata, 1.5-2.5 cm. longa, 0.6-1.2 cm. lata, nervis lateralibus utrinque 4-5. *Inflorescentia* terminalis, pedunculo glabro 2-3 cm. longo suffulta, 3-multiflora, umbellata, 3.5 mm. longa, pedicellis hirsutis bracteolatis 2.5-5 mm. longis. *Calyx* hirsutus, lobis 4 rotundato-ovatis ad marginem hirsutis venatis 1.5 mm. longis, tubo 0.5 mm. longo. *Corolla* alba (ex *Winit*); lobi 4, breves, unicostati, acuti, glabri,

1-1.5 mm. longi; tubus 2-2.5 mm. longus. *Stamina* 4, libera; antherae lineares, apice rotundatae, 1.25 mm. longae, 0.5 mm. latae; filamenta 1.25 mm. longa, 0.25 mm. supra corollae tubi basem affixa, antheris 0.25 mm. exsertis. *Ovarium* 1 mm. longum et latum; stylus filiformis, 1.75 mm. longus; stigma parvum, capitellatum.

Lampang, 400 m., shady places near stream, *Winit* 746.

Mussaenda cuspidata *Geddes* [Rubiaceae-Mussaendeae]; a *M. Hossei* Craib, foliis elliptico-lanceolatis, petiolis brevioribus, calycis lobo aucto angustiore, corollae tubo brevior differt.

Frutex erectus vel scandens (ex *Winit*); ramuli iuventute ferrugineo-hirsuti. *Folia* elliptico-lanceolata, apice longe acuminata, basi obtusa, 4-9 cm. longa, 2-3 cm. lata, supra hirsuta, fusca, subtus tomentosa, pallida, nervis lateralibus utrinque circa 7 supra conspicuis subtus prominentibus, chartacea vel subcoriacea; petioli breves, 0-3 mm. longi, fusco-hirsuti; stipulae bifidae, acutae, circa 9 mm. longae, hirsutae. *Inflorescentia* terminalis, cymosa, pedunculis dense hirsutis. *Calyx* dense hirsutus; lobi 5, lineares, 1.5-2 mm. longi, hirsuti, lobo aucto 3 cm. longo 2.3 cm. lato pubescente petiolo hirsuto. *Corolla* aurantea (ex *Winit*); tubus 2.1 cm. longus, extra hirsutus, intra pilis luteis ad situm antherarum tectus; lobi 5, oblongi, cuspidati, 2.5 mm. longi, 2 mm. lati, extra hirsuti. *Stamina* 5, in parte corollae tubi dilata posita; antherae lineares, vix 4 mm. longae; filamenta brevissima; prope antherarum bases affixa. *Stylus* fere filiformis, basi quam apice latior, 6.25 mm. longus, glaber; stigmata duo, linearia, 2.5 mm. longa, glabra. *Baccus* 10-12 mm. longus, 6-6.5 mm. latus, calyce persistente, epicarpio lenticellato.

Chiengmai, Mè Kang, 950 m., old clearing in evergreen forest, *Winit* 1310.

Mussaenda ferrea *Geddes* [Rubiaceae-Mussaendeae]; a *M. Hossei* Craib, foliis ellipticis, corollae lobis paulo longioribus, corollae tubo paulo brevior differt.

Frutex in arboribus scandens (ex *Kerr*); ramuli iuvenes molliter et dense hirsuti, mox pubescentes lenticellati. *Folia* elliptica, apice acuminata, basi rotundata vel cuneata, 6.7-10 cm. longa, 3-3.8 cm. lata, supra sicco viridia, dense hirsuta, subtus sicco pallide viridia, pilis tomentosis albis instructa, nervis lateralibus utrinque circa 8 pagina utraque conspicuis; petioli 5-10 mm. longi, fusco-hirsuti; stipulae bifidae, 4-5 mm. longae, dense fusco-hirsutae. *Inflorescentia* terminalis; cymus e floribus compactis compositus. *Calyx* sericeo-hirsutus; lobi 5, inter se inaequales, 1-2 mm. longi, 0.75 mm. lati, lobo aucto fere orbiculari 3.5 mm. diametro. *Corolla* aurantea (ex *Kerr*); tubus 2 cm. longus, extra sericeo-hirsutus, intra in parte tubi dilata pilis luteis tectus; lobi 5, fere orbiculares, cuspidati, 3.5 mm. longi, 2.7-3 mm. lati, extra sericeo-hirsuti. *Stamina* 5, tubo corollae

parte dilata affixa, inclusa; antherae lineares, acuminatae, basi bifidae, 4 mm. longae. *Stigma* bilobum, 2.5-3 mm. longum; stylus filiformis, 5 mm. longus.

Korat, Kao Lêm, 700 m., climbing on trees at edge of evergreen forest, *Kerr* 9974.

Mussaenda longisepala *Geddes* [Rubiaceae-Mussaendeae]; ab affini *M. Teysmanniana* Miq., floribus minime hirsutis, calycis lobis brevioribus differt.

Frutex scandens (ex *Kerr*); ramuli iuvenes hirsuti, mox ferrugineo-hirsuti. *Folia* ovato-lanceolata vel ovata, apice acuminata basi cuneata, lamina decurrente, 6-12 cm. longa, 2.2-5.9 cm. lata, supra sicco fusco-viridia, sparse hirsuta, subtus sicco pallida, pilis longis densis praesertim in costa et nervis tecta, nervis lateralibus utrinque 9-11 pagina utraque prominentibus, nervis transversis conspicuis inter se parallelis; petioli 5-17 mm. longi, pubescentes, pilos longos in axillis ferentes; stipulae bilobae, 7-9 mm. longae, pubescentes. *Inflorescentia* terminalis, pedunculis partialibus divaricatis hirsutis; pedicelli 2-5 mm. longi, pubescentes; bractae lanceolatae, prope flores 6-8 mm. longae, prope basem cymii breviores. *Calyx* hirsutus; lobi 5, anguste lanceolati, 6-7 mm. longi, lobo aucto albo (ex *Kerr*); rotundato-ovata apice acuminata basi truncata 6.5-11 cm. longo 5-9 cm. lato nervis pubescente. *Corolla* aurantea (ex *Kerr*); tubus 2.5 cm. longus, extra hirsutus, intra ore pilis luteis barbatus; lobi 5, valvati, orbiculares, cuspidati, 4 mm. longi. *Stamina* 5, in parte corollae tubi dilata posita, inclusa; antherae lineares, apiculatae, basi bifidae, 4.5-5 mm. longae; filamenta 1 mm. longa. *Stigma* bilobum, lineare, 2 mm. longum; stylus vix 2 cm. longus, glaber.

Pattani, Bukit, under 50 m., climbing in scrub, *Kerr* 7139.

Mussaenda mollis *Geddes* [Rubiaceae-Mussaendeae]; ab affini *M. Wrayi* King, corolla pro rata longiore differt.

Frutex scandens; ramuli primo parum compressi, pallide tomentosi et pilis divergentibus instructi, cito pallide ferruginei, mox subferrugineo-tomentosi et teretes, annotini glabri, brunnei vel cinereo-brunnei, conspicue lenticellati, saepe striati. *Folia* ovata, ovato-lanceolata vel interdum lanceolata, apice longe acute acuminata vel subacuminata, basi acuminata vel rarius late cuneata, 4.5-11.5 cm. longa, 2.3-4.5 cm. lata, chartacea, pagina superiore sericea, inferiore pallidiora, tomentosa praeterea ad costam nervosque laterales pilis longiusculis tecta, nervis lateralibus utrinque 9-14 supra conspicuis subtus prominulis, nervulis pagina utraque obscuris, margine ciliata; petioli 3-10 mm. longi, indumento ei ramulorum simili tecti; stipulae per annum persistentes, bifidae, 5-6 mm. longae, dense adpresse hirsutae. *Corymbi* terminales, usque ad 6 cm. diametro et 4 cm. longi, pedunculo communi rarissime evoluto, pedunculis partialibus tribus ad 10 mm. longis inter se subaequilongis vel mediano lateralibus conspicue longiore, ultimis brevibus, omnibus indumento ei ramulorum

simili tectis, floribus subsessilibus; bractae 5–8 mm. longae, dense adpresse hirsutae, inferiores haud rarius foliaceae floribus aurantiacis (ex *Kerr*), calycis segmentis omnibus inter se aequalibus lobo expanso haud evoluti. *Receptaculum* longum, dense adpresse hirsutum, cito longius et sparse hirsutum. *Calyx* extra dense adpresse hirsutus; tubus 1 mm. longus; segmenta 5. 10–11 mm. longa, 2.5–3 mm. lata, lanceolata, basi fere cuneata. *Corollae* tubus 2.25 cm. longus, extra dense adpresse hirsutus, intra villosus, lobi 5, late triangulares, 3 mm. longi, 3–4 mm. lati, extra dense adpresse hirsuti, intra glandulosi, valvati. *Stamina* 5, ad tubum corollae in parte turgida adhaerentia; filamenta 1 mm. longa; antherae inclusae, lineares, apice apiculatae, basi vix bilobae, 5 mm. longae; a situ staminorum ad basem tubi corollae 10.5 mm. distat, summis antheris usque ad summum corollae tubum distat 7 mm. *Styli* glabri, lati, 8.5 mm. longi, stigmatibus duobus linearibus subaequalibus 5–6 mm. longis. *Ovarium* 2-loculare, multis ovulis in locularibus.

Pattani, Banang Sta, 50 m., climbing at edge of evergreen forest, *Kerr* 7285.

***Knoxia rosettifolia* Geddes** [Rubiaceae-Knoxieae]; ab affini *K. congesta* Pitard, corollae tubo lobisque brevioribus, nervis numerosis et statim adscendentibus differt.

Herba erecta; caulis 10–29 cm. altus, pilis pallidis prope apicem densioribus tectus, quadrangularis, nitens, glaber. *Folia* 4–6, rosulata, ovata vel ovato-lanceolata, apice acuta vel obtusa, 2.5–6.3 cm. longa, 0.7–3 cm. lata, supra sicco fusco-ferruginea, pilata, subtus pallida, nervis marginibusque pilata, nervis utrinque circiter 6, conspicuis, sessilia. *Inflorescentia* terminalis, capitulata, singularis vel duo, pedunculo ramoso vel singulo; flores parvi, subsessiles. *Calycis* lobi 4, breves, inter se inaequales. *Corolla* purpurea (ex *Kerr*); tubus 1.5 mm. longus, extra glaber, intra dense hirsutus; lobi 4, obtusi, 0.5 mm. longi. *Stamina* 4, tubo corollae prope medium affixa; antherae 0.9 mm. longae, inclusae, lineares, apice subacutae, basi emarginatae; filamenta brevissima. *Ovarium* 2-loculare, ovulo singulo magno in loculo pendente; stylus filiformis, 2.5 mm. longus; stigmata duo, revoluta.

Chiengmai, Mè Rim, 1100 m., open grassy pine forest, *Kerr* 6249.

***Ixora fusca* Geddes** [Rubiaceae-Ixoreae]; ab affini *I. nigricante* R. Br., floribus iuventute longioribus tenuibusque, corollae et calycis lobis longioribus differt.

Frutex vel *arbor*, 5–6 m. alta (ex *Mrs. Collins*); ramuli primo nigri vel fusci, deinde pallidiores. *Folia* oblanceolata, apice acuminata, obtusa, basi cuneata, 13.2–16.7 cm. longa, 4.3–5.3 cm. lata, sicco nigricantia vel fusca, omnino glabra, subcoriacea, nervis lateralibus utrinque circa 10 subtus prominentibus supra conspicuis ad marginem anastomosantibus, nervulis passim conspicuis passim inconspicuis, petiolis 6–8 mm. longis glabris; stipulae

triangulares, cuspidatae, basi connatae, 6 mm. longae, basi 2 mm. latae. *Inflorescentia* corymbosa, 6 cm. longa, 8.5 cm. lata, pedunculo puberulo articulato; bractae lanceolatae, 4–5 mm. longae, prope flores breviores; pedicelli florum lateralium circa 2.5 mm. longi; flores terminales sessiles; bracteolae 2, ad basem receptaculi positaе, lanceolatae, puberulae, 2 mm. longae. *Receptaculum* glabrum, 1.5 mm. altum. *Calyx* glaber; tubus 0.5 mm. longus; lobi 4, inter se parum inaequales, lanceolati, 2.75–3.25 mm. longi. *Corolla* alba (ex *Mrs. Collins*); tubus glaber, 1.7–1.8 cm. longus, 1 mm. diametro; lobi 4, valvati, anguste oblongi, acuti, 8–9 mm. longi, circa 2 mm. lati. *Stamina* 4, ad summum corollae tubi affixa; filamenta 1.75 mm. longa; antherae acutae, 6.5 mm. longae. *Stigma* bifidum, 4 mm. longum, stylus filiformis; glaber, 2.2 cm. longus.

Sriracha, 8 m., *Mrs. D. J. Collins* 102 A.

***Psychotria sempervirens* Geddes** [Rubiaceae-Psychotrieae]; ab affini *P. symplocifolia* Kurz, nervis magis numerosis differt.

Frutex ad 3 m. altus (ex *Kerr*); inflorescentia excepta glaber; ramuli fusci, magis minusve striati. *Folia* elliptica vel late oblanceolata, apice acuminata, summo acuta vel obtusa, basi cuneata, 11–18 cm. longa, 3.8–7.5 cm. lata, firme chartacea, sicco viridia, nervis lateralibus utrinque circa 11–12 pagina utraque prominentibus, margine recurva, petiolo 0.7–3.3 cm. longo canaliculato suffulta; stipulae connatae, 7–8 mm. longae, ovatae et cuspidatae. *Inflorescentia* terminalis, trichotoma, pedunculo communi circa 4.5 cm. longo bifacialiter puberulo suffulta, ramis lateralibus duobus oppositis circa 6 mm. longis. *Receptaculum* 1.5 mm. altum, glabrum. *Calyx* 0.75 mm. longus, dentibus quinque brevissimis. *Corollae* tubus 1.5 mm. longus, extra glaber, ore dense pilosus; lobi 5, valvati, triangulares, apicibus revertis, marginibus inconspicue puberuli, 2 mm. longi, 1.5 mm. lati. *Stamina* 5, ore corollae tubi inter lobos posita; antherae exsertae, oblongae, glabrae, 0.75 mm. longae; filamenta 0.25 mm. longa. *Stylus* filiformis, 2 mm. longus, glaber, bifidus; ovarium biloculare, uno ovulo per loculum basi adhaerente. *Fructus* 9–10 mm. longus, 5.7 mm. latus, breviter pedicellatus, oblongus, carinatus, glaber, calyce persistente; testa 7 mm. longa, 4.5 mm. lata, carinata.

Chiengmai, Doi Sutep, 1050–1200 m., evergreen forest, *Kerr* 1188 (type), 2221.

***Prismatomeris fragrans* Geddes** [Rubiaceae-Morindeae]; ab affini *P. tetrandra* K. Sch., floribus multo maioribus differt.

Arbor circa 3 m. altus (ex *Marcan*). *Folia* elliptica, apice acuminata, basi breviter cuneata, 6.7–11.7 cm. longa, 3.3–5.3 cm. lata, sicco altera viridia, altera fusca, supra glabra, nitentia, subtus pallida, glabra, vix nitentia, nervis lateralibus utrinque 10–11 pagina superiore conspicuis prope marginem anastomosantibus, venis subconspicuis; petioli 8–18 mm. longi, glabri, canaliculati; stipulae connatae, glabrae, mox deciduae. *Inflorescentia* termin-

alis, e floribus 2-3 pedicellis 1-3 cm. longis suffultis nitentibus glabrisque ebracteolatis constituta. *Calycis* lobi 5, breves, fere truncati, tubus 4.5-5 mm. longus. *Corolla* alba et odorans (ex *Marcan*), 3 cm. lata; lobi 5, lineares vel lanceolati, apice obtusi, 17 mm. longi, 3.5-4 mm. lati, glabri, coriacei; tubus omnino glaber, 18.5 mm. longus, circa 3 mm. latus. *Stamina* 5, corollae tubi medio affixa; antherae 5 mm. longae, inclusae, lineari-oblongae, apice basique rotundatae, ad summum corollae tubi pervenientes, connectivo sicco nigro; filamenta 4 mm. longa, infra medium antherarum affixa. *Ovarium* biloculare; stigmata duo, 3 mm. longa, linearia, obtusa, glabra; stylus 7 mm. longus, glaber.

Sriracha, Ban Dan, 20 m., evergreen forest, *Marcan* 1381 (type), 176.

XXIV.—NEW SPECIES FROM THE ANDES OF ARGENTINA. N. Y. SANDWICH.

On his return last summer from a horticultural and botanical expedition in Argentina, Mr. H. F. Comber selected from his collection of herbarium specimens some two hundred plants of special horticultural interest of which he had been able to obtain either seeds or living vegetative material. These have been identified at Kew and it is hoped to publish the full list elsewhere; meanwhile it appears advisable to name and describe fourteen new species which were present in this part of the collection.

As is perhaps generally known, Mr. Comber collected in the Territory of Neuquen, between 37° and 40° S., with centres at such places as Neuquen, Chos Malal and Zapala; Chile was entered at least once, but the bulk of the specimens were found well within the limits of Argentina. This choice of ground was no doubt based upon the conclusions reached by Mr. W. B. Turrill in his paper on botanical exploration in Chile and Argentina.* Mr. Turrill's surmise that this area was likely to provide a large number of good new plants seems to have been amply justified, at any rate from the botanical standpoint, as seven per cent. of the selected specimens have proved to be new species, and the rest of the collection numbering four hundred additional gatherings still remains to be named. The whole is a most valuable addition to the Herbarium; whether the horticultural novelties will prove useful in this country remains to be seen.

While Neuquen itself has probably been frequently visited by botanists, it is clear that the Andine region to the west, towards the frontier of Chile, has hitherto been very little worked. Mr. Comber was particularly successful in the dry rocky neighbourhood of Zapala, at an altitude of about 900-1200 metres, where he gathered a fine new *Chuquiragua*, and a remarkable series of *Verbena*

of a spiny Andine type which evidently comprises many more species than have been yet described. The sets of *Adesmia*, *Nassauvia*, *Mutisia*, *Ourisia*, *Calceolaria* and other genera are also of particular interest, as well as of great beauty, for it is obvious that no pains were spared in drying and preparing the specimens, with results that can rarely have been equalled, considering the conditions under which the work was undertaken. Of the new species here described, apart from the spiny Verbenas with their peculiar heterophylly, the most strikingly novel from every point of view are undoubtedly the *Berberis*, the *Anarthrophyllum* and the *Cassia*, each of these exhibiting features which are quite remarkably different from those of the other species of their respective genera.

It is to be hoped that Mr. Comber has been, or will be, able to continue his explorations southwards as far as Lake Nahuelhuapi. The immediate vicinity of the lake has been visited by botanists travelling from the east or west, but there seem to be no records from the whole line of the Andes of Argentina between there and Zapala.

Berberis Comberi *Sprague et Sandwith* sp. nov. [Berberidaceae]; species egregia foliis ramorum longorum omnibus eu-foliaceis nec spiniformibus, foliis ramulorum abbreviatorum saepissime nullis, inflorescentiis solitariis binis vel ternis unifloris, floribus omnibus pentameris verticillis superpositis.

Frutex satis humilis, 0.3-1.2 m. altus, ope surculorum 3.6 m. diametro attingens. *Rami seniores* crassi, circiter 8 mm. diametro 30 cm. infra apicem, internodiis saepius 1-1.5 cm. longis, teretes, cortice griseo extra fibroso fibris delabentibus; rami annotini patuli vel fere patentes, 8-12 cm. longi, internodiis 0.5-2 cm. longis, e basi usque ad apicem manifeste angustati, medio saepius 3-4 mm. diametro, superne subangulati, subargenteo-nitiduli, fibris pallidis secedentibus longitudinaliter fusco-striati. *Folia* (etiam in ramis senioribus diu persistentia) heteromorpha, valde spinoso-dentata, dimidio vel parte minore superiore deltoidea, alia tridentata rhomboidea parte inferiore deltoidea vel convexo-deltoidea, alia quinquedentata hexagona quadrato-rhomboidea lateribus conspicue arcuato-concavis basi subtruncata vel plus minusve cuneata, omnia spinis 1-2.5 mm. longis brunneo-aurantiacis, subsessilia, petiolis brevissimis incrassatis marginibus liberis stipulis minutis hyalinis breviter subulatis terminatis, supra petiolos conspicue articulata, articulo 2-2.5 mm. lato, petiolulo circiter 1 mm. longo; lamina crassa coriacea, margine cartilagineo, glaberrima, 1.7-3.5 cm. longa, 1-2.5 cm. lata, supra nitidula pallide viridia nervis omnino immersis sed rete venularum satis manifesto, subtus glauca nervo medio crasso lateralibusque elevatis rete venularum fere occulto. *Inflorescentiae* axillares, solitariae binae vel ternae, uniflorae; pedunculus ad 2.5 mm. longus, inferne pluriperulatus perulis plerumque oppositis congestis; perulae 2 infimae connatae 0.7 mm. longae, superiores ovato-oblongae vel ovatae apiculatae, 1.5-2 mm.

* *Kew Bull.* 1920, pp. 57-66.

longae, praesertim versus apicem ciliolatae; bracteolae in flore altero inspecto 2, irregulariter suborbiculares, 2.5–3 mm. diametro, valde irregulariter obtuse sublobatae, membranaceae, ciliolatae, trinerves nervo quarto accessorio laterali minore; in flore altero inspecto bracteolae 5, sensim in sepala transeuntes. *Sepala* 5, minute ciliolata, exteriora 2 suborbicularia 4.5–6 mm. longa 4–4.5 mm. lata 5-nervia, interiora 3 elliptico-obovata 7.5–10 mm. longa 4.5–6 mm. lata 4-nervia. *Petala* 5, elliptico-obovata, in alabastro 6–7 mm. longa 3.4–4.5 mm. lata, in flore aperto 9–10 mm. longa 6–7 mm. lata, apice subtruncata obtuse denticulata, trinervia nervis lateralibus cito bifurcatis, nectariis tribus; in alabastro nectarium intermedium oblongum, 0.7–1 mm. longum, 0.2–0.4 mm. supra basim nervi medii initians; nectaria lateralibus superne bifurcata, 1.8–2 mm. longa; in flore aperto nectaria 3–3.5 mm. longa, 1.2 mm. lata. *Stamina* 5; in alabastro 4.5–5 mm. longa, filamentis 2–2.5 mm. longis medio vix 1 mm. latis, apicem basimque versus ampliatis; in flore aperto 7.5 mm. longa, filamentis 4 mm. longis ad 1 mm. latis, antheris 3–3.5 mm. longis; valvae thecarum 2.5 mm. longae. *Pistillum* in alabastro 4.5 mm. longum, stipite 0.5 mm. longo incluso; ovarium subglobosum circiter 2 mm. diametro; stylus 1.5 mm. longus; stigma peltatum ultra 1 mm. diametro; pistillum in flore aperto 7.5 mm. longum, ovario 4 mm. longo 2.5–3 mm. diametro, stylo 3.5 mm. longo 1.8 mm. diametro, stigmatem peltato 1.75 mm. diametro. *Ovula* 8–10.

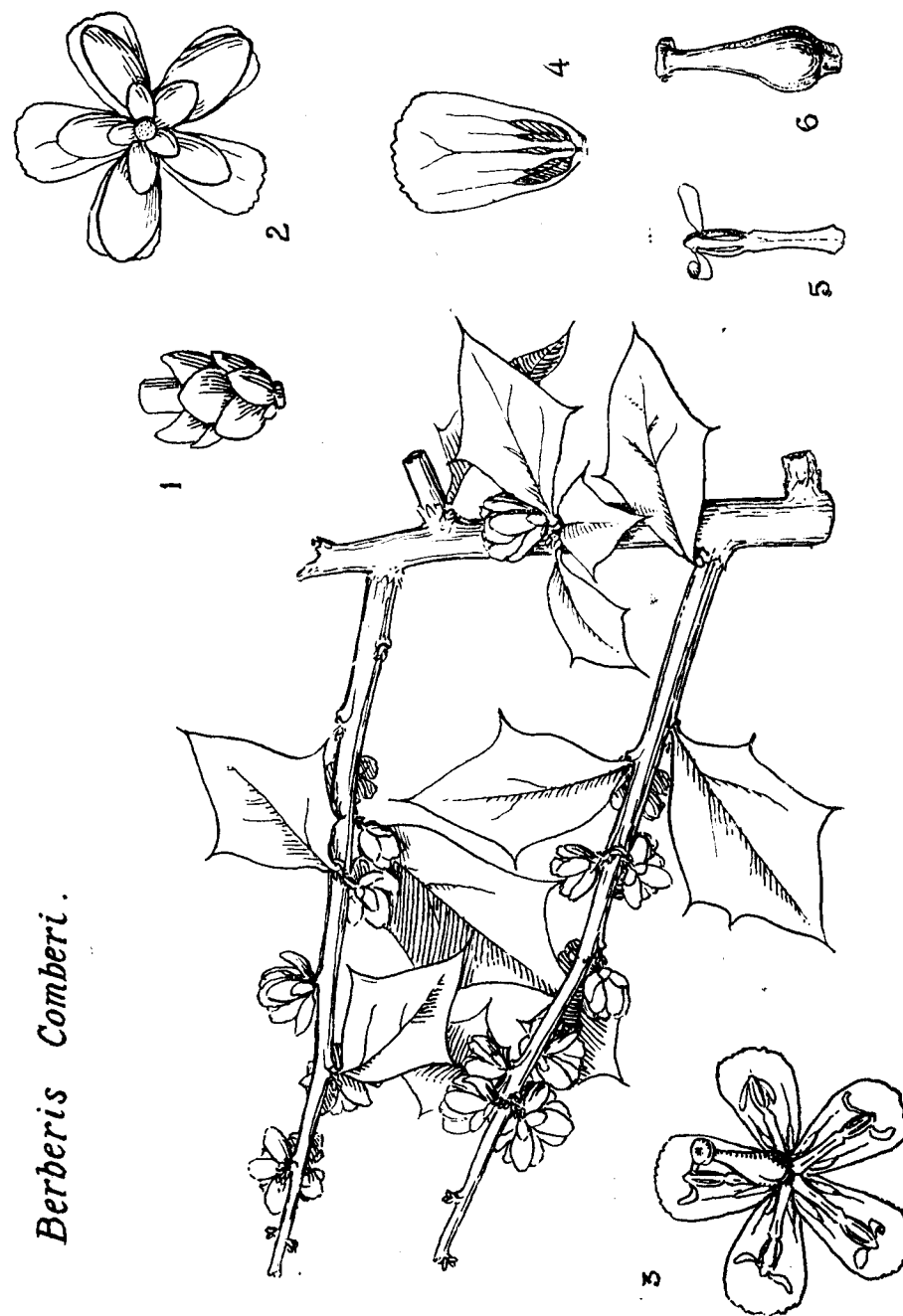
Cerro Lotena, 900 m., September 24th, 1925, *Comber* 49. "Grows in sheltered and exposed places on several kinds of sandy and stony soil, facing south. Free-flowering; flowers orange-yellow, fragrant, with sensitive stamens."

Berberis Comberi is a low shrub, 1–4 ft. in height, occasionally forming masses 12 ft. in diameter by the aid of suckers. The leaves are evergreen and resemble those of holly. It is anomalous in two respects: in the absence of spine-leaves, and in all the flowers being pentamerous with superposed whorls. In a great majority of species of *Berberis* the long shoots bear spine-leaves exclusively, while the foliage-leaves and inflorescences are borne on the short shoots. In *B. Comberi* the foliage-leaves are all but confined to the long shoots, the short shoots being mostly aphyllous.

All parts of the flower exhibit a great increase in size during expansion; hence it seems desirable to give measurements from a flower-bud as well as those from an expanded flower.

Malvastrum corymbosum *Sandwith*, sp. nov. [Malvaceae-Malveae]; affinis *M. Alberti* (Phil.) Reiche, ut videtur, a quo habitu non suffruticoso, foliis magis evidenter quinquelobis, petiolis inferioribus multo longioribus, petalis duplo tantum neque triplo quam calycibus longioribus differt.

Herba annua, pallide viridis, e radice simplici ad 15 cm. longa ramos paucos 10–14 cm. longos, caulem principalem 15 cm. longum emittens; caules inferne vellere pilorum stellatorum brevi denso



Berberis Comberi.

Branch and branchlets, natural size. Fig. 1, peduncle with perulae; 2, exterior of flower from below; 3, interior of flower from above; 4, petal; 5, stamen; 6, pistil.—Fig. 1, $\times 6$; 2 and 3, $\times 2$; 4, 5 and 6, $\times 3$. In Figs. 2 and 3 the parts of the flower are drawn as if pressed out horizontally.

albescence induti, superne viridescences pilis stellatis majoribus satis numerosis immixtis; internodia 1-2.5 cm. longa. *Folia* inferiora petiolis 2.5-3.5 cm. longis, superiora petiolis 0.7-1.5 cm. longis suffulta; petiolorum indumentum ei caulium partis superioris simile; laminae supra pallide virides, molliter et dense tomentosae, subtus magis cinereae et pilis stellatis multo sparsius indutae, 1-2.5 cm. longae, 0.8-2.5 (vulgo 2) cm. latae, facie ei *M. humilis* A. Gr. simili, triangulari-ovatae, inferiores distincte superiores obscurius quinquelobatae, lobis imbricatis 4 inferioribus 4-8 mm. longis 4-9 mm. latis, lobo medio majore ovato 0.7-1.3 cm. longo atque lato, lobis omnibus satis profunde atque late rotundato-crenatis, crenis 1-4 mm. longis atque latis; stipulae subulatae, ad 6 mm. longae. *Inflorescentia* apice caulium satis dense corymboso-paniculata, ramis inferioribus in axillis foliorum superiorum longe pedunculatis; pedicelli 1-6 mm. longi; bractae integrae, lineares, 3-5 mm. longae, ut bracteolae pedicelli calycesque dense stellato-tomentosae; bracteolae 3 setaceae, 3-5 mm. longae. *Calyx* 8-9 mm. longus, in lobos anguste ovato-lanceolatos vel triangulari-lanceolatos 5-6.5 mm. longos, 2-3 mm. latos divisus. *Corolla* laete rosea, siccitate purpurea, 1.3 cm. longa, petalis basi stellato-pilosis. *Staminum columna* pilis stellatis sparse induta, 2.5 mm. longa, apice in filamenta 2 mm. longa divisa. *Ovarium* 1.5 mm. diametro, parte superiore et praesertim apice satis longe pilosum; styli rami 11, ad 2 mm. longi, apice clavato-stigmatosi.

Rio Coyunco, in sandy region, November 12th, 1925, *Comber* 140.

***Cristaria eburnea* Sandwith**, sp. nov. [Malvaceae-Malveae]; affinis *C. argyliifoliae* Phil., ut videtur, caulibus albo-tomentosis nec hirsutis, foliis ambitu suborbicularibus nec ovatis, etiam inferioribus valde partitis, stipulis longioribus, calyce longiore differt.

Herba teste lectore perennis, prostrata, cinerea, 22.5-60 cm. diametro, apice radice simplicis ultra 9-12 cm. longae complures ramos axillares 10-18 cm. longos caulem principalem brevem facile superantes emittens; rami plerumque simplices, 2-3 mm. diametro, inferne vellere albo-eburneo brevi denso pilorum stellatorum obtecti, superne ut folia tomento minus denso igitur facie paulo farinosiore magis cinerea praediti, apicem versus in inflorescentias arcuato-adscendentes; internodia 2-4.5 cm. longa, superiora multo breviora. *Folia* infima petiolis 2-4.5 cm. longis suffulta, suborbicularia, 3 cm. longa, 3-3.5 cm. lata, profunde in petiolum pedatim quinque-partita, segmento medio cum petiolulo ad 5 mm. longo, segmentis omnibus profunde bipinnatifidis, laciniis primariis 0.5-1 cm. longis, 3-8 mm. latis, secundariis oblongis obtusis vel rotundatis 1-5 mm. longis, 1-2 mm. latis; folia superiora petiolis 1-2 cm. longis suffulta, infimis similia sed nonnunquam tripartita et saepe minus composita ita ut segmenta solum simpliciter pinnatifida esse videantur; stipulae subulatae 2-3 mm. longae. *Flores* in axillis foliorum superiorum solitarii, inferiores cum pedunculis 2-2.5 cm. longis, ceteri apice ramorum conferti cum pedunculis

gradatim diminuentibus. *Calyx* campanulatus, pilis stellatis quam alibi conspicue longioribus laxioribusque vestitus, 8-10 mm. longus, infra medium in lobos triangulari-lanceolatos 6 mm. longos basi 2.5-3.5 mm. latos divisus. *Corolla* laete rosea, siccitate purpurea, 1.5-2 cm. longa, igitur ad 4 cm. diametro. *Tubus stamineus* glaber, 2.5 mm. longus, apice in filamenta propria 2-3 mm. longa divisus. *Ovarium* glabrum, 2 mm. diametro; stylus 0.5 mm. longus, ramis 14 glabris, 1.8-2 mm. longis, apice clavato-stigmatosis.

Zapala; common in sand around the town, fl. November 11th, 1925, *Comber* 134.

This should be compared with several other Patagonian species of *Cristaria* of which I have not seen specimens. None of the descriptions, however, agrees with the above.

***Larrea simulans* Sandwith**, sp. nov. [Zygophyllaceae]; affinis *L. nitidae* Cav., habitu prostrato, ramis magis nodosis atque intricatius dispositis, squama staminali longiore, praesertim foliis multo minoribus tantum 5-7-foliolatis, foliolis minus parallelis, primo visu facile dignoscitur.

Frutex glutinosus, teste lectore prostratus, 2.4 m. diametro; ramuli seniores internodiis 3-10 mm. longis, hornotini pubescentes 1-5 cm. longi internodiis 2-4 mm. longis. *Folia* ovata, pinnata, glabra vel sparse pilosa, 2-6 mm. longa, 2-4 mm. lata, foliolis 5-7 oblongis apicem versus decrescentibus, 1-3.3 mm. longis, 0.5-1.3 mm. latis. *Flores* in axillis solitarii, pedunculis pubescentibus 1-4 mm. longis. *Calyx* sepalis ovatis 3.5-4.5 mm. longis, vulgo 2.5 mm. latis. *Corolla* flava, petalis 7 mm. longis. *Staminum* filamenta 7 mm. longa, squamis 4-4.5 mm. longis; antherae 1.7 mm. longae, apiculatae. *Ovarium* ut in *L. nitida* argenteo-pilosum, 2.3 mm. diametro, stylo 2-3 mm. longo.

Cerro Lotena; in sheltered and exposed places side by side with *L. nitida* and flowering at the same time, October 27th, 1925, *Comber* 105.

Differs conspicuously from *L. nitida* by the small leaves which bear only five to seven leaflets, whereas those of *L. nitida* bear from ten to thirteen. After an examination of several flowers from both species, the staminal scale of *L. simulans* was found to be uniformly longer than that of *L. nitida*. Mr. Comber says that the new plant grows with *L. nitida*, but that there are no intermediates, and that it is prostrate, whereas *L. nitida* grows to a height of from three to ten feet. From this evidence the plant would seem to deserve specific rank. It may lie between *L. nitida* and *L. Ameghinoi* Speg., as the latter is described as a prostrate shrub with only 3-5-lobed pubescent leaves, which are 6-7 mm. long and 4 mm. broad.

***Anarthrophyllum ornithopodum* Sandwith**, sp. nov. [Leguminosae-Genisteae]; ab omnibus speciebus adhuc descriptis floribus vulgo 5-6 apice ramulorum capitatis, dentibus calycis apice longe spinoso-setaceis, praecipue foliis saepius 4-5-fidis mire differt.

Frutex "0.9-1.8 m. altus," ramis junioribus flavo-olivaceis 2-3 mm. diametro, partibus novellis cum pilis albis adpressis sericeis vestitis; vetustioribus rubro-cinereis 3-7 mm. diametro; internodia 5-10 mm. longa. *Folia* petiolis 3-6 mm. longis 1.5-3 mm. latis suffulta, 4-5- rarius 3-partita, segmentis stellatodivariatis rigidis spinosis striatis primo viridi-argenteis tum fusco-olivaceis, 1.3-3.3 (vulgo 2.5) cm. longis, 1-2 mm. diametro; stipulae triangulari-ovatae vel anguste triangulari-lanceolatae, erectae et saepe ramulis subadpressae, juventute ut ramuli calycesque sericeo-argenteae, serius glabrescentes costatae spinosae, saepe ultra medium connatae, 3-5 (vulgo 5) mm. longae, igitur petiolos aequantes vel saepius paulo superantes, basi 2-3 mm. latae. *Flores* 3-6 (vulgo 5-6) apice ramulorum capitatum aggregati, subsessiles vel saepius cum pedicellis 1-3 mm. longis; bractee 2-3 integrae, lineari-setaceae, 5-8 mm. longae. *Calyx* dense sericeo-argenteus, pilis quam in ceteris partibus longioribus laxioribusque; tubus 5 mm. longus, 3-4.5 mm. latus; labia subaequilonga, 1.2-1.3 cm. longa, dentibus apicem versus glabris et fusco-spinoscentibus, eis labii superioris basi 2.5-3 mm. latis, eis labii inferioris usque ad 3.5 mm. supra basim connatis. *Corolla* aurantiaca; vexillum circiter 2 cm. longum, 1 cm. latum, lamina extra sericeopilosa basi ut alae et carina auriculata; alae et carina glabrae, 1.75 cm. longae. *Stamina* glabra, 9, in vagina 9-10 mm. longa superne fissae connatae, partibus liberis ad 6 mm. longis; stamen decimum vexillare 4-7.5 mm. supra basim vaginae conjunctum, igitur parte libera 1-1.2 cm. longa. *Ovarium* lineare, adpresse sericeo-pilosum, gradatim in stylum glabrum arcuatum stigmatem capitellatum productum, cum stylo 1.7-2 cm. longum, 2-3 mm. diametro; ovula 5. In sandy soil between Chos Malal and Rio Agrio, at 900 m., fl. November 23rd, 1925, *Comber* 200.

A very remarkable plant, as indicated in the diagnostic phrase; but there seems at present to be no sufficient reason for removing it from this genus. Hitherto the species of *Anarthrophyllum* have fallen naturally into two sections, one with simple (§ *Amerophyllum*), the other with tripartite (§ *Trimerophyllum*) leaves; none has ever been said to produce quadri- or quinquepartite, as well as tripartite, leaves. Two other species, *A. brevistipula* Phil. and *A. rigidum* (Gill. ex H. & A.) Hieron., bear flowers congested in heads, but the corollas are small, nor have the calyces the long spinescent teeth which are so characteristic of *A. ornithopodum*.

***Adesmia guttulifera* Sandwith** sp. nov. [Leguminosae-Hedysareae]; (Series *Spinescentes* Taubert in Engl. & Prantl, *Pflanzenfam.*, iii. 3. 322); forsitan affinis *A. genistoidi* Presl, et *A. viventi* Phil., foliis brevioribus arcuato-recurvatis 3-jugis tantum, foliolis crassis plicatis, petiolis pedicellis calycibusque glabris nec pubescentibus sed glandulis multis sessilibus punctatis differt.

Frutex lignosus, spinosus, 0.3-1.5 m. altus, 0.3-1.2 m. diametro; spinae vetustiores cinereae, aliae nudaе, aliae nodis spinas novellas

superne floriferas inferne foliatis 2-6 cm. longas basi perulis brunneis confertis stipularibus circumdatas edentes; partes novellae omnes pallide virides, glandulis olivaceis sessilibus conspicuis numerosis praeditae, aliter omnino glabrae, pagina foliolorum superiore excepta. *Folia* arcuato-recurvata, 8-15 mm. longa, 3-juga, rhachide apice ad 1.5 mm. conspicue producta, petiolis 4-6 mm. longis; foliola elliptica vel obovato-oblonga, 3-7 mm. longa, 1.5-2.5 mm. lata, plerumque plicata vel etiam fere conduplicata, crassa enervia, nervo medio prominente excepto, pagina superiore pilis adpressis inconspicuis sed satis densis vestita, inferiore glabra, utrinque et praesertim in margine quasi sinuato-dentato glandulis sessilibus conspicuis notata; rhachis inter juga inferiora vulgo 3 mm. longa; stipulae novellae basi connatae, fere 2 mm. longae. *Inflorescentia* in spinis novellis glandulosis basi foliatis racemosa, vulgo 3 cm. longa; pedicelli 1-2 cm. longi; bractee integrae ovatae, 1-2.5 mm. longae, saepe concavae et cymbiformes. *Calyx* campanulatus, cum dentibus 5-6 mm. longus, 3-4 mm. latus, superne in dentes late triangulari-subulatos 1.5-2.5 mm. longos divisus, extra ut pedicelli bracteeque glaber et glandulosus, intus superne breviter et dense pilosus. *Corolla* laete flavo-aurantiaca; vexillum glabrum, circiter 1.25 cm. longum, lamina fere 1 cm. lata; alae glabrae, circiter 1.25 cm. longae; carina circiter 1 cm. longa, margine dorsali leviter et inconspicue piloso. *Stamina* glabra, 1-1.4 cm. longa. *Ovarium* 5-6 mm. longum, papillis albis densis obtectum; stylus glaber, fere 1 cm. longus, stigmatem capitellatum; ovula 5-6. *Fructus* ignotus.

Cerro Lotena, Neuquen and Zapala, in moist and more sheltered spots, fl. October 27th, 1925, *Comber* 102. "Wood very brittle".

***Cassia* (§ *Senna*) *egregia* Sandwith** sp. nov. [Leguminosae-Caesalpinioideae]; foliis 1-4-foliolatis, stipulis parvis rubropurpureis tumentibus glanduliformibus insigniter dignoscitur.

Suffrutex verisimiliter ramosissimus; rami seniores cortice rugoso pallide fusco, 3.5 mm. diametro; partes juniores omnes siccitate pallide virides, pilis albis adpressis inconspicuis nisi in alabastris pedicellisque junioribus subargenteis indutae; rami juniores striati, ad 3 mm. diametro, nodis plerisque ramulos 3-15 cm. longos edentes; internodia 1-2.5 cm. longa, infimis ramulorum 3-4.5 cm. longis exceptis. *Folia* paripinnata, 1-2-juga vel nonnunquam pseudo-trifoliolata foliolo altero jugi superioris necnon internodio rhacheos suppresso, cum petiolo 1-1.8 cm. longa; petiolus 3.5-7 mm. longus, in foliis 1-jugis vel trifoliolatis ultra insertionem foliolorum paullum productus; rhachis foliorum 2-jugorum 1-3 mm. longa, ultra jugum superius ad 1 mm. pariter producta; foliola petiolulata, obovata vel obovato-oblonga, apice rotundata, truncata vel emarginata, saepius ob nervum medium excurrentem obscure apiculata, basi rotundata vel saltem obtusa, nervo medio prominente excepto enervia, crassiuscula, 5-12 mm.

longa, 3-7 mm. lata, glandula cylindrica pallide rubra 0.5 mm. longa inter foliola inferiora supra praedita; stipulae parvae 1.5 mm. longae, sed cum facie curiosa conspicuaque, quod sunt rubro-purpureae, ovoideae, acuminatae, inferne tumentes glanduliformes ad 1 mm. latae, tum subito subulato-acuminatae. *Inflorescentia* foliata, e pedunculis 1-2-floris in axillis foliorum superiorum constituta; folia suffulcientia inferioribus similia sed minora; pedunculi 1-3 cm. longi, graciles; pedicelli 0.8-2 cm. longi floribus sub antherarum pondere saepe nutantibus; bractae apice pedunculi positae, 1.5-2 mm. longae, cum facie et colore simili ei stipularum sed basi multo minus tumidae. *Sepala* olivacea, membranacea, minute ciliata, rotundato-ovata, inaequalia, majora circiter 9 mm. longa 8 mm. lata, minora 5 mm. longa 3.5 mm. lata. *Corolla* flavo-aurantiaca, circiter 2.7 cm. diametro, petalis cum ungue 1.3-1.5 cm. longis. *Stamina* 3 summa imperfecta filamentis 2 mm. longis, antheris 2 mm. longis atque latis; 7 perfecta antheris apice 2-porosis fere aequalibus 4.5-5 mm. longis 2 mm. latis, filamentis 4 superiorum 3 mm. longis, 3 inferiorum 6-10 mm. longis. *Ovarium* curvatum, stylo excepto dense adpresse pilosum, ad 1.7 cm. longum. *Fructus* abest.

Near Chos Malal, common in many dry places, at 1200 m., November 20th, 1925, *Comber* 163. "Has the habit of *Genista tinctoria*."

Remarkable for its minute red stipules, which have the appearance of swollen glands.

Chuquiragua straminea *Sandwith* sp. nov. [Compositae-Mutisieae]; habitu et facie *C. oppositifoliae* Gill., foliis alternis angustioribus, involucri bracteis etiam juventute glabrescentibus nitentibusque, interioribus strictis, exterioribus laxe et insigniter patulis demum reflexis differt.

Frutex spinosus, 90 cm. altus, ramis lignosis intricatis nigro-cinereis 2-10 mm. diametro; ramuli novelli pallide straminei pubescentes, 3-5 cm. longi, 1-1.3 mm. diametro. *Folia* et nodis ramorum vetustiorum fasciculata, et per ramulos novellos alterna internodiis vulgo 4-7 mm. longis; omnia lineari-lanceolata, 0.8-1.5 cm. longa, 1-2 mm. lata, apice spinescentia crassiuscula sed fragilia et caduca, pallide viridia, utrinque pilis adpressis sericeis inconspicue vestita, pagina inferiore nervo medio conspicuo quasi carinata; spinae axillares geminae, stramineae, 0.6-1.5 (vulgo 1.2) cm. longae. *Capitula* apice ramulorum solitaria, mediocria, flavo-aurantiaca, siccitate laete straminea; adulta vulgo 2.3 cm. longa; involucri bractae glabrescentes nitentesque, apice spinescentes, in compluribus seriebus dispositione triplici satis conspicua dispositae: interiores stricte erectae, glabrae vel intus apicem versus leviter sericeae, lineari-lanceolatae, 1.8-1.9 cm. longae; mediae breviores latioresque, primo patulae demum insigniter reflexae, intus apicem versus sericeae, lanceolatae, 1.5-1.7 cm. longae, ad 3.5 mm. latae; exteriores multo minores, pallidiores,

magis spinescentes, semper erecto-adscendentes vel adpressae, diutius pubescentes, ovato-lanceolatae sed ad 2.5 mm. tantum latae. *Corollae* 1.3-1.4 cm. longae, bracteas involucri interiores aequantes, tubo intus atque extra parce piloso, lobis 4 mm. longis apicem versus breviter sed dense sericeo-pilosis. *Stamina* filamentis 6 mm. longis; antherae circiter 9 mm. longae, basi ad 2-2.5 mm. sagittatae. *Stylus* 1.7 cm. longus, igitur corollam excedens. *Achaenia* sericeo-villosa, 3 mm. longa; pappi setae numerosae, circiter 1 cm. longae.

Zapala, in desert region, at 900 m., March 15th, 1926, *Comber* 585.

A very beautiful plant, differing conspicuously from other species of the genus in the strongly contrasted directions taken by the various series of bracts in the bright straw-coloured heads. Other alternate-leaved species with axillary spines, for instance *C. spinosa* D. Don and *C. argentea* Speg., have a different involucrel arrangement with a different indumentum, broader or shorter leaves, and, in the case of *C. argentea*, a very different habit.

Calceolaria (§ Scapiflorae) poikilanthos *Sandwith* sp. nov. [Scrophulariaceae]; forsitan affinis *C. biflorae* Lam., foliis minoribus obovato-spathulatis supra pilis albis longis conspersis, floribus simul ochroleucis purpureisque differt.

Herba perennis, acaulis, scaposa, biflora, radice dense fibrosa. *Folia* satis parva omnia radicalia, in rosulis compluribus confertis disposita, obovato-spathulata, apice rotundata, lamina usque ad basim folii decurrente ita ut petiolus vix distingui possit, majora in toto 1.2-4 cm. longa, 0.8-3 cm. lata, parte petiolari 3-5 mm. lata, integerrima, margine nonnonquam sinuata, pallide viridia, supra et in margine pilis albis longis articulatis insigniter conspersa, subtus glaberrima fortiter nervata. *Scapi* 1-2, graciles, nudi, e foliis rosularum summis minimis surgentes, breviter glanduloso-pilosi, 12-15 cm. alti, tum furcati biflori sed ebracteati, pedicellis magis glandulosis 1-3 cm. longis. *Calyx* dense breviter glandulosus, lobis ovato-lanceolatis 3-4 mm. longis, 2-2.5 mm. latis. *Corolla* teste lectore supra laete ochroleuca subtus purpurea, siccitate saepius maculis anastomosantibus velut in *Fritillaria Meleagris* L. notata, parce et inconspicue glandulosa; labium superius calyce brevius, 2-3.5 mm. longum, 3-4 mm. latum; labium inferius orbiculare, fere clausum, siccitate circiter 1.6 cm. longum, ad 1.8 cm. latum.

Suanguo; growing in masses in moist and sheltered, but sunny, places at 1800-1950 m., January 16th, 1926, *Comber* 487. "On January 30th, the flower-stems were frozen in the exposed places. Flowers rich cream above, purple beneath."

Argylia robusta *Sandwith* sp. nov. [Bignoniaceae-Tecomeae]; forsitan affinis *A. uspallatensi* DC., magnitudine omnium partium praesertim caulis alti fere nudi longeracemosi multiflori, calycis dentibus angustioribus longioribus acutis, statim distinguitur.

Herba perennis, teste lectore 30–60 cm. alta, e radice principali crassa 8–12 mm. diametro emittens ramos breves seu surculos apice foliis coronatos e quibus surgunt 1–4 caules floriferi robusti nudi vel basi parce foliati vel nonnunquam etiam ramosi, 10–40 cm. longi, striati, satis dense breviter glandulosi, 2.5–4 mm. diametro. *Folia* surculorum floriferorum petiolis longis cylindricis glandulosis caulibus similibus basi dilatatis 5–9 cm. longis 2–4 mm. diametro suffulta, 5-partita; foliola obovata vel obovato-lanceolata, basi cuneata, 2–5.5 cm. longa, 1–2.8 cm. lata, versus apicem profunde vel inciso-crenata, crenis ad 6 mm. longis rotundatis saepe ipsis crenatis, vel acute inciso-serrata, plerumque versus basim integra, coriacea, supra glaberrima, subtus ut ceterae partes dense glandulosa, nervo in medio subtus prope basim crassissimo nervisque lateralibus conspicuis, foliolo terminali lateralibus semper longiore atque latiore. *Folia* surculorum adhuc sterilium (in planta Fischeriana tantum visa) minora, plerumque tripartita, petiolis brevioribus, foliolis magis rotundato-obovatis et magis rotunde crenatis. *Racemus* adultus ad 19 cm. longus; bracteae subulatae, glandulosae, 3–5 mm. longae; pedicelli glandulosi, 3.5–8 mm. longi. *Calyx* 7–9 mm. longus, in lobos lineari-lanceolatos, acutos, extra dense glandulosos, marginibus dense albo-ciliatis, intus glabros, 4.5–7 mm. longos, 1–1.3 mm. latos divisus. *Corolla* laete flava, tubo ad 3.5 cm. longo, superne ad 1.4 cm. latitudine ampliato, extra et intus dense breviter piloso, limbo 2.5–3 cm. diametro. *Staminum* quattuor didynamorum filamenta superne glabra, prope basim atque sub insertionem dense glandulosa, parte libera 2 longiorum circiter 1.8 cm., 2 breviorum 8–9 mm. longa; antherarum loculi divergentes circiter 4 mm. longi; stamen quantum abortivum filamentum glabro 5 mm. longo, anthera sterili 2.5 mm. longa. *Ovarium* juvenile disco satis conspicuo 1.75 mm. lato et alto sessile, minute glandulosum, cylindricum, fere 3.5 mm. longum, 1 mm. diametro. *Fructus* (in planta Fischeriana tantum visus) dense breviter glandulosus, maturitate sursum arcuatus, 4.5–5.5 cm. longus.

Between Rio Agrio and Chos Malal, at 900–1200 m., fl. November 20th, 1925, *Comber* 162. "Leaves shiny; flowers rich yellow, not scented. Found in two places on the road in hot dry places."

To this belongs Fischer 172, from General Roca, Rio Negro, distributed as *A. trifoliolata* DC., presumably on account of the tripartite leaves on the young non-flowering shoots. *A. trifoliolata*, which was founded on a misunderstanding, was collected at Uspallata by Cruickshank, and is *A. uspallatensis* DC. *A. robusta* has evidently no affinity whatsoever with *A. potentillaefolia* DC., though its leaves would at once suggest that name.

Verbena (§ Verbenaca, Pungentes) cedroides Sandwith sp. nov. [Verbenaceae]; affinis *V. tridentis* Lag., ramulis novellis foliis calycibusque pallentibus glabrescentibus, inflorescentiis brevioribus paucifloris, bracteis plerisque ovatis integris, foliis axillaribus

secundariis paucioribus atque plerumque longioribus laxè rosulatis nec unquam in ordinibus tetraquetris dispositis differt.

Frutex humilis, 22.5–90 cm. altus, ramis cinereis spinosis intricatis, vetustioribus 2–6 mm. diametro cum nodis fasciculisque foliorum quadrifariam dispositis, novellis florigeris oppositifoliis 2–3 cm. longis minute puberulis vel glabrescentibus. *Folia* brevissima, carnosa, subnitentia glabra, heteromorpha. *Folia primaria* fere ad basim trifida, lobis 0.5 mm. latis, lateralibus centrali vix 2 mm. longo brevioribus, in ramis vetustioribus sub fasciculis foliorum novellorum spinescentia et cinerascencia. *Folia secundaria* in ramis vetustioribus laxè rosulatis fasciculata, linearia vel lineari-oblonga, 1.5–3.5 mm. longa, 0.5–1 mm. lata, igitur primaria superantia, cetera in ramulis novellis similia sed pauciora et breviora. *Inflorescentia* apice ramulorum breviter spicato-capitata cum floribus (vulgo 5–8) 1–1.8 cm. longa; bracteae omnes calycibus multo breviores, 1–2 inferiores foliis primariis trifidis simillimae, ceterae integrae ovatae acutae breviter ciliatae, 2 mm. longae, vulgo 1.5 mm. latae. *Calyx* olivaceus, facie glabra atque subnitente sed sub lente saepe minute adpresse puberula; tubus 5–6 mm. longus, 1–2 mm. latus; dentes 1–1.5 mm. longi, basi triangulares tum acute divaricato-subulati. *Corolla* alba vel lavandulaceo-caerulea, suaveolens, cum pubescentia *V. tridentis* et *V. asparagoidis* propria; tubus 9 mm. longus, parte e calyce exserta extra ac intus dense griseo-pubescente; limbus 5–8 mm. diametro, circa faucem dense griseo-pubescentis. *Stamina* ut in *V. tridente*. *Ovarium* truncatum, 1.2 mm. longum, 0.7 mm. diametro, glabrum; stylus glaber, cum stigmate 4.5 mm. longus.

Zapala; common on the hottest driest rocks in the district, at 900 m., fl. November 27, 1925, *Comber* 189.

This very attractive species is related to *V. tridentis* Lag. (*V. Carroo* Speg.) and *V. asparagoides* Gill. & Hook., and comes fairly near to the former, but is distinguished at once by the characters given in the diagnostic phrase. *V. asparagoides* is a very different plant with much larger, strongly spiny, primary leaves; a many-flowered, closely-packed, hairy inflorescence; and shorter calyces, with longer, conspicuously spiny, teeth. Zapala lies between the areas of these two related species.

Verbena (§ Verbenaca, Pungentes) Comberi Sandwith sp. nov. [Verbenaceae]; habitu et facie *V. erinaceae* Gill. & Hook., indumento dissimili, foliis primariis spinosis brevioribus, secundariis ovatis vel ellipticis potius quam linearibus differt.

Frutex humilis, spinoso-pulvinatus, teste lectore 0.3–1.8 m. diametro; caules primarii lignosi, in typo 6–8 mm. diametro; rami vetustiores multi, elongati, spinosissimi, foliis vetustis obtecti, apice ramulos hornotinos dense foliatis et floriferos argenteo-pilosulos congeste corymbosos breves circiter 2–3 cm. longos gerentes. *Folia primaria* subulata, valde spinosa, haud vel basi tantum ciliata, supra dense adpresse sericeo-pilosa, subtus glabrescentia crasse

carinata, plerumque recte adscendentia, basi connata, 7-13 (vulgo 10) mm. longa; inferiora in ramulis hornotinis nonnunquam breviora, minus pungentia, apice recurvata. *Folia secundaria* in axillis primariorum rosulata, saepius satis pauca et inconspicua, ovata vel elliptica, carnosa, dense breviter adpresse albo-pilosa, 1-2.5 mm. longa, ad 1 mm. lata. *Flores* apice ramulorum gemini, folia spinosa aequantes vel superantes; bracteae dense adpresse pilosae, ovato-lanceolatae, apice spinescentes glabrae, costa centrali conspicua glabra, basi connatae, 4 mm. longae, 2 mm. latae, igitur calycis tubum subaequantes. *Calyx* dense adpresse pilosus; tubus 4.5 mm. longus; dentes inaequales, paullum spinescentes, ad 1.5 mm. longi. *Corolla* alba vel caerulea; tubus extra glaber, intus pilosus, circiter 1 cm. longus; limbus ad 9 mm. diametro. *Stamina* filamentis brevissimis; superiora corollae tubo infra fauces ita longe affixa ut antherae videri non possint. *Ovarium* glabrum, ad 1 mm. altum; stylus glaber, cum stigmate 6.5 mm. longus.

Rio Coyunco, in sandy soil at 750 m., fl. November 12th, 1925, *Comber* 138. "A hard cushion plant. Flowers white or blue, sweetly scented."

Spegazzini described *V. erinacea* as a very variable species, but this plant cannot possibly be considered conspecific with the type of Gillies and Hooker.

Verbena (§ Verbenaca, Pungentes) dolichothyrsa *Sandwith* sp. nov. [Verbenaceae]; forsan affinis *V. hystrix* Briq., foliis primariis omnibus integerrimis plerumque longioribus, secundariis multo majoribus, bracteis calycibusque longioribus differt.

Frutex humilis, teste lectore 15-45 cm. altus, 22-65 cm. diametro; rami vetusti cinerei, 5 mm. diametro, apice caules juniores annotinos multos aggregatos saepius 8-10 cm. longos 2 mm. diametro edentes; caules annotini partibus novellis terminati, ex axillis foliorum vetustiorum spinescentium ramulos hornotinos brevissimos floriferos 0.8-1.5 cm. longos emittentes. *Folia primaria* vetustiora valde spinescentia, 8-10 mm. longa, integerrima, albo-cinerea, juvenilia apice ramorum connata, 3-6 mm. longa, pubescentia. *Folia secundaria* brevissima, in axillis foliorum spinescentium vel laxe rosulatum fasciculata vel basi ramulorum floriferorum disposita, linearia vel lineari-oblonga, 2-3 mm. longa, obtusa vel saepe apiculata, carnosa, pubescentia, subtus valde carinata. *Inflorescentiae* ramulos brevissimos supra commemoratos ita terminantes ut thyrsum longum angustum foliatum praebeant; bracteae ovatae, integrae, connatae, pubescentes atque ciliatae cum nervo medio crasso, 2-3 mm. longae, 1.5-2 mm. latae. *Flores* 2-6 ramulos singulos terminantes. *Calyx* pubescens; tubus 5-5.5 mm. longus, 2 mm. latus, cum costis de apice dentium decurrentibus; dentes subulato-spinosi, circiter 1.5 mm. longi. *Corolla* pallide lilacina; tubus glaber, 9 mm. longus; limbus glaber, ad 8 mm. diametro. *Stamina* filamentis brevissimis; superiora corollae tubo infra fauces ita longe affixa ut antherae

videri non possint. *Ovarium* glabrum; stylus glaber cum stigmate circiter 5 mm. longus.

Zapala: Cerro Lotena, on hot dry rocky ground, at 900 m., fl. October 14th, 1925, *Comber* 79. "Flowers strongly scented, especially at night. It flowers profusely like No. 78, and is more common and flowers later than that plant."

This species resembles *V. seriphioides* Gill. & Hook. and *V. echinata* Phil. in producing the inflorescences on very short lateral shoots in the axils of older leaves. The description of *V. hystrix* Briq., a name which cannot stand owing to the existence of *V. hystrix* Phil., reads very like *V. echinata* Phil., which is probably conspecific with *V. seriphioides*. The type of the latter has a facies very different from that of *V. dolichothyrsa*, having much shorter primary and secondary leaves, and shorter bracts. In contrasting his *V. hystrix* with *V. seriphioides*, Briquet says of the latter that the flowers are isolated at the tops of the branches. This shows how easily a totally false impression of the facies of a plant may be gathered from reading a short and vague description, for in this instance Briquet cannot have seen an authentic specimen. The fact remains that the degree of constancy in the characters of the young shoots and the different leaf-series, which give such a distinctive facies to these spiny species of *Verbena*, needs careful investigation in the field, before their true relationships can be settled in the herbarium.

Verbena (§ Verbenaca, Pungentes) spissa *Sandwith* sp. nov. [Verbenaceae]; affinis *V. caespitosae* Gill. & Hook., foliis primariis spinosis multo numerosioribus brevioribusque, secundariis multo minoribus densius rosulatis viridioribus glabrescentioribusque differt.

Frutex humilis, teste lectore 30 cm. altus et 30-90 cm. diametro; rami principales inferiores nudi, lignosi, crassissimi, 1-2 cm. diametro, apice pulvinum densum spinosum ad 14 cm. diametro gerentes; pulvinus e ramulis vetustioribus rosulis nigris foliorum praeteritorum densissime obtectis et e partibus novellis spinosis floriferisque compositus. *Folia primaria* quadrifariam disposita, subulata, valde spinescentia, brevia, 3-4.5 mm. longa, juventute pubescentia et ciliata. *Folia secundaria* in primariorum axillis ita densissime conferta ut axem ramulorum omnino occultent, ovata vel lineari-oblonga, 0.5-2 mm. longa, 0.3-0.7 mm. lata, pubescentia. *Flores* apud has rosulas gemini; bracteae ovatae, pubescentes et ciliatae, fere ad medium connatae, ad 2.5 mm. longae. *Calyx* dense breviter albo-pilosus; tubus ad 3.5 mm. longus; dentes ad 1.5 mm. longi sed vulgo breviores. *Corolla* alba; tubus glaber, 8-9 mm. longus, igitur e calyce satis longe exsertus; limbus glaber, parvus, 5-6 mm. diametro. *Stamina* filamentis brevissimis; superiorum antherae in corollae faucibus manifestae. *Ovarium* glabrum, 1 mm. altum; stylus glaber, cum stigmate 4.5-5 mm. longus.

Zapala: Cerro Lotena, at 900 m., fl. October 14th, 1925, *Comber* 78. "Found on the top of hot, dry, rocky ground, but not common. Flowers strongly-scented, white, yellowish on fading." It flowers profusely, earlier than *V. dolichothyrsa*.

This has the habit, geminate flowers and calyx of *V. caespitosa*, but parts company with it in other respects, approaching *V. seriphioides* in the dense black rosulate clothing of the old branchlets, which resembles that of *Nassauvia rosulata* Ball.

XXVI.—MISCELLANEOUS NOTES.

MR. HUGH C. SAMPSON, C.I.E., B.Sc., formerly Director of Agriculture, Madras, has been appointed Economic Botanist at the Royal Botanic Gardens, Kew.

This appointment has been made in connection with the grant of £4,000 for five years which has been received from the Empire Marketing Board through the Ministry of Agriculture and Fisheries.

The grant will be devoted partly to the employment of the economic botanist, who will be available either to visit the Dominions and Colonies from time to time or to set free a superior officer of the Kew staff to undertake oversea missions, and partly to sending botanical collectors to various parts of the world to study and bring home plants of economic importance for cultivation at Kew and distribution to suitable parts of the Empire.

The close liaison which exists between Kew and the agricultural and botanical departments of the world has proved of great benefit to the Dominions and Colonies in the introduction of new staples and the development of the natural vegetable resources of the Empire. With the progressive opening up of new territories and the continual expansion of agricultural enterprise in the Empire overseas the need has arisen for a closer co-operation and a more direct service, and these the grant is designed to afford.

The following appointment has been made by the Secretary of State for the Colonies:—Mr. A. C. BARNES, Agricultural Chemist, Nigeria, to be Assistant Director of Agriculture, Zanzibar.

The Botanic Gardens, Singapore.—The recently published Illustrated Guide to The Botanic Gardens, Singapore, provides an interesting account for the resident and a useful guide and attractive souvenir for the visitor. It is dedicated to Mr. H. N. Ridley, C.M.G., F.R.S., and others to whose interest and work the Gardens owe their present-day reputation. The general arrangement of the description is centred round the chief features of the Gardens, and, whilst attention is drawn to plants of interest, the opportunity is taken to give notes on the history of the Gardens, the history and introduction of plants with records of their success or failure, and notes on economic products. The forty plates show

delightful views of the Gardens as well as illustrate some of the fine specimens of trees and palms which are such a noticeable feature. References throughout the text are to an accompanying plan specially marked to show the position of the subject. An Index to the plants mentioned, the different features of the Gardens, and the notes of economic interest, is a useful addition. The author, Mr. I. H. Burkill, who retired from the post of Director in 1925, is to be congratulated on his work, which is excellently produced. It is published at the modest price of one dollar Straits (2s. 4d.).

A New Economic Use for *Ceanothus americanus*.—An interesting article by Mr. E. H. Wirth, which appeared in the American Journal of Pharmacy for October, 1926, under the title "The Pharmacognosy of *Ceanothus americanus*," places this shrub before us in a new light. In Great Britain its usefulness has been estimated from a decorative rather than from an economic point of view, for, although it was known that its astringent properties led to its inclusion amongst the medicinal plants of certain tribes of N. American Indians, and that its leaves were used during the American Revolutionary Wars as a substitute for tea, it has never been regarded as a valuable economic plant. Used as a parent, with other species, however, it has produced a number of very useful and decorative summer and autumn flowering shrubs which are widely grown in gardens. Recent research reveals the plant from another standpoint, for it has been discovered that a drug prepared from the root bark possesses very distinct coagulative properties, and is valuable for the control of haemorrhage when administered orally.

C. americanus L. is a shrub 2½–3½ feet high with a thick reddish rootstock and slender erect branches. The leaves are ovate, often 1½–2 inches long and ½–¾ inch wide, but larger on cultivated plants; the flowers are small and white, and they are produced in terminal panicles from current year's shoots from June to September; the fruits are three-parted capsules, almost black when ripe, containing three hard seeds each. The plant is widely distributed in the Central and Eastern States of N. America.

In the article in question both plant and drug are described. The bark is stripped from the roots and appears in the market as short greyish or reddish-brown quills which break with a short fracture. During manufacture the bark is ground into a fine reddish-brown powder. The active principle appears to be starch and calcium oxalate which are found in varying quantities in different samples. One authority placed the starch at 1.87 per cent. and the calcium oxalate at 0.52 per cent.

From an economic point of view the following lines taken from the article are of particular interest. "The plant has recently become of special interest due to the discovery of new therapeutic properties. Taylor working with an extract of the root bark and

with the alkaloids extracted therefrom has shown the drug to have marked coagulative properties when administered orally.

"Groot reports an average depression of 41.8 per cent. in coagulation time in one group of thirteen pathological cases. He used an extract of the drug and a solution of the purified alkaloid. Tharaldson has discussed the blood reactions of the drug and confirms the work of Groot on coagulation. Payne cites 235 cases in which he has used the extract of the drug preoperatively to hasten coagulation and to control haemorrhage. Clark has determined that the alkaloids from the root bark, recently isolated by Taylor, are present as a complex mixture. He was able to isolate one crystalline alkaloid and also briefly reports an interesting resin-like substance. The recently discovered therapeutic properties are supposedly due to the alkaloids."

W. D.

A New Work on Trees and Shrubs.*—It has been known for a considerable time past that Mr. Rehder has had in preparation a book on Trees and Shrubs. This has now appeared and a copy has been presented to the Kew Library by the publishers, the Macmillan Company of New York. It is a single volume of 930 pages. The author has long been recognised as one of the leading authorities in America on trees and shrubs, and students have had previous opportunities of judging his capabilities by his contributions to Bailey's "Standard Cyclopedia of Plants" and his "Monograph of the Genus *Lonicera*." Of both these products from his pen those who have studied them have formed the highest opinion and have looked forward eagerly to the appearance of this more important work. It may at once be said that their anticipations of its value will be amply fulfilled. We have long admired Mr. Rehder's wide knowledge and qualifications as a botanist, his industry and the extreme care that characterises all his work. All these qualities are evident on every page of his book and there is no doubt that it will at once take its place as a standard work. Although primarily intended for the North American public, it will, being mainly descriptive, be of great value in this country, very many cultivated trees and shrubs, of course, being common to both countries. Notices of such genera as the New Zealand Veronicas and South American *Nothofagus* are not excluded, although probably they can be grown only in the warmer States.

The book commences with a "Synopsis of the Natural Orders and Families" under which the genera dealt with are included, their sequence being in accordance with the system of Engler and Prantl. It begins therefore with the Gymnosperms (*Ginkgoaceae*) and ends with the *Compositae*. A key to the genera of each Natural Family

is provided, also one to the species of each genus. Finally concise, but sufficiently full and adequate descriptions of all the species established in cultivation are given, together with abbreviated ones of little known or less important ones. They are arranged in the order of their relationship. From this it will be seen that a complete scheme is provided for the "running down" or identification of any given species.

In the main the work must be regarded as botanical rather than horticultural. The language is technical and it is unfortunate that gardeners and even educated amateurs will not go to the trouble of committing to memory the comparatively few botanical terms used in a work like this. Compared with what people term "plain English" such terms, of course, not only represent a great economy in paper and print, but express the meaning of the writer with a preciseness and exactitude impossible except by resorting to a wearisome length of phrase. Mr. Rehder says little or nothing about cultivation and propagation, but frequently gives some idea of the garden value of a species and a note regarding its most characteristic feature.

The value of a work like this can only be fully estimated by using it, but little foresight is needed to predict that the more it is used the more will one come to rely on it. It represents a great step forward in hardy tree and shrub lore.

With regard to nomenclature, Mr. Rehder in his preface observes that he has followed the International rules. After seeing what some American authors arrive at by following this and cognate processes, one opened his book with a shiver of apprehension. But, happily, with respect to genera at any rate, as the pages are turned over we see the familiar names appear.

Some of the larger genera as estimated by Bentham and Hooker are here split up into several, such as *Pyrus*, *Vitis* and *Spiraea*, and some of the smaller ones are given names different from what have hitherto been in common use, such as *Campsis* for *Tecoma*, *Meratia* for *Chimonanthus*, *Thea* for *Camellia*. Still, on the whole, Mr. Rehder has been mercifully conservative in his use of generic names.

With regard to specific ones we cannot feel so happy. We see many that are strange and unfamiliar. Take for example our chief English elms: the common one (*U. campestris*) becomes *U. procera*; the Wych elm (*U. montana*) appears as *U. glabra*; and the smooth-leaved elm (*U. nitens*) is disguised as *U. foliacea*. Consequently not one of the names in common use for our elms is adopted. With reference to our *U. campestris*, Mr. Rehder seems to stretch its limits as a species too far. What evidence is there, for instance, that *U. viminalis*, which he makes a variety of it, ever originated from *U. campestris*? It seems to me also very doubtful that the elm of S. Europe here called var. *australis* can be anything other than a distinct species. But these are controversial matters,

* Manual of Cultivated Trees and Shrubs Hardy in North America. By Alfred Rehder. Macmillan Co., New York, 1927, pp. xxxvii. + 930. Price 42s. net.

and differences of opinion about them do not detract from the general excellence of the work, which must have involved an enormous amount of labour. The author deserves our sincerest congratulations.

W. J. B.

A Garden in Wales.*—This volume forms a useful addition to the many works on gardens already in existence. The author has a good garden and shows that he has a real knowledge and deep insight into the flowers and shrubs which he so enthusiastically cultivates. The subject matter is written in a conversational and popular style and is free from technical terms, thereby making it pleasant reading. A great deal of valuable information can be obtained from the book on the laying out of a garden, and there are many hints concerning the planting and cultivation of the more delicate plants. The excellent illustrations either of the plants *in situ* or of small stretches of the garden itself add greatly to the attractiveness of this work.

M. L. G.

South African Poisonous Plants.†—In *Kew Bulletin* 1925, p. 37, Dr. Burtt Davy drew attention to the valuable research carried out by the botanical department of the Union of South Africa in the detection of native plants suspected to be poisonous to stock. This research showed that several plants were responsible, mainly those of the families *Rubiaceae* (*Vangueria*), *Compositae* (*Matricaria*), *Papilionaceae* (*Crotalaria*), and *Chailletiacae* (*Dichapetalum*). Dr. Phillips has now provided a complete list of the known poisonous plants of South Africa accompanied by twenty plates, most of them in colour, with simple descriptions and a key for their determination. This forms No. 9 of the Memoirs of the Botanical Survey and should prove to be of great practical value to farmers and others whose interests are concerned in this important subject.

We record with great regret, as this number goes to the printers, the death on the 22nd March of Professor C. S. SARGENT, Director of the Arnold Arboretum, Harvard University. A notice of his contributions to arboriculture will appear in the next number of the Bulletin.

* By A. T. Johnson. Edward Arnold & Co., London, 1927. 8vo. pp. 324, 19 illustrations. Price 16s.

† A Preliminary List of the Known Poisonous Plants found in South Africa, by E. P. Phillips, Botanical Survey of South Africa, Memoir No. 9, Govt. Printing and Stationery Office, Pretoria, 1926. Pp. 30, plates 20. Price 2s. 6d.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1927 ROYAL BOTANIC GARDENS, KEW

XXVI.—SANTALUM, EUCARYA, AND MIDA. T. A. SPRAGUE AND V. S. SUMMERHAYES.

In response to an enquiry received from the Forestry Department, Western Australia, as to the generic status of *Fusanus* R.Br. (*Santalaceae*), and particularly as to whether it should be included in *Santalum* L., an investigation into the taxonomy and nomenclature of these and allied genera has been undertaken with the following result.

I. Taxonomy.

Alphonse de Candolle (DC. Prodr. xiv. 681, 684: 1857), merged *Fusanus* R.Br. in *Santalum* L. In this he has been followed by F. Mueller (First Cens. Austral. Pl. 64: 1882; Second. Cens. III: 1889) and C. Moore (Fl.N.S.W. 226: 1893), but all other Australian botanists have followed the Genera Plantarum and Pflanzenfamilien in recognising them as distinct genera. *Santalum* may be distinguished by the relatively long campanulate, cylindrical, ovoid or obconical perianth-tube, the tongue-like projections of the otherwise adnate disc, and the slender elongated style. *Fusanus* R.Br.* on the other hand, has a shortly cupular or patelliform perianth-tube, very short subtruncate interstaminal disc-lobes, much broader than long, and a very short stout conical style or the stigmas sessile. An examination of several related genera of *Santalaceae* has shown that the differences between what are generally regarded as distinct genera in this family are at any rate no greater than those subsisting between *Santalum* and *Fusanus* R.Br.; and it therefore seems undesirable to unite the latter genera. *Fusanus* R.Br. differs from *Colpoon* Berg, with which it was united by Robert Brown under the name *Fusanus* L.† in having a distinct, though sometimes greatly flattened perianth-tube and, except in the single New Zealand species, in the flowers being hermaphrodite. It includes two very distinct sections, namely, *Eufusanus* Benth. (Australia), and *Mida* (A. Cunn.) Benth. (New Zealand), the former approaching *Colpoon* in the much flattened perianth-tube of *F. persicarius*, and the latter resembling *Colpoon* in its tendency to unisexuality. The separation of these two sections as distinct genera would make it easier to diagnose them from *Santalum* on the one hand and from *Colpoon*

* It is necessary, in order to avoid ambiguity, to append the authority "R.Br.," because, as explained on p. 195, the name *Fusanus* is properly applicable only to *Fusanus* Murr., a synonym of *Colpoon* Berg.

† The correct citation would have been *Fusanus* Murr., since Linnaeus was not responsible for the name.

on the other. The logical result of the union of any two of the four genera in question would be the recognition of a single genus comprising these four as well as *Rhoiacarpus* and *Osyris*, which would serve no useful purpose. Baillon (Hist. Pl. xi. 421, 463: 1892) actually merged *Fusanus* R.Br. and *Colpoon* Berg in *Santalum*, though he kept *Osyris* distinct, but his generic description of *Santalum* excludes *Colpoon*, which has diclinous flowers and no free perianth-tube. Bentham and J. D. Hooker (Gen. Pl. iii. 226: 1880) pointed out that *Acanthosyris*, *Santalum*, *Comandra*, *Fusanus*, *Mida*, *Colpoon*, *Rhoiacarpus* and *Osyris* are closely related, and might be regarded as sections of a single genus, but that the union of *Santalum* and *Osyris* would hardly be accepted by botanists. So far as our own investigations have gone, the genera *Santalum*, *Mida*, *Eucarya* (i.e. *Fusanus* Sect. *Eufusanus*), *Rhoiacarpus*, *Colpoon* and *Osyris* seem to form a fairly natural series. *Colpoon* is undoubtedly related to *Osyris*, to which it has been reduced by some authors (A.DC. in DC. Prodr. xiv. 632, 634: 1857; A. W. Hill in Dyer, Fl. Cap. v. Sect. 2, 209: 1915), and *C. compressum* indeed resembles *O. abyssinica* so closely that it has sometimes been regarded as a mere synonym. The sessile stigmas of the former, however, afford a distinguishing character which may be utilised even in the fruiting stage.

A consideration of the diagnostic characters of *Eufusanus* and *Mida* seems to justify their recognition as separate genera. *Eufusanus* has an inferior ovary, a patelliform perianth-tube, strictly hermaphrodite flowers, and globose or subglobose fruits. *Mida* has a semi-inferior ovary, a shortly cupular perianth-tube, flowers sometimes unisexual, and turbinate fruits. In a paper (Trans. N.Z. Inst. lvii. 57: 10th March, 1927) received at Kew after the present article was in the printers' hands, Cockayne and Allan have independently arrived at the same conclusion as regards the separate generic status of *Mida*.

While examining the species of the above-mentioned genera, it was noticed that *Santalum fernandezianum* F. Phil., a native of Juan Fernandez, differed from all the other species of *Santalum* in its shortly cupular perianth-tube and sessile stigmas, characters which at once suggested that it might be congeneric with *Mida*. Examination of two flowers from a specimen collected by Söhrns confirmed this view, and we accordingly transfer *S. fernandezianum* to *Mida*. Neither the figures of the disc-lobes given in Hook. Ic. Pl. t.2430 nor those given by Johow, Fl. Juan Fernandez, 132, quite agree with our observations: the shape of the lobes in the two flowers examined is rather variable, but on the whole relatively broader than in the figures cited. They approach, however, the form of lobe characteristic of *Santalum*, which doubtless explains why the species was originally referred to that genus, instead of to *Fusanus* R.Br., undue prominence, in our opinion, having been given to this character in the keys in the Genera Plantarum and Pflanzenfamilien.

It now remains to determine the correct generic names of *Eufusanus* and *Mida*.

II. Nomenclature.

The name "*Fusanus* R.Br.", has been applied to a group of 5 species (four from Australia and one from New Zealand) in Benth. & Hook. f. Gen. Pl., Engler & Prantl, Nat. Pflanzenfam. and Cheeseman, Man. N.Z. Fl., but as this application of the name *Fusanus* is merely the retention of a wrong identification, the species concerned must bear another generic name or names (vide Journ. Bot. 1922, 138, No. 16). The name *Fusanus* was originally given by Murray (Linn. Syst. Veg. Ed. 13, 765: 1774) to a South African species, *F. compressus*, which has proved to be identical with *Colpoon compressum* Berg. (Descr. Pl. Cap. 38, t.1, fig. 1: 1767), the type species of the genus *Colpoon* Berg. *Fusanus* Murray is therefore a mere synonym of *Colpoon*. Robert Brown (Prodr. 355: 1810) adopted the later name *Fusanus*, citing the earlier name *Colpoon* as a synonym, and added three Australian species.

A. de Candolle (DC. Prodr. xiv. 684, 685: 1857) transferred the three Australian species of *Fusanus* to *Santalum* sect. *Eusantalum*, § 2 (Stylus abbreviatus et ideo stigmata infra antheras sita) and proposed a second section, *Mida*, based on the genus *Mida* A. Cunn. (Ann. Nat. Hist. 1. 376: 1838) which W. J. Hooker (Ic. Pl. tt.563, 575: 1843) had already transferred to *Santalum*.

Bentham (Fl. Austral. vi. 215: 1873) used the name "*Fusanus* Linn." for a genus comprising the three Australian species of *Fusanus* described by Brown, *Santalum persicarium* F. Muell. and the genus *Mida* A. Cunn. He stated that the genus *Fusanus* was limited to Australasia, thus excluding the type-species, which is a native of South Africa. He cited *Eucarya* T. L. Mitchell (Three Exped. ii. 100: 1839) as a synonym. The genus, as thus circumscribed, clearly cannot bear the name *Fusanus* under International Rules, since it does not include Murray's original species. Two names, *Mida* A. Cunn. ex Endl. (1837) and *Eucarya* T. L. Mitch. (1839) are available for the genus as defined by Bentham, Hieronymus and Cheeseman, and as generally accepted nowadays. Of these *Mida* has priority of publication and should be accepted by those who prefer to retain *Eufusanus* and *Mida* in a single genus, as has already been pointed out by Kuntze (Rev. Gen. ii. 588: 1891; Post & Kuntze, Lexik. Gen. Phan. 1367: 1903).

If they are separated generically, as recommended above, the four Australian species should bear the name *Eucarya* Mitch. As this was published without an adequate description, we supply short diagnoses of *Eucarya* and *Mida*.

III. Enumeration of genera and species (*Eucarya* and *Mida*).

Eucarya T. L. Mitch. Three Exped. ii.100 (1839), cum ic., nomen subnudum, nunc descriptum. *Fusanus* R.Br. Prodr. 355 (1810), partim; Benth. Fl. Austral. vi. 215 (1873), excl. sp. Nov.-Zeland., non Murr. *Santalum* sect. *Eusantalum*, § 2, DC. Prodr. xiv.

684 (1857), excl. *S. insulare* Bert. *Fusanus* sect. *Eufusanus* Benth. & Hook. f. Gen. Pl. iii. 225 (1880); Hieron. in Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 1, 217 (1889). *Mida* sect. *Eucarya* Kuntze in Post & Kuntze, Lexik. Gen. Phan. 367 (1903). Species 4, omnes australienses.

Flores hermaphroditi. *Perianthii* *tubus* supra ovarium patelliformis. *Disci lobi* brevissimi, lati, subtruncati. *Ovarium* inferum; stylus brevissimus, crassus, vel nullus. *Fructus* globosi vel subglobosi. *Folia* opposita vel ternatim verticillata.—Confer icones in Maiden, For. Fl. N.S.W. i. t.16.

1. *E. acuminata* (R.Br.) nob., comb. nov.—*Fusanus acuminatus* R.Br. Prodr. 355 (1810); Benth. Fl. Austral. vi. 215 (1873); Turner, Forage Pl. Austral. 91 (1891), cum ic.; Bailey, Queensl. Fl. 1386 (1902); J. M. Black, Fl. S. Austral. 168 (1924). *Santalum preissianum* Miq. in Lehm. Pl. Preiss. i. 615 (1844-5); F. Muell. Sel. Extra-trop. Pl. ed. ix. 491 (1895). *Santalum acuminatum* A.DC. in DC. Prodr. xiv. 684 (1857); F. Muell. First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); C. Moore, Fl. N.S.W. 226 (1893). *Mida acuminata* Kuntze, Rev. Gen. ii. 589 (1891).

2. *E. murrayana* T. L. Mitch. Three Exped. ii. 100 (1839), cum ic.—*Santalum persicarium* F. Muell. in Trans. Vict. Inst. 41 (1855); First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); C. Moore, Fl. N.S.W. 226 (1893). *Fusanus persicarius* F. Muell. ex Benth. Fl. Austral. vi. 216 (1873); Bailey, Queensl. Fl. 1386 (1902); J. M. Black, Fl. S. Austral. 168 (1924). *Mida persicaria* Kuntze, Rev. Gen. ii. 589 (1891).

3. *E. spicata* (R.Br.) nob., comb. nov.—*Fusanus spicatus* R.Br. Prodr. 355 (1810); Benth. Fl. Austral. vi. 217 (1873); J. M. Black, Fl. S. Austral. 168 (1924), fig. 41, F.G. *Santalum spicatum* A.DC. in DC. Prodr. xiv. 685 (1857). *Santalum cygnorum* Miq. in Lehm. Pl. Preiss. i. 615 (1844-5); F. Muell. First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); Sel. Extra-trop. Pl. ed. ix. 491 (1895). *Mida cygnorum* Kuntze, Rev. Gen. ii. 589 (1891).

4. *E. crassifolia* (R.Br.) nob., comb. nov.—*Fusanus crassifolius* R.Br. Prodr. 355 (1810); Benth. Fl. Austral. vi. 217 (1873). *Santalum crassifolium* A.DC. in DC. Prodr. xiv. 685 (1857); F. Muell. First Cens. Austral. Pl. 64 (1882); Second Cens. 111 (1889); C. Moore, Fl. N.S.W. 226 (1893). *Mida crassifolia* Kuntze, Rev. Gen. ii. 589 (1891).

Several other species described by Miquel and De Candolle were cited by Bentham as synonyms of the first three, but the descriptions are insufficient to determine them with certainty. Further material of *Eucarya* is required before a detailed revision of the genus can be undertaken.

Mida A. Cunn. ex Endl. Gen. Pl. 327 (1837); A. Cunn. in Ann. Nat. Hist. i. 376 (1838). *Santalum* sect. *Mida* A.DC. in DC.

Prodr. xiv. 686 (1857). *Fusanus* sect. *Mida* Benth. & Hook. f. Gen. Pl. iii. 225 (1880); Hieron. in Engl. & Prantl, Nat. Pflanzenfam. iii. Abt. 1, 218 (1889). *Mida* Sect. *Eumida* Kuntze in Post & Kuntze, Lexik. Gen. Phan. 367 (1903).

Species 2, altera Novae-Zelandiae, altera insularum chilensium Juan Fernandez incola.

Flores hermaphroditi vel unisexuales. *Perianthii* *tubus* supra ovarium breviter cupularis. *Disci lobi* aut brevissimi, latissimi, subtruncati (*M. salicifolia*), aut irregulariter trapezoidei vel subquadrati (*M. fernandeziana*). *Ovarium* semi-inferum; stylus nullus. *Fructus* turbinati. *Folia* alterna vel opposita.—Confer icones in Hook. Ic. Pl. tt.563, 575; Cheeseman, Ill. N.Z. Fl. t.177; Hook. Ic. Pl. t.2430.

1. *M. salicifolia* A. Cunn. in Ann. Nat. Hist. i. 376 (1838), emend. Kuntze, Rev. Gen. ii. 589 (1891) incl. *M. eucalyptoides* A. Cunn. l.c. et *M. myrtifolia* A. Cunn. l.c. 377. *Santalum mida* Hook. Ic. Pl. tt.563, 575 (1843), nomen abortivum. *Santalum cunninghamii* Hook. f. Fl. Nov. Zel. i. 223 (1854), nomen abortivum; A.DC. in DC. Prodr. xiv. 686 (1857); Hook. f. Handb. N.Z. Fl. 247 (1864). *Mida cunninghamii* Chatin, Anat. Veg., Pl. Paras. 361 (1856-91). *Fusanus cunninghamii* Benth. & Hook. f. ex T. Kirk, For. Fl. N.Z. 137, tt.75, 76 (1889); Cheesem. Man. N.Z. Fl. ed. 1, 624 (1906); Cheesem. Ill. N.Z. Fl. t.177 (1914); Cheesem. Man. N.Z. Fl. ed. 2, 388 (1925). *Santalum salicifolium* Meurisse, in Bull. Soc. Linn. Par. ii. 1026 (1892). *Fusanus eucalyptoides* Druce, in Rep. Bot. Exch. Club Brit. Isles, 1916, 623 (1917).

NEW ZEALAND. North Island, from North Cape to Cook Strait.

Under International Rules (Art. 46, 48) this species, as circumscribed by the Hookers and by Cheeseman, must bear one of the three names given to it by A. Cunningham. W. J. Hooker, on reducing *Mida* to *Santalum*, united Cunningham's three species under the new name *S. mida*, which is consequently a nomen abortivum, as is also *S. cunninghamii* Hook. f. W. J. Hooker selected *M. salicifolia* A. Cunn. as the var. *a* of *S. mida*, and Kuntze (Rev. Gen. ii. 589; 1891) chose *M. salicifolia* in preference to *M. eucalyptoides* and *M. myrtifolia*; this choice cannot be modified by subsequent authors (Internat. Rules, Art. 46).

As a result of investigations in the field, Cockayne and Allan (Trans. N.Z. Inst. lvii. 57: 1927) accept *M. salicifolia* and *M. myrtifolia* as independent species, and suggest that *M. eucalyptoides* may be a hybrid between them. From Cunningham's descriptions of *M. salicifolia* and *myrtifolia* we are unable to draw a line between these two species in the herbarium, and await further descriptions of them by Cockayne and Allan before coming to a definite conclusion.

2. *M. fernandeziana* (Phil.) nob., comb. nov.—*Santalum fernandezianum* F. Phil. in Anal. Mus. Nac. Santiago, Bot. 1892, 5;

F. & R.A. Phil. Bot. Abhandl. 3 (1893); Oliver in Hook. Ic. Pl. t. 2430 (1896); Johow, Fl. Juan Fernandez 127-133 (1896); Skottsberg, Nat. Hist. Juan Fernandez ii. 117 (1922). *Santalum album* Gay, Fl. Chil. v. 326 (1849), quoad loc. Juan Fernandez tantum, excl. descr., non L.

JUAN FERNANDEZ. Masatierra. Now extinct, the last known tree having died between 1908 and 1916. According to Skottsberg (l.c.) semi-fossil wood of a species of *Santalum* has been found on Masafuera.

IV. Geographical Distribution of the Genera.

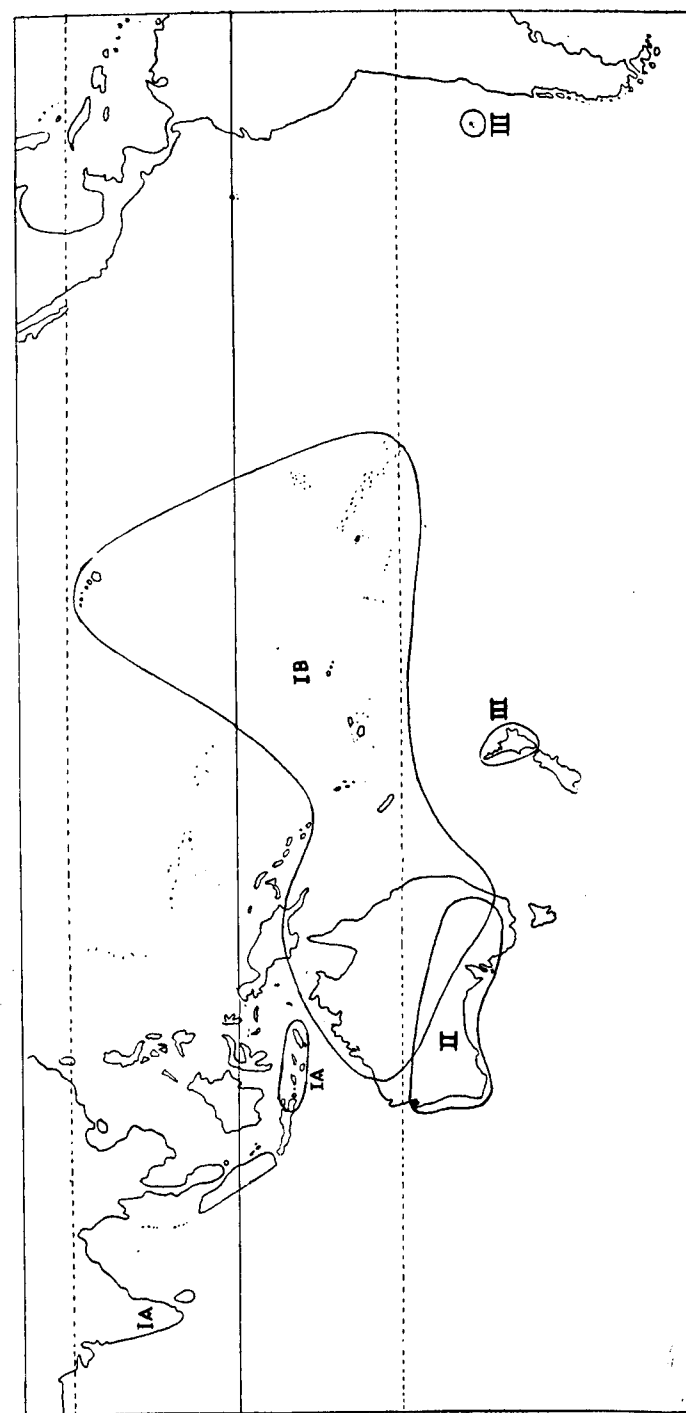
The geographical distribution of the three genera is shown on the accompanying map. Except for a slight overlapping of the ranges of *Santalum* and *Eucarya* in South Eastern Australia, the areas occupied by the genera are separate, *Santalum* occurring in Southern India, Eastern Malaya, Australia and Polynesia, *Eucarya* being restricted to Extra-tropical Australia, while *Mida*, which has the most southerly distribution, has one species in New Zealand and a second in Juan Fernandez.

The distribution of *Eucarya* calls for no comment. That of *Mida* (New Zealand-Juan Fernandez) might *prima facie* seem surprising. A number of genera, however, are confined to Temperate South America (especially Chile) and New Zealand, and some of these occur also in Juan Fernandez. It is generally supposed that such genera were formerly inhabitants of the antarctic continent, whence they migrated northwards to New Zealand on the one hand and to South America on the other. It is here suggested that *Mida* represents a special case of this type of distribution, and that it may formerly have existed both in the South Island of New Zealand and on the mainland of South America. On the other hand its near relationship with *Santalum* suggests the possibility of a diphyletic derivation from that genus and of a tropical origin. *M. salicifolia* exhibits tendencies to alternate leaf arrangement, lateral inflorescence and polygamy, none of which appears to be present in *M. fernandeziana*, which in these respects approaches *Santalum*.

The discontinuous distribution attributed to *Santalum album* (absent between India and Eastern Java) might conceivably be due to extirpation by disease in the intervening area, or to the introduction of the species from Eastern Malaya into India.

With regard to the first hypothesis the endemic sandal-wood tree of Juan Fernandez (*Mida fernandeziana*) was formerly very common, but according to Gay (Fl. Chil. v. 326: 1846) in the course of a single year all the trees perished and only dead trunks were to be seen. Although several trees were subsequently discovered of which one survived until the beginning of the present century, it can hardly be doubted that the extinction of *Mida fernandeziana* was due primarily to the above-mentioned epidemic.

In connection with the second hypothesis Mr. C. E. C. Fischer has kindly contributed the following account.



I A. Range of *Santalum album*. I B. Range of remaining species of *Santalum*. II *Eucarya*. III *Mida*.

V. *Santalum album* in India. (By C. E. C. Fischer.)

The natural distribution of *Santalum album* Linn. in India is given as from Nassik in the Bombay Presidency southwards to Madura in the Madras Presidency. As far as I know, the assumption that the species is truly indigenous has never been openly questioned.

When I had to deal with this tree, as a Forest Officer in the Coimbatore District of the Madras Presidency, I came to the conclusion that it is not indigenous in that District, and I doubted that it is indigenous in India at all. My reason was that in Coimbatore, as in the conterminous parts of Mysore, the tree occurs (or occurred in 1905-07) only in the vicinity of existing villages or abandoned village sites, mainly in hedgerows and thickets. As one went further from such centres the sandal thinned out, became rarer and rarer till it disappeared altogether, though all the conditions appeared to be identical. The contrary is what one would expect if the species were truly indigenous, because cattle are exceedingly fond of sandal leaves and are apt to destroy the plants and cattle aggregate around the villages. This also explains why the plants are found almost confined to the thickets and hedgerows, because it is there that they find some protection from the cattle. The fact that though sandal reproduces freely from seed it had not long since spread into all suitable areas impressed me greatly and led me to consider how it could have been introduced and spread so as to cause it to be considered indigenous.

Now for many years, before the British conquered Mysore from Tippoo Sultan, the rulers of that country had exercised a royal prerogative over the sandal-wood tree and had imposed very stringent regulations against its exploitation without proper authority; in fact the tree, wherever it occurred, and whether artificially or naturally grown, was the property of the rulers and not of the occupier of the land, to whom it would be, therefore, a positive nuisance. This fact, together with the observations above, induced me to think that the tree had been introduced in a dim past of which the record is lost (or at least buried and available only to the sanskrit scholar) for the sake of the valuable scented oil of its wood, and was thereafter treated as a "royal tree". Its dispersal might well have been enforced on the subjects of an autocratic ruler in order to ensure a constant and ample supply. Such introduction must have taken place at a very early date, possibly a pre-Christian one, since the use of sandal-wood is encrusted in the religious life of Brahmins and others. After its satisfactory introduction in a suitable locality its further spread would follow by natural processes, for it is a hardy and adaptable tree provided that the soil is not too wet. It will stand considerable mutilation except in early youth, indeed, short of uprooting, it is not easy to kill a sandal tree.

Its spread, however, has been comparatively slow and I cannot

conceive why it should not have occupied all suitable adjoining tracts long since if it is truly indigenous.

According to Garcia and Acosta in their works written in the middle of the 16th Century, the greater quantity of and the best sandal-wood came from Timor and adjacent islands. The latter states that the Chinese, who had a mercantile establishment there, brought sandal-wood from the Malay Islands to Calicut on the west coast of India, from whence it was distributed to all parts. Though admitting that some sandal is grown in India proper (there is, however, some confusion between red or coloured sandal, which is the Red Sanders wood of *Pterocarpus santalinus*, and the white or yellow sandal-wood of *Santalum album*), Acosta does not refer to its being brought to Calicut, and it is no great presumption to think that if it formed part of the sandal-wood trade it was only a very minor factor. Sandal-wood, however, was much prized all over the eastern region not only then but for centuries before, as it was much used medicinally and for scenting the oils used for anointing and cooling the body. Sandal figures in the earliest of the Sanskrit medical works. It is not straining the imagination, therefore, to believe that if sandal did not occur in India but was brought abundantly to Calicut, some one may have had the happy thought of growing the tree in India. That being so, Mysore would be probably the best locality for its introduction and one of the nearest suitable places. Some support is also gained from the statement of Mathiolo Sevensen quoted by Acosta, who states that the coloured sandal grew exclusively on the "hither" side of the Ganges and the white and yellow sandal on the far side. By these terms he can only have meant by the hither side India proper and the far side Burma and Malaya.

In 1800 Francis Buchanan-Hamilton made an extended tour through Mysore, Coimbatore, Malabar and Kanara, and he refers in his reports frequently to the sandal-wood tree, which by then was well established in parts of these territories, which were those of which Tippoo had recently been dispossessed. But even there sandal was restricted, and he states that there was no sandal, or only an insignificant quantity, in Coorg, where now it is plentiful and a source of considerable revenue. Hamilton mentions a plantation of healthy sandal some 20 years old at Waluru near the eastern border of Mysore and not many miles from the Palmaner plateau of the present Chittoor District of the Madras Presidency. About a century later a keen and observant Forest Officer, the late Mr. C. E. Brazier, made an official tour of this plateau and submitted a detailed inspection note with suggestions for future management. He found two or three thriving small sandal plantations which had been made some 30 or 40 years earlier, but he makes no reference whatever to finding sandal growing promiscuously in the surrounding jungle. In 1921 sandal was abundant nearly all over the forests of the plateau of some 200 square miles. It is quite impossible that Mr. Brazier should have overlooked a

plant of such value and with which he was well acquainted had it occurred in any quantity, i.e., even had there been one plant for every hundred that existed in 1921. If sandal could spread so rapidly in some 20 years or so in this locality it is incredible that, were it an indigenous species, it would not have intruded into every suitable locality during the previous centuries.

There is evidence in Hamilton's report that the spread of sandal artificially was encouraged among, if not even forced on, local cultivators and land owners in Mysore, but as they did not benefit thereby but probably found sandal a nuisance, it is not surprising that progress was slow.

Sandal succeeds best at a fair elevation, about 2,000-3,500 feet above sea level, and it is within these limits that the Bangalore plateau lies. Generally speaking, rather dry conditions are ascribed as its preference, but there the tree seldom attains more than 40 feet in height and 30-36 inches in girth, whereas under moister conditions and with a richer soil it will grow to a height of 100 feet with a girth at breast height of 6 feet, the rate of growth being of course, much more rapid. It is alleged that the proportion of scented wood is smaller in such rapidly grown trees, but I am not aware that comparison has been made between trees of the same age. It is only to be expected that the percentage of scented wood should be smaller when the growth is rapid, as it is only the heart wood that is scented, and it is quite probable that with age the proportion of scented wood would be comparable in rapidly grown trees. These facts have a certain importance in the question of the origin of the sandal tree, for if it is indigenous in India it is so in the drier tracts of Mysore, and yet we find it better grown and more vigorous in the damper parts. That is what we would expect if the tree came originally from the Malay Archipelago. It would have been introduced first in the immediate vicinity of the larger towns, e.g., Seringapatam, and these lie in the drier parts of Mysore. It has spread more towards the west, where a moister climate prevails, than into the drier East.

There is ample record of a considerable trade of sandal-wood from Timor and other islands of the Malay Archipelago in the early records of European travellers in the East, and of none or a very inconsiderable proportion from India itself, except in the nature of re-export. That conditions have become entirely reversed at the present time is an exact parallel on a small scale with the trade in Para rubber when comparing the output of the natural forests of South America with that of the plantations of the Malay Peninsula.

Though it cannot be claimed that these observations definitely prove the non-Indian origin of *Santalum album*, it seems to me that they give it a certain amount of definite support.

XXVII.—CONTRIBUTIONS TO THE FLORA OF BURMA: III.*

Michelia uniflora Dandy [Magnoliaceae]; affinis *M. Lacei* W. W. Sm., sed gemmis pedunculoque cinereo-tomentosis differt.

A large tree; branchlets at first grey-tomentose, finally glabrous; terminal bud grey-tomentose. *Leaves* obovate-oblong, subobtusate at the base, shortly acuminate at the tip, about 14-18 cm. long and 5-7 cm. broad, coriaceous, glabrous, shining above, paler beneath, laxly reticulate on both surfaces; lateral nerves about 15 on each side of the midrib, not very prominent; petiole about 1.5-2 cm. long, glabrous, channelled above; stipules free from the petiole. *Flowers* large, white, fragrant, one to a branchlet, axillary but apparently terminal owing to the pushing aside of the terminal bud; peduncle stout, about 1.5 cm. long, grey-tomentose. *Perianth-segments* about 10, the outer oblanceolate and about 6 cm. long, the inner linear and somewhat smaller. *Stamens* about 20-25 mm. long; connective with a short ligular subobtusate appendage. *Gynaecium* with a grey-tomentellous stalk; carpels about 12, grey-tomentellous at the base, glabrescent above; ovules numerous (more than 12). *Fruit* not seen.

Southern Shan States, Bauzaing (Mawson), Feb., 1888, *N. Manders*.

"Large flowering tree similar in size and shape to a Mangoe. White flowers with sweet heavy odour."

Desmos chinensis Lour. var. *siamensis* Williams [Anonaceae]. Known only from Siam.

South Tenasserim. Mayinngge, Tenasserim River, sea-level, April, *C. E. Parkinson* 1382.

Goniothalamus Sawtehii Fischer [Anonaceae]; affinis *G. Thwaitesii* Hook. f. & T., sed ramulis novis pedicellis florisque fulvo-tomentosis, petalis exterioribus latioribus, interioribus rhomboideo-ovatis, carpellis glabris distincta.

Tree about 20 feet high and 3 feet in girth; branchlets glabrescent, dark-grey; twigs densely fulvous-tomentose, later becoming dark-brown felted. *Leaves* thinly chartaceous when dry, elliptic, minutely pellucid-dotted, acute or acuminate, base rounded or cuneate, 9-19 cm. long, 3-6 cm. wide, fulvous-tomentose on both sides when young, later glabrescent above and fulvous-tomentose on the midrib and nerves beneath, midrib channelled above, prominent below, primary nerves indistinct, 9-11 pairs, anastomosing in loops near the margin; petioles 4-7 mm. long, dark-brown or fulvous-tomentose. *Flowers* solitary from the axils of fallen leaves, 3-4 cm. long; peduncles very short with 2-3 apical, broadly-ovate, acute bracteoles, fulvous-tomentose without, glabrous within; pedicels 1-1.5 cm. long, fulvous-tomentose. *Sepals* shortly united at the base, lobes suborbicular, bluntly cuspidate, fulvous-tomentose.

* Continued from *K.B.* 1927, p. 94.

Petals flat, unequal, 3 outer broadly ovate or ovate-lanceolate, 3-4 cm. long, 1.5-2 cm. wide, obtusely acuminate, base narrowed into a short, broad claw, slightly keeled exteriorly, densely fulvous- or aureo-tomentose on both sides except inside the claw and a triangular patch above it, which are glabrous and black (when dry), 3 inner cohering by their apices, rhomboid-ovate, about 1.5 cm. long, 0.5-0.8 cm. wide, apex thickened and tapering to a blunt point, base narrowed, hardly clawed, apical portion fulvous- or fuscous-tomentose, glabrous and black at the base except for a triangular decurrent patch in the middle of the dorsal aspect. *Stamens* numerous, about 2 mm. long, nail-shaped, the linear anthers concealed by the flat dome-shaped connective. *Carpels* numerous, subulate, glabrous, about 3 mm. long; ovule 1, basal; style continuous with the ovary and about half as long, subulate, entire. *Fruit* not seen.

South Tenasserim. Kyein chaung, June, Maung Saw Tch per C. E. Parkinson 1380.

Vernacular name: *Ta Mee Pie* (Karen).

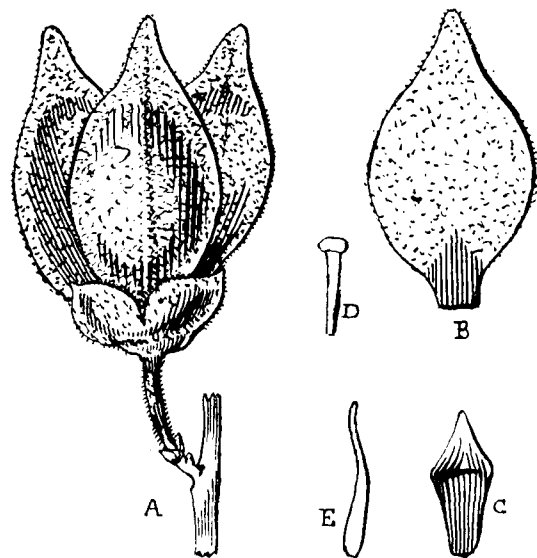


Fig. A. Flower; B. Outer petal; C. Inner petal (all about nat. size); D. Stamen; E. Carpel (both $\times 6$).

Goniothalamus latestigma Fischer [Anonaceae]; affinis *G. tenuifolio* King, sed foliis majoribus, sepalis minoribus pubescentibus ciliatisque, petalis exterioribus basi non constrictis distincta.

Shrub 8-10 feet high; youngest shoots sparsely furnished with appressed reddish-brown hairs. *Leaves* membranous, oblong, abruptly acuminate, 14-27 cm. long, 4-8 cm. wide, minutely pellucid-punctate, glabrous above, with very sparse appressed, dark hairs below, margins minutely crenulate-undulate, midrib channelled

above, prominent below, primary nerves 10-13 pairs, slightly raised below, secondary nerves irregular, reticulations minute; petioles 0.7-1 cm. long, channelled above, appressed-pubescent. *Flowers* solitary, axillary; pedicels about 6 mm. long, rather stout, appressed-pubescent, with 2 supra-basal, lanceolate, hirsute bracts nearly as long as the pedicel. *Sepals* free, thin, ovate-rotund, nearly as long as the pedicel. *Sepals* free, thin, ovate-rotund, acute, apiculate, reticulately veined, 1-1.5 cm. long, gland-dotted, appressed-hairy without, glabrous within, strongly ciliate with reddish-brown hairs. *Petals* fleshy, yellowish-green, 3 outer lanceolate, subacute, slightly keeled dorsally, 2.5-3.5 cm. long, rugulose, densely felted with appressed reddish-brown hairs on both sides except for a triangular patch at the base within, 3 inner ovate, subacute, conniving over the stamens and pistils, base concave, apical half thickened, 1-1.5 cm. long, felted with reddish-brown hairs without, greyish pubescent within except the glabrous concave base. *Stamens* numerous, 1.5 mm. long, nail-shaped, anthers concealed by the hemispherical, densely fuscous-villous connective. *Carpels* many. *Ovary* compressed subulate, 1.5-2 mm. long, sparingly reddish-brown hirsute; ovule 1, basal; style very short, stigma as long as or longer than the ovary, curved outwards, funnel-shaped, split down one side, the edges involute (at least when dry), glabrous, apical margin lobulate. *Fruit* not seen.

South Tenasserim. Banlamut, Zawe chaung, about sea-level, March, C. E. Parkinson 1962.

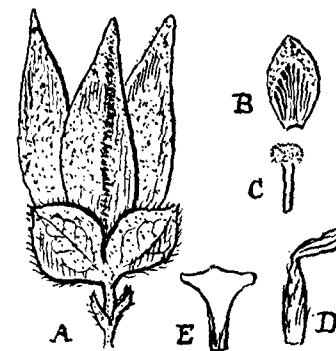


Fig. A. Flower; B. Inner petal, ventral aspect (both about nat. size); C. Stamen; D. Pistil (both $\times 6$); E. Expanded stigma ($\times 12$).

Cyathocalyx uniflorus Fischer [Anonaceae]; affinis *C. virgato* King, sed floribus solitariis, petalis obtusis subequalibus, carpello solitario, toro plano distincta.

Tree 50 feet high; twigs pale-brown, glabrous except the puberulous extremities. *Leaves* rigidly papery, oblong or elliptic-oblong, abruptly acutely acuminate, base acute or cuneate, 6-22 cm. long, 2.5-6.5 cm. wide, glabrous, shining, midrib slightly raised above, prominent below, primary nerves 5-10 pairs, spreading, curved, anastomosing in several loops near the margin, raised below,

secondaries transverse, reticulations fine, distinct. *Petioles* rather stout, shallowly channelled above, 0.6–1.2 cm. long, puberulous. *Flowers* solitary, extra-axillary or leaf-opposed, 2–3 cm. long; pedicels stout, about 5 mm. long, felted with rufous pubescence; bracts caducous. *Sepals* coriaceous, shortly united below, broadly ovate, subacute, 0.8–1 cm. long, felted with rufous pubescence without, fuscous-pubescent within. *Petals* 6, coriaceous, 2-seriate, subequal, valvate, oblong-lanceolate, slightly constricted in the basal third into a broad claw, the inner somewhat concave at the base, apex rounded, 2–2.6 cm. long, felted on both sides with fuscous pubescence except the base which is glabrous and black (at least when dry). *Torus* flat. *Stamens* numerous, narrowly obcuneate, about 2.5 mm. long; anthers concealed by the flat connective. *Carpel* solitary, narrowly conical, truncate, glabrous, rugose, 3–4 mm. long; ovules about 12; stigma hollowed out in the apex of the ovary, puberulous. *Fruit* not seen.

South Tenasserim. Thebyu, Theinkun chaung, June, Maung Saw Teh per C. E. Parkinson 1383.

Vernacular name:—*Migyaung-u* (Burmese).

Melodorum Thorellii Pierre [Anonaceae].

Known from Cambodia and Laos.

Mergui. Leikpok chaung, 400 ft., Mr. Braybon's collector 2, per C. E. Parkinson.

Some of the leaves are abruptly narrowly cuspidate.

Roydsia suaveolens Roxb. [Capparidaceae].

Known from N.E. India and Cambodia.

South Pegu. Intakaw new reserve, C. E. Parkinson 2562.

Dipterocarpus Kerrii King [Dipterocarpaceae].

Hitherto known only from the Malay Peninsula and possibly Siam.

South Tenasserim. Minthan taung, Tenasserim River, 200 ft., March, C. E. Parkinson 2007.

"A tree 100 feet or more high. Much tapped for oil." (Parkinson).

Vernacular name:—*See-Bin* (Burmese).

The following divergences from the original description were noted in the present specimens:—The leaves are up to 5.5 in. long and 2.6 in. wide and have up to 14 pairs of primary nerves; the petioles attain 1.3 in. long. The wings of the fruit attain a length of 6 in.; the nut is sometimes strongly depressed-globose, up to 1.2 in. across and but 0.6 in. deep.

Hopea Helferi Brandis [Dipterocarpaceae].

South Tenasserim. Thebyu chaung forests, 100 ft., Feb., C. E. Parkinson 1929. "Tree 80–120 ft. high" (Parkinson).

Vernacular name:—*Thingan Kyauk*.

As the fruit was hitherto unknown its description is appended:—*Nut* ovoid, apiculate, 5 mm. long, closely embraced by the 3 unenlarged sepals and the bases of the 2 wings. *Wings* membranous,

narrowly oblong, 5–7 cm. long, 1.2–2 cm. wide, apex rounded, base narrowed into a short claw, 7-nerved, minutely puberulous.

Hopea minutiflora Fischer [Dipterocarpaceae]; affinis *H. odoratae* Roxb., sed foliis subtus puberulis domatiis dense hirsutis munitis, floribus minoribus, sepalis majoribus obtusis, ovarium subglobosum, stylo brevissimo, fructus alis oblanceolatis distincta.

Tree 60 feet high; twigs terete, brown, thinly covered with reddish-brown, densely fascicled hairs. *Leaves* lanceolate, gradually tapering to a blunt point, base rounded, inequilateral, 6–13 cm. long, 2.3–4 cm. wide, midrib and the 8–10 pairs of ascending primary nerves prominent below, secondary nerves close, obliquely transverse, indistinct, glabrous above except the puberulous midrib, thinly puberulous below with short fascicled hairs, the lower axils of the nerves with large densely hirsute domatia; petioles 0.8–1.2 cm. long, covered with reddish-brown fascicled hairs. *Inflorescence* of terminal and axillary, paniced, unilateral racemes, usually shorter than the leaves; rhachis and its branches tomentose with greyish fascicled hairs; pedicels shorter than the sepals, stout. *Sepals* grey-felted, the 2 larger oblong, rounded, 2 mm. long, the 3 smaller subacute. *Petals* falcately obovate-oblong, obtuse, about 3 mm. long, grey-pubescent. *Stamens* 10, about 1 mm. long, glabrous; filaments flat, anthers elliptic-oblong, shorter than the filaments, connective produced into an arista about as long as the anther. *Ovary* subglobose, 2 mm. long, pubescent; style very short, glabrous, stigma minutely 3-toothed. *Nut* ovoid, apiculate, about 4 mm. long, closely embraced by the sepals. *Wings* 2, oblanceolate, apex rounded, 3.5–4.7 cm. long, 1.2–1.6 cm. wide, 6–7-nerved, minutely puberulous.

South Tenasserim, Maliwun, Victoria Point, 100 ft., March, C. E. Parkinson 2028.

Vernacular name:—*Mai-ka-kien* (Shan).

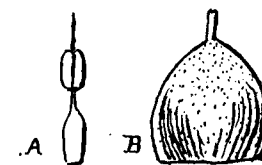


Fig. A. Stamen ($\times 20$); B. Ovary ($\times 10$).

Ancistrocladus extensus Wall. [Ancistrocladaceae].

South Tenasserim, Kanaungyi, Tenasserim River, 200 ft., March, C. E. Parkinson 1976.

The sepals bear 1 or 2 median pitted circular glands on the outer side, when 2 they may be collateral or one a little above the other. They can still be traced in the wings of the fruit. These glands do not appear to have been mentioned in any description, though they seem to be constant and are present in the type specimen in the Wallichian Herbarium. Similar glands are to be seen in other species of the genus.

Brownlowia Helferiana Pierre [Tiliaceae].

South Tenasserim. Banlamut, Zawe chaung, about sea-level, March, C. E. Parkinson 1964.

This species has been represented hitherto in the Kew Herbarium by a single sheet of Helfer's, Kew Distr. No. 624. There is, however, a sheet from Siam without flowers or fruit and with 2 leaves only, which seems to be this species. Pierre's description is very meagre, and so a fuller one is appended:—

A small tree. *Leaves* peltate, broadly ovate or rotund-ovate, acuminate or shortly finely caudate, base rounded, margins subundulate, sometimes with a few broad, apiculate teeth in the apical third, 9–10-ribbed, nerves concentric, ultimate reticulations minute, 20–30 cm. long, of which about one-seventh is below the insertion of the petiole, 14–20 cm. wide, glabrous above, below densely matted with minute greyish, stellate tomentum and more or less hairy, especially on the nerves, with long brownish simple hairs; petiole terete, slightly swollen at either end, glabrescent, 15–25 cm. long. *Inflorescence* terminal, of elongate, paniced cymes up to 30 cm. long; rhachis and its branches densely tomentose with reddish-brown stellate scales. *Flowers* numerous, about 1 cm. diam.; buds subglobose, red; pedicels articulate at the base, 5–7 cm. long, reddish-brown stellate-scaly. *Calyx* cup-shaped, fleshy, 6–7 cm. long, subequally 5-lobed about $\frac{1}{2}$ way down, lobes ovate, subacute, densely felted with reddish-brown stellate scales without, thinly silky within. *Petals* 5, obovate-oblong, rounded, very shortly clawed, glabrous, white, about 1 cm. long. *Torus* about 1 mm. long, slightly angular, glabrous. *Stamens* very many, about 6 mm. long, filaments capillary; anthers small, cells reniform. *Staminodes* linear-ensiform, acuminate, nearly as long as the stamens, standing in the grooves of the ovary. *Ovary* depressed globose, about 2 mm. long, deeply 5-ridged, ridges rounded, striate, densely brown-villous, 5-celled; ovules 2, superposed, compressed ellipsoid, naked; styles subulate, cohering, usually bent over at the apex, covered in the lower third with stellate brown scales, glabrous above, about 5 mm. long. *Fruit* not seen.

Dysoxylum turbinatum King [Meliaceae].

Known only from the Malay Peninsula.

South Tenasserim. Mayinnge, Tenasserim River, about 200 ft., March, C. E. Parkinson 1994.

In Mr. Parkinson's specimens the midrib of the leaves on both sides and the nerves below are more permanently hairy than is described by King or Ridley; the disk is 8-lobulate and densely pilose throughout within.

Amoora cucullata Roxb. [Meliaceae].

South Tenasserim. Mayinnge, Tenasserim River, at sea-level, March, C. E. Parkinson 2005. "A tree 40–50 feet high of mangrove swamps. Juice milky. Flowers yellow. Has long, sharply-pointed pneumatophores." (Parkinson).

Milky juice and pneumatophores do not appear to have been recorded previously for this species.

Vernacular name:—*Myauk-Leseik* (Burmese).

Parkia streptocarpa Hance [Mimosaceae].

Known only from Siam.

South Tenasserim. Chaungnaukpyan, 300 ft., Jan., C. E. Parkinson 1642.

Barringtonia reticulata Mig. [Lecithydaceae].

Known from the Philippines and Borneo.

South Tenasserim. Kyein chaung forests, 200 ft., Feb., C. E. Parkinson 1668.

This species does not appear to me to be conspecific with *B. acutangula* Gaertn. as suggested by Merrill; it differs by the more acuminate leaves with more numerous primary nerves (12 or more against 8–9), finer and more open reticulation, longer spikes with larger flowers with different indumentum and the sepals ciliate.

Gaertnera lasianthoides Fischer [Loganiaceae]; affinis *G. phanerophlebiae* Baker, foliis majoribus ad basim sensim angustatis, stipulis non membranaceis nec vaginantibus laciniatis, floribus minoribus differt.

Shrub 3–4 ft. high; twigs flattened, rufous-hirsute. *Leaves* membranous, oblanceolate, acute, base tapering into the petiole, margins entire, slightly revolute, 12–18 cm. long, 4–6.5 cm. wide, glabrous above, laxly rufous-hairy below, more densely on the midrib and the nerves, midrib prominent below, primary nerves 10–13 pairs, prominent below, regular, ascending, arched, secondary nerves and very fine reticulations slightly raised below but obscure; petioles 0.8–1.5 cm. long, densely rufous-hirsute; stipules 2, oblong, apex more or less lacinate with 2 or more filiform aristae, about 1 cm. long, 0.75 cm. wide, hirsute without and ciliate with rufous hairs, glabrous within. *Flowers* in terminal, paniced, trichotomous cymes much shorter than the leaves, sessile and aggregated at the ends of the cyme-branches; peduncles, rhachises and cyme-branches densely rufous-hirsute; bracts at the forks united in pairs, oblong, 3-toothed at the apex, the middle tooth acuminate, much longer than the lateral, densely rufous-hirsute without, glabrous within; bracteoles simple, lanceolate, acuminate, entire or like the bracts and similarly hirsute. *Calyx* tubular-campanulate, 5-lobed about $\frac{1}{2}$ the way down, about 4 mm. long, rufous-hirsute without, glabrous within, lobes ovate, subacute. *Corolla* hypocrateriform, pale-mauve to white, hirsute with grey and rufous hairs without, glabrous within, tube cylindric, about 4 mm. long, lobes a little shorter, ovate, acute. *Anthers* sessile on the mouth of the corolla-tube, partly exerted, linear-oblong. *Ovary* discoid, small, apex flat, glabrous, 2-celled; ovule solitary in each cell, basal erect, obovoid, compressed; style filiform, glabrous, about as long as the corolla-tube, apex 2-lobed. *Fruit* not seen.

South Tenasserim, Ngawun chaung, 200 ft., Jan., C. E. Parkinson 1607.

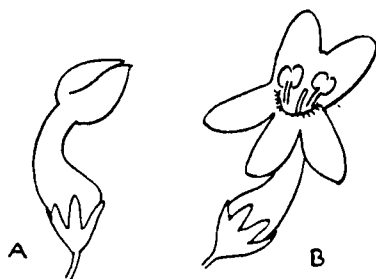
Gymnostachyum trilobum Ridley [Acanthaceae].

Known only from Siam.

South Tenasserim. Kyein chaung, 200 ft., Feb., C. E. Parkinson 1673.

Sphinctacanthus Parkinsonii Fischer [Acanthaceae]; affinis *S. siamensi* C. B. Clarke, foliis et floribus majoribus, spicis longe pedunculatis, lobis corollae obtusis differt.

A small *shrub*; twigs with thin, pale, shining (at least when dry), outer cortex, black within. *Leaves* thinly membranous, narrow-elliptic to oblanceolate, acute or acuminate, base narrowed into the petiole, 12–22 cm. long 3.5–9 cm. wide, quite glabrous, with numerous minute linear cystoliths, margins subundulate, midrib very broad, not raised, dark, primary nerves 8–13 pairs, regular, arching, anastomosing well within the margin, reticulations obscure; petioles 1.5–2.2 cm. long, dark, glabrous, lineolate. *Inflorescence* a terminal, many-flowered spike, 15 cm. long; peduncle 4–5 cm. long peduncle and rhachis dark, minutely puberulous; bracts minute. *Flowers* pedicelled in opposite fascicles of 3 at each node, fascicles sometimes very shortly peduncled. Pedicels slender,



Sphinctacanthus Parkinsonii Fischer.

A. bud; B. open flower (both about nat. size).

3–6 mm. long, minutely puberulous, with a few scattered, stipitate glands. *Calyx* 4 mm. long, 5-lobed for $\frac{2}{3}$ of its length, minutely puberulous without, lobes linear-lanceolate acute or subacute, equal or the anterior shorter. *Corolla* glabrous, 1.8–2 cm. long, mauve, tube curved, swollen at the base, constricted above and narrowed to the mouth, limb 2-lipped, 8–9 mm. long, ovate and imbricate in bud, spreading in flower, upper lip 2-lobed for about $\frac{1}{3}$ its length, lobes oblong, rounded, lower lip deeply 3-lobed, lobes narrower, rounded. *Stamens* 2 perfect, on the mouth of the corolla-tube, exserted, the base of each united by a narrow ligament to a short, ligulate staminode; filaments flat, broad, glabrous, about 2 mm. long; anthers 2-celled, cells separate, suborbicular or reniform, one slightly below the other, muticous. *Disk* annular, short. *Ovary* ellipsoid, glabrous, 3 mm. long; ovules 4, rotund-ovoid,

compressed, acute, glabrous; style filiform, glabrous shortly exserted; stigma minutely 2-lobed. *Fruit* not seen.

Mytkyina District, Nawraw chaung, Dec., C. E. Parkinson 390.

Justicia valida Ridl. var. **glandulosa** Fischer [Acanthaceae]; a typo rhachidibus bracteis pedicellis calicibusque externe glanduloso-pubescentibus differt.

A branched *shrub* 3–6 ft. high; twigs subquadrangular in section, brown, glabrous. *Leaves* herbaceous, oblanceolate, acutely or bluntly acuminate, base gradually narrowed into the petiole, glabrous, lineate with minute, linear cystoliths, 9–29 cm. long, 3.5–10 cm. wide, margins more or less undulate-crenate, midrib rather broad, slightly raised on both faces, shallowly channelled above, primary nerves about 7 pairs, rather broad, pale, regular, arched, anastomosing in several loops near the margin, reticulations obscure; petioles flattened, striate, glabrous 1.5–4.5 cm. long. *Inflorescence* in terminal, very shortly peduncled spikes or racemes, often with a pair of much reduced leaves at the base; rhachis minutely glandular-puberulous; bracts opposite, lanceolate, acuminate, 1–4 mm. long, minutely glandular-puberulous. *Flowers* very shortly pedicelled, 1.2 cm. long, bracteoles like the bracts. *Calyx* about 4 mm. long, 5-partite almost to the base, minutely glandular-puberulous without and glandular-ciliate, minutely pubescent within, lobes linear-lanceolate, acute. *Corolla* 1 cm. long, tubular-ventricose, 2-lipped, greenish dotted with purple, lower lip white, whitish-pubescent without, minutely hairy inside the tube, tube 6 mm. long, rather broad, slightly ventricose at the base, upper lip oblong, shortly 2-lobed, lobes rounded, lower lip 3-lobed for $\frac{1}{2}$ its length, mid lobe triangular-ovate, acute, lateral lanceolate, acute. *Stamens* 2; filaments free from about the middle of the corolla-tube, filiform-subulate, shortly white-hairy below, glabrous above; anthers exserted, elliptic, white-hairy on the back, 2-celled, cells separated, one a little above the other with empty, minutely spurred bases. *Disk* short, annular, sparsely, minutely ciliate. *Ovary* ellipsoid, 2–3 mm. long, glabrous except the sparsely hairy tip; ovules 4, suborbicular, glabrous; style filiform, furnished with ascending hairs on the lower half, glabrous above, slightly exserted; stigma minutely 2-lobed. *Capsule* clavate with a solid cylindric base, minutely puberulous. *Seeds* 2, supported by upturned, hard retinacula, flat, suborbicular or cordate, 4–5 mm. long, brown, papillose-rugose.

South Tenasserim, Theinkun chaung, Naunghwa, 200 ft., Feb., C. E. Parkinson 1696 (type). Also in Herb. Kew., Siam, Nam Rat, 100 m., October, Vanpruk 690.

Glochidion subterblancum Fischer [Euphorbiaceae]; sectioni *Glochidiopsi* congruit sed a specibus aliis sepalis aequalibus latis, foliis infra albis differt.

A small *shrub*; branchlets terete, glabrous, brown. Twigs slightly flattened, often 2-keeled by the decurrent petioles, glabrous,

pale-brown. *Leaves* bifarious, broadly ovate, obtuse or subacute, base rounded and sometimes shortly, abruptly acute, 4-6.5 cm. long, 2.5-4 cm. wide, quite glabrous, creamy-white below, midrib slightly raised above, primary nerves 6 pairs, arching and uniting by a single loop near the margin, distinct above, obscure below, reticulations obscure, margins very slightly revolute; petioles terete, glabrous, 2-3 mm. long; stipules short, ovate or lanceolate, acute or acuminate, glabrous. *Inflorescence* of a few flowers fascicled on axillary, multibracteate branchlets 2-5 mm. long. *Flowers* ♂ about 4 mm. in diam.; pedicels 2-3 mm. long. *Perianth* spreading, 6-lobed for about half its length, lobes broad, basal angles rounded and overlapping, apex rounded or cuspidate, pale-green. *Stamens* 3, united into a central column; anthers erect, as long as the column, obovate. *Pistillode* 0. *Flowers* ♀ 0.9-1 cm. in diam.; pedicels stouter than of the ♂. *Perianth* as in the ♂ but less cuspidate, more often truncate or emarginate. *Ovary* pyramidal-discoid, 6-lobed, 3-celled; ovules 2 in each cell, collateral; styles 3, quite free, bifid for about $\frac{1}{2}$ their length, the 2 segments subulate. *Fruit* not seen.

South Tenasserim, Kyein chaung, 200 ft., Feb., C. E. Parkinson 1669.

Vernacular names: *Kyanna* (Burmese); *Thakwan* (Shan).

Tacca Chantiéri André [Taccaceae] (= *T. Garretti* Craib).

Known from Malaya and Siam.

South Tenasserim. Htape chaung, 300 ft., Jan., C. E. Parkinson 1619.

XXVIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXII.

Oberonia apiculata Kerr [Orchidaceae—Epidendreae]; affinis *O. demissae* Lindl., sed labelli lobo mediano rotundato et apiculato recedit.

Herba epiphytica, acaulis, 4-5-foliata. *Folia* late ensiformia, interdum leviter falcata, minutissime apiculata, ad 2.5 cm. longa et 0.8 cm. lata, carnosula. *Inflorescentia* 3.8-5 cm. longa, decurvata; pedunculus 1.3-1.6 cm. longus, paucibracteatus; racemus 2.5-3.5 cm. longus, perdense multiflorus; bracteae late triangulares, 2.5 mm. longae, 2.5 mm. latae, subdentatae; pedicellus cum ovario 1.5 mm. longus, crassus; flores expansi 3 mm. diametro. *Sepalum intermedium* late ovatum, obtusum, 2 mm. longum, 1.2 mm. latum; sepala lateralalia late falcata, obtusa, 1.3 mm. longa, 1.2 mm. lata. *Petala* elliptica, obtusa, 1.75 mm. longa, 0.75 mm. lata, margine paucidentata. *Labellum* 1.5 mm. longum, 1.75 mm. latum, trilobatum; lobi laterales rotundati, margine dentati; lobus intermedius triangularis vel

suborbiculatus, apiculatus, margine integer; discus concavus. *Columna* perbrevis, crassiuscula.

Krabin, under 50 m., on trees in open deciduous forest, Kerr 0208.

Oberonia betongensis Kerr [Orchidaceae—Epidendreae]; species ad *O. miniatam* Lindl., accedit sed labello latiore, floribus subverticillatis differt.

Herba epiphytica, caespitosa; caules erecti, ad 9 cm. alti. *Folia* cultriformia, acuta, ad 2.5 cm. longa, 0.7 cm. lata, carnosula. *Racemus* ad 19 cm. longus, usque supra basem floriferus, multiflorus, floribus subverticillatis, rhachi tomento albedo lepidoto vestito; bracteae ovatae, acuminatae, 2 mm. longae, dense tomentosae; pedicellus cum ovario 0.5 mm. longus, dense tomentosus. *Sepala* inter se subaequalia, late ovata, obtusa, 0.75 mm. longa, 0.5 mm. lata, extus tenuiter tomentosa. *Petala* lanceolata, 0.7 mm. longa, 0.4 mm. lata, minute denticulata. *Labellum* obcordatum, e basi gradatim dilatatum, 1 mm. longum, 0.7 mm. latum, apice bilobatum et obscure denticulatum. *Columna* brevis, crassiuscula.

Patani, Betong, 400 m., on trees in evergreen forest, Kerr 093.

Kerr 072 also from Betong, but in young bud only, may be this species.

Oberonia bambusicola Kerr [Orchidaceae—Epidendreae]; affinis *O. recurvae* Lindl., sed labello pro rata brevior, petalis minus erosis differt.

Herba epiphytica, acaulis, 6-7-foliata. *Folia* lineari-oblonga, recta vel subfalcata, acuta, ad 6 cm. longa, 0.6 cm. lata. *Inflorescentia* ad 10 cm. longa, pedunculo communi dense bracteato ad 3.5 cm. longo incluso; racemus dense multiflorus, floribus subverticillatis; bracteae anguste triangulatae, acutae, 3 mm. longae, 1 mm. latae, irregulariter erosae; pedicellus cum ovario 1.5 mm. longus, tenuis. *Sepala* inter se subaequalia, late ovata, obtusa, 1.5 mm. longa, 1.3 mm. lata. *Petala* obovata, obtusa, 1.5 mm. longa, 0.8 mm. lata, subdentata. *Labellum* subquadratum, 2 mm. longum, 2.2 mm. latum, lobis lateralibus magnis rotundatis dentatis, lobo intermedio obcordato cum apiculo minuto in sinum interiecto. *Columna* brevis, crassiuscula.

Sriracha, Nawng Kaw, 50 m., on bamboos in evergreen forest, flowers greenish-brown, Kerr 383.

Oberonia quinquelobata Kerr [Orchidaceae—Epidendreae]; affinis *O. myrianthae* Lindl., sed labello lobis quinque subaequalibus facile distinguenda.

Herba epiphytica, acaulis, 3-5-foliata. *Folia* ensiformia, interdum leviter falcata, acuta, ad 7.5 cm. longa, 0.6 cm. lata. *Inflorescentia* ad 20 cm. longa, pedunculo communi bracteis acutis disseminato incluso; racemus ad 18 cm. longus, floribus subverticillatis; bracteae triangulatae, acutae, 3.5 mm. longae, 1 mm. latae, membranaceae, marginibus profunde et irregulariter laceratae; pedicellus cum ovario 1 mm. longus. *Sepalum inter-*

* Continued from *K.B.*, 1927, p. 174.

medium ovatum, obtusum, 1.5 mm. longum, 0.75 mm. latum; sepala lateralalia late falcata, obtusa, 1.5 mm. longa, 1 mm. lata. *Petala* ovata, obtusa, 1.5 mm. longa, 0.5 mm. lata, integra. *Labellum* subquadratum, 1.5 mm. longum, 1.5 mm. latum, quinquelobatum; lobi laterales parvi, rotundati, erecti; lobus intermedius tribus lobulis subaequalibus, margine haud dentatus. *Columna* brevis, ampla, patulo clinandrio.

Chiengmai, Kawng Hê, 900 m., *Lung Yi* 0228 in Herb. *Kerr*.

Oberonia teres *Kerr* [Orchidaceae—Epidendreae]; species *O. Myosuro* Lindl., similis, sed labelli lobo intermedio haud caudato facile distinguenda.

Herba epiphytica, subacaulis, caespitosa, 3-7-foliata. *Folia* recurvata vel recta, teretia, haud sulcata, ad 2.5 cm. longa, 0.2 cm. diametro. *Inflorescentia* ad 2.8 cm. longa (pedunculo communi ad 1 cm. longo multibracteato incluso), perdense multiflora; bracteae oblongae, obtusae, 1.7 mm. longae, 0.7 mm. latae, apice irregulari-dentatae. *Sepala* subaequalia, ovata, concava, obtusa, 1 mm. longa, 0.7 mm. lata. *Petala* linearia, 0.8 mm. longa, 0.2 mm. lata, versus apicem subdentata. *Labellum* suborbiculatum, 1.2 mm. diametro; lobi laterales parvi, auriculiformes; lobus intermedius rotundatus, apice bilobulatus, cum apiculo interjecto, margine leviter dentatus. *Columna* crassiuscula, clinandrio antheram arcte attingente.

Chiengmai, Mê Tun, 800 m., on trees in open forest, *Kerr* 484.

Oberonia variabilis *Kerr* [Orchidaceae—Epidendreae]; ab *O. intermedia* King et Pantling, labello lobo intermedio haud eroso, petalis pro rata latioribus recedit.

Herba epiphytica, caespitosa; caulis ad 2 cm. longus, 3-5-foliatus. *Folia* ensiformia, interdum leviter falcata, acuta, ad 2.4 cm. longa, 0.4 cm. lata. *Inflorescentia* ad 10 cm. longa; pedunculus communis ad 2.5 cm. longus, gracilis, multibracteatus; racemus ad 7.5 cm. longus, dense multiflorus, floribus subverticillatis; bracteae ad 1.5 mm. longae, 0.7 mm. latae, margine leviter undulatae; pedicellus cum ovario 1 mm. longus. *Sepalum intermedium* ovatum, obtusum, 0.7 mm. longum, 0.4 mm. latum; sepala lateralalia obtusa, late falcata, 0.7 mm. longa, 0.5 mm. lata. *Petala* ovata, obtusa, 0.7 mm. longa, 0.5 mm. lata, integerrima. *Labellum* 0.8 mm. longum, 0.8 mm. latum, 3-lobatum; lobi laterales angusti, leviter falcati; lobus intermedius rotundatus, interdum apiculatus. *Columna* crassiuscula, amplo clinandrio.

Chiengmai, Kawng Hê, 960 m., common on tea trees, flowers reddish, *Local Collector* 369 in Herb. *Kerr*.

Oberonia variabilis *Kerr*, var. **trilobulata** *Kerr* [Orchidaceae—Epidendreae]; a typo labelli lobo intermedio apice trilobulato recedit.

Chiengmai, Kawng Hê, 960 m., on tea trees, flowers reddish, *Local Collector* 369a in Herb. *Kerr*.

Liparis angkae *Kerr* [Orchidaceae—Epidendreae]; a *L. nepalense* Lindl., labello pro rata latiore, acumine brevior inter alia recedit.

Herba terrestris; rhizoma breve, circiter 0.4 cm. diametro; pseudobulbus ovoideus, ad 1.5 cm. altus, basi 0.8 cm. diametro, 2-foliatus. *Folia* late ovata, obtuse acuminata, basi cordata, 5-8.5 cm. longa, 3.5-5.5 cm. lata; folium inferius petiolo ad 3 cm. longo suffultum, superius sessile. *Inflorescentia* ad 14 cm. longa; pedunculus communis ad 8 cm. longus, dimidio superiore dense bracteatus; racemus ad 6 cm. longus, multiflorus; bracteae oblongae, obtusae, ad 5 mm. longae, 1.5 mm. latae, 1-nervatae; pedicellus cum ovario 7 mm. longus. *Sepalum intermedium* oblongo-ovatum, obtusum, 7.5 mm. longum, 2 mm. latum, integerrimum, 3-nervatum; sepala lateralalia oblongo-ovata, leviter inaequilateralalia, obtusa, 7.5 mm. longa, 2 mm. lata, 3-nervata, subter labellum incumbientia. *Petala* linearia, 7.5 mm. longa, 0.7 mm. lata, 1-nervata, deflexa. *Labellum* ovatum, breviter acuminatum, 9 mm. longum, 5 mm. latum, basi callis triangularibus duobus. *Columna* 2.5 mm. longa, valde curvata, haud alata.

Doi Angka, Pa Ngem, 2100 m., on mossy open rocks, sepals green, petals red, lip green with red veins, *Kerr* 497.

Liparis Craibiana *Kerr* [Orchidaceae—Epidendreae]; affinis *L. stenoglossae* Par. et Reichb. f., sed habitu robustiore labello angustiore differt.

Herba terrestris; pseudobulbus ovatus, circiter 3 cm. altus, basi 1 cm. diametro, plerumque 4-foliatus. *Folia* laminis late ellipticis vel ovato-ellipticis basi sensim angustatis usque ad 18 cm. longis et 7.5 cm. latis, petiolis 2-4 cm. longis suffulta. *Inflorescentia* ad 19 cm. longa; pedunculus communis ad 14 cm. longus, 1-2-bracteatus; racemus ad 5 cm. longus, 8-12-florus; bracteae late ovatae, longe acuminatae, 3 mm. longae, 1 mm. latae; pedicellus cum ovario 8 mm. longus; ovarium alis crenulatis sex. *Sepala* oblonga, obtusa, subaequalia, 7.5 mm. longa, 1.5 mm. lata, 5-nervata; lateralalia leviter falcata. *Petala* linearia, obtusa, 7 mm. longa, 0.5 mm. lata. *Labellum* liguliforme, 6 mm. longum, 2 mm. latum, basi callis duobus curvatis cornuformibus instructum, apice obscure trilobatum, supra partem basalem leviter constrictum. *Columna* 3 mm. longa, arcuata, apice breviter biauriculata.

Doi Sutep, 750 m., on rock in evergreen forest, flowers green, *Kerr* 349.

Liparis fimbriata *Kerr* [Orchidaceae—Epidendreae]; affinis *L. barbatae* Lindl., a qua floribus maioribus et labello valde fimbriato recedit.

Herba terrestris; caulis 5-9 cm. longus, inferne leviter tumidus, 2-3-foliatus. *Folia* late elliptica vel ovata, leviter acuminata, ad 10 cm. longa, 4.5 cm. lata, petiolo ad 1.5 cm. longo suffulta. *Inflorescentia* ad 9 cm. longa; pedunculus communis ad 5 cm. longus, paucibracteatus; racemus ad 4 cm. longus, pauciflorus; bracteae triangulares, 1.5 mm. longae, 1 mm. latae; pedicellus cum

ovario 8 mm. longus. *Sepalum intermedium* lineare, obtusum, 7 mm. longum, 1 mm. latum, 3-nervatum; sepala lateralalia 5 mm. longa, 1.7 mm. lata, leviter falcata, 3-nervata. *Petala* linearia, obtusa, 6 mm. longa, 0.9 mm. lata, 1-nervata. *Labellum* oblongo-cuneatum, bilobatum, 6 mm. longum, 3 mm. latum, basi callis parvis duobus, lobis terminalibus rotundatis breviter fimbriatis.

Doi Sutep, 580-660 m., by stream in evergreen forest, *Kerr* 351 (type), 351a. Flowers pale green with a double purple streak along disc.

***Liparis odorata* Lindl., var. *intacta* Kerr** [Orchidaceae—Epidendreae]; a typa floribus minoribus, labelli margine haud denticulato et bracteis plerumque deflexis recedit.

Chiengmai, Mè Tun, 1000 m., open grassy forest, *Kerr* 0235.

***Liparis paludigena* Kerr** [Orchidaceae—Epidendreae]; species *L. deflexae* Hook. f., affinis sed labelli callo bilobato et columna distincte alata differt.

Herba terrestris; caulis ad 10 cm. longus, basi circiter 1.3 cm. diametro, superne paulatim decrescens, 3-4-foliatus. *Folia* late elliptica, acuminata, basi inaequilateralia, ad 20 cm. longa, 10 cm. lata, nervis septem prominentibus; folium inferius petiolo 3.5 cm. longo suffultum; folia superiora sessilia vel subsessilia. *Inflorescentia* ad 35 cm. longa; pedunculus communis ad 19 cm. longus, costatus, 2-3-bracteatus; racemus ad 16 cm. longus, multiflorus; bracteae lineares, acutae, 8.5 mm. longae, 1 mm. latae, deflexae; pedicellus cum ovario ad 1.2 cm. longus, gracilis. *Sepalum intermedium* oblongum, obtusum, 6 mm. longum, 1.5 mm. latum; sepala lateralalia late falcata, obtusa, 4.5 mm. longa, 2 mm. lata, 3-nervata. *Petala* falcato-oblonga, obtusa, 5.5 mm. longa, 1.25 mm. lata. *Labellum* obovatum, 4 mm. longum, 3.75 mm. latum, basi callo bilobato et auriculis parvulis columnam complectentibus instructum. *Columna* 3 mm. longa, iuxta stigma alis triangulis parvulis instructa.

Pattani, Bachaw, 600 m., on damp ground by stream in evergreen forest, column green, perianth purple, *Kerr* 036.

***Liparis pusilla* Ridley, var. *breviscapa* Kerr** [Orchidaceae—Epidendreae]; inflorescentia foliis brevior, columna brevior et robustiore distinguenda.

Pattani, Kao Kalakiri, 500 m., on trees in evergreen forest, flowers pale green, *Kerr* 0105.

***Liparis saltucola* Kerr** [Orchidaceae—Epidendreae]; affinis *L. striatae* Par. et Reichb. f., sed labello mucronato haud denticulato et basi callo bicorni differt.

Herba epiphytica; pseudobulbus teres, gracilis, ad 9 cm. longus, 0.3 cm. diametro, basi vaginis vestitus, 2-foliatus. *Folia* lanceolata vel oblanceolata, acuta vel obtusa, ad 8.5 cm. longa, 2.3 cm. lata, subsessilia. *Inflorescentia* ad 19 cm. longa; pedunculus communis ad 5 cm. longus, 1-2-bracteatus; racemus ad 14 cm. longus, multiflorus; bracteae triangulares, 4 mm. longae, 1.5 mm.

latae, 1-nervatae; pedicellus cum ovario ad 8 mm. longus. *Sepalum intermedium* oblongo-lanceolatum, subacutum, 5.5 mm. longum, 1.5 mm. latum, margine revolutum, 3-nervatum; sepala lateralalia leviter falcata, 6 mm. longa, 2 mm. lata, aliter sepalo intermedio similia. *Petala* linearia, 5 mm. longa, 0.6 mm. lata, 1-nervata. *Labellum* panduriforme, apice rotundatum, mucronatum, 6 mm. longum, 3 mm. latum, basi callo bicorni. *Columna* 2.5 mm. longa, arcuata, superne alis oblongis instructa.

Chiengmai, Mè Chèm, 1400 m., on tree in evergreen forest, *Kerr* 491.

***Dendrobium confinale* Kerr** [Orchidaceae—Epidendreae]; affine *D. eriifloro* Griff., sed labello margine brevius dentato et columna puberula differt.

Herba epiphytica; caules ad 7 cm. longi, aggregati, e basi crassiore sensim attenuati, vaginis amplis imbricatis vestiti. *Folia* deficientia. *Inflorescentia* ad 3.5 cm. longa, terminalis et lateralis; pedunculus communis ad 1.5 cm. longus, vaginis 2-3 instructus; racemus ad 2 cm. longus, 4-7-florus; bracteae ovato-oblongae, acutae, 2.5 mm. longae, 0.75 mm. latae; pedicellus cum ovario 5 mm. longus, gracilis. *Sepalum intermedium* ovato-oblongum, leviter carinatum, acutum, 7 mm. longum, 2 mm. latum, 5-nervatum; sepala lateralalia falcato-triangularia, leviter carinata, minute mucronata, 6.5 mm. longa, 2.5 mm. lata, 5-nervata. *Petala* oblongo-obovata, 6.5 mm. longa, 1.5 mm. lata, 3-nervata. *Labellum* ovatum, 6.5 mm. longum, 5 mm. latum, haud lobatum, margine leviter dentatum, iuxta apicem crispatum, lineis tribus elevatis in disco e basi orientibus et 2 mm. ab apice terminantibus; mentum 6 mm. longum, apice rotundatum et sursum curvatum. *Columna* 2.5 mm. longa, minute puberula, margine leviter ciliata.

Krat, Baw Rai, near Siam-Cambodia boundary, 400 m., on trees in evergreen forest, sepals and petals white, lip white, closely veined with purple, *Kerr* 0218.

***Dendrobium kratense* Kerr** [Orchidaceae—Epidendreae]; species *D. incurvo* Lindl., similis sed floribus maioribus, mento longiore, et sepalis petalisque pro rata angustioribus differt.

Herba epiphytica; caules aggregati, teretes, ad 16 cm. longi, 0.4 cm. diametro, internodiis ad 1.5 cm. longis, superne 4-6-foliati, inferne vaginis 2-3 obtecti. *Folia* lineari-lanceolata vel lineari-oblonga, oblique biapiculata, ad 6 cm. longa, 1 cm. lata. *Inflorescentia* ad 3 cm. longa, lateralis et terminalis, foliis brevior; pedunculus communis ad 1.5 cm. longus, 3-vaginatus; racemus ad 1.5 cm. longus, 2-9-florus; bracteae ellipticae, apice breviter acuminatae, 4.5 mm. longae, 1.5 mm. latae; pedicellus cum ovario 5.5 mm. longus. *Sepalum intermedium* lineari-oblongum, acutum, 10 mm. longum, 1.5 mm. latum, apice margine involutum, 3-nervatum; sepala lateralalia leviter falcata, acuta, 9 mm. longa, 2 mm. lata, apice margine involuta, 3-nervata. *Petala* lineari-ob lanceolata, acuta, 9 mm. longa, 1.5 mm. lata, basi 3-nervata,

deinde 1-nervata. *Labellum* supra apicem menti oriens, elliptico-ovatum, acutum, 9 mm. longum, 4.5 mm. latum, haud lobatum, iuxta apicem margine valde crispatum, lineis tribus vix elevatulis in disco; mentum circiter 5.5 mm. longum, fere rectum, gracile, sensim attenuatum ad apicem rotundatum. *Columna* 1.5 mm. longa.

Krat, Kao Saming, under 20 m., on small tree in open glade, flowers fragrant, sepals and petals white, lip greenish-white with green veins, *Kerr* 0193.

Dendrobium Ridleyanum *Kerr* [Orchidaceae—Epidendreae]; species ad gregem *D. crumenati* Sw., pertinens sed epichilio quadrato mobile facile distinguenda.

Herba epiphytica; caules aggregati, ad 60 cm. longi, basi 2–3 cm. (2–3 internodiis) teretes, deinde 4–8 cm. (2–3 internodiis) fusiformi-incrassati, valde sulcati, superne graciles, leviter compressi, foliosi. *Folia* sessilia, oblonga, apice inaequaliter bilobata, ad 6 cm. longa, 1 cm. lata, vaginis 1.5–2.5 cm. longis. *Flores* in parte superiore defoliata caulis succedanei e bracteis glomeratis orientes; bracteae 6 mm. longae; pedicellus cum ovario 7 mm. longus. *Sepalum intermedium* ovato-oblongum, obtusum, 1 cm. longum, 0.35 cm. latum; sepala lateralalia late falcata, 1 cm. longa, 0.6 cm. lata. *Mentum* late conicum, obtusum, circiter 1.2 cm. longum, rectum. *Petala* lanceolata, acuta, 1 cm. longa, 0.25 cm. lata. *Labellum* 1.5 cm. longum; hypochilium 1 cm. longum, 1.1 cm. latum, lobis lateralibus magnis rotundatis, in disco 3 lineis elevatis in cristam villosam iuxta coniunctionem epichilii terminantibus; epichilium quadratum, emarginatum, 0.5 cm. longum, 0.7 cm. latum, irregulariter dentatum, in hypochilio per cardinem angustum affixum. *Columna* 0.3 cm. longa, steliis late triangularibus recurvis.

Pattani, Betong, 200 m., on tree by stream in evergreen forest, flowers white, tinted pink, with a pale yellow patch on lip, *Kerr* 0102.

Bulbophyllum bractescens *Rolfe* mss. descr. *Kerr* [Orchidaceae—Epidendreae]; inter species *B. cupreo* Lindl., affines bracteis amplioribus flores omnino occultantibus facile distinguendum.

Herba epiphytica; rhizoma teres, robustum, circiter 0.3 cm. diametro, pseudobulbos 3–6 cm. inter se remotos ferens; pseudobulbus ovatus, ad 2 cm. altus, basi 1.5 cm. diametro, unifolius. *Folia* oblongo-lanceolata, obtusa, leviter bilobata, ad 12 cm. longa, 2.2 cm. lata, basi in petiolum 1.3 cm. longum sensim attenuata. *Inflorescentia* e basi pseudobulbi juvenilis oriens, ad 8 cm. longa, decurvata; pedunculus communis ad 4 cm. longus, bracteis amplis laxis ad 2.8 cm. longis et 1.7 cm. latis obtectus; racemus circiter 4 cm. longus; bracteae oblongae, obtusae, 2.4 cm. longae, 0.5 cm. latae, 5-nervatae, flores multum superantes; pedicellus cum ovario 2.5 mm. longus, curvatus. *Sepalum intermedium* ovato-oblongum, apice truncatum, minute mucronatum, 5.5 mm. longum, 2 mm.

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latum, 5-nervatum; sepala lateralalia ovato-lanceolata, acuminata, 6 mm. longa, 3 mm. lata, apicibus connatis. *Petala* obovata, acuminata, 2.5 mm. longa, 1.5 mm. lata, integerrima, 1-nervata. *Labellum* longe triangulare, 2.5 mm. longum, 0.5 mm. latum, margine minute denticulatum, basi auriculis acutis recurvatis. *Columna* 2.5 mm. longa, robusta, steliis 0.5 mm. longis acutis recurvis; pes columnae ultra originem sepalorum lateralium leviter productus.

Doi Sutep, 1000–1650 m., very common on trees in evergreen forest, *Kerr* 192.

Bulbophyllum Craibianum *Kerr* [Orchidaceae—Epidendreae]; affinis *B. leptantho* Hook. f., sed foliis pro rata latioribus, pseudobulbo ovato, haud cylindrico, inter alia differt.

Herba epiphytica; rhizoma gracile, repens, pseudobulbos 2–4 cm. inter se disiunctos ferens; pseudobulbus ovatus, ad 1.2 cm. altus, basi 0.6 cm. diametro, retiforme rugosus. *Folia* subsessilia, oblonga vel ovato-oblonga, apice bilobulata, ad 4 cm. longa, 1 cm. lata. *Inflorescentia* subcapitata, 3–6-flora; pedunculus communis ad 4 cm. longus, basi pseudobulbi oriens, vaginis amplis duabus vestitus; bracteae ovatae, obtusae, 2.5 mm. longae, 1.5 mm. latae, 1-nervatae. *Sepalum intermedium* oblongo-ovatum, 5.5 mm. longum, 1.25 mm. latum, 3-nervatum, versus apicem margine leviter involutum; sepala lateralalia oblongo-triangularia, 5.5 mm. longa, 1.5 mm. lata, aliter sepalo intermedio similia. *Petala* ovata, obtusa, 2.5 mm. longa, 1.5 mm. lata, 1-nervata. *Labellum* carnosum, triangulum, obtusum, 2.25 mm. longum, decurvatum, paulum lateraliter compressum, superne profunde canaliculatum, breviter stipitatum, haud auriculatum. *Columna* 1 mm. longa, brevibus fere rectis steliis, pede ultra insertionem sepalorum lateralium producta.

Doi Sutep, 1200–1500 m., on trees in evergreen forest, flowers greenish-yellow, *Kerr* 102 (type). Doi Chiengdao, 1300 m., on trees in open evergreen forest, *Kerr* 0253.

Bulbophyllum Noeanum *Kerr* [Orchidaceae—Epidendreae]; species sine congeneribus intime propinquis, *B. eublepharo* Reichb. f., remote affinis, sed petalis haud fimbriatis, segmentis perianthii multo longioribus angustioribus valde distincta.

Herba epiphytica; rhizoma 5 mm. diametro, repens, pseudobulbos inter se 2.5–4 cm. disiunctos ferens; pseudobulbus 1.5 cm. altus, ovatus, unifolius. *Folia* petiolo ad 11 cm. longo suffulta, lamina coriacea ad 19 cm. longa et 6 cm. lata oblongo-ovata vel oblongo-obovata apice obtusa leviter bilobulata basi in petiolum sensim attenuata. *Inflorescentia* e basi pseudobulbi oriens; pedunculus communis ad 20 cm. longus, 4–5 vaginis; racemus ad 20 cm. longus, multiflorus; bracteae ad 8 mm. longae, 1.5 mm. latae, acutae; pedicellus cum ovario 1.2 cm. longus. *Sepalum intermedium* lineari-oblongum, acutum, 13 mm. longum, 2 mm. latum, 3-nervatum, intus pilis glanduliferis instructum; sepala lateralalia

15 mm. longa, 2 mm. lata, ceteribus sepalo intermedio similia. *Petala* ovata, longe acuminata, 10 mm. longa, 1.5 mm. lata, pilis brevibus glanduliferis dense instructa. *Labellum* 3 mm. longum, 0.75 mm. latum, oblongum, decurvatum, superne sulco linea elevata utrinque marginato e lacuna triangulari basi oriente, versus apicem decurrente auriculis parvulis rotundatis integris. *Columna* carnosae, 2 mm. longa, stolidiis rectis gracilibus.

Pattani, Kao Kalakiri, 900 m., on trees in evergreen forest, sepals and petals greenish-yellow, sepals with three longitudinal purple lines, petals with one, *Kerr* 0013.

Named in honour of Nai Noe Isanguara, my companion in many botanical trips.

Sacciolepis tenuissima C. E. Hubbard [Gramineae]; affinis *S. huillensi* Stapf, sed culmis gracilioribus multinodis, panicula brevior et spiculis pubescentibus differt.

Gramen annuum. *Culmi* erecti vel geniculato-ascendentes, 15–50 cm. alti, tenuiter filiformes, gracillimi, diffusi, debiles, glabri et laeves, ramosi, multinodi, nodis glabris vel obscure pubescentibus. *Foliorum* vaginae solutae vel superiores arctae, internodiis breviores, tenuiter striatae, subauriculatae, glabrae et laeves; ligulae truncatae, brevissimae, membranaceae, albidae; laminae anguste lineares, obtusae, 2–10 cm. longae, ad 1.5 mm. latae, planae vel involutae, strictae vel flexuosae, debiles, tenues, glabrae et laeves. *Panicula* spiciforma, cylindrica, 0.75–1.5 cm. longa, 2.5–3.5 mm. lata, densa, contigua, longe exserta; pedicelli binati, graciles, 0.3–0.7 mm. longi, adpressi, scaberuli. *Spiculae* oblique ovatae, acutae vel obtusae, 1.2–1.5 mm. longae, sparse pubescentes, prominenter nervosae, pallidae. *Gluma* inferior reniformi-ovata, subobtusae vel tenuiter acuta, 0.75 mm. longa, trinervia, hyalina, glabra; gluma superior ovato-elliptica, obtusa vel rotundato-obtusa, 1.5 mm. longa, sparse pubescens, 7–9-nervia, membranacea. *Anthoecium inferum* vacuum; lemma ovatum, obtusum, 1.5 mm. longum, sparse pubescens, 7-nervium, membranaceum; palea linearis, obtusa, 0.4 mm. longa, hyalina. *Anthoecium superum* ♀, ambitu ellipticum, utrinque subacutum, 1 mm. longum, nitidum, albidum; lemma et palea tenuiter chartacea, enervia. *Caryopsis* 0.8 mm. longa.

Chantaburī: Chantabūn; Tārūang, c. 100 m., common in savannah, Dec., *Kerr* 9732 (*type*). Rāchasimā: Kōrāt; Chan Tūk, c. 300 m., among low herbage on open ground, Dec., *Kerr* 8061.

XXIX.—MISCELLANEOUS NOTES.

MR. H. RITCHINGS and MR. F. S. BANFIELD, Student-Gardeners, Royal Botanic Gardens, Kew, have been appointed by the Secretary of State for the Colonies, Horticultural Assistants, Federated Malay States.

LUDWIG RADLKOEFER.—The death of Prof. Ludwig Radlkofer, which took place at Munich on February 16th last, removes from the

ranks of botanists one whose record for longevity and prolonged activity is probably not easily surpassed. His published papers cover a period of seventy years and the fact that he took an active part in the controversy between Schleiden, v. Mohl and Hofmeister, on the fertilisation process of Angiosperms is evidence of a career that extended over three generations.

It is remarkable that Radlkofer spent practically the whole of the ninety-eight years of his life in his native town. Born at Munich in 1829, he graduated there in 1854, became "Privatdozent" in 1856, and by 1863 had attained a full professorship. He ceased to take an active part in the ordinary teaching work of the university in the nineties of the last century, but he continued to supervise research workers and to act as Director of the Botanical Museum to the last. His end came rather suddenly, but up to that time he had retained his full vigour, and I am told that he rarely missed faculty and other university meetings.

Although some of his early work lay in other directions, he devoted most of his life to systematic botany. He was known as an authority on the *Sapindaceae*, being responsible for the sections dealing with this family in Martius' "Flora Brasiliensis," and in the "Naturliche Pflanzenfamilien." At an early stage of his career he became a prominent supporter of the use of anatomical characters for taxonomic purposes, and he demonstrated their value in numerous communications. A continuous stream of dissertations and other papers dealing with the systematic anatomy of the diverse families of Dicotyledons issued from Radlkofer's laboratory and towards the end of the century his pupil, Hans Solereder, collected together this large mass of material, much of which was relatively inaccessible, in "The Systematic Anatomy of Dicotyledons," in the introduction to which a glowing tribute is paid to Radlkofer as the chief originator of the anatomical method. In the course of his long experience Radlkofer acquired a very intimate knowledge of the anatomy of Dicotyledons, and he became an adept at the determination of sterile herbarium material, for which his aid was sought from all quarters. He was fond of narrating, at the expense of the Kew Herbarium, that on the occasion of his last visit, many years ago, a demand for a microscope led to the production of an old instrument covered with dust and unearthed from the top of one of the cupboards.

F. E. F.

CHARLES SPRAGUE SARGENT.—Kew is happy in having scattered throughout the world numerous friends, whose sincere and constant interest in its fortunes have helped it greatly to attain the position it now occupies. Amongst them there is not one whose memory will evoke a greater sense of gratitude than Charles Sprague Sargent, whose death on March 22nd, 1927, we have to deplore. For more than fifty years he, as Director of the Arnold Arboretum, has been a continuous and generous contributor to our collections of hardy trees and shrubs, and their present magnificence is very largely due to his assistance. Although Sargent was himself a keen collector, he never

succumbed to the collector's great failing—the desire to be the only possessor of a specimen. However rare a plant that he had succeeded in obtaining might be, his aim invariably was to propagate and distribute it. We are happy to acknowledge that Kew was always one of the first recipients.

Sargent was born on April 24, 1841, and graduated at Harvard University in 1862. Soon after that he joined the Federal Army and served during the American Civil War, ultimately attaining the rank of Major. On his return to civil life he took up the study of botany, more especially that of the trees of North America. In 1872, largely due to his individual efforts and influence, the Arnold Arboretum was established at Jamaica Plain on the outskirts of Boston, Mass. It is really part of the botanical equipment of Harvard University, and Sargent was appointed its first director. The fifty-five years during which he held that position saw its development into one of the most important scientific institutions in the world, a position which it may be said to owe almost entirely to Sargent's ability, energy and influence. Greatly also has it benefitted by his private generosity, especially in regard to its library, the foundation of which was laid by the gift of six thousand of his own books.

Of the various works that have come from Sargent's own pen the most important is "The Silva of North America," which appeared in fourteen quarto volumes between 1891 and 1902, illustrated by 704 plates. It is one of the most sumptuous of all botanical works. Other books of which he was the author were, a "Manual of the Trees of North America" (an abridgement of the "Silva"), and the "Forest Flora of Japan." To "Garden and Forest," a weekly periodical which he founded in 1888, he contributed many articles during the ten years of its existence. Of works he edited the most important are *Plantae Wilsonianae*, a description of the plants collected in China for the Arnold Arboretum by E. H. Wilson; the "Bradley Bibliography," a list of books and papers relating to all woody plants published in all languages down to 1900; and "Trees and Shrubs," an occasional publication.

Sargent was an assiduous traveller in his own country and is reputed to have seen all but two or three of the species of tree native of the United States growing wild. He visited Japan in 1892—a journey that proved fruitful in the introduction of many trees and shrubs to the United States and England, and one result of which was his "Forest Flora of Japan," adverted to above. He also paid frequent visits to England, the last in July and August, 1914.

Sargent was a man of magnificent physique, with a fine, strong, and, in his latter days, somewhat rugged face. His features were a true index to his personality, the most prominent characteristics of which, perhaps, were his masterfulness and his indomitable perseverance. When once he set his mind to do a thing it took much to turn him from his goal. Such a character, especially when it came in contact with others of similar calibre, naturally aroused strong antagonisms, but these were more than balanced by stronger friend-

ships. To his faculty for enlisting powerful help the present eminence of the Arnold Arboretum may in a great measure be ascribed. He was a charming host, as visitors from this country to his home at Brookline have grateful cause to remember—not least those who went from Kew. We trust that although he has gone, the Arboretum may carry on its splendid work without interruption. It would be a grievous calamity if its fortunes suffered any relapse. Just as St. Paul's Cathedral is properly recognised as Wren's great monument, so, we hope, may the Arnold Arboretum come to be regarded by future generations as Sargent's chief memorial. The epitaph to Wren in St. Paul's—"Si monumentum requiris, circumspice"—might also, with equal truth, be inscribed on the gates of the Arboretum in memory of its creator.

ABERCROMBIE ANSTRUTHER LAWSON.—The sudden death of Prof. A. A. Lawson, which occurred on March 26th, will be deeply regretted both by his many friends and by the wide circle of botanists who are acquainted with his scientific work.

Lawson was appointed Professor of Botany in the University of Sydney in 1912, and, from that date onwards, has occupied that post with unqualified success. The classes in Botany increased greatly in size during his Professorship, and, apart from the heavy work involved in arranging lectures and laboratory work for these, a large amount of research has been carried out by Lawson himself, by his assistants, and under his direction. Besides this he devoted much care and attention to superintending the erection and equipment of the new buildings which form the present School of Botany of the University (*K.B.* 1926, p. 222), and which, to quote from an account in a Sydney newspaper, are "now considered to be one of the finest institutions of its kind in the British Empire."

Lawson, who at first intended to enter the medical profession, found, while studying Botany under Prof. F. O. Bower at Glasgow University, that this subject appealed to him so strongly that he gave up his original intention and made Botany his profession. After graduating at Glasgow, he went for a time to the University of Toronto, and afterwards to Leland-Stanford University, California, where he became Instructor in Botany in 1904 and Assistant Professor in 1905. In 1906, he spent some time at Bonn, working in Prof. Strasburger's laboratory, and in 1907 he left Stanford to take up the post of Lecturer in Botany in Glasgow University, where he remained until his appointment to the Chair of Botany in Sydney.

The numerous contributions to botanical science published by Lawson deal chiefly with cytology and morphology, and include a series of papers on the gametophytes and embryo of several species of Conifers, the research work in some cases having been carried out in the Jodrell Laboratory at Kew. Among other important publications are papers on the prothallus of *Psilotum* and of *Imesipteris*, both published in 1917. In recognition of the value of his scientific

researches, Lawson received the award of the gold medal of the Royal Society of Edinburgh, of which he was a Fellow, and in the present year he was selected for election to the Royal Society.

Lawson was keenly appreciative of the beauty and value of Kew and found a special attraction in the extensive collection of Conifers. On the occasions of his returning to England from abroad, he always made an early visit to Kew, more often on the day of his arrival.

Fifth International Botanical Congress, 1930.—At the International Congress of Plant Sciences held at Ithaca in August last, an invitation was conveyed from British Botanists through Dr. A. B. Rendle, Dr. A. W. Hill and Dr. E. J. Butler for the Fifth International Botanical Congress to be held in England in 1930. The invitation was accepted by the Botanists assembled at Ithaca and arrangements are now being made for the Congress to be held at Cambridge in the middle of August, 1930, when it is hoped that many botanists from all parts of the Empire will be present.

An Executive Committee has been formed to make arrangements for the Congress, consisting of Prof. A. C. Seward (Chairman), Dr. A. B. Rendle (Treasurer), Sir David Prain, Prof. A. G. Tansley, Prof. V. H. Blackman, Dame Helen Gwynne-Vaughan, Dr. A. W. Hill, Prof. W. Neilson Jones and Prof. Walter Stiles.

It has also been decided to organise the Conference in the following seven sections: Morphology (including Anatomy), Taxonomy and Nomenclature, Plant Geography and Ecology, Palaeobotany, Genetics and Cytology, Physiology, and Mycology and Plant Pathology.

Mr. F. T. Brooks, The Botany School, Cambridge, and Dr. T. F. Chipp, Royal Botanic Gardens, Kew, have been appointed Joint Secretaries of the Congress, and any communications with regard to the Congress should be addressed to one or other of the Secretaries.

Indian Palms.*—The last general account dealing exclusively with the Palms of India and Ceylon was published in 1893 by Dr. O. Beccari and Sir J. D. Hooker in the Flora of British India, and since that time various important generic monographs and scattered papers on the subject have been issued. The Rev. E. Blatter has now brought this information together in one volume, in which he has adopted Drude's classification in Engler and Prantl's Pflanzenfamilien. After an introductory chapter on structure and classification, detailed accounts are given of the various species and include references to literature, vernacular names, uses and cultivation. The book is illustrated with 103 plates from photographs, besides text figures and has a bibliography of 28 pages. The work should form a useful guide to those interested in Indian Palms.

C. H. W.

* The Palms of British India and Ceylon, by Ethelbert Blatter, S.J., Ph.D., F.L.S. Oxford University Press, 1926. Pp. xxviii + 600, plates 106, text-figs. 49, maps 2. Price 45s.

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BULLETIN OF MISCELLANEOUS INFORMATION

No. 6 1927
ROYAL BOTANIC GARDENS, KEW

XXX.—THE GENUS *DIOSCOREA* IN SIAM. D. PRAIN and
I. H. BURKILL.

In some bundles of Siamese plants we have been privileged to examine, we find examples of 32 species belonging to the genus *Dioscorea*, and referable to the following sections:—*Stenophora*, 4; *Shannicorea*, 2; *Combilium*, 1; *Opsophyton*, 1; *Lasiophyton*, 8; *Enantiophyllum*, 13; with one which we transfer to the section *Stenocorea* and two to which it is as yet unsafe to assign their actual position. The Asiatic section *Paramecocarpha* has not yet been reported from Siam.

Phytogeographically these species belong to various floras that meet in Siam. Thus *D. velutipes*, a member of the small section *Shannicorea*, which is characteristic of the flora common to the Shan Hills and Yunnan, has only been reported from Payap, the most northern circle of Siam: the species of this section occur in a region where the higher hills are pine-clad, and are sometimes met with in the pine forests. Another species met with, in Siam only in the Payap circle, is *D. kamoonsensis*, which occurs throughout the area occupied by the section *Shannicorea*, but extends westward beyond that area, along the Himalaya, at about 1200–1300 m. above sea-level, as far as Lohathal (long. 80° 8' E.) in Kamaon. The endemic *D. pseudo-nitens*, here described, which so far has only been reported from the Payap circle, may perhaps be accounted a member of this particular flora.

Species belonging to the Burmese flora which extend to Siam, are *D. Prazeri*, *birmanica*, *Arachidna*, and *decipiens*: these occur away from the pine-forests, though not necessarily away from the oak-chestnut forests; to the group may be added *D. Hamiltonii*, a species that has acquired an extension westward from Burma along the Himalaya, but not so far as *D. kamoonsensis*. These five species occur in Siam to the south of the circle of Payap; indeed *D. Prazeri* extends in Lower Siam southwards as far as lat. 8° N., while *D. Hamiltonii* has been met with a little south of lat. 11° N., in the Tavoy district of Tenasserim: the westward extension of this last has carried it across the Bengal alluvium into Chota Nagpur, and beyond into the Malabar Ghats, where its southern limit is somewhat nearer the Equator than its southern limit in Tenasserim.

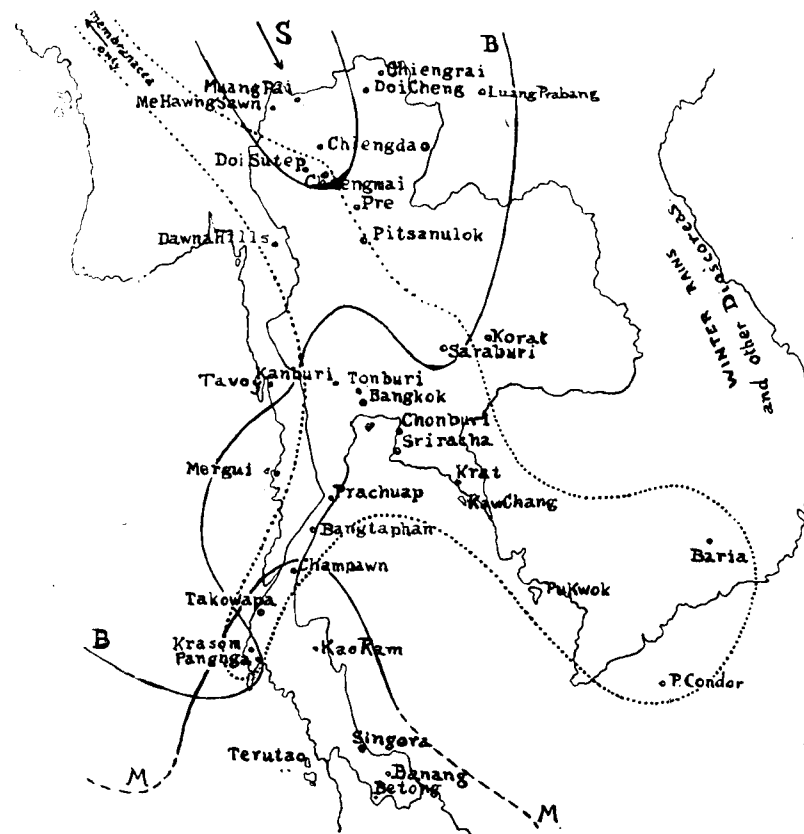
Though the climates of Siam have not yet been worked out systematically, the meteorological data available indicate the existence of a belt of heavy rainfall in the tract of hill-country extending along the eastern side of the Gulf of Siam and into Indo-

China. To the flora of this belt *D. Pierrei* and *D. brevipetiolata* appear to belong; both species were first described from Indo-China, but have since been met with in Siam. Another member of this flora seems to be *D. kratika*. Perhaps *D. daunaea* may also belong, though this species crosses the low rice-country of Central Siam and was first described from the Dawna Hills in the Amherst district of Tenasserim, some fifteen miles west of the Siam-Burma boundary, and has not yet been recorded from Cochin-China. Intermediate in distribution between these and the Burmese group is *D. membranacea*.

The meteorologists who indicate that the hill-country east of the Gulf of Siam is wet, attribute a considerably smaller rainfall to the rice-plain of Bangkok. In this rice-plain there occurs in abundance the *Dioscorea* named by us *D. oryzetorum*. Of the sixteen gatherings of this plant seen so far, all with three exceptions come from the adjacent circles of Prachinburi and Krungtep: these show that it varies greatly in the width of its leaves, but that the forms which differ in shape of leaf grow in intimate association. As a species, *D. oryzetorum* is very near *D. glabra* Roxb., which as part of its distribution is abundantly found in another rice-plain—the rice-plain of Bengal. But *D. oryzetorum* is not the familiar *D. glabra* of Bengal; nor is it the glabrous *Dioscorea* of Penang and the adjoining parts of Kedah, generally accepted as a form of *D. glabra*; nor is it the plant of south-eastern China known as *D. glabra* var. *longifolia*: its fruits are smaller than in any of these.

A dotted line on the same map bounds an area wherein are found species not limited to Siam, but characterising hilly country partly within it. These are:—*D. daunaea*, *D. Pierrei* and *D. brevipetiolata*;

to which *D. membranacea* is added, but it is in distribution transitory towards the species of Burma. As it has proved impossible to give in the first map much information regarding the distribution of the species of the fourth group, four small maps showing where they have been found have been added (p. 228).



Map of the Siam peninsula showing the depth of penetration of the *Dioscoreas* characteristic of the Shan Hills (S), of Burma (B-B), of Malaya (M-M). The dotted line indicates the area in which occur *D. dauracea*, *D. Pierrei*, *D. brevipetiolata* and *D. membranacea*, except that the last extends to the southern Chin Hills beyond the map (see figs. p. 228).

does. The species of the section *Shannicorea*, met with only in the extreme north of Siam, flower in July. Those of the section *Stenophora* show some diversity. In the Payap circle *D. birmanica* was found in flower in May—the month in which it flowers in Burma; but *D. membranacea*, found in flower in the Payap circle in July, was found in the Ayuthia circle in September. In the Ayuthia circle *D. Praxeri*, which flowers in Burma and in Northern India in or before the rains—June to September—was gathered, not only before the rains, but only just out of flower as late as November. Then *D. daunaea*, a species whose sectional position is somewhat

doubtful, found in flower in the Amherst district of Tenasserim in March, and in the Siamese circle of Sritamarat in February, was obtained in flower in the circle of Chantaburi in November. All the species of the section *Enantiophyllum*, wherever found in Siam, flower between August and January and ripen their seeds before the dry season is over. But the *Dioscorea* here named *D. paradoxa*, which has a capsule like that of an *Enantiophyllum*, was met with in the circle of Ayuthia with ripe fruit in August, and may therefore have been in flower when the rainy season began.

We gratefully thank Dr. F. G. A. Kerr, Dr. Eryl Smith, Mrs. D. J. Collins, Professor W. G. Craib and Dean E. D. Merrill for information kindly communicated. Most of the specimens quoted are represented in the Herbarium of the Royal Botanic Gardens, Kew: a few not there are to be found in the Botanic Gardens, Singapore, and others in the Herbarium of the University of California at Berkeley.

Section *Stenophora*.

1. *D. birmanica* Pr. & Burk. in Jour. Asiatic Soc. Bengal, 73, (1904), p. 185 and N.S. 10, (1914) p. 13: Craib in Kew Bull., 1912, p. 407: R. Knuth in Engl. Pflanzenreich, iv-43, (1924), p. 186. *D. rangunensis* R. Knuth, in op. cit. p. 320.

Circle of PAYAP. Salween basin, Mè Surin, Mè Hawng Sawn, on old clearing at about 500 m., with flowers in May, Kerr 5456! Doi Sutep, in scrub jungle at nearly 330 m., with fruit in August, Kerr 1326! Circle of PITSANULOK, Pitsanulok town, Groff 6078!

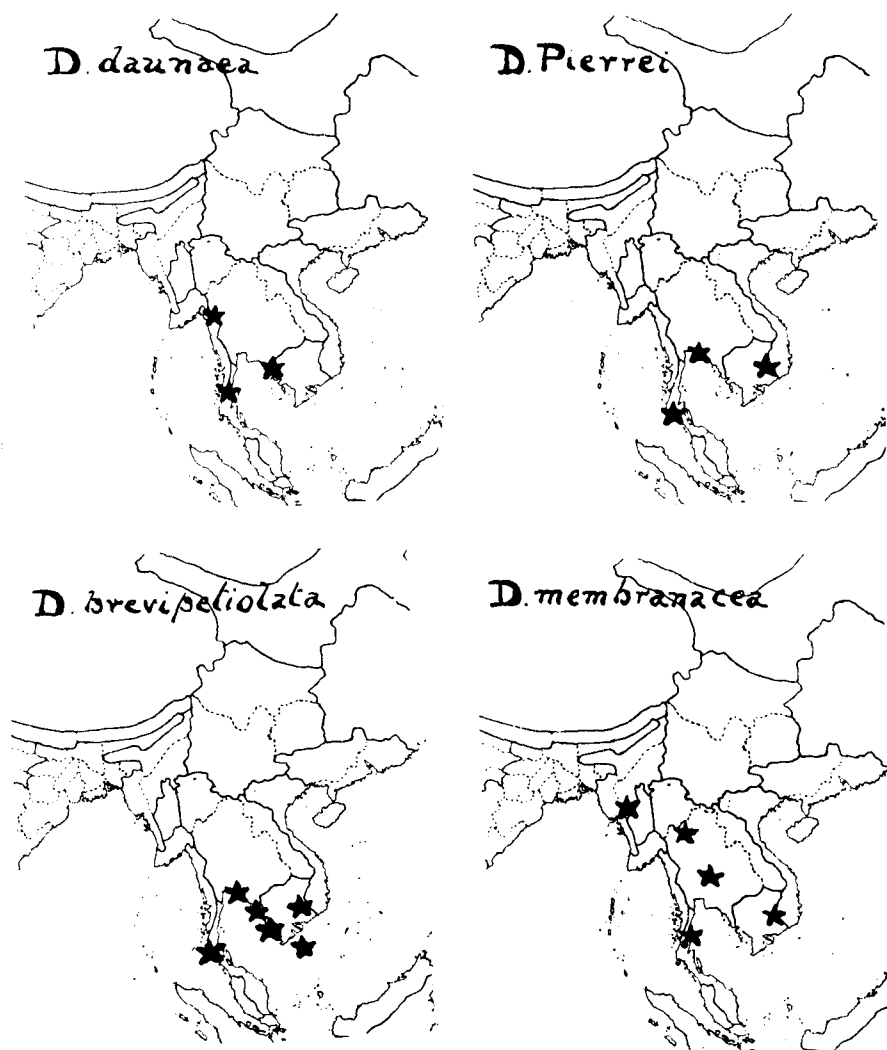
Distrib. This coarse species is very characteristic of the moister parts of Burma, but seems not to pass far into Siam: has not been found in south Siam, Lower Siam, or Tenasserim south of the Amherst district.

2. *D. membranacea* Pierre in Herb. Paris: Craib in Kew Bull., 1912, p. 407 (name only): Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 13: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 315.

Circle of PAYAP. Doi Sutep, in mixed jungle at 400 m. with male flowers in July, Kerr 1245! Chiangmai, Mè Hia, in mixed jungle at 330 m., with half-ripe fruits in July, Kerr 1951! Circle of AYUTHIA. Saraburi, Muak Lek, on limestone hill at about 400 m., with male flowers in September, Kerr 9152! Circle of SURAT. Chumpawn, Bang Song, on limestone hill at 120 m., sterile in May, Mohamed Haniff and Mohamed Nur 4230!

Distrib. broken: was found first in the Pakokku Chin Hills, an outlying locality: extends from Siam into Cambodia and Lower Cochinchina.

3. *Dioscorea* (*Stenophora*) *Rockii* Prain et Burkill, sp. nov.; cum *D. membranacea* Pierre capsulis omnino congruit: differt foliis integris.



Distribution of *D. daunaea*, *D. Pierrei*, *D. brevipetiolata* and *D. membranacea*.

Rhizoma et pars caulis ab eo exorta desunt. *Caulis* distans glaber, leviter striatus, inermis, sinistrorsum volubilis. *Folia* alterna, glabra, elongato-cordata, in apicem angustata, majora 10 cm. longa, 6 cm. lata, 9-nervia: areola intranervia clausa interior oblanceolata; areola a nervorum paribus alteris amplexa elliptica: pagina superior hebes, nervis nervulisque distinctis; pagina inferior quam superior nitentior, nervis elevatis, nervulis distinctis: petiolus tenuis, 4 cm. longus, basi aliquo modo puberulus. *Flores* ♂ ignoti. *Flores* ♀ in racemis 12 vel plures: axis puberulus vel glabrescens, striatus: bracteae longe lanceolatae. *Sepala* anguste ovata. *Petala* similia, paullulo minora. *Capsulae* resistentes, nitentes, flavo-fuscescentes, apice truncato-retusae, basi subcordatae: pedicellus 5-7 mm. longus: alae 17-20 mm. longae, 12-16 mm. latae, margine rotundatae praesertim oblique rotundatae. *Semina* circumcirca alata: ala hyalino-lactescens, 12-15 mm. diametro: nucleus reniformis.

Circle of PAYAP. Rain-forests on the lower slopes of Doi Chang, near Hui San, in fruit in January, *Rock* 1721!

It may prove possible to regard this as a variety of *D. membranacea*.

4. **D. Prazeri** Pr. & Burk. in Jour. Asiatic Soc. Bengal, suppl. to 73, (1904) p. 2, and N.S. 10, (1914) p. 15: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 175: Pr. & Burk. in Kew Bull., 1925, p. 66: Burk. in Rec. Bot. Survey India, 10, (1925) p. 387. *D. Clarkei* Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10 (1914) p. 15. *D. sikkimensis* Pr. & Burk. in the same, suppl. to 73 (1904), p. 3 and N.S. 10, (1914) p. 16.

Circle of AYUTHIA. Saraburi, Muak Lek, on rocky limestone hill at about 300 m. and 400 m., with male flowers and with young fruit in September, *Kerr* 9144! 9158! and also with flowers in March, *Marcan* 741! Circle of PUKET. Pangnga, Pulau Seng Pinang, in lat. 8° 20' N., with fruit in December, *Mohamed Haniff and Mohamed Nur* 4029! Pangnga, on Pulau Tebun, male and just out of flower in November, *Mohamed Haniff and Mohamed Nur* 3599!

Distrib. along the foot of the eastern Himalaya between long. 84° 30' E. under Central Nepal, and the Abor Hills in long. 95° 20' E., thence southwards through Upper Burma, the Shan Hills and into Siam. Further, a specimen (*Ichebesta* 18!) from the extreme north of the Malay State of Perak may belong.

Section **Stenocorea**.

5. **D. daunaea** Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 4, (1908) p. 450 and 10 (1914) p. 12: R. Knuth in Engl. Pflanzenreich iv-43, (1924) p. 191.

Circle of CHANTABURI. Krat, Baw Rai, 1600 m., with male flowers in November, *Kerr* 9495! Circle of NAKAWN SRITAMARAT. Kao Ram, at about 800 m., with male flowers in February, *Dr. Eryl Smith* 502!

Distrib. This species was obtained first in the Dawna Hills of the Amherst district of Tenasserim, some fifteen miles west of the Siamese frontier: and is now recorded from Siam. Unfortunately the female plant is unknown. All three gatherings have been made in different dry-season months,—February, March and November.

We correct ourselves regarding its section. Better material of *D. stenomeriflora* Pr. & Burk. than we possessed when we described it, shows that its stems twine to the left, and that in the male inflorescences it, *D. daunaea* and *D. keduensis* Pr. & Burk. are so similar as to be of one section; with them we place tentatively *D. Ridleyi* Pr. & Burk., of which male flowers remain unknown.

Section **Shannicorea**.

6. **Dioscorea (Shannicorea) pseudo-nitens** Prain et Burkill, sp. nov.; a *D. nitenti* Pr. et Burk. capsulis multo majoribus facile distinguatur.

Tuber annuum, ut videtur singulum, in terram descendens, verisimiliter 30 cm. et ultra longum, plus minusve 1 cm. diametro. *Caulis* inermis, laevis, tenuis, sinistrorsum volubilis. *Folia* alterna, ovato-cordata aut suprema triangulari-ovata, ad 10 cm. longa, ad 5 cm. lata, 7-nervia: areola intranervia clausa interior late lanceolata, basi acuta, apice acuminata: areola a nervorum paribus alteris amplexa ovata vel in foliis maximis a basi truncato ovata: pagina superior vix nitens, nervis conspicuis, nervulis distinctis; pagina inferior laevis, nitens, nervis elevatis, nervulis distinctis subelevatis: petiolus ad 3 cm. longus. *Flores* ♂ in cymulis glomerati: et cymulae in inflorescentiam spiciformem ad 30 cm. longam compositae: axis glaber, alatus: bracteae ovatae, longe-acuminatae, 1-2 cm. longae, glabrae. *Sepala* elongato-triangularia, acuta, 1.5 mm. longa. *Petala* ovata, obtusa, sepalis paullulo breviora. *Stamina* sex, in marginem disci inserta, incurvata, aequalia: antherae filamentis paullulo longiores. *Flores* ♀ ad 12, spicati, ad anthesin bracteis longe acuminatis breviores, bracteolis linearibus aequilongi. *Sepala* ovata, acuta, 1.5 mm. longa. *Petala* similia, paullulo breviora. *Staminodia* minuta. *Capsulae* reflexae, apice obcordatae: pedicellus ad 7 mm. longus: alae nitentes, 25 mm. longae, semi-obovatae, 10 mm. latae. *Semina* apicem versus alata: ala rufo-castanea.

Circle of PAYAP. Chiangmai, Mè Chem, in evergreen forest at about 1000 m., with male flowers and also in fruit in July, *Kerr* 6279!

This species is readily distinguishable from *D. nitens* by its fewer and much larger capsules.

7. **D. velutipes** Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 19: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 320.

Circle of PAYAP. Doi Chiangdao, 1600-1800 m. in open rocky forest, with male flowers in July, *Kerr* 5581!

Distrib. Southern Shan States.

slightly constricted at mid-length: the stamens are shorter, the broad anther equalling the filament in length. The gynoecium is a small cone. The capsules are produced in a raceme, 1-2 to the number of 20 or 25. *Jour. Asiatic Soc. Bengal, N.S.* completely so: they are in *Kew Bull.*, 1912, p. 407 (name only):

Pflanzenreich, iv-43, (1924) p. 138.

14. *PAYAP*. Doi Suteh, 470 m., with male flowers in September, *Kerr* 1404!

Distrib. only known from this collecting.

11. **Dioscorea (Lasiophyton) Collinsae** *Prain et Burkill*, sp. nov.; a *D. pentaphylla* Linn. differt foliis minoribus levioribus nec rubellis, floribus masculis magis aggregatis.

Tubera esculenta, sed forsitan insipida, a nobis non visa. *Caulis* inermes, tenues, sinistrorsum volubiles, seu penna corvina crassi, minutissime pubescentes et propter pilos ad innovationes pallide rufo-straminei. *Folia* alterna, trifoliolata: petiolus parce pubescens, ad 2.5 cm. longus: foliolum medium obovatum, abrupte breviter acuminatum, plus minusve 9 cm. longum, 3.5 cm. latum, penninerve; foliola lateralia dimidio late semi-ovata, dimidio semi-cordata: pagina superior glabra, nervis distinctis: pagina inferior in nervis majoribus exstantibus parce pubescens: petioluli 2-3 mm. longi. *Flores* ♂ in racemis spiciformibus 30-50-ni: racemi racemosim in inflorescentias 16 cm. attingentes compositi: axis pilis rufo-aurantiacis parce pubescens, lineatus: bracteae flores amplexantes, abrupte acuminatae: pedicelli 0.5 mm. longi. *Sepala* obovata, 1 mm. longa. *Petala* aequilonga, subspathulata. *Staminodia* quam stamina longiora. *Flores* ♀ ignoti.

Circle of PRACHINBURI. Sriracha, in the lower parts of the forest, both in bud and with male flowers in October, *Mrs. D. J. Collins* 267! (type), 268! Also without locality, *Bradley*!

It is necessary, for furthering the study of the section of *Dioscorea* to which this species belongs, to use characters of a somewhat ill-defined unsatisfactory nature: and *D. Collinsae* is no exception: it is not clearly marked. By its yellow tint in the herbarium it suggests *D. Kerrii* Pr. & Burk., but as far as is known the latter always has simple leaves. It lies between this endemic species and *D. pentaphylla* Linn., and is quite distinct from that other close ally of *D. pentaphylla*, namely *D. Pierrei*, which occurs in Siam.

12. **Dioscorea (Lasiophyton) pseudo-tomentosa** *Prain et Burkill*, sp. nov.; a *D. tomentosa* Heyne foliis tenuissimis pro portione latioribus distincta.

Tubera ignota. *Caulis* distans inermis, tenuis, sparse albotomentosus, dein subglabrescens, sinistrorsum volubilis. *Folia* alterna, trifoliolata, tenuissima: petiolus ad 2.5 cm. longus, albo-pubescent: foliolum medium obovatum vel obovato-orbiculare, apice mucronulatum, ad 5 cm. longum, ad 4.5 cm. latum, penninerve: foliola lateralia dimidio semi-obovata dimidio late semi-

Distrib. of the species; through the Asiatic Monsoon area, and the remotest Pacific island groups. Through this wide area it is found in many varieties, some of which receive cultivation tomentosa, nervis majoribus. *var. siamensis* is eaten, 5 plus minusve 25-ni in racemis spiciformibus 50 cm. below the inflorescentias ad 25 cm. longas racemosim 50 cm. below the inflorescentias, late ovatae, acuminatae, pubescentes from close flores amplexantes, late ovatae, acuminatae, pubescentes from close celli 1-2 mm. longi. *Sepala* ovato-orbicularia, 1 mm. longa. It is pubescentia, margine ciliata. *Petala* late spathulata, glabra, sepalis fere aequilonga. *Staminodia* anguste spathulata, petalis aequilonga. *Stamina* tria breviora. *Flores* ♀ ignoti.

Circle of AYUTHIA. Saraburi, Muak Lek, Kao Sisiat A, with male flowers in July, *Noe* 102!

At first sight this recalls *D. tomentosa* Heyne: but it appears to be a much weaker plant, with very thin foliage. It is desirable that we should see more material of it.

13. **D. Arachidna** Pr. & Burk. in *Jour. Asiatic Soc. Bengal, N.S.* 10. (1914) p. 21: R. Knuth in *Engl. Pflanzenreich*, iv-43, (1924) p. 139. *D. pentaphylla* Linn. var. near var. *Jacquemontii* Craib in *Kew Bull.*, 1912, p. 407.

Circle of PAYAP. Doi Suteh, in mixed jungle, 400 m., with young fruit in October, *Kerr* 1450! Circle of AYUTHIA. Saraburi, Muak Lek, in open evergreen jungle at about 200 m., with male flowers in September, *Kerr* 9121!

Distrib. This species was described from plants collected in the hill-forests south of the Brahmaputra valley. Although they were sterile, we ventured to give the plant a name, as we were acquainted with it alive, and it has an economic interest. Now that we have male flowers and young fruit from Siam, we believe that we can recognise it in an immature fruiting specimen from the southern face of the Khasia Hills, so that its distribution is from these hills, eastwards within India, and forward into the north of Siam. The Khasia plant came from the Boga Pani at about 1300 m., and was collected by C. B. Clarke (44881 b).

The dimensions of the largest leaves of the Siamese specimens are 9.5 by 5 cm. In all points, but their greater size, they agree with the leaves obtained in the Nowgong and Haflong hills. The male flowers are small and numerous, on spike-like racemes arranged racemosely along inflorescences that attain 22 cm. in length. Sometimes in a leaf-axil there are two of these inflorescences, the lower much smaller than the upper. The spike-like racemes have the lowest 4-5 mm. sterile; in all they are up to 30 mm. long, and bear upwards of 70 flowers: the axis is angled, very minutely hairy, the hairs reddish, but so minute as not to give a reddish colour to the plant. The bracts are orbicular-acuminate, folded around the bud completely and embracing the flower, 1 mm. long. The sepals are broadly elliptic, glabrous, scarcely 1 mm. long. The petals are equally long, but narrower than the sepals, rounded above. The staminodes are rather more than half as long as the petals and are

slightly constricted at mid length; the stamens are shorter, the broad anther equalling the filament in length. The gynoecium is a small cone. The capsules are produced in ~~spikes~~ ^{racemes} about 15 cm. long to the number of 20 or more, and are reflexed, but scarcely completely so: they are 18 mm. long and the wings are 5 mm. wide.

14. *D. kamoonsensis* Kunth, Enum., 5, (1850) p. 395: Seab. in Kew Bull., 1912, p. 407: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 21. *D. kumaonensis* Hook. fil., Fl. Brit. Ind., 6, (1892) p. 290: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 140. *D. Burkilliana*, *D. Engleriana*, *D. firma*, *D. mengtzensana*, *D. rotundifoliolata* and *D. subfusca*, R. Knuth in op. cit., pp. 140-143. *D. pentaphylla*, var. *kamaonensis* Uline ex R. Knuth in op. cit., p. 140.

var. *straminea* Pr. & Burk. in loc. cit.

Circle of PAYAP. Doi Sutep, in evergreen forest, 1330 m., with male flowers in September, *Kerr* 2712! and in open jungle at 1400 m., with male flowers in September, *Kerr* 1374!

Distrib. of the species, from a centre in China, where it extends through Yunnan into Kweichow and Hupeh, westwards along the Himalaya to Kumaon and southwards into northern Burma, and northern Siam.

15. *D. Pierrei* Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 22: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 144.

Circle of PRACHINBURI. Sriracha forest at Chak Kaw, with male flowers in November, *Mrs. D. J. Collins* 1002! Nong Kaw forest, in fruit, *Mrs. D. J. Collins* 628! Circle of PUKET. Pangnga, Pulau Tebun, the male flowers just over, and with fruit in November, *Mohamed Haniff and Mohamed Nur* 3593! 3607!

Distrib. in Cochinchina and Siam. The deep-burying tubers, *Mrs. Collins* says, are dug up by woodmen and eaten to quench thirst. They descend to a depth of 1.25 m., and are mature in October and November. The tuber is called "man nam" or water tuber.

16. *D. pentaphylla* Linn., Sp. Plant., (1753) p. 1032: Craib in Kew Bull., 1912, pp. 407 and 408: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 23: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 145.

var. *siamensis* Pr. & Burk. var. nov.

Circle of PAYAP. Chiangmai at 300 and at 330 m. in scrub jungle, with female flowers in November, *Kerr* 2251! 2251a!; and in evergreen jungle at 660 m., with female flowers in September, *Kerr* 2701 (type), and without altitude, *Kerr's collector*!

var. *communis* Pr. & Burk. in loc. cit.

Circle of PAYAP. Doi Sutep at 1000 m., with male flowers in September, *Kerr* 1383! 1383 a! Doi Chom Cheng, between 1500 and 1600 m., *Rock* 300!

Distrib. of the species; through the Asiatic Monsoon area, and to the remotest Pacific island groups. Through this wide area it appears in a number of varieties, some of which receive cultivation or half-cultivation for food. The variety *siamensis* is eaten, according to Dr. Kerr. Its tuber descends to 50 cm. below the soil and at that depth may remain tender, but the part from close to the surface of the ground in his specimen is very stringy. It is abundantly covered by bristly roots. According to Dr. Kerr it is one of the species called "man awn" by the Laos. By the narrowness of its leaflets (up to 16 cm. in length by 2 cm. in width) and the lesser amount of hair upon them it is distinguished from var. *malaica*.

17. *D. hispida* Dennst., Schluess. Hort. Malab., (1818) pp. 15, 20 and 33: Merrill, Interpret. Rumph. Herb. Amboin., (1917) p. 148. *D. daemona* Roxb., Fl. Ind., 3, (1832) p. 805: Craib in Kew Bull., 1912, p. 407. *D. triphylla* Linn., Herb. Amboin., (1754) p. 23, but not in Sp. Plant., (1753) p. 1032: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 25: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 131, excluding all the African specimens and references thereto.

var. *reticulata* Hook. fil., Fl. Brit. Ind., 6, (1892) p. 289.

Circle of CHANTABURI. Kaw Chang, in scrub near sea-level, with male flowers in April, *Marcan* 1322! Kaw Chang, Klawng Nonsi, *Schmidt* 469, and upon the coast opposite to Kaw Salak, *Schmidt* 721 (both probably of this variety). Circle of KRUNG-TEP or else PRACHINBURI. "Gulf of Siam", *Finlayson* in Herb. Ind. Or. 5100! Circle of PRACHINBURI. Sriracha, with male flowers "from April to July", *Mrs. D. J. Collins* 255! and with fruit in October, *Mrs. D. J. Collins* 255 a! Sriracha, Bawn Dan, in a clearing, with male flowers in March, *Marcan* 135! Circle of RACHABURI. Bangtaphan, *Keith* 465! Circle of SURAT. Chum-pawn, Bang Song, in fruit in May, *Mohamed Haniff and Mohamed Nur* 4204!

var. *mollissima* Pr. & Burk. in loc. cit.

Circle of PAYAP. Muang Pai, in scrub, 600 m., *Kerr*! Foot of Doi Sutep, in mixed jungle, 330 m., with flowers in June, *Kerr* 681!

var. *scaphoides* Pr. & Burk. var. nov.

Circle of PUKET. Pangnga, Pulau Tebun, with fruit in November, *Mohamed Haniff and Mohamed Nur*, 3596!

var. *neo-scaphoides* Pr. & Burk. var. nov.

Circle of PAYAP. Chiangmai, in deciduous forest, 300 m., with male flowers in August, *Kerr* 5650! (type). Circle of RACHABURI. Kanburi, Baw Re, with male flowers in July, *Put* 195!

Distrib. of *D. hispida*; from the west side of India, with limits therein approximating to those of *D. pentaphylla*, but not in Ceylon, towards the east only as far as western New Guinea; so that it is absent from any of the Pacific islands: and it is absent also from the Andaman islands. In India proper it occurs as var. *daemona*: on the east of the Bay of Bengal, var. *reticulata* rules: var. *mollis-*

sima is sparingly associated with var. *reticulata*: and the two varieties mentioned here for the first time—var. *scaphoides* and var. *neo-scaphoides*—likewise. Dr. Knuth, who does not know var. *mollissima* as such, quotes Kerr 681 as var. *reticulata*.

Further material may prove vars. *scaphoides* and *neo-scaphoides* to be one: but as the first is known in the female and the second in the male it would be rash to assume this. The rather small very long acuminate leaflets are the same in both. The male inflorescence in var. *neo-scaphoides* is strikingly small. The capsules of var. *scaphoides* differ from those of vars. *daemona*, *reticulata* and *mollissima* in being bluntly pointed.

We have spent much time in attempting to correlate the colour of the flesh of the tuber with other characters, but have failed. Although we know that the flesh is sometimes white and sometimes lemon-yellow, both in India where var. *daemona* occurs, and in Siam where var. *reticulata* so varies, we base no varieties upon colour.

As is well known, the Siamese call the tuber of *D. hispida* “man kloi” or “man koi”. Both Mr. Marcan and Mrs. Collins adopt the first form, and record its use as food. Impoverished groups of men in the region where this *Dioscorea* grows often resort to it; and Mrs. Collins indicates that in the years towards the end of the World War when the price of rice in Siam went beyond their means, the tubers were extensively used. The plant with white-fleshed tubers is called, about Sriracha, “kloi khaw chow” and that with yellow flesh “kloi khaw neo”. The leaves of the latter are said to be darker than those of the former: apparently as food they are alike. They are dug in October and November when the 15 metres-long vines begin to wither, and then they weigh up to three pounds. They are peeled and sliced: the slices are soaked in water,—sea-water preferably, otherwise in water that has been salted: after twenty-four hours, during which the water should be changed several times, they are placed under pressure, still in water, for another twenty-four hours: these two processes are repeated up to eight times, when the poison should have been removed. To test for this, a bit of the prepared food is incinerated, and if it is consumed quietly it is fit to be eaten.

A man poisoned by an insufficiently washed preparation “suffers from dizziness and sees red”. Sugar and water are given as an antidote, and the discomfort may pass away in a day, or may last several days, or even prove fatal more or less rapidly.

The Siamese method of preparation differs in little from that used elsewhere. Thus the Lepchas of Sikkim soak the slices in a running stream. The people of Bali, in the time of Rumpf, roasted the tubers, peeled them, and coated them with ashes for twenty-four hours before soaking them in salt water, and dried them between each soaking. The Amboynese kneaded them under salt water. Others would bury them in ashes.

Section *Enantiophyllum*.

18. *D. myriantha* Kunth, Enum., 5, (1850) p. 382: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S., 10, (1914) p. 38: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 271. *D. Koordersii* R. Knuth in op. cit., p. 292.

Circle of NAKAWN SRITAMARAT. Terutao, Telok Wau, with fruit in November, Mohamed Haniff and Mohamed Nur 7473!

Distrib. through Malaysia to the Philippine islands. Dr. Knuth restricts the name *D. myriantha* to Philippine specimens, and applies the name *D. Koordersii* to one from Celebes: he does not know the plant as it grows in Java, Solor, Timor and southern Siam.

19. *Dioscorea* sp.,—a species which has been known to us sterile for ten years and found in several places, and has been cultivated by us: but we have failed to get flowers, and fruits also, unless Mr. Mohamed Haniff's no. 645 from Bukit Wang in Kedah be it. From Lower Siam to the neighbourhood of Kuala Lumpur is its known distribution in the Malay Peninsula, and we have obtained it from Sumatra,—Sibolangit between Medan and the Toba Lake.

Circle of PUKET. Pangnga, on limestone, Mohamed Haniff and Mohamed Nur 3868! Circle of SURAT. Tong Sang, Mohamed Haniff and Mohamed Nur 4286! Circle of PATTANI, Banang, at about 100 m., Kerr's collector!

Dr. Kerr calls it in Malay “ubi tanyo” and adds that the Malays eat it. It is eaten by the Sakai further south, where Father Ichebesta has collected it under the name of “hou”.

20. *D. Hamiltonii* Hook. fil., Fl. Brit. India, 6, (1892) p. 295, excluding the synonyms *D. ovata* Ham., and *D. alata* Griseb.: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 39: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 266.

Circle of PAYAP. Chiangmai, Doi Chang, in fruit in January, Rock 1723! not quite typical. Circle of AYUTHIA. Saraburi at Muak Lek, in a clearing at about 200 m., not cultivated, with male flowers in November, Marcan 1880!, also a little doubtful.

Distrib. This species, probably one of the parents of the next, is found in north-eastern India, and extends southwards into Siam and Tenasserim, as well as westwards on the further side of the Bengal plains in Chota Nagpur and the Malabar Ghats.

Mr. Marcan calls it “man rák”.

21. *D. alata* Linn., Sp. Plant., (1753) p. 1033: Craib in Kew Bull., 1912, p. 406: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 39: Burk. in Gard. Bull. Straits Settlements, 1, (1917) p. 371; 2, (1918) p. 37; and 3, (1923) pp. 4 and 5: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 265. *D. Hamiltonii* Koorders, Excursionsflora Java, 1, (1911) p. 309 and 4, (1923) p. 261.

D. alata is generally cultivated throughout Siam and readily persists for a time after shifting cultivation. Finlayson in his "Mission to Siam" (written in 1822-23) p. 270 mentions a luxuriant crop of it on the island of Ko-kan (Kaw Kan, a mile to the west of Kaw Si-chang and opposite Sriracha): but unfortunately his text continues with a statement that there was brought to him a tuber weighing 474 lbs. and measuring 9 ft. in circumference, dirty white at the top and fibrous within: this certainly can have been a tuber of *D. alata*. However that he saw *D. alata* in cultivation in the year 1822 may be accepted.

From Sriracha, by Mrs. Collins' generosity, the Royal Botanic Gardens, Kew, has at present in cultivation races which the Siamese call "man mu-mi" or bear's paw tuber, "man luat-ki" or chicken's blood tuber, "man gnu" or snake tuber, and "man chow-maprow" or swelling coconut-germ tuber. All these, Mrs. Collins says, are grown in small quantities for domestic consumption. She has supplied dried specimens of additional races—"man sao" or "man tua mai" or female yam, and "man sao sermg" or "man tua pu" or male yam, these being wild about Sriracha, where their deep-going tubers are dug for food. In addition she mentions in a note a race called "man mu-seur" or tiger's paw tuber. The bear's paw tuber is white-fleshed and in shape broad, flattened and lobed in such a measure as to suggest the name. One may consider it as what the Shans call "man tin-mi", the words having the same meaning. The chicken's blood tuber, as its name indicates, is magenta-fleshed, and in shape is rather narrow and is lobed. The snake tuber is one of these very interesting races which recurve in the soil and are sometimes of considerable length. Once, says Mrs. Collins, she saw a tuber of it ten feet long and coiled in several tiers. Being something quite unusual, it had been brought to the Governor of Sriracha as a present. The swelling coconut-germ tuber is a race very like that to which Roxburgh gave the name *D. globosa*, with a layer of magenta immediately under the skin, but white below it.

"Man tua mai" is stated to have a smaller tuber than "man tua pu", and a less angled stem.

There is not much information regarding the occurrence of these yams in other parts of Siam. That the species runs wild in the Circle of Payap is attested by specimens from Doi Sutep at 370 m. in scrub jungle, with ripe fruits in January, *Kerr* 1528 a!, and Chiangmai at 330 m. in scrub jungle, with male flowers in November, *Kerr* 1528 b! and on Doi Chang, with ripe fruits in January, *Rock*!

Professor Rock's specimen is not quite typical, having slightly larger fruits and slightly more prominent veinlets in the leaves; but it is not possible to give it another name.

Dr. Kerr's no. 1528 b bears the vernacular name of "man keng chang".

Outside Siam, *D. alata* extends in cultivation through the

tropics. Its origin in the Indo-China region is discussed in the Gardens' Bulletin of the Straits Settlements 3, (1924) p. 165.

22. *Dioscorea* (*Enantiophyllum*) *kratica* *Prain et Burkill*, sp. nov.; species ex affinitate *D. alatae* Linn. et *D. persimilis* Pr. et Burk., sed foliis conspicue differt.

Tubera esculenta, a nobis non visa. *Caules* glabri, striati, penna corvina crassiores. *Folia* vernalia alterna; serotina opposita vel subopposita, majora e basi cordata longe lanceolato-ovata, abrupte acuminata, ad 24 cm. longa, ad 7 cm. lata, 7-nervia: areola intra-nervia interior clausa anguste oblanceolata, basi angustissima: areola a nervorum paribus alteris amplexa elliptica: pagina superior glabra, nervis primariis conspicuis, nervis secundariis distinctis subrectis, reti indistincto: pagina inferior glabra, nervis primariis exstantibus, alteris distinctis: petiolus ad 6 cm. longus: folia serotina longe-ovata. *Flores* ♂ ignoti. *Flores* ♀ in spicis quam folia longioribus: axis angulatus, glaber. *Sepala* ovata, vix 1 mm. longa. *Petala* sepalis aequilonga, apice obtusa. *Staminodia* minuta. *Capsulae* crassiusculae, umbrinae: apice obcordatae: pedicellus 4 mm. longus: alae margine subaeque rotundatae, 20 mm. longae, 20 mm. latae. *Semina* castanea, circumcirca alata, loculis conformia.

Circle of CHANTABURI. Krat, Baw Rai, in evergreen forest at about 50 m. above sea level, with ripe capsules in November, *Kerr* 9453! (type). Krat, Kao Saming, upon the edge of evergreen forest, likewise with ripe capsules in November, at 20 m. above sea-level, *Kerr* 9415!

Male flowers are wanted to establish the position of this species. It is found in a region of heavy rainfall and close to sea-level.

23. *D. brevipetiolata* *Pr. & Burk.* ex Craib in Kew Bull., 1912, p. 407 (name only), and in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 38: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 287.

Circle of CHANTABURI. Kaw Chang, Klawng Kloi, at 50 m., with male flowers in September, *Kerr* 9243! Circle of PRACHIN-BURI. Sriracha, Nawng Kaw, on the edge of the railway-track, with young fruit in September, *Kerr* 2047! general in the Sriracha forest, with male flowers in October, *Mrs. D. J. Collins* 982! 1043!

Distrib. in the mountainous parts along the east coast of the Gulf of Siam, both in Siam and in Cambodia, and forwards into Lower Cochinchina. Dr. Knuth errs in interpreting us as stating that it grows on the sea-shore; but it is found in the coastal forest. Mrs. Collins calls it "man tien" or candle tuber, its long slender tubers, with creamy flesh, waxy after cooking, being dug and marketed in November when the vines wither. Dr. Kerr confirms the use, but calls it "man dong".

24. *D. glabra* *Roxb.*, Hort. Beng., (1814) p. 72 (name only), and Fl. Ind., 3, (1832) p. 803: Craib in Kew Bull.,

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B

(1287)

1912, p. 407: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 37 excluding var. *salicifolia*: R. Knuth in Engl. Pflanzenreich, iv-43 (1924) p. 277, excluding Arsin's specimen and var. *salicifolia*. *D. siamensis* R. Knuth, in op. cit. p. 281.

var. *vera* Pr. & Burk. in loc. cit.

Circle of PAYAP. Doi Sutep, in scrub jungle at 370 m., Kerr 1485! (the type of *D. siamensis*, R. Knuth). Circle of CHANTABURI. Kaw Chang, Klawng Nonsi, with male buds in September, Kerr 9165!

var. *grisea* Pr. & Burk. in loc. cit.

Circle of PUKET. Takowapa, Mohamed Haniff and Mohamed Nur 2072! Krasom, Mohamed Haniff and Mohamed Nur 3625! Pangnga, Pulau Tebun, Mohamed Haniff and Mohamed Nur 3573! 3600! 3622! 3625! Circle of NAKAWN SRITAMARAT. Singora, Kaw Yaw, Annandale!

Distrib. *D. glabra* occurs widely in the north-eastern parts of India, whence it spreads through Burma southwards, intergrading in southern Siam in a perplexing manner with *D. pyrifolia* Kunth. It is the commonest species of the section *Enantiophyllum* in the plains of Bengal, and thence extends westwards into the Circars and Chota Nagpur.

Mrs. Collins in 1925 sent to the Botanic Gardens, Singapore, a tuber labelled "man tien", which gave rise to a plant with male flowers on a zigzag axis such as *D. alata* and *D. brevipetiolata* possess. It suggests a hybrid of *D. glabra*.

25. *Dioscorea* (*Enantiophyllum*) *oryzatorum* Prain et Burkill, sp. nov.; inter affines colore luteo-viride statim insignis: quoad forma florum capsularumque *D. glabrae* Roxb. similis: capsulis quam in *D. glabra* minoribus; in latitudine foliorum variabilis

Tubera longe terram penetrantia, seu pollex crassa. *Caulis* glaber, inermis, laevis nisi ad basin ipsam ramorum lateralium inconstanter scaberulus. *Folia* (infima ignota) opposita, latissime quadrato-cordata, alia ovata, minima angusta e basi rotundata ovato-lanceolata vel lineari-lanceolata, in siccitate pallescentia, glaberrima, 5-7-nervia: areola intranervia clausa interior in foliis quadrato-cordatis anguste obovata, in foliis longe ovatis vel ovato-lanceolatis oblanceolata, in foliis lineari-lanceolatis linearis: areola a nervorum paribus alteris amplexa ambitu fere ut folia: pagina superior glabra, nervis distinctis: pagina inferior glabra, nervis majoribus elevatis, reti distincto: petiolus 2-4 cm. longus, gracilis. *Flores* ♂ in spicis 15-50-ni: spicae binae vel quaternae ad nodos in inflorescentias compositae: axis rectus tenuissimus, angulatus, ad 40 mm. longus: bracteae laeves, pallidae, truncatae, rigidiusculae, ovatae: alabastra nunc aliquomodo prorsa, nunc subquadratum axi imposita, ad axin compressa. *Sepala* umbrina, ovata, et basi lata, 1 mm. longa. *Petala* oblanceolata, sepalis breviora, crassiora. *Stamina* sex: filamenta brevissima. *Flores* ♀ in spicis ad 30-ni distributi: axis angulatus: bracteae ovatae.

Sepala late ovata, 1 mm. longa. *Petala* rotundata, crassa. *Staminodia* admodum parva. *Capsulae* porrectae, parvae, laeves, subglaucae: pedicellus 3-4 mm. longus: alae latiores quam semicirculares, ad 14 mm. longae, ad 11 mm. latae, apice paullulo semipb cordatae. *Semina* loculis conformia, circumcirca alata: ala castanea.

var. *latifolia* Prain et Burkill, var. nov. *Folia* ad 10 cm. longa, ad 7 cm. lata, e basi cordata quadrato-ovata.

Circle of CHANTABURI. Sai, Ban Tap, in fruit in December, Kerr 9689! Circle of PRACHINBURI. Sriracha forest, throughout, with male flowers in September, Mrs. D. J. Collins 984! (type of ♂). Circle of KRUNGTEP. Bangkok, on a ditch-bank, with female flowers in October, Marcan 1817! Tonburi, Wat Sing, by a ditch, with male and with female flowers in October, Kerr 9349! (type of ♀). Circle of SURAT. Kao Lao, at about 20 m. above sea level, in dry evergreen forest, Kerr 11135! Without locality, Bradley!

var. *mediifolia* Prain et Burkill, var. nov. *Folia* ad 8 cm. longa, ad 5 cm. lata, elongato-ovata vel ovato-lanceolata.

Circle of PRACHINBURI. Sriracha, with male flowers in October and in November, Mrs. D. J. Collins 266! 1044! Circle of KRUNGTEP. Tonburi, Wat Sing, by a ditch in scrub, with male and with female flowers in October, Kerr 9350! 9350 a! Bangkok, in a hedge, with nearly ripe fruit in November, Kerr 9352! (type), and with male flowers in October, Marcan 1044! on a canal bank and a ditchside, with male flowers in October, Marcan 1826! 1827! and with female flowers in October, Marcan 1828! with half-ripe fruit in November, Marcan 1838! Circle of SURAT. Kao Lao, common in dry evergreen forest, Kerr, 11135a!

var. *angustifolia* Prain et Burkill, var. nov. *Folia* ad 7 cm. longa, ad 1 cm. lata, e basi rotundata lanceolato-linearis.

Circle of KRUNGTEP. Tonburi, Wat Sing, among bushes by a ditch almost at sea-level, with male flowers in October, Kerr 9347! Bangkok, with male flowers in October and November, Kerr 4508! 7870! 9353! (type). Marcan 451! Bangkok, Klawng Rangsit, in scrub, with fruit in January, Marcan 1606!

We regret having to propose another species in the difficult group of *D. glabra*: but we have had much material of it through our hands. In common with the next two, it differs from the typical *D. glabra* Roxb., in the small size of its capsules. It may well be a species emerging under the peculiar conditions of the Bangkok plains, where in the dry weather the water-table sinks to a depth which would seem out of reach of such a *Dioscorea* as this, and where in the rainy season, though the actual precipitation is not very great, the soil is saturated by reason of the large volume of water in the rivers.

Dr. Kerr calls it "man nok", a name which Mrs. Collins applies to *D. bulbifera*, whereas she calls this "man mu" or hand-tuber, and "man doang" in different varieties, the first for var. *mediifolia* and the second for var. *latifolia*. She states that "man doang" is eaten steamed and in curries. Dr. Kerr records the same use as

being made of the tuber of *D. glabra* var. *vera*: it is probable that on the table one is as good as the other.

The tubers diverging in the soil, suggest fingers; thence the name "man mu". Mrs. Collins states that it is difficult to dig out the roots on account of the way in which they spread. It would be helpful if the botanists working in Siam could figure these tubers in a natural position.

26. *D. gracilipes* Pr. & Burk. in Kew Bull., 1925, p. 63.

Circle of PUKET. Pangnga, Pulau Tebun, in fruit in November, Mohamed Haniff and Mohamed Nur 3603!

27. *D. calcicola* Pr. & Burk. in Kew Bull., 1925, p. 64.

Circle of PUKET. Pangnga, on a limestone hill at 170 m., Mohamed Haniff and Mohamed Nur 3974! Pangnga, Pulau Tebun, Mohamed Haniff and Mohamed Nur 3601!

28. *Dioscorea* (*Enantiophyllum*) *stemonoides* Prain et Burkill, sp. nov.; species distincta calcaribus vel verrucis apice politis 1-3-nis ad basin petiolorum.

Tubera pluria, descendencia, tenuiuscula. *Caulis* glaber, gracilis, inermis, dextrorsum volubilis. *Folia* inferiora alterna, elongato-cordata, ad 5.5 cm. longa, ad 3.5 cm. lata, superiora opposita minora, 7-nervia: areola intranervia interior clausa lanceolata vel oblanceolata: areola a nervorum paribus alteris amplexa ambitu fere ut folia: pagina superior glabra, nervis primariis distinctis, aliis obscuris: pagina inferior glabra, nervis primariis elevatis, aliis aliquanto distinctis: petiolus tenuis, ad 55 mm. longus, basi, si folia infima, calcaribus apice politis ornatus, si superiora invicem verrucis apice politis 1-3-nis. *Flores* ♂ ignoti. *Flores* ♀ spicatae: spicae pauciflorae, angulatae, capsulas 2-3 ferentes: axis 6-8 cm. longus, glaber: bracteae ovato-lanceolatae. *Sepala* matura haud visa. *Capsulae* laeves, griseo-fulvae, basi fere cordatae, apice obcordatae: pedicellus 3 mm. longus: alae rotundato-subquadratae, ad 17 mm. longae, ad 18 mm. latae. *Semina* castanea, circumcirca alata, alis castaneo-fuscis.

Circle of RACHASIMA. Korat, Chan Tuk, Kao Sisiat A, at about 400 m., climbing among limestone rocks, and bearing nearly ripe fruit in September, Kerr 9098! (type). Circle of AYUTHIA. Saraburi, Muak Lek, at about 300 m., growing in crevices of limestone rocks, sterile in September, Kerr 9098a!

The affinity of this species seems to be with such species of the section *Enantiophyllum* as *D. glabra* Roxb., and *D. pyrifolia* Kunth: the multiple tubers suggest it. But no *Enantiophyllum* has as yet been detected with the gland-like processes which this possesses. Prickles occur in the same positions in many species; but the processes of *D. stemonoides* are not sharp, but blunt and polished: they are indeed more like the weak stipule-like processes found in a small group of species of the section *Stenophora*.

The fewness of the female flowers upon the spikes is suggestive of *D. paradoxa* which is described below; but there can scarcely be any close affinity between it and that species, seeing that the twining of the stem is reversed. But *D. calcicola* and *D. gracilipes* produce few capsules on each spike; and they apparently are closely allied.

29. *D. orbiculata* Hook. fil., Fl. Brit. Ind., 6, (1892) p. 292: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 31: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 281.

Circle of PATTANI. Betong, at 200 m. in scrub, with male flowers in August, Kerr 7485!

Distrib. This species occurs from Dr. Kerr's Siamese locality southwards through the Malay Peninsula and in Sumatra (locality unrecorded) and in Dutch Borneo.

Dr. Kerr gives it the Siamese name of "man ta yong", and states that the tubers are considered edible.

30. *D. decipiens* Hook. fil., Fl. Brit. Ind. 6, (1892) p. 293: Craib in Kew Bull., 1912, p. 407: Pr. & Burk. in Jour. Asiatic Soc. Bengal, N.S. 10, (1914) p. 31: R. Knuth in Engl. Pflanzenreich, iv-43, (1924) p. 287.

Circle of PAYAP. Doi Suteh, in mixed jungle at 400 m., Kerr 1449! Chiangmai, at 300 m. in deciduous forest, with male buds in August, Kerr 5651! Chiengrai, Mè Yen, at 430 m. in deciduous jungle, with male flowers in September, Winit 765!

Distrib. With its centre in Upper Burma, it extends (i) into the hills upon the south of the Brahmaputra, (ii) just into Yunnan, and (iii) just into the Laos territory at Luang Prabang, (iv) into Siam as indicated, and (v) towards the south it reaches the Tavoy district of Tenasserim.

Dr. Kerr records for it the Siamese name "man tung", and so also does Luang Winit. The latter adds that the tuber is edible.

Section uncertain.

31. *Dioscorea inopinata* Prain et Burkill, sp. nov.; species sectionis incertae, ab omnibus nisi *D. Brandisii* Pr. & Burk. distinctissima: spicis masculis solitariis praedita, cum petalis iis *D. bulbiferae* Linn. similibus sed brevioribus, cum foliis ab iis *D. bulbiferae* non longe dissimilibus: sed vero species longe distat.

Partes inferiores ignotae. *Caules* tenues, inermes, striati, dextrorsum volubiles. *Folia* alterna, e basi cordata ovato-lanceolata, acuminata, ad 9 cm. longa, 2.5-3.5 cm. lata, 7-nervia: areola intranervia interior clausa lanceolato-elliptica, areola a nervorum paribus alteris amplexa fere ambitu folii conformis: pagina superior hebes, laevis, nervis primariis distinctis, aliis paene invisibilibus: pagina inferior pallidior, nervis primariis vix vel paullulo elevatis, aliis indistinctis: petiolus perbrevis, 5-7 mm. longus, purpurascens. *Spicae* ♂ solitariae, rigidiusculae, ad 3.5 cm. longae, plus minusve

30-florae: flores quadratim dispositi: axis glaber, angulatus: bracteae ovato-lanceolatae, acuminatae, ad 1 mm. longae, basin floris subamplectentes, subscariosae: bracteolae ovatae. *Sepala* lanceolata, acuta, fere 2 mm. longa. *Petala* oblanceolata, acuta, fere sepalis aequilonga. *Stamina* sex, parva: antherae subrotundatae, filamentis longiores. *Flores* ♀ ignoti.

Circle of RACHABURI. Prachuap, Sam Roi, Yawt, on a rocky limestone hill at less than 50 m. above sea-level, with male flowers in July, *Kerr* 10978!

This *Dioscorea* resembles *D. Brandisii* Pr. & Burk., in its flowers: and *D. Brandisii* we considered as possibly a hybrid between *D. bulbifera* and a species of the section *Enantiophyllum* such as *D. glabra* Roxb. But the stiff male spikes that we observe in *D. inopinata* are not like the branched spikes of *D. Brandisii*. Moreover we observed that *D. Brandisii* twines to the left in common with *D. bulbifera*, whereas we find *D. inopinata* to twine to the right in common with *D. glabra*. At present we have no authority for assuming that a hybrid between species of these two sections is possible; nor have we consequently any indication how the characters would blend. But if hybridisation be possible, *D. Brandisii* and *D. inopinata* could have their origins from the same two species. There is yet much to ascertain regarding them before any view can be established and above all we need their underground parts.

32. *Dioscorea paradoxa* Prain et Burkill sp. nov.; species distincta: capsulis cum iis sectionis *Enantiophylli* ad amussim quadrantibus, sed caulibus sinistrorsum volubilibus ab hac sectione longe distat: spicis foemineis unifloris apice subspinosus speciebus *Dioscoreae* omnibus adhuc descriptis statim differt.

Partes inferiores ignotae. Caules inermes, glabri, laeves, politi, seu penna corvina crassi, sinistrorsum volubiles, axillis foliorum alternis tantum fertilibus. *Folia* alterna, triangulari-cordata, breviter acuminata, ad 6 cm. longa, ad 5.5 cm. lata, glaberrima, 7-nervia: areola intranervia interior clausa elliptico-lanceolata: areola a nervorum paribus alteris amplexa ovata: petiolus laminae aequilongus vel longior, pergracilis. *Flores* ♂ ignoti. *Flores* ♀ solitarii, lateraliter in ramis molliter subspinosus positi: invicem ramus uni- vel bi-foliatus, ramus uniflorus: axis floriferus 1.5–2 cm. longus, laevis, apice aliquomodo induratus: bractea ovato-lanceolata: bracteolus longe distat in pedicello capsulae, ovato-triangularis. *Sepala* et *petala* matura non visa. *Capsulae* magnae, stramineae, basi truncatae, apice obcordatae: pedicellus 15 mm. longus, leviter curvatus: ala 25 mm. longa, 25 mm. lata, rotundata. *Semina* circumcirca alata, brunneo-ochracea, loculis conformia; nucleus 10 mm. longus, 7 mm. latus, subreniformis.

Circle of AYUTHIA. Saraburi, Hin Lap, climbing over bushes upon a rocky limestone hill, in great abundance, at 100 m. above sea-level, with ripe fruit in September, *Kerr* 9132!

The capsules of this curious species suggest the section *Enantiophyllum* in that they free the seeds so that they glide out: but the direction in which the stems climb is contrary to that characteristic of that section. The underground parts and the male plant are required. Its morphology suggests that it is very distinct from all other known species.

XXXI.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXVII

1161. *Delphinium Nortonii* Dunn [Ranunculaceae-Helleboreae]; species *D. coeruleo* Jacq. affinis, sed calcare brevior distincta.

Herba perennis 7–10 cm. alta, dense breviter hirsuta. *Caules* ex radice plures, uniflori. *Folia* longe petiolata, breviter vaginantia, orbicularia; radicalia 2–3 cm. diametro, palmatim tripartita, segmentis late cuneatis valde imbricatis breviter petiolulatis palmatim incisus laciniis obtusis; caulina similia, pauca, minora. *Flores* magni, violacei, inflato-globosi, extus pubescentes, cum calcare 4 cm. longi, 3 cm. diametro; pedunculi 4–5 cm. longi, bibracteolati, bracteolis lanceolatis vel foliaceis 0.5–1 cm. longis. *Sepala* ovato-rotundata, membranacea, venosa, imbricata. *Calcar* rectum, 1–1.5 cm. longum, gradatim attenuatum. *Petala* lateralia bifida, aurantiaco-hirta; posteriora bidentata. *Staminum* filamenta glabra, inferne membranaceo-dilatata. *Carpella* 3, velutina.

TIBET. On sandy soil with a western aspect above Kampa Dzong, 12 miles north of Sikkim 5000 m., 17th June, 1922, Major E. F. Norton 369 (Mount Everest Expedition).

1162. *Parrya Finchiana* Dunn [Cruciferae-Arabideae]; similis *P. platycarpae* Hook. f. et Thom., sed pedunculis petiolisque dense pilosis distincta.

Herba perennis, dense breviter pilosa, 4–5 cm. alta. *Radix* longa, crassa, annulata, verticalis, apice in capita plura congesta ramosa. *Scapi* et flores singuli basi foliis cincti. *Squamae* extra folia scariosae, oblongae, acutae, ciliatae. *Folia* lanceolata, apice basique attenuata, ciliata, pilosa, 2 cm. longa. *Flores* congesti breviter racemosi, 1.5 cm. longi; pedicelli 5 mm. longi. *Sepala* linearia, 7 mm. longa, margine scariosa. *Petala* spathulata, violacea, in unguem longum flavum attenuata, 1.4 cm. longa. *Antherae* lineares. *Ovarium* oblongum; stylus brevis; stigmata brevissima, connata. *Siliqua* et semina non visa.

TIBET. Stony hillsides facing south east, along the Chongphu torrent, about 20 miles north east of Mt. Everest, 5700 m., 8th June, 1922. Major E. F. Norton 41 (Mount Everest Expedition).

The species is named in honour of Capt. George Finch of the Imperial College of Science who accompanied the Expedition and both as climber and naturalist contributed to its success.

1163. *Nototriche holoserica* A. W. Hill [Malvaceae]; species *N. compactae* A. W. Hill affinis, sed foliis multi-lobatis holosericis, calyce longiore, tubo corollae extus hirsuto praecipue differt.

Fruticulus depressus, dense caespitosus, pulvinatus, cinerascens, tomentosus; caudex subterraneus, lignosus, firmus, ramosus. *Folia* arcte aggregata, imbricata; petiolus circiter 1 cm. longus; stipulae parte libera lineari-lanceolata, 3-4 mm. longa, cum petiolo utrinque incano-holoserico-stellato-tomentosa; lamina ambitu semicircularis vel reniformis, subcarnosula, palmatim 7-9-loba, circa 3.5-5 mm. longa, 7-9 mm. lata, utrinque dense incano-holoserico-tomentosa, lobis 1.5-2.5 mm. longis 3-5 lobulatis, lobo medio 7-lobulato. *Calyx* urceolatus, 8-9 mm. longus, extus et lobi intus dense lanato-tomentosus, lobis triangulari-ovatis subacutis. *Corolla* alba vel pallide rosea, 8-9 cm. longa; petala obovata, rotundata, basi in tubum extus hirsutum circa 2.5-3 mm. coalita. *Carpella* 6-10, birostrata, 6 mm. longa, inferne breviter stellato-tomentosa, rostris 1.5-2 mm. longis dorso superne pilis longis stellatis instructis.

CHILE. Prov. Atacama: Vallenar; Cordillera Laguna Chica, 4200 m., *E. Werdermann* 264 (Jan. 1924); bleak slope north of Portezuelo de Laguna Chica, 4200 m., *Ivan M. Johnston* 5944; near Laguna Valeriano, Quebrada, just above the lake, common on silty and gravelly beaches, 4150 m., *Ivan M. Johnston* 6046 (Jan. 1926).

Dr. Ivan M. Johnston has sent four interesting specimens of *Nototriches* to Kew for determination; two of these from the Atacama desert are found to be a new species, allied to *N. compacta*, but differing especially in the more silky tomentum, the smaller lobulae of the leaf and the hairs on the outside of the calyx tube; they are said to be common in this region. *Werdermann* collected the same plant two years before. The other plants were collected in the Andes of North-western San Juan, Northern Argentina, at 4100-4400 m., and prove to be *N. transandina* A. W. Hill.

N. transandina is evidently closely related to *N. megalorrhiza* Philippi, and it may be found, when better material comes to hand, that these two plants will prove to be identical. Owing to the imperfect nature of Philippi's material at Kew and his meagre description (*Flor. Atacama* p. 11), it is not possible at present to consider the reduction of *N. transandina* to the earlier described species.

1164. *Microcos Brassii* Summerhayes [Tiliaceae]; affinis *M. grandiflorae* Burret, sed foliis minoribus glabris, nervis lateralibus foliorum utrinsecus 3-4, floribus minoribus satis distinguenda, et *M. Schlechteri* Burret a qua staminibus numerosis differt.

Arbor 9-12 m. alta. *Ramuli* teretes, longitudinaliter rugulosi, glabri, brunnei. *Stipulae* caducissimae. *Petioli* 0.8-1.4 cm. longus, supra leviter applanatus, minute lepidotus, ceterum glaber. *Lamina* oblongo-elliptica, apice subito acuminata, summo apice obtusa, basi subcuneata, margine integra, 7.5-13 cm. longa,

3-5.5 cm. lata, subcoriacea, utrinque juventute minute sparseque albido-puberula, demum glabra, laevis, concolor; costa media et nervi laterales supra inferne impressi superne subprominentes, subtus valde prominentes; nervi basales ad dimidium laminam ascendentes; nervi laterales utrinsecus 3-4, prope marginem arcuatim conjuncti, nervis tertiariis tenuiter reticulatis. *Inflorescentiae* terminales, paniculatae, angustae, 3-5 cm. longae, ramulis siccitate longitudinaliter sulcatis dense lepidoto-pilosis; flores 3-nati, triades pedunculo 4-7 mm. longo; foliola involucria caduca; pedicelli brevissimi, usque ad 1 mm. longi. *Alabastra* oblongo-ellipsoidea vel oblongo-obovoidea, 3-4.5 mm. longa. *Sepala* oblonga vel oblongo-elliptica, 4.5-5 mm. longa, apice obtusa, cucullata, margine superne valde inflexa, extra minute stellato-pilosula, intus breviter pubescentia. *Petala* cuneato-oblonga, apice emarginata, 2 mm. longa, utrinque puberula, ciliata. *Stamina* numerosa (circiter 30); filamenta linearia, 3 mm. longa, basi albido-pilosa. *Ovarium* conicum, dense breviterque pilosum, in stylum brevem glabrum exiens, triloculare, loculis biovulatis.

NEW GUINEA. Ihu, Vailala River, erect rain-forest tree 9-12 m. high with a close brown bark, Feb. *Brass* 949.

1165. *Tephrosia egregia* Sandwith [Leguminosae-Galegeae]; inflorescentia floribusque *T. Hassleri* Chod. revocans, foliolis apice saepius retusis brevissime apiculatis tantum supra glabratiss, indumento alibi inconspicuo adpresso differt; foliis atque ramificatione necnon indumento ad *T. nitentem* Bth. approximans, tamen calycis forma stylo glabro stigmate penicillato longe distat.

Ramuli exstantes 15-20 cm. longi inflorescentia terminati, costato-angulati, inter costas late sulcati, ut foliorum rhachis densiuscule subappresse cinereo-pilosi; internodia 2-4 cm. longa. *Folia* usque ad 10 cm. longa, inferiora 6-8-juga, superiora 2-4-juga, superiora praesertim flores solitarios vel fasciculos paucifloros suffulcientia; petioli 0.5-1 cm. longi; rhachis internodia 0.6-1.2 cm. longa; petioluli dense adpresse albo-pilosi, 2 mm. longi; foliola oblanceolata vel inferiora saepe obovata, apice saepius retusa, nonnunquam rotundata, apiculo 0.5 mm. vix attingente, 1.8-4 cm. longa, 0.6-1.3 cm. lata, sursum gradatim majora, chartacea, supra glabrata vel sparsiuscule minute adpresse setulosa, subtus dense adpresse cinereo-pilosa; stipulae subulatae, usque ad 1 cm. longae, extra dense adpresse albo-pilosae. *Inflorescentia* dense subsericeo-pilosa, et terminalis racemiformis floribus superioribus solitariis inferioribus fasciculatis, et floribus solitariis, vel fasciculatis in axillis foliorum superiorum; bractae subulatae 5-8 mm. longae; pedicelli 6-7 mm. longi. *Calyx* extra dense cinereo-pilosus, intus minute pubescens; tubus campanulatus inter labium posticum et lobos ceteros 3 mm. longus, ad 5 mm. latus; dentes subulati, 2 superiores 5 mm. longi tum connati, 3 inferiores 7-9 mm. longi medio lateralibus longiore. *Corolla* magna speciosa, ad 1.8 cm. longa; vexillum lamina orbiculari extra satis dense

adpresse cinereo-pilosa intus glabra, ad 1.4 cm. longa, ad 1.6 cm. lata, ungue ad 3.5 mm. longo; alae glabrae, lamina obovata 1.3 cm. longa, ungue 2-3 mm. longo; carina glabra, ad 1.2 cm. longa, unguibus 2-2.5 mm. longis. *Stamina* in vaginam glabram fere 9 mm. longam connata, filamentis liberis glabris 3-5 mm. longis; stamen vexillare mediae vaginae usque ad 4-5 mm. connatum, aliter liberum. *Ovarium* disco cupulari glabro 0.5 mm. longo 1.3 mm. lato positum, dense adpresse albo-pilosum, ad 1 cm. longum, 1.2 mm. latum; stylus glaber, circiter 7 mm. longus, fructu maturescente manifeste applanatus subinduratus, stigmatibus pilis albis conspicue penicillato.

BRAZIL: Ceara, G. Bolland.

1166. **Astragalus Rockii** Marquand et Shaw [Leguminosae-Galegeae]; subgeneris *Pogonophaces* sectionis *Phyllolobii* nulli speciei nobis notae arcte affinis, ab *A. complanato* R. Br. ex Bunge leguminibus inflorescentiaeque pedunculis duplo vel triplo brevioribus, et ab *A. pycnorrhiza* Wall. inflorescentiis 3-7-floris floribus luteis, facile distincta.

Herba perennis. *Radix* valida, 3-4 mm. diametro, lignosa. *Caules* suberecti vel adscendentes, flexuosi, ramosi, ad 3 dm. longi, superne parce pubescentes, striati. *Stipulae* liberae, parvae, triangulari-subulatae, c. 3 mm. longae. *Folia* 2-3 cm. longa, 8-9 mm. lata, foliolis 7-9-jugis breviter petiolatis, obovatis vel subellipticis, saepe emarginatis, mucronatis, 4-5 mm. longis, 2-2.5 mm. latis, supra glabris, subtus glauco-pallidioribus pilis albis brevibus adpressis parce vestitis. *Racemi* 3-7-flori, numerosi, pedunculis breviter pubescentibus 2-3 cm. longis suffulti. *Bractae* anguste triangulares vel subulatae vix ad 3 mm. longae. *Flores* pedicellis brevibus suffulti; bracteolis minimis subulatis. *Calycis* tubus sparsissime nigro-pubescentis, 2-3 mm. longus, dentibus aequalibus anguste subulatis c. 4 mm. longis densius nigro-pubescentibus. *Corolla* ochroleuca, c. 14 mm. longa. *Vexillum* suborbiculare, c. 10 mm. diametro, emarginatum, basi attenuatum. *Alae* anguste obovatae, c. 12 mm. longae, 4 mm. latae, apice rotundatae, basin versus breviter auriculatae. *Carina* c. 13 mm. longa, 4-5 mm. lata, apice fusca, oblique subtruncata. *Stamina* diadelphea. *Stigma* barbatum. *Legumen* turgidum, glaberrimum, subcomplanatum, oblongo-lanceolatum, dorso alte sulcatum, 1.3-1.5 cm. longum, 4-5 mm. latum, apice attenuatum, polyspermum.

S.W. CHINA. YUNNAN: Ngululo; dry loamy soil, eastern slopes of Likiang Snow Range, Yangtze watershed, 18 Sept., 1923, J. F. Rock 10745.

1167. **Oxytropis Malloryana** Dunn [Leguminosae-Galegeae]; affinis *O. tataricae* Cambess. habitu, sed pubescentia pilis longis sparsis nec sericeis densis adpressis differt.

Herba perennis, acaulis, pilis albis patulis conspersa. *Radix* longa, verticalis, multiceps. *Folia* basi congesta, 3-5 cm. longa, imparipinnata, 10-12-juga; foliola oblongo-ovata, obtusa, mar-

ginata, tenuiter involuta, 3 mm. longa; petioli 1-2 cm. longi; stipulae ovatae vel lanceolatae, obtusae, petiolo basi adnatae, venosae, saepe membranaceo-marginatae, ciliatae, 5 mm. longae. *Capitula* 4-5-flora. *Flores* purpurei, 6 mm. longi, bracteolis lanceolatis calyce brevioribus. *Calycis* tubus 2 mm. longus ut dentes et legumina pilis brevibus nigris adpressis indutus, dentibus lanceolatis tubo bis brevioribus. *Corolla* calyce sesquialongior; vexillum ovatum in unguem brevem attenuatum; alae aequilongae; carina alis brevior, apice acuta rostrata; filamenta inaequaliter libera. *Ovarium* sessile; stylus imberbis. *Legumen* lineare, uniloculare, sutura ventrale intrusa, 1-4 cm. longum.

TIBET. Stony slope facing south in Phung Chu (Arun) valley, 3800 m., 16th June, 1922, Major E. F. Norton 113 (Mt. Everest Expedition).

This species commemorates the name of the late Mr. George Leigh-Mallory who lost his life in an attempt to reach the summit of Mt. Everest during the expedition of 1924. His photographs and notes have proved a useful adjunct to the specimens of the flora brought back by the 1922 expedition.

1168. **Tryphostemma humile** Dandy [Passifloraceae]; affine *T. Sandersonii* Harv., sed habitu plerumque humiliore, foliis margine integris, pedunculis brevioribus 2-floris, satis distinctum.

Herba; caules subsimplices, graciles, glabri, sulcati, e rhizomate lignoso ramoso usque ad 15 cm. alti. *Folia* subsessilia, ovata vel oblongo-ovata, basi rotundata vel subrotundata, apice acuta mucronata, margine integra leviter revoluta, usque ad 2 cm. longa et 1 cm. lata, membranacea, utrinque glabra leviter, nervis lateralibus inconspicuis; stipulae minutae, filiformes. *Inflorescentiae* 2-florae; pedunculus brevis; pedicelli graciles, circiter 0.7-0.8 cm. longi; bractae minutae, filiformes. *Flores* circiter 0.4-0.5 cm. longi. *Sepala* elliptica, apice obtusa, hyalina, brunneo-maculata, longitudinaliter 5-nervia. *Petala* sepalis similia angustioraque vel nulla. *Corona* duplex, exterior membranacea fimbriata, interior annularis brevis crassa. *Staminum* filamenta lata, membranacea. *Ovarium* ovoideum, minute puberulum; ovulum solitarium; styli 3-4, filiformes, ovario multo longiores, stigmatibus capitatis.

TROPICAL AFRICA. Southern Rhodesia: Melssetter distr., fl. Oct., Walters 2727.

1169. **Tryphostemma phaulanthum** Dandy [Passifloraceae]; ab affini *T. Hanningtoniano* Mast. habitu erecto, foliis crassioribus margine plus minusve serratis, pedunculis brevioribus, floribus capsulaque minoribus, differt.

Herba annua, ad 40 cm. alta, glaberrima, prope basim ramosa; caulis ramique adscendentes, subteretes sed inferne leviter costati. *Folia* chartacea, subtus pallidiora, fere ad basim 3-loba, lobis ellipticis sed 2 lateralibus basi inaequalibus, apice obtusis breviter mucronatis, margine irregulariter plus minusve serratis, ad 4.5 cm.

longis et 1·7 cm. latis; petioli graciles, 2·5 cm. attingentes; stipulae filiformes, parvae. *Inflorescentiae* axillares, 2-florae; pedunculi ad 7 mm. longi, in cirrhum gracillimum convolutum exeuntes; pedicelli brevissimi, circiter 1 mm. longi; bractae filiformes, minutae; alabastra oblongo-ovoidae. *Flores* minuti, vix 2 mm. longi. *Sepala* viridia, oblonga, apice rotundata, fructus basi persistentia. *Petala* nulla. *Corona* sepalis subaequalis, duplex, exterior alba breviter tubulosa laciniata laciniis filiformibus tubum aequantibus, interior brevissime cupuliformis dentata staminifera. *Antherae* vix 0·5 mm. longae. *Ovarium* breviter stipitatum; ovulum 1; styli 3 brevissimi, stigmatibus capitatis. *Capsula* ovoidae, stipitata, circiter 8 mm. longa et 4·5 mm. lata. *Semen* 1, leviter compressum, ambitu fere orbiculare, circiter 4 mm. longum et 3·5 mm. latum, distincte arcolatum.

TROPICAL AFRICA. Tanganyika: Mwanza, *Davis* 208.

1170. **Tryphostemma scabrifolium** Dandy [Passifloraceae]; inter species foliis non lobatis ob folia subsessilia parva scabra manifeste distinctum.

Herba; rami glabri, leves, costati. *Folia* oblongo-lanceolata, basi cuneata, apice obtusa primo manifeste mucronata, margine leviter revoluta plerumque denticulis paucis callosis munita, usque ad 2 cm. longa et 0·7 cm. lata, rigida, supra scabra, subtus praesertim ad costum crassum nervosque prominentes reticulatos pilis brevibus rigidis primo albidis dense vestita; petioli brevissimi, crassi; stipulae subulatae, demum spinescentes, ad 2·5 mm. longae. *Inflorescentiae* axillares, 2-florae; pedunculi brevissimi; pedicelli graciles, ad 10 mm. longi, in fructu longiores incrassatique; bractae subulatae, parvae; alabastra oblonga, 3–5 mm. longa, albido-pilosa. *Sepala* oblonga, apice rotundata, 6–8 mm. longa et 2–2·5 mm. lata, extus rigide pilosa. *Petala* anguste oblonga, apice rotundata vel parum lobata, 4–5 mm. longa. *Corona* triplex, exterior cupuliformis margine fimbriata, intermedia crassa disciformis, interior breviter cupuliformis intus staminifera. *Filamenta* circiter 4 mm. longa; antherae circiter 2 mm. longae. *Ovarium* breviter stipitatum, ovoideum, glabrum; ovula pauca; styli 3 fere 4 mm. longi, stigmatibus capitatis. *Capsula* stipitata, ellipsoidea, circiter 1·8 cm. longa, glabra, levis. *Semina* pauca, compressa, circiter 7·5 mm. longa et 5·5 mm. lata.

TROPICAL AFRICA. Uganda: fl. and fr. April, 1926, *van Someren* (type). Kenya: Kisumu, fl. Mar., *Butler* 39.

XXXII.—MISCELLANEOUS NOTES.

It is with great pleasure we learn that Dr. O. STAPP, F.R.S., has been awarded the Gold Medal of the Linnean Society for 1927.

We note with pleasure, in the recent Birthday Honours List the following appointment to Membership of the Most Excellent Order of the British Empire, Mr. F. S. SILLITOE, Superintendent of Government Gardens, Khartoum.

Mr. W. E. BASSETT, Student Gardener, Royal Botanic Gardens, Kew, has been appointed by the Secretary of State for the Colonies, Assistant Superintendent, Victoria Botanic Gardens, Cameroons.

Mr. J. S. DASH, Professor of Agriculture, Imperial College of Tropical Agriculture, Trinidad, has been appointed by the Secretary of State for the Colonies, Director of Science and Agriculture, British Guiana.

Portrait of Mr. W. J. Bean.—Mr. Ernest Moore held an exhibition in London last year of his portraits of famous Yorkshiremen, and among them was a portrait of Mr. W. J. Bean, the Curator. This portrait has been most generously presented to the Royal Botanic Gardens by Major Reginald Loder and accepted by the Minister of Agriculture and Fisheries. The presentation of the portrait was made in the Gardens Library, on Tuesday, 21st June, by Lord Lambourne and Major Loder in the presence of a large number of members of the staff and several prominent amateur horticulturists. After a few introductory remarks by the Director and Major Loder, Lord Lambourne, President of the Royal Horticultural Society, unveiled the portrait and the Director accepted it on behalf of the Royal Botanic Gardens. A vote of thanks to Lord Lambourne and to the artist, for the excellent portrait, was proposed by Sir David Prain. The portrait has been hung in the Gardens Library.

Arnold Arboretum.—We are informed by the President of Harvard University that Mr. E. H. Wilson, the Assistant Director, has been appointed Keeper of the Arnold Arboretum, and Mr. Oakes Ames, Professor of Botany, has been appointed Supervisor of the Arboretum, as well as of the Botanical Museum, the Cryptogamic Herbarium and the Garden at Soledad in Cuba.

These changes in the staff of the Arnold Arboretum consequent on the death of Prof. Sargent (*K.B.*, 1927, p. 221) have been made with the object of bringing the Arboretum into closer co-operation with all the other botanical departments of the University and thereby reinforcing the scientific work of the Arboretum.

A New Economic Use for *Ceanothus americanus*.—With reference to the note on this subject which appeared in *K.B.*, 1927, p. 189, paragraph three, sentence four, should have read, "The active principle is an alkaloid, but in an analysis of the drug, starch and calcium oxalate are found in varying quantities, &c.". An article entitled "*Ceanothus americanus* L. as a Hemostatic, a Résumé of recent Investigations into the Chemistry, Pharmacology and Clinical Use of the Drug," by Guy C. Taylor, Ph.G., Research Laboratory of Flint, Eaton & Co., Decatur, Illinois, appeared in Vol. 99, No. 4, April, 1927, pp. 214-232, of the *American Journal of Pharmacy*. This article includes all the salient facts regarding the drug and its uses known to the present time, and it concludes with a bibliography of the subject.

W. D.

Male Irish Yew.—It is a matter of common knowledge that the first Irish Yews were two plants discovered by a Mr. Willis in the mountains of Fermanagh about 1780. One of these was planted at Florence Court, the seat of the Earl of Enniskillen, the other Willis planted in his own garden. The latter has disappeared, but the former, I believe, still exists at Florence Court, and from it probably most, or all the plants in cultivation are descendants. It is a female tree, and as its progeny, having been raised from cuttings, are naturally of the same sex, it has generally been assumed that no male plants exist. Elwes and Henry in the *Trees of Great Britain and Ireland*, p. 110, observe that "no true male Irish yew has ever been met with." Last March, however, some shoots of yew, undoubtedly male and undoubtedly Irish, were received from Mr. W. H. B. Fletcher, of Aldwick Manor, Bognor, Sussex. They were accompanied by an interesting letter, from which the following extracts are taken:—

"Having regard to the history of the Irish yew I thought that you might perhaps like to see specimens of plants which I take to be the male form of the green type and of one of its variegated forms which I have come across during the last few days under the following circumstances. I was going along a footpath leading to the graveyard at North Mundham, a parish between Bognor and Chichester, which is bounded by high hedges, perhaps some 10 ft. high, in which are some variegated Irish yews. I gave two of these a tap with my walking stick, and was surprised to see a cloud of pollen drift off. These hedges were planted for my late brother, who was Vicar of the parish from 1882-1926, so I suspected whence he got the yews.

"In the course of a day or two it occurred to me to have a look round the Irish yews in my own shrubbery, and there I found three male bushes of the green form and one of the variegated, all about 10 ft. in height, as well as smaller bushes of the variegated form.

"A few days later I examined the variegated Irish yews at our County Mental Hospital at Chichester, and there found three good bushes of the variegated Irish (male).

"My own bushes came from The Barnham Nurseries, Ltd., Barnham, near Bognor, in the planting season 1900-01. No doubt the others came from the same place.

"A day or two ago I went to the Nursery, which has been going about 50 years, and saw the foreman, who has been there 40 years. He told me they had continuously propagated the Irish yews by cuttings from the stock on the premises and did not grow them from seed.

"He did not know where their stock originally came from. They have in the nursery a good many bushes of the male variegated Irish Yew, 6-8 ft. high, in two forms, one brighter than the other.

"They seem to have none of the green form of the male now, as their stock of Irish yews became very low during the war and they had to buy in a fresh stock. I examined the new stuff, but could find no males among it.

"It is unfortunate that so far one has been unable to find out the earlier history of these forms."

From what Mr. Fletcher states there does not now appear to be any chance of ascertaining the origin of male Irish yews about which he writes. In the *Gardeners' Chronicle*, July 18, 1891, p. 68, Dr. Masters had a note about the Irish yew in which he states that he had lately received from Mr. Tillett, of Sprowston, near Norwich, sprays bearing "unequivocal male flowers." Whether these were gathered from an entirely male tree or from "sporting" branches on a female one is not stated.

The chief distinction of the Irish yew from the common one, besides that of its erect habit, is the radial arrangement of its leaves, an arrangement which, in the common yew, occurs only on the leading shoots. The ordinary pectinate arrangement is never seen. An Irish yew, therefore, may be regarded as an assemblage of leading shoots.

The flowers of the ordinary Irish yew occasionally develop fertile seeds, having been fertilised by common yew. Such seeds have been sown at different times at Kew, but no true Irish yew has been raised from them. They usually revert to common yew, but a few of them have shown a tendency towards a fastigiate habit. Possibly the varieties *erecta* and *nidpathensis* have originated in this way, both being characterised by a partial or wholly radial arrangement of the leaves.

W. J. B.

A Treatise on Viticulture.*—This work is intended to serve both the student and practical grape-grower, particularly readers in

* By A. I. Perold. Macmillan & Co., Ltd., St. Martin's Street, London, 1927. Pp. 696, ill. 108. Price 25s.

South Africa, Australia and California. The first few chapters are devoted to the biology of the vine, internal and external morphology and ampelography. These are followed by chapters on propagation, grafting, diseases and cultivation in general. The production and sale of table grapes for export is dealt with in great detail and will be of special interest, particularly to South African readers in view of the development of the grape export industry from the Cape in recent years. An exhaustive bibliography, accompanied by an alphabetical list of grape species and varieties is a useful feature of a book that should make a strong appeal to all interested or engaged in viticulture.

F. N. H.

Flora of the Maltese Islands.*—This most interesting and, for the price, well published book should prove of great use not merely to students of botany in the Valetta University, but also to visitors to the islands and to all who work on the flora of the Mediterranean Basin. The bulk of the book is occupied with full descriptions, in English, of the genera and species of Maltese plants, accompanied by details of their general and Maltese distribution, flowering periods, habitats, vernacular names, and uses. An introduction of 68 pages contains an account of the history of botanical exploration, of the geology, water supply, climate, and vegetation. Full acknowledgment is given of the researches of the late Mr. J. F. Duthie, who collected in the islands in 1871-72 and 1874, and it may be useful to call attention to the excellent sets of specimens collected by him during these visits and now in the Kew Herbarium. In spite of the small size of these islands, their dense population, and high cultivation, and of the absence of mountains and forests the wild flora is still rich and interesting. The rocks and soils are predominantly calcareous and calcifuge plants are therefore rare. The flora is definitely Italian in its character and there are at most only two or three species which are endemic.

W. B. T.

Eradication of Lantana in Bombay.—According to the "Review of Agricultural Operations in India, 1925-26" it is stated that "After a considerable number of trials in Bombay with different agents and methods, it appears that a large measure of success in eradicating *Lantana* can be obtained by the following method. The *Lantana* bush is cut down and the stump painted with Sodium Arsenate. This method is reported to have given 94% of success when tried on a large scale in jungle conditions; recutting and repainting of sprouted surviving plants with Sodium Arsenate completely wiped them out. Chemical analysis shows that the Arsenic penetrates the plant and reaches the smaller root branches."

* Descriptive flora of the Maltese Islands, including the ferns and flowering plants, by John Berg, M.A., M.D., Malta. Government Printing Office, 1927. 5s. pp. 846.

BULLETIN OF MISCELLANEOUS INFORMATION

No. 7 1927

ROYAL BOTANIC GARDENS, KEW

XXXIII.—THE GENERA OF MAGNOLIEAE. J. E. DANDY.

While carrying out a critical study of the *Magnoliaceae* (sensu stricto)* with a view to their taxonomic revision, I have come to the conclusion that much of the confusion which for a long time has existed in this group is due to the various interpretations of the limits of the genera. If the very distinct genus *Liriodendron* be left out of consideration—and in my opinion it should be set apart as the tribe *Liriodendreae*†—the remainder of the family, forming the true *Magnolieae*, is an extremely natural group, about the number of whose constituent genera there has never been uniformity of opinion. Up to the time of publication of the "Genera Plantarum" about ten genera had been described by various authors. Of these Bentham and Hooker‡ retained four: *Talauma*, *Magnolia*, *Manglietia*, and *Michelia*; Prantl§ further reduced the number to three by including *Manglietia* under *Magnolia*. Meanwhile Baillon in his "Mémoire sur la Famille des Magnoliacées"¶ had suggested two possible alternatives, either to unite all the genera as subgenera of one genus, or to keep up all the ten genera and perforce describe others on single and unimportant characters to cater for isolated species¶. Baillon himself chose the former course, and arranged the genera under five sections of the one genus *Magnolia***.

Through the kindness of those in charge of the various herbaria, I have been able to assemble at Kew for the first time the type-specimens of nearly all the species of the tribe. A study of these in conjunction with the mass of material now available has convinced me that Baillon's "unigeneric" view is untenable, both on taxonomic grounds and also from a utilitarian standpoint in that it necessitates a large and unwieldy genus. Its rejection on the other hand involves, to my mind, the recognition of nine genera, a number less unreasonable than Baillon's second alternative would have us believe.

In deciding which genera should be retained, it is convenient to start with the four recognised by Bentham and Hooker††, all of which are sound. The subsequent reduction of *Manglietia* to *Magnolia* by Baillon and by Prantl was the product of a mechanical

* Hutch. in Kew Bull. 1921: 185; Fam. Flowering Pl. 1: 81 (1926).
† Reichb. Handb.: 278 (1837). Spach (Hist. Nat. Veg., Phan. 7: 486 (1839)) also isolated this genus as *Liriodendrineae*. ‡ Benth. et Hook. f. Gen. Pl. 1: 18-19 (1862). § Engl. et Prantl Nat. Pflanzenf. 3, 2: 16 (1888). ¶ Baill. Adansonia 7: 1 (1866). ¶ I.c.: 3. ** I.c.: 66. †† I.c.

process which should not be introduced into taxonomy, for it was reasoned that since a difference in ovule-number was not considered sufficient grounds for the division of *Michelia* into two genera, then *Manglietia* should not be regarded as generically distinct from *Magnolia*. Actually, neither the biovulate nor the pluriovulate *Michelias* form an homogeneous group, whereas the species of *Manglietia* are a natural assemblage whose members can be recognised from their appearance alone.

Bentham and Hooker, and later Prantl, followed Miquel* in reducing *Aromadendron* to *Talauma*. This was quite erroneous; *Aromadendron* is much further removed from *Talauma* than are *Manglietia* and *Magnolia*, and shows closest affinities with such species as *Magnolia Gustavii* and its allies; it differs from *Talauma* in (1) the indehiscent fleshy fruiting carpels, (2) the free stipules, (3) the elongated peduncle, (4) the numerous tepals, and (5) the long connective-appendage. It was recently revived as a genus by Ridley†.

To the five genera *Talauma*, *Manglietia*, *Magnolia*, *Aromadendron*, and *Michelia*, I find it necessary to add four new ones. Of these *Kmeria* is based upon perhaps the most remarkable plant in the tribe, i.e. *Magnolia Duperreana*, which has unisexual flowers and a mode of dehiscence of the carpels quite unknown in the rest of the family. There is little doubt that if Pierre had not been following Baillon in his recognition of but one genus, he would have founded a new genus for this plant; as it was, he made a new subgenus *Kmeria*‡ for its reception.

Pachylarnax, the second new genus, is based upon a species hitherto undescribed. Two flowering specimens at Kew, both from Penang, had previously suggested that the plant was a new and very distinct species of *Manglietia*, but additional material from the Paris herbarium, collected in Annam, shows that the fruit is capsular and therefore unique in the family. The two or three carpels are united in the mature fruit, which dehisces completely along the back of the carpels and partially along their line of union, forming two or three thick woody valves which become recurved and bifid at the tip; each valve thus consists of two halves of adjacent carpels. Although the Penang specimens are in flower only, and the Annam plant possesses only fruit, they are otherwise identical, and the structure of the gynaecium in the Penang specimens agrees well with the character of the fruit in the example from Annam.

By the separation of *Michelia Cathcartii* as a new genus *Alcimandra*, the genus *Michelia* is converted into a well-defined group with constantly axillary flowers. *Michelia Cathcartii* was apparently originally referred to *Michelia* on account of the stipitate gynaecium and character of the fruit. There, however, the

resemblance ends, and the plant is more correctly placed near *Magnolia Gustavii* and *Aromadendron*.

The fourth proposed new genus, *Elmerrillia*, embraces a group of very closely allied species confined to the Eastern Malayan Islands from Borneo and the Philippines to New Guinea. The plants resemble some species of *Michelia* in general appearance and in the axillary flowers, but differ in the sessile gynaecium and introrsely dehiscent anthers, while the stipules are always quite free from the petiole. The generic position of these plants has been so puzzling that two of the species have been described independently in each of the genera *Talauma* and *Michelia*, a third was described as a *Talauma*, while the fourth was referred to *Michelia*.

I append a key to the genera of the tribe together with descriptions of the new genera and a list of new names and combinations which it is found necessary to make.

KEY TO THE GENERA.

Flowers bisexual; mature carpels circumscissile or dehiscent along the dorsal suture, or indehiscent:

Flowers terminal (rarely some also subaxillary):

Carpels usually numerous; fruit not capsular:

Mature carpels woody or coriaceous, dehiscent; tepals usually fewer than 18; connective-appendage usually much shorter than the anther:

Mature carpels free or concrescent, circumscissile, the upper portions falling away independently or in irregular masses and leaving the persistent lower portions with their suspended seeds; stipules adnate to the petiole, leaving a scar on its upper surface.....1. *Talauma*.

Mature carpels free, dehiscent along the dorsal suture:

Gynaecium sessile or shortly stipitate, exserted from the androecium:

Ovules 4 or more.....2. *Manglietia*.

Ovules 2.....3. *Magnolia*.

Gynaecium stipitate, narrowly cylindrical, not exserted from the androecium; peduncle elongated, slender; tepals 9, subequal; ovules about 2-5; stipules free from the petiole, the latter therefore unscarred.....

4. *Alcimandra*.

Mature carpels concrescent, fleshy, indehiscent; peduncle elongated, fairly slender; tepals 18 or more; connective-appendage about as long as or longer than the anther; ovules 2; stipules free from the petiole, the latter therefore unscarred.....5. *Aromadendron*.

Carpels 2-3, concrescent; fruit capsular, woody, dehiscing completely along the dorsal suture of the carpels and partially along their line of junction; tepals 9, subsimilar; ovules several; stipules free from the petiole, the latter therefore unscarred.....6. *Pachylarnax*.

* Miq. Ann. Mus. Bot. Lugd.-Batav. 4: 70 (1868). † Ridl. Fl. Mal. Penins. 1: 17 (1922).

‡ Pierre Fl. For. Cochinch. 1: sub t. 1 (1879).

Flowers axillary :

Gynaeceum sessile ; anthers introrsely dehiscent ; stipules free from the petiole, the latter therefore unscarred.....

7. *Elmerrillia*.

Gynaeceum stipitate ; anthers latrorsely dehiscent.....

8. *Michelia*.

Flowers unisexual, terminal ; tepals 6 ; gynaeceum sessile ; ovules 2 ; mature carpels free, woody, completely dehiscent along the ventral suture, partially so along the dorsal suture and thus finally bifid at the apex ; stipules adnate to the petiole, leaving a scar on its upper surface.....9. *Kmeria*.

***Alcimandra* Dandy, gen. nov.**

Tepala 9, subaequalia. *Stamina* numerosa ; filamentum breve ; anthera linearis, longissima, introrse dehiscens ; connectivum in appendicem brevem linguiformem productum. *Gynaeceum* stipitatum, anguste cylindricum, ex androecio haud exsertum ; carpella numerosa ; ovula circiter 2-5. *Fructus* cylindricus, saepe curvatus ; carpella matura libera, laxe disposita, coriacea, ad suturam dorsalem dehiscentia. *Semina* 1-4, libera, omnino arillata, funiculo filiformi suspensa.—*Arbor*. *Folia* integra ; petiolus e cicatrisatus ; stipulae a petiolo liberae. *Flores* solitarii, terminales, bisexuales ; alabastrum in spatha unica intervallo nullo sub tepalis inserta inclusum ; pedunculus elongatus, gracilis.

Species 1 :

***Alcimandra Cathcartii* (Hook. f. et Thoms.) Dandy, comb. nov.** ; *Michelia Cathcartii* Hook. f. et Thoms. Fl. Ind. 1 : 79 (1855).—Sikkim to Assam and Upper Burma, and Tongking.

***Pachylarnax* Dandy, gen. nov.**

Tepala 9, subsimilia, interiora minora basi angustiora. *Stamina* numerosa ; filamentum brevissimum ; anthera linearis, introrse dehiscens ; connectivum in appendicem brevem productum. *Gynaeceum* sessile ; carpella 2-3, concrescentia ; ovula plura. *Fructus* capsularis, lignosus, et ad suturas carpellorum dorsales omnino et ad commissuras partim ita dehiscens ut valvas 2-3 crassas recurvas apice bifidas praebeat. *Semina* in carpellis singulis 2-3, libera, funiculo filiformi suspensa.—*Arbor*. *Folia* integra ; petiolus e cicatrisatus ; stipulae a petiolo liberae. *Flores* solitarii, terminales, bisexuales ; alabastrum in spatha unica intervallo brevissimo sub tepalis inserta inclusum ; pedunculus crassus, brevis.

Species 1 :

***Pachylarnax praecalva* Dandy, sp. nov.**

Arbor ; ramuli glabri. *Folia* oblanceolato- vel anguste elliptico-oblonga vel oblanceolata, basi cuneata vel attenuata, apice obtusa vel rotundata saepe emarginata, usque ad 19 cm. longa et 6.5 cm. lata, coriacea, utrinque glabra nitida, subtus in sicco laxe reticulata ; nervi laterales utrinsecus circiter 12-15, inconspicui ; petiolus usque ad 2.5 cm. longus, glaber ; stipulae glabrae. *Pedunculus* circiter

0.5-1 cm. longus, glaber. *Tepala* glabra, exteriora oblanceolato-oblonga circiter 3-3.5 cm. longa. *Stamina* circiter 17-20 mm. longa ; connectivi appendix acuta. *Gynaeceum* elongato-obovoideum, glabrum. *Fructus* circiter 5-6 cm. longus.

PENANG. Haniff 3485, 4067 (typus in Herb. Kew.).

ANNAM. Tourane Prov. : prope Tourane, Ba-na, 1000 m., Poilane (Inst. Sci. Indoch.) 7264.

This plant was referred by Ridley* to *Manglietia glauca*, as was also a specimen of *Talauma betongensis* collected on Kedah Peak by Bell and Haniff.

***Elmerrillia*† Dandy, gen. nov.**

Tepala 9-15, subsimilia, interiora minora basi angustiora. *Stamina* numerosa, incurva ; filamentum breve ; anthera linearis, introrse dehiscens ; connectivum in appendicem brevem productum. *Gynaeceum* sessile, subcylindricum ; carpella numerosa, conferta ; ovula 2 vel 4. *Fructus* subcylindricus carpellis maturis liberis coriaceis ad suturam dorsalem dehiscentibus, vel suboblongus carpellis maturis concrescentibus carnosus indehiscentibus. *Semina* 1-4, libera, omnino arillata, funiculo filiformi suspensa.—*Arbores*. *Folia* integra ; petiolus e cicatrisatus ; stipulae a petiolo liberae. *Flores* solitarii vel 2-3-nati, axillares, bisexuales ; alabastrum in spathis 2 inclusum, exteriori intervallo manifesto interiore intervallo nullo sub tepalis inserta ; pedunculus elongatus, satis gracilis.

Type-species : *E. papuana* (Schltr.) Dandy.

The following species are referable to this genus :

***Elmerrillia papuana* (Schltr.) Dandy, comb. nov.** ; *Talauma papuana* Schltr. in Engl. Bot. Jahrb. 50 : 70 (1913) ; *Michelia Forbesii* Baker f. in Journ. Bot. 61, Suppl. : 2 (1923).—New Guinea.

That this plant could not formerly be placed satisfactorily in any genus is shown by the fact that whereas Schlechter referred it with considerable uncertainty to *Talauma*, Baker in describing it independently regarded it as a *Michelia*.

***Elmerrillia celebica* (Koord.) Dandy, comb. nov.** ; *Michelia tsiampacca* Miq. Ann. Mus. Bot. Lugd.-Batav. 4 : 73 (1868), an L. ? ; *Michelia celebica* Koord. in Meded. Lands Pl. 19 : 328, 631 (1898).—Celebes.

***Elmerrillia pubescens* (Merr.) Dandy, comb. nov.** ; *Talauma pubescens* Merr. in Philipp. Journ. Sci., Bot. 3 : 133 (1908).—Philippines.

***Elmerrillia ovalis* (Miq.) Dandy, comb. nov.** ; *Talauma ovalis* Miq. Ann. Mus. Bot. Lugd.-Batav. 4 : 69 (1868) ; *Michelia*

* Ridl. Fl. Mal. Penins. 1 : 14 (1922).

† After Elmer Drew Merrill, author of one of the species, who has kept up-to-date our knowledge of the Philippine representatives of this often neglected family.

platyphylla Merr. in Philipp. Journ. Sci., Bot. 13: 11 (1918).—Philippines and Celebes.

The Philippine plant is identical with the type-specimen of Miquel's species. This is another case, as in *E. papuana*, of a member of this genus being described independently in *Talauma* and *Michelia*. The fruit of this species and *E. Vrieseana* differs from that of their congeners in being a syncarp composed of fleshy indehiscent carpels. These species thus afford an interesting parallel with *Michelia Baillonii*, which on account of its fleshy syncarpous fruit has been erroneously referred to *Talauma* and *Aromadendron* (see p. 310 seq.).

Elmerrillia Vrieseana (Miq.) Dandy, comb. nov.; *Talauma Vrieseana* Miq. Ann. Mus. Bot. Lugd.-Batav. 4: 70 (1868).—Celebes.

Miquel referred this species to his section *Aromadendron* of *Talauma*. I have not seen the fruit, and Miquel did not state whether it is terminal or axillary, but the portion of the type which I have seen clearly represents a species closely allied to *Elmerrillia ovalis*, which comes from the same region and possesses a fruit very similar to that of *Aromadendron*.

Kmeria (Pierre) Dandy, gen. nov.; *Magnolia* subgen. *Kmeria* Pierre Fl. For. Cochinch. 1: sub t. 1 (1879).

Tepala 6, subsimilia, interiora minora. *Stamina* numerosa, in axem brevem conicum inserta; filamentum breve; anthera linearis, introrse dehiscens; connectivum in appendicem vix productum. *Gynaecium* sessile; carpella numerosa; ovula 2. *Fructus* subglobosus; carpella matura libera, lignosa, ad suturam ventralem omnino, ad dorsalem etiam partim, dehiscentia, hinc demum apice bifida. *Semina* 1-2, libera, omnino arillata, funiculo filiformi suspensa.—*Arbor*. *Folia* integra; petiolus supra cicatrisatus; stipulae petiolo adnatae. *Flores* solitarii, terminales, unisexuales, monoici; alabastrum in spatha unica intervallo nullo sub tepalis inserta inclusum; pedunculus satis elongatus.

Species 1:

Kmeria Duperreana (Pierre) Dandy, comb. nov.; *Magnolia Duperreana* Pierre Fl. For. Cochinch. 1: t. 1 (1879); *Talauma Duperreana* Finet et Gagnep. in Bull. Soc. Bot. France 52, Mem. 4: 32 (1906).—Cambodia.

New Names and Combinations.

Talauma Miqueliana Dandy, nom. nov.; *Manglietia celebica* Miq. Ann. Mus. Bot. Lugd.-Batav. 4: 72 (1868), non *Talauma celebica* Koord.—Celebes.

Examination of the type-specimen and fruiting material shows that this plant is a *Talauma*, not a *Manglietia*, and that it is not Koorders' *Talauma celebica*.

Michelia Scortechinii (King) Dandy, comb. nov.; *Manglietia Scortechinii* King in Journ. As. Soc. Bengal 58, 2: 370 (1889).—Perak and Sumatra.

The axillary flowers, stipitate gynaecium, and pair of ovules all keep this plant out of *Manglietia* and indicate that it is a species of *Michelia*. Material from Sumatra shows that the fruit is a fleshy syncarp somewhat resembling that of *M. Baillonii*.

Michelia Balansae (Aug. DC.) Dandy, comb. nov.; *Magnolia Balansae* Aug. DC. in Bull. Herb. Boiss., Ser. 2, 4: 294 (1904); *Michelia baviensis* Finet et Gagnep. in Bull. Soc. Bot. France 52, Mem. 4: 44, t. 5B (1906).—Tongking.

Magnolia Balansae and *Michelia baviensis* were both founded on Balansa's n. 3886, and the former was the earlier name.

Michelia Martinii (Léveillé) Dandy, comb. nov.; *Magnolia Martinii* Léveillé in Bull. Soc. Agric. Sci. Arts Sarthe 59: 321 (1904); *Michelia Bodinieri* Finet et Gagnep. in Bull. Soc. Bot. France 53: 574 (1906).—China.

The earlier name for this species was that of Léveillé; it was described independently by him and by Finet and Gagnepain from the same plant (*Martin and Bodinier* n. 2066).

Michelia philippinensis (P. Parmentier) Dandy, comb. nov.; *Magnolia philippinensis* P. Parmentier in Bull. Sci. France et Belg. 27: 206 in obs., 270 (1896); *Michelia parviflora* Merr. in Publ. Bur. Gov. Lab. (Philipp.) 35: 70 (1906), non DC.; *Michelia Cumingii* Merr. et Rolfe in Philipp. Journ. Sci., Bot. 3: 100 (1908).—Philippines.

Cuming's n. 783 served as the basis for both Parmentier's and Merrill's descriptions, and Parmentier's name has priority of publication. *Michelia Cumingii* was merely a new name to replace Merrill's *M. parviflora*, which had already been used by de Candolle.

Michelia Leveilleana Dandy, nom. nov.; *Michelia Cavaleriei* Léveillé in Fedde Repert. Sp. Nov. 9: 459 (1911), non Finet et Gagnep. (1906).—Kweichow.

Léveillé's name had previously been used by Finet and Gagnepain for a very different species.

Magnolia Macklottii (Korth.) Dandy, comb. nov.; *Manglietia Macklottii* Korth. in Nederl. Kruidk. Arch. 2, Versl.: 97 (1851); *Magnolia*? *Pealii* Koord. et Valeton in Meded. Lands Pl. 17: 148 (1896), non *M. Pealiana* King; *Magnolia javanica* Koord. et Valeton l.c.: 315 in obs. (1896).—Sumatra and Java.

Comparison of the type-specimens of *Manglietia Macklottii* and *Magnolia javanica* shows them to be identical. The species was correctly referred to *Magnolia* by Koorders and Valeton, who pointed out its affinity with *M. Gustavii* and *M. Pealiana*.

Magnolia poasana (Pittier) Dandy, comb. nov.; *Talauma poasana* Pittier in Contrib. U.S. Nat. Herb. 13: 93 (1910).—Costa Rica.

This is a species of *Magnolia* closely allied to *M. Schiedeana* and *M. guatemalensis*. The petiole is unscarred, a character which serves to distinguish at a glance the species of this group from those of *Talauma*, in which the petiole always bears the scar of the fallen stipules.

Magnolia kachirachirai (*Kanehira et Yamamoto*) Dandy, comb. nov.; *Michelia kachirachirai* Kanehira et Yamamoto in Yamamoto Suppl. Icon. Pl. Formos. 2: 14, f. 9-10, t. 1 (1926).—Formosa.

The authors referred this species to *Michelia* apparently on account of the stipitate gynaeceum; the flowers and fruit, however, are those of *Magnolia*, and the plant represents a species of the latter genus closely related to *M. nitida*, which also possesses a stipitate gynaeceum.

Manglietia kwangtungensis (*Merr.*) Dandy, comb. nov.; *Magnolia kwangtungensis* Merr. in Journ. Arnold Arboret. 8: 5 (1927) pro parte, excl. spec. n. 12179.—Kwangtung.

Merrill cited three specimens, of which the type (*Canton Christian College* n. 12344) represents a species closely allied to *Manglietia Fordiana*, as he suggested. *Canton Christian College* n. 12179 belongs to a different species, while I have not seen the third specimen (*Canton Christian College* n. 12548).

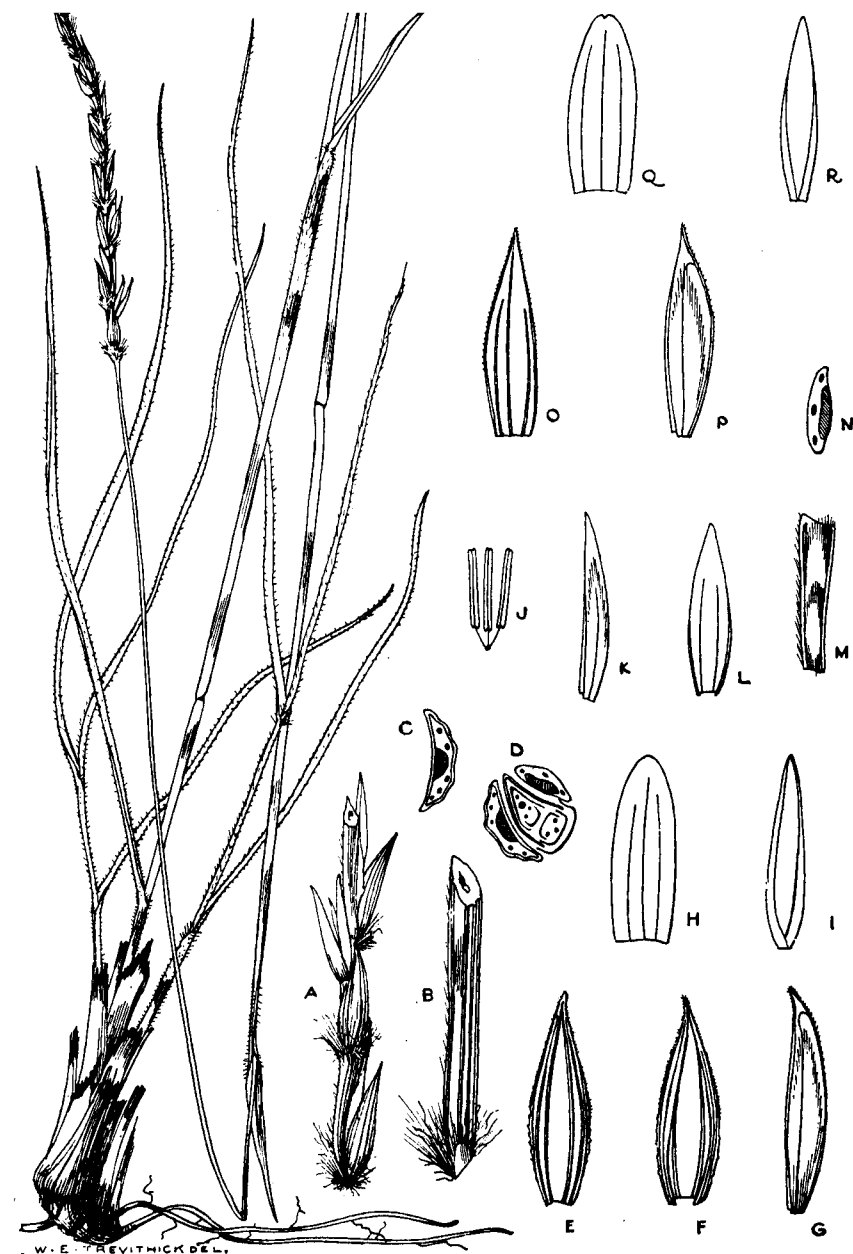
XXXIV.—NOTES ON AFRICAN GRASSES, V*.

NEW SPECIES.

Lasiurus Maitlandii Stapf et Hubbard, sp. nov.; affinis *L. hirsuto* Boiss., sed culmis erectis caespitosis simplicibus, foliis viridibus flaccidioribusque, ligulis membranaceis, racemis minus densis angustioribusque, articulis oblique truncatis, spiculis minoribus binatis, glumis aequalibus, inferiore integra, superiore 5-nervia differt.

Gramen perenne, caespitosum, 50-90 cm. altum. *Culmi* erecti, e rhizomate brevi orti, graciles, inferne leviter compressi, superne teretes, simplices, 2-3-nodi, glabri laevesque, vel infra nodos imprimis summos rarius uno latere barbati, innovationibus intra-vaginalibus. *Foliorum* vaginae arctae vel laxiores, compressae carinataeque, striatae, internodiis breviores, laeves, superiores sparse pubescentes vel glabrae, infimae diu persistentes; ligulae obtusae vel subacutae, ad 1.5 mm. longae, membranaceae, glabrae vel breviter ciliolatae; laminae anguste lineares, longe et tenuiter acutae, plicatae vel deinde planae, inferiores 6-16 cm. longae, 2.5-4 mm. latae, superiores multo breviores, virides, laxae patule albo-pilosae, marginibus leviter incrassatis albidis scaberulis. *Racemi* solitarii, erecti, spiciformes, graciles, 5-7 cm. longi, 3-5 mm. lati, fragiles, e vagina summa longe exserti, spiculis binatis; articuli lineares,

* Continued from K.B., 1927, p. 75.



Lasiurus Maillandii Stapf et Hubbard, showing habit. A Portion of raceme (x2). B Joint of raceme (x4). C Transverse section of joint. D Diagram of raceme. E and F Lower glume, back, and front-view (x4). G Upper glume, in side-view (x4). H and I Lemma and palea of lower floret (x4). J Stamens (x3). K and L Lemma (side-view) and palea of upper floret (x4). (E-L of sessile spikelet.) M Pedicel (x4). N Section of pedicel. O Lower glume (x4). P Upper glume, side-view (x4). Q and R Lemma and palea of lower floret (x4). (O-R of pedicelled spikelet.)

13–8 mm. longi, breviter ciliati, e dorso convexi, facie concavi, apice oblique truncati; pedicelli lineares, 4–5 mm. longi, adpressi, compressi, uno latere ciliati. *Spiculae sessiles* lanceolato-oblongae, ovato-lanceolatae vel superiores ovatae, 6–8 mm. longae, pallide virides, plerumque purpureo-suffusae, callo pilis albis erectis vel patulis ad 3 mm. longis dense sericeo-barbato. *Glumae* aequales, 6–8 mm. longae; inferior acuminata, integra, subcoriacea, dorso plana vel leviter convexa et glabra, 2-carinata, carinis scaberulis et sursum ciliolatis medio obtuse denticulatis, nervis inter carinas 4, extra eas 2; superior navicularis, a latere oblonga, acuta, membranacea, valide carinata, 3-nervia, apice ciliata. *Anthoecium inferum* ♂; lemma oblongum, obtusum, 6–7 mm. longum, hyalinum, tenuiter 3-nervium, glabrum; palea lanceolata, obtusa, lemmati aequilonga, hyalina, 2-nervia. *Antherae* lineares, 3–3.5 mm. longae. *Anthoecium superum* ♀, infero aequilongum; lemma ovatum, acutum, hyalinum, 3-nervium, glabrum; palea lanceolata, hyalina, lemmati aequilonga vel paulo brevior. *Spiculae pedicellatae* sessilibus similes, 6–7 mm. longae, callo fere glabro, utroque anthoecio ♂.

TROPICAL AFRICA. Uganda: Serere; Serere, in stony grasslands subject to burning, 1140 m., July 1926, *Maitland* 1282.

***Digitaria Maitlandii* Stapf et Hubbard**, sp. nov.; affinis *D. nardi-foliae* Stapf, sed foliorum inferiorum vaginis villosis, laminis latioribus, pedicellis plerumque longioribus, spiculis paulo minoribus, gluma superiore multo brevior emarginata differt (see fig. 2, p. 271).

Gramen perenne, compacte caespitosum, a basi fibris densis obtectum, innovationibus intravaginalibus. *Culmi* erecti vel ascendentes, 25–90 cm. alti, graciles, teretes, simplices, 1–2-nodi, glabri laevesque. *Foliorum* vaginae demum internodiis breviores, superiores laxiusculae, tenuiter striatae, infimae longe persistentes, tomentosae vel villosae, demum in fibras fissae, superiores pubescentes vel glabrae et laeves; ligulae truncatae, ad 1 mm. longae, scariosae; laminae anguste lineares, longe et tenuiter acutae, involutae, demum planae, 4–18 cm. longae, applanatae ad 3.5 mm. latae, rigidulae, pubescentes vel glabrae, facie asperulae, dorso laeves. *Racemi* graciles, 5–8, sessiles in axi communi 2–3 cm. longo, 4–11 cm. longi, flexuosi, erecti vel patentes; rhachis triquetra, tenuiter marginata, ad 0.5 mm. lata, laevis vel scaberula; pedicelli 2–4-nati, inaequales, tenuiter filiformes, 1–5 mm. longi, flexuosi, laeves vel asperuli, apice discoidei. *Spiculae* dense vel demum laxae imbricatae, oblongae vel elliptico-oblongae, acutae vel subacutae, 2–2.25 mm. longae, 0.8 mm. latae, breviter hirsutae. *Gluma* inferior ad marginem subannuliformem delicate hyalinum album reducta; gluma superior orbiculata, truncata, emarginata, 0.75 mm. longa, hyalina, albida, 3-nervia, lineis quaternis pilorum hirsuta, pilis clavatis albis sericeis patentibus exterioribus longioribus. *Anthoecium inferum* sterile; lemma oblongum vel elliptico-oblongum, obtusum, spiculam aequans, 5–7 nervium, tenuiter membranaceum, quoad pubescentiam glumae superiori simile; palea minuta, hyalina, ad 0.75 mm. longa.

Anthoecium superum ♀, oblongum vel elliptico-oblongum, acutum vel acuminatum, spiculam aequans, firme chartaceum, castaneo-fuscum, demum nigro-fuscum.

TROPICAL AFRICA. Uganda: Masaka; Mbarara road, on roadside and in plains, Oct. 1925, *Maitland* 766 (type): Ruwenzori; Bwamba, Bulanga, 740 m., Dec. 1925, *Maitland* 928.

***Panicum inaequilatum* Stapf et Hubbard**, sp. nov.; affinis *P. aequinervi* Nees, sed spiculis minoribus, glumis conspicue inaequilatis, inferiore anguste et 3-nervia differt.

Gramen perenne. *Culmi* vagantes, e basi decumbente geniculato-ascendentes, 15–55 cm. longi, debiles, gracillimi, teretes, glabri, laeves, laxi ramosi, multinodi, nodis glabris. *Foliorum* vaginae arctae, teretes, tenuiter striatae, 1.5–6 cm. longae, tenues, ciliatae, sparse pubescentes vel glabrae, internodiis breviores; ligulae ad seriem ciliolatum reductae; laminae lanceolato-lineares, subauriculatae, tenuiter acutae, 2.5–6 cm. longae, 2.5–6 mm. latae, planae, patentes, tenues, sparse pubescentes vel fere glabrae, tenuiter nervosae et transverse trabiculatae, marginibus minute scaberulis. *Panicula* laxa, 4–7 cm. longa, 1.5–6 cm. lata, plerumque breviter exserta; rhachis filiformis, laevis, glabra; rami solitarii, ad 4 cm. longi, pauci, distantes, demum patentes, tenuiter filiformes vel capillares, flexuosi, glabri laevesque; pedicelli 3–11 mm. longi, apice cupulato-clavati. *Spiculae* ovatae vel ovato-oblongae, acutae vel subacuminatae, 2.5–2.75 mm. longae, sparse pubescentes, virides. *Glumae* tenuiter herbaceo-membranaceae, ad marginem et apicem hyalinae, explanatae obtusae; inferior anguste oblongo-ovata, circ. 2.5 mm. longa, 3-nervia; superior late oblongo-elliptica, quam inferior duplo latior, circ. 2.75 mm. longa, 7-nervia. *Anthoecium inferum* sterile; lemma glumae superiori simile sed ellipticum, 2.5 mm. longum, glabrum, 5-nervium; palea lineari-oblonga, 1.8 mm. longa, hyalina. *Anthoecium superum* ♀, oblongo-ellipticum, subacutum, 1.8–2 mm. longum, albidum, laevissimum; lemma subcoriaceum. *Antherae* lineari-oblongae, 1.2 mm. longae.

TROPICAL AFRICA. S. Rhodesia: Umtali, 1560 m., on hillsides in shade of bush and undergrowth, Feb. 1926, *Herb. Dept. Agric. S. Rhod.* 3375.

Amongst the Tropical African species it is nearest to *P. Hochstetteri* Steud., a native of equatorial Africa, from which it differs in its much weaker culms, thinner, loosely nerved and transversely veined leaves; simpler, laxer panicles; equally long, hairy and finely nerved glumes.

***Setaria aequalis* Stapf**, sp. nov.; affinis *S. Thollonii* Stapf (comb. nov. e *Panico Thollonii* Franch.), sed culmis 2–3-nodis, laminis firmioribus majoribusque, spiculis late oblongis, gluma inferiore enervia, superiore 5-nervia anthoecium superum aequante, lemmate inferiore 5-nervio differt.

Gramen annuum, laxae caespitosum, 15–25 cm. altum. *Culmi* tenuiores, suberecti vel geniculatim ascendentes, tenuiter striatae,

laeves glabrique, 2-3-nodi, e nodis omnibus summis exceptis ramosi, ramis suberectis, internodiis intermediis 4-5 cm. longis, summo tenuiter filiformi demum longe exserto et ad 12 cm. longo. *Foliorum* vaginae leviter compressae vel superiores teretes, angustae, tenuiter herbaceae, tenuius sulcato-striatae, inferiores mox a culmo solutae, intermediae 2.5-4 cm. longae, ciliolatae et magis minusve sparse tenuiter pubescentes vel glabrae, nodis delicate pubescentibus; ligulae ad seriem ciliorum brevium reductae; laminae lanceolatae, basi magis minusve attenuatae, acutae, 4-7.5 cm. longae, 6-12 mm. latae, planae, basi leviter plicatae, tenues, virides, glabrae vel basi sparse ciliolatae, leviter scaberulae, costa gracillima, nervis primariis 6-8 tenuissimis. *Inflorescentia* paniculata, angusta, magis minusve flexuosa, laxa, 4-5 cm. longa, 6-8 mm. lata; axis filiformis, subteres atque laevis vel sursum versus complanatus et scaberulus; rami oblique erecti, solitarii, distantes, inferiores 1.25-2 cm. longi, tenuiter filiformes, acute angulati, scaberuli, cum seta terminali, spiculas ad 10 subsessiles contiguas vel distantes in racemos subsecundos simplices dispositas gerentes, spiculis plerumque setis solitariis suffultis; setae graciles, rigidulae, 3-6 mm. longae; pedicelli minutissimi, apice truncati. *Spiculae* late oblongae, subobtusae vel acutae, turgidulae, 2.5 mm. longae, 1 mm. latae, virides. *Glumae* inaequales; inferior orbiculata, 0.5 mm. longa, hyalina, enervia; superior anthoecium superum aequans vel paulo brevior, tenuiter membranacea, albida, 5-nervia, nervis viridibus. *Anthoecium inferius* sterile, superum aequans; lemma gluma superiori simile sed complanatum vel leviter depressum; palea oblonga, lemmate multo brevior. *Anthoecium superius* ♀, oblongum, obscure apiculatum, albidum, demum pallide fuscum; lemma et palea crustacea; lemma tenuiter transverse rugosum, apice papilloso-asperulum, paleam granulati-punctatam marginibus late amplectens.

TROPICAL AFRICA. Tanganyika Territory: Kilimanjaro; Marangu, 1500 m., *Volgens* 914.

***Setaria ramentacea* Stapf**, sp. nov.; affinis *S. homonymae* Chiov., sed ramis paniculae basi setis sterilibus fasciculatis stipatis, spiculis paulo minoribus, gluma superiore longiore angustioreque, anthoecio supero laevi nitidoque differt.

Gramen perenne. *Culmi* moderate graciles, longe ascendentes, nodis ad 9, magis minusve ramosi, parte ascendente compresso, infra paniculam pubescentes, infra nodos molliter retrorso-hirsuti, caeterum glabri laevesque, internodiis intermediis circiter 2.5 cm. longis, superioribus 7.5-15 cm. longis, summo longe exserto ad 35 cm. longo. *Foliorum* vaginae potius tenues, superiores subherbaceae, striatae, inferiores compressae, carinatae, magis minusve hirsutae et saepe ore barbatae vel superiores versus basin retrorso-pubescentes et superne glabrae, intermediae internodiis multo longiores, solutae et superne arcte complicatae; ligulae ad seriem ciliorum densorum reductae; laminae lineares, basi magis minusve attenuatae vel (foliorum superiorum) leviter rotundatae, plerumque longe plicatae,

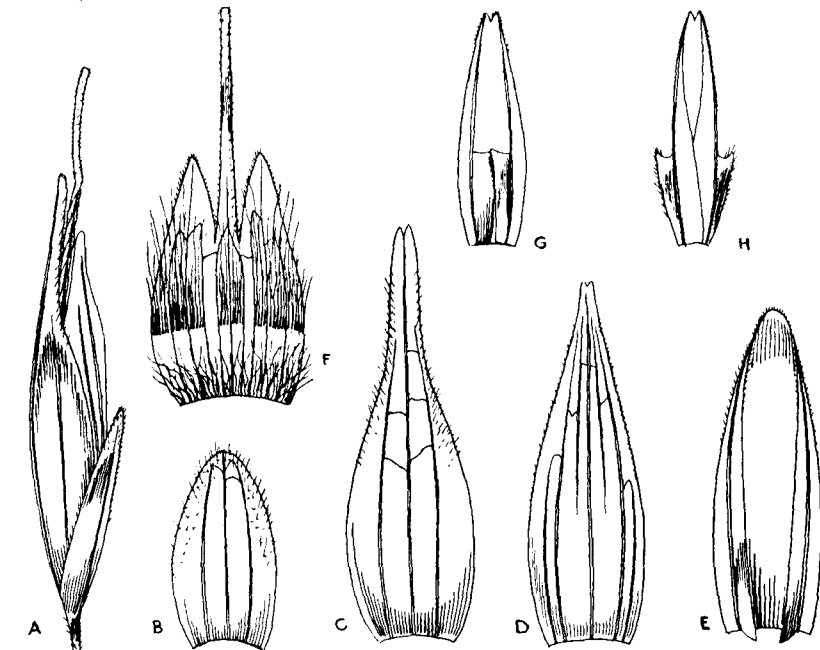
in acumen longe attenuatae, ad 18 cm. longae, 4 mm. latae, demum sursum versus explanatae, virides, laxe hirsutae, costa tenuissima albida, nervis primariis 6-8. *Inflorescentia* paniculata, erecta, 10-12.5 cm. longa, 2.5 cm. lata, praeter basin densiuscula; axis gracilis, inferne teres, superne angulatus vel sulcatus, scaberulus; rami distantes, irregulariter approximati vel fere verticillati, infimi ad 4 cm., caeteri ad 1.5 cm. distantes, oblique erecti, inferiores plerumque 2.5-4 cm. longi, superiores 0.75 cm. longi, omnes graciles, stricti vel flexuosi, angulati, scaberuli, cum seta terminali, a basi divisi hic ibique ramulos edentes steriles setas pertenuas purpurascentes ad 4 mm. longas magis minusve fasciculatas gerentes, superne in racemos simplices vel basi subcompositos abeuntes, spiculis plerumque contiguis cum vel sine seta fulciente; setae longitudine varia; pedicelli tenuiter filiformes, minutissimi vel ad 1 mm. longi, apice subdiscoidei. *Spiculae* oblongae, subacutae, 2-2.5 mm. longae, 1 mm. latae, turgidae, ambitu leviter obliquae, pallide virides, varie purpureo-suffusae. *Glumae* membranaceae; inferior late ovata, obtusa vel subacuta, circiter 0.75 mm. longa, 5-nervia; superior ovato-oblonga, subacuta, 1.6-2.2 mm. longa, 5-7-nervia. *Anthoecium inferum* ♂, superum aequans vel paulo longior; lemma firme membranaceum, late oblongum, subacutum, inter margines tumidos conspicue et anguste depressum, 7-nervium; palea lemma subaequans, oblonga, acuta, carinis marginatis; antherae 1.5 mm. longae. *Anthoecium superum* ♀, oblongum, obtusum vel subacutum, albidum vel pallide purpureum; lemma et palea subcoriacea, nitida, laevia.

TROPICAL AFRICA. Uganda: Lugalambo, in thickets, 1200 m., *Dummer* 3099.

***Danthoniopsis minor* Stapf et Hubbard**, sp. nov.; arcte affinis *D. Gossweileri* Stapf, sed omnibus partibus minor, praeterea spiculis vix turgidis, glumis magis obtusis superne pubescentibus, lemmate inferiore minus rostratis diversa.

Gramen perenne caespitosum. *Culmi* erecti, 0.9-1 m. alti, graciles, teretes, simplices, 4-nodi, internodiis inferioribus albidosublanatis, caeteris sparse pubescentibus vel glabris laevibusque, aut omnibus fere glabris. *Foliorum* vaginae arctae vel basales demum solutae, teretes, leviter striatae, inferiores sublanatae, superiores pubescentes, ciliatae vel glabrae aut omnes fere glabrae laevesque, ad nodos lanato-villosae vel pubescentes, praeter infimas internodiis breviores; ligulae ad seriem ciliorum reductae, pilis albis ad 1.5 mm. longis; laminae lineares, ad basem longe attenuatae, tenuiter setaceo-acutae, 7-15 cm. longae, 5-8 mm. latae, firmae, planae vel ad margines involutae, utrinque lanato-pilosae, molliter pubescentes vel glabrae, marginibus cartilagineis scaberulis, uno margine crispo. *Panicula* angusta, densiuscula, 14-17 cm. longa, 1-1.5 cm. lata; rhachis gracilis, teres, albidopubescent vel glabra scaberulaque; rami solitarii vel 2-nati, erecti, ad 4 cm. longi, filiformes, pubescentes vel glabri et scaberuli; ramuli breves, 1-3-

spiculati; pedicelli 0.5-3 mm. longi. *Spiculae* lanceolatae vel ovato-lanceolatae, vix turgidulae, 8-9 mm. longae, pallide virides et purpureo-suffusae. *Glumae* membranaceae, prominenter 3-nerviae, superne et ad margines breviter pubescentes, caeterum glabrae; inferior elliptico-oblonga, obtusa, 4 mm. longa; superior ovato-oblonga, rostrato-acuminata, brevissime bifida vel integra obtusaque, ad 9 mm. longa. *Anthoecium inferum* ♂; lemma 7 mm.



T. DEL. *Danthoniopsis minor* Stapf et Hubbard. A Spikelet (x7). B Lower glume (x6). C Upper glume (x6). D and E Lemma and palea of lower floret (x7). F Lemma of upper floret (x6). G and H Palea of upper floret (x6).

longum, vix acuminatum, ovato-oblongum, brevissime bifidum, membranaceum, superne 7-nervium, ibique ad margines ciliatum, caeterum glabrum; palea lineari-oblonga, obtusa, 5.5-6.5 mm. longa, superne ciliolata, carinis anguste et tenuiter alatis; antherae 2 mm. longae. *Anthoecium superum* ♀; callus brevissimus, obtusus, barbatus; lemma 5-6 mm. longum, late elliptico-oblongum, bilobum, lobis acutis 1.5 mm. longis, membranaceum, 9-nervium, pilorum alborum fasciculis 8 in unam seriem transversam dispositis barbatum et basi pilosum, caeterum glabrum; arista geniculata, 10 mm. longa; palea lineari-oblonga, brevissime bifida, 4.5-5.5 mm. longa, carinis e basi ad medium alatis, ala abrupte truncata ciliata, auriculata. *Antherae* 2.5 mm. longae.

TROPICAL AFRICA. Rhodesia: Salisbury, 1440 m., Feb., 1921, Eyles 2968 (type); Feb. 1920, *Henricksen in Herb. Eyles*. 2495.

***Diplachne Dummeri* Stapf et Hubbard**, sp. nov.; affinis *D. fuscae* P. Beauv., sed ligulis truncatis ciliolatis, spiculis brevioribus

angustioribus laxioribus, anthoeciis 3-4, gluma inferiore brevior latioreque, antheris minoribus differt.

Gramen perenne, surculiferum vel primo anno florens et tunc interdum annuum. *Culmi* erecti, 0.6-1 m. alti, moderate validi, striati, inferne subcompressi, caeterum teretes, glabri laevesque, e medio ramosi, 3-6-nodi, nodis glabris. *Foliorum vaginae* valide compressae et carinatae, imprimis basales, solutae, tenuiter striatae, pallidae, glabrae laevesque vel leviter scaberulae, tenuiter chartaceae, internodiis longiores; ligulae truncatae, circ. 1 mm. longae, membranaceae, ciliolatae; laminae anguste lineares, 15-20 cm. longae, applanatae ad 3 mm. latae, e basi longe attenuatae, tenuiter acutae, planae, involutae vel convolutae, flexuosae, glabrae,

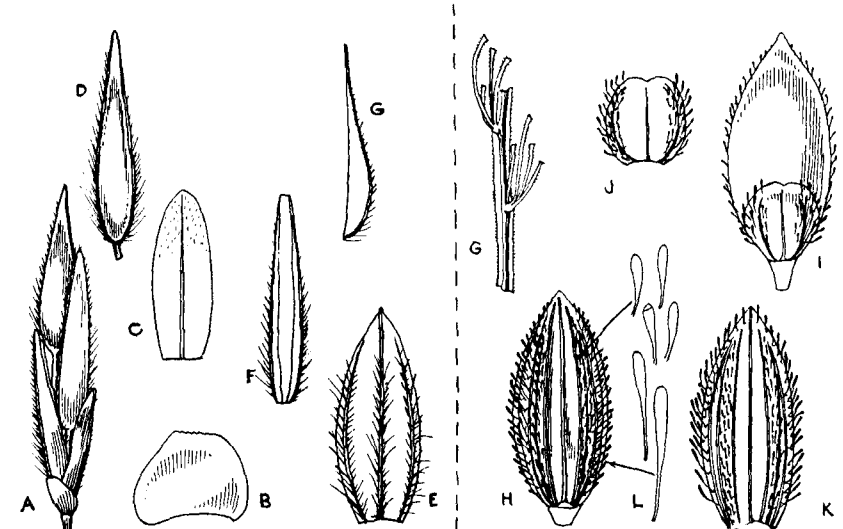


Fig. 1.

Fig. 2.

Fig. 1. *Diplachne Dummeri* Stapf et Hubbard. A Spikelet (x10). B Lower glume (x10). C Upper glume (x10). D Floret (x8). E Lemma (x8). F and G Palea in front and side-view (x8).

Fig. 2. *Digitaria Maitlandii* Stapf et Hubbard. G Portion of raceme with spikelets removed (x4). H and I Spikelet in back- and front-view (x14). J. Lower glume (x14). K Upper glume (x14). L Hairs of upper glume, much enlarged.

utrinque asperulae vel fere laeves. *Panicula* magis minusve nutans, oblonga, contracta vel demum soluta, 15-25 cm. longa, 2.5-8 cm. lata; rhachis gracilis, tenuiter striata, scaberula; rami solitarii, rarius 2-nati, flexuosi, triquetri, scaberuli; pedicelli 0.25-1 mm. longi. *Spiculae* 4-6 mm. distantes, lineares vel lineari-lanceolatae, pauciflorae, 5-7.5 mm. longae, 1-1.5 mm. latae, pallide virides vel purpureo-suffusae. *Gluma* inferior 0.75-1 mm. longa, oblata, truncata vel rotundato-truncata, tenuiter membranacea, enervia vel 1-nervia; gluma superior 2-3 mm. longa, obtusa vel emarginata, 1-nervia. *Anthoecia* 3 vel 4; rhachillae internodia 1.5-1.75 mm.

longae; lemma oblongum vel elliptico-oblongum, apice explanato obtusum, truncatum vel leviter emarginatum, breviter mucronatum, 3-4 mm. longum, 3-nerviis, ad nervos ad medium breviter pilosum; palea lineari-oblonga, truncata, 3-3.75 mm. longa, carinis ultra medium dense ciliatis. *Antherae* oblongae, 0.5 mm. longae. *Caryopsis* oblonga, 1.3 mm. longa, pallide fusca.

TROPICAL AFRICA. Uganda: Nairobi, grassy valley, 1630 m., Feb. 1915, Dummer 1981 (type); Bulimezi, Luwelo, edge of swamp, 1110 m., Sept. 1926, Maitland 1361.

UGANDA GRASSES.

By T. D. Maitland and C. E. Hubbard.

An account of the grasses of Uganda in reference to their agricultural uses has not so far been published. A recent collection of plants including numerous grasses having been made in Uganda by Mr. T. D. Maitland, the opportunity is here taken to enumerate them together with the copious notes made by the collector in the field. These notes include valuable first hand observations on the grass flora of Uganda, including information as to their value as forage and their distribution in the colony.

In the text the letter *M* denotes a specimen collected by Mr. Maitland in order to distinguish from others incidentally mentioned. The genera are arranged according to the Flora of Tropical Africa.

A special study of the grasses of Uganda has so far not been undertaken, and the present paper, although it deals with a wide range of grasses is little more than an introduction to the subject. This study has not hitherto been a matter of urgency as there has been no necessity for intensive grazing, owing to the greater part of the stock being owned by the pastoral tribes who have large tracts of land over which to graze. There are therefore no parts very closely grazed except around the villages of the agricultural peasants, who keep a few cattle but have mostly goats and sheep. The native stock-owner consequently does not concern himself with the renewal of his grazing land; he leaves that to nature and seeks fresh pastures further afield. The endeavours now being made among the more intelligent natives to build up good herds by selection and by the introduction of grade stock, and the increasing numbers of cattle owned by Europeans, make the study of the grasses a matter of more urgent importance. In addition there is the imperative need for restricting the movement of stock to prevent the spread of disease; this in many parts would bring about a closer grazing and a need for the maintenance of pasture-land.

There are large tracts of country covered with Elephant Grass (*Pennisetum purpureum* Schum.), which always provide good and ample grazing. But in Uganda this grass has a great disadvantage in that it harbours the *Stomoxys* fly, and it is impossible to keep cattle

in an area heavily infested with this pest. The breeding places of the *Stomoxys* fly consist of decaying vegetable debris, which cannot be satisfactorily controlled in Elephant Grass areas. To make stock rearing profitable and satisfactory these areas would require to be cleared and planted with some of the good grazing short grasses, such as *Brachiaria brizantha* Stapf, *Cynodon plectostachyus* Pilger, *Axonopus compressus* P. Beauv., or mixtures of them.

The real stock-areas of the country are not the tall Elephant Grass tracts, but the short grass areas, like the Ankole plains or open grass country scattered with *Acacias* and the cactoid *Euphorbia* (*E. antiquorum* L.).

With regard to the distribution of the grasses, Elephant Grass is the most dominant on the mainland of the Victoria Nyanza region, where it covers the land from the swamp-levels to well up the hillsides, the higher positions being taken up by "*Lusenke*" (*Imperata cylindrica* P. Beauv.), although the latter is found to a more or less extent practically everywhere. There is very little Elephant Grass on the Sese group of islands and practically none on the Buvuma group in the north-east of the Victoria Nyanza, where *Trichopteryx kagerensis* K. Schum. is the principal grass and covers large areas. The larger islands, especially, are afforested along the summits, with belts of forests running down the valleys to the edge of the lake; between these valleys the slopes are open stretches of grasses, where *Trichopteryx kagerensis* K. Schum. often occurs in almost pure stands, or is mixed with *Imperata cylindrica* P. Beauv., *Cymbopogon afronardus* Stapf, *Hyparrhenia filipendula* Stapf, *Andropogon canaliculatus* Schum., and *Ctenium elegans* Kunth. *Panicum maximum* Jacq. occurs here as elsewhere in Uganda, about the edges of the forests, near villages, and along the edges of paths.

The Elephant Grass, besides being the most abundant in the Victoria Nyanza region, occurs again in the Ruwenzori area on the western slopes of the mountains, where it forms a great belt up to an altitude of 5,000 feet or more. Towards the northern end of the range near the approach to the Bwamba and Lake Albert plains, it diminishes abruptly, while on the eastern slopes it hardly ever occurs. Here, however, *Imperata cylindrica* P. Beauv. is very prevalent, although well up on the slopes it is mixed with many herbaceous plants. About the base of the slopes and on the levels approaching them it forms pure stands waist deep.

An Elephant Grass belt is again encountered in the Kibale district and running into Mwengi, along a line roughly parallel with the mountain range.

Typical savannah is encountered from Hima at the southern end of the Ruwenzori range, especially in the neighbourhood of Lake Katwe where a great plain exists, made up of a mixture of *Themeda triandra* Forsk., *Hyparrhenia filipendula* Stapf, *Heteropogon contortus* P. Beauv., etc., which appears like a vast wheat field when the grasses are ripe. This is an area with a rainfall of about 30-35 inches,

whereas the Elephant Grass is not found much outside areas with a rainfall under 50 inches.

Elephant Grass is found only very sparingly in the northern parts of Busoga and the Eastern Province, which together make up the principal Cotton-growing areas of Uganda, but *Pennisetum polystachyon* Schult. becomes very prevalent. It is also a common grass on the Buvuma Islands adjoining Busoga, but being an annual, it does not in any way take the place of the Elephant Grass. *Imperata cylindrica* P. Beauv., *Setaria aurea* Hochst., *Hyparrhenia rufa* Stapf, and *H. filipendula* Stapf, together usually make up the grass areas in this part of Uganda. This combination holds good as a rule outside the Elephant Grass tracts. These are the main features of the grass lands of Uganda.

There are numerous grasses which although not forming a prominent part of the flora are excellent for fodder, and would be suitable for planting and sowing, either for grazing or for feeding to stock.

Up to the present very little has been attempted in the direction of ascertaining the economic value of the grasses, apart from a few readily available which have been tested in small plots with encouraging results. Tall grasses such as *Hyparrhenia rufa* Stapf, *H. cymbaria* Stapf, which flower readily and are coarse under natural conditions, were kept in a fine leafy condition throughout the year by a few periodical cuttings. Some of the tufted species were found difficult to keep free of weeds, whilst others of a close spreading habit, such as *Axonopus compressus* P. Beauv., *Cynodon plectostachyus* Pilger, and *Paspalum auriculatum* Presl. provided a fine cover and showed promise of standing pure for a long time.

T. D. M.

Enumeration of Uganda Species.

Urelytrum digitatum K. Schum. in Engl. Pflanz. Ost-Afr. C. 97 (1895); Stapf in Prain, Fl. Trop. Afr. ix. 48 (1917).

Masaka: Sango Bay, 1110 m., Oct. 1925, M. 746.

This is the second species of *Urelytrum* to be recorded from Uganda. It occurs sparingly distributed in open country on hill-sides near lake level in the Sango Bay region, associated with *Hyparrhenia rufa* Stapf, *H. bracteata* Stapf, and *Andropogon canaliculatus* Schum. It is of little importance as a fodder.

Hemarthria fasciculata Kunth, Rév. Gram. i. 153 (1829); Stapf in Prain, Fl. Trop. Afr. ix. 55 (1917). *Rottboellia compressa* var. *fasciculata* Hack. in DC. Monogr. Phan. vi. 286 (1889). *R. fasciculata* Lam. Illustr. i. 204 (1791).

Sese Islands: Sozi, 1110 m., Dec. 1922, M. 377.

This grass is of fairly frequent occurrence in the Victoria Nyanza region, growing at the edge of the lake in open boggy parts, together with *Axonopus compressus* P. Beauv., *Mariscus* and *Kyllinga* spp. The ground is often flooded and this grass may prove useful for

planting in swampy areas. This is the first record of the species from Uganda.

Manisuris granularis Sw. Prodr. Veg. Ind. Occ. 25 (1788); Stapf in Prain, Fl. Trop. Afr. ix. 57 (1917). *Cenchrus granularis* L. Mant. ii. App. 575 (1771).

Budama: Paya, 1100-1200 m., July 1926, M. 1165.

An annual grass growing on sandy soil by the side of native paths and roads, on hills in the dry region. It is also found rather scattered in open pockets on the savannah where the sand has been washed, but is not prominent and is of little importance. Previously it had been collected at Umyoro, in Nov. 1862, by Speke and Grant.

Lasiurus Maitlandii Stapf et Hubbard in Kew Bull. 1927, 264. Serere: Serere, 1140 m., July 1926, M. 1282.

A tufted grass of little importance, found growing in rather dry, stony, open country, subject to grass fires, together with *Hyparrhenia filipendula* Stapf, *Themeda triandra* Forsk., and *Imperata cylindrica* P. Beauv.

Elyonurus argenteus Nees, Fl. Afr. Austr. 95 (1841); Stapf in Prain, Fl. Trop. Afr. ix. 70 (1917).

Masaka: on plains a little beyond Kyotera, Oct. 1925, M. 769.

A tufted grass with little leaf development, growing under similar conditions to *Lasiurus Maitlandii* Stapf et Hubbard, in savannah country, with scattered specimens of *Acacia* and *Capparis* spp. It has not before been collected in Uganda.

Rottboellia exaltata Linn. f. Suppl. 114 (1781); Stapf in Prain, Fl. Trop. Afr. ix. 73 (1917).

Kampala: 870 m., Oct. 1922, M. 260. Serere: Tira, 1110 m., July 1926, M. 1436.

A very common grass, generally distributed in the open or under the shade of trees, though not in great quantity. It forms a pure stand in old cultivated ground and near habitations. In its vegetative state it is a useful fodder grass, but dies down rapidly. It was first collected in Uganda by Dummer (3095), at Mukono in Feb., 1917.

Coelorhachis afraurita Stapf in Bull. Soc. Bot. Fr. lv, Mém. viii. 98 (1908) and in Prain, Fl. Trop. Afr. ix. 80 (1917).

Masaka: Bukakata, June 1925, M. 782.

Vern. Name: *Njegu*.

This gathering considerably extends the distribution of the species. Up to 1917 it had only been recorded from French Guinea and Angola, now it has been collected in the Tanganyika Territory, Kyimbila District (Stolz 1372), and in Rhodesia at Marandellas (Eyles 3444), Salisbury (Eyles 2168).

In Uganda it grows in alluvial sandy country (boggy in wet seasons) almost at lake-level. It is quite a good fodder-grass as it is of rather a leafy nature.

Imperata cylindrica P. Beauv. var. **Thunbergii** Durand et Schinz, Consp. Fl. Afr. v. 693 (1894) ; Stapf in Prain, Fl. Trop. Afr. ix. 88 (1917).

Vern. Name : *Lusenke*.

A grass very widely distributed throughout Uganda. It forms large, almost pure belts or is scattered about on hill slopes with good soil, but is not found to any extent in open savannahs or waterless tracts. It is often mixed with *Pennisetum purpureum* Schum. and many other grasses, trees, shrubs and herbs such as *Acacia senecarpha* Hochst., *Clerodendron myricoides* R. Br., *Lantana camara* L., *L. trifolia* L., and species of *Securidaca*, *Anona*, *Vernonia*, *Wedelia*, *Coreopsis*, *Pentas*, etc. It is grazed by cattle and game, providing a good feed all the year round, as, owing to its deep roots, it suffers little during the dry season ; in cultivated ground, however, it is a troublesome weed. The natives use it for thatching their huts, the stems and leaves being very durable.

Saccharum spontaneum L. var. **aegyptiacum** Hack. in DC. Monogr. Phan. vi. 115 (1889) ; Stapf in Prain, Fl. Trop. Afr. ix. 95 (1917).

Entebbe : 1160 m., July 1922, *M.* 19.

Vern. Name : *Kisalo*.

A tall stout grass from 12 to 18 ft. high, with very beautiful, conspicuous, silvery panicles ; common on the swampy shores and in the water of the Victoria Nyanza, and on the banks of rivers. It occurs mixed with bushes, *Cyperus Papyrus* L., and in association with " Ambatch " (*Herminiera Elaphroxylon* G. et P.). It is unimportant as fodder, but might be useful if cut and fed to stock. Before the days of imported salt, the natives used to extract salt from the ashes of the burned leaves and stems. This gathering is the first from Uganda.

Sorghum aterrimum Stapf in Prain, Fl. Trop. Afr. ix. 121 (1917). Busoga : Namwendwa, railway cutting, 1110 m., July 1926, *M.* 1405.

This appears to be a race distinct from the other two recorded by Stapf, l.c. The rachis, branches and branchlets have very hairy joints and the spikelets have slightly longer awns ; otherwise it agrees well with the species. As regards its uses, it is comparable with *S. verticilliflorum* Stapf.

S. rigidifolium Stapf in Prain, Fl. Trop. Afr. ix. 143 (1917).

Masaka : Kyotera region, *M.* 747 ; Mbarara Road, Oct. 1925, *M.* 767.

Not very common in Uganda. It grows on the sides of roads in savannahs which become waterlogged during the rains. The vegetative characters are rather good and although tufted it may prove to be a useful grass for planting for fodder. It had previously been collected by Sir Evan James at Sibu in the Nandi country in 1905.

S. verticilliflorum Stapf in Prain, Fl. Trop. Afr. ix. 116 (1917).

Entebbe : 1160 m., Aug. 1922, *M.* 89. Ruwenzori : Kikorongo, 1080 m., Dec. 1925, *M.* 1400.

Vern. Name : *Oluwemba Olukatale* (Sorghum of the bush, or Wild Sorghum ; the native name of the cultivated Sorghum is *Oluwemba*).

A grass similar to *S. arundinaceum* Stapf, but more valuable. In its vegetative state it forms good fodder and is suitable for silage or for cutting and feeding to stock. It answers practically the same purpose as *S. sudanense* Stapf (Sudan Grass) and appears to be worthy of cultivation, but it is not of much use for hay. Like *Rottboellia exaltata* Linn. f., it grows in old cultivated ground, usually on heavy soils, where it forms pure stands. Previously Dummer (474) had collected it at Kipayo in Dec. 1913.

Cleistachne sorghoides Benth. in Hook. Ic. Pl. xiv. 60, t. 1379 (1882) ; Stapf in Prain, Fl. Trop. Afr. ix. 154 (1917).

Entebbe : 1160 m., Aug. 1922, *M.* 88.

Vern. Name : *Kikonsikonsi*. This name is applied to numerous grasses with paniced inflorescences, but particularly to *Panicum maximum* Jacq., and it implies that the cattle are able to " smell it out."

It grows in Elephant Grass country in stony ground on hillsides and is rather sparingly distributed. It occurs mainly where the *Pennisetum purpureum* (Elephant Grass) zone on the lower slopes merges into the *Imperata cylindrica* zone on the upper slopes ; here it is associated with species of *Tephrosia*, *Crotalaria* and *Vernonia*. The inflorescences are very beautiful ; in the young state they are of a pale chestnut-brown shade, but at maturity they change to a dark brown. Dummer (679) collected this grass at Kipayo in Feb. 1914.

Arthraxon Quartinianus Nash in North Amer. Fl. xvii. 99 (1912) ; Stapf in Prain, Fl. Trop. Afr. ix. 166 (1917).

Ruwenzori : Musandama, 1800 m., Dec. 1925, *M.* 1007.

Growing at the edge of forests and in forest paths. It is similar to *Oplismenus hirtellus* P. Beauv., in habit and is of little or no economic importance.

Amphilophis insculpta Stapf in Prain, Fl. Trop. Afr. ix. 176 (1917). *Andropogon insculptus* Hochst. ex A. Rich. Tent. Fl. Abyss. ii. 458 (1851).

Ruwenzori : Kikorongo, 1080 m., Dec. 1925, *M.* 1399.

A savannah grass, with the same uses as *Andropogon canaliculatus* Schum., *Hyparrhenia filipendula* Stapf and *H. Ruprechtii* Stapf. It had previously been collected in Uganda by Dummer (3177) at Bugungu on grassy uplands at 1200 m. in May 1917.

Andropogon canaliculatus Schum. var. **Fyffei** Stapf in Prain, Fl. Trop. Afr. ix. 252 (1918).

Entebbe : 1160 m., Aug. 1922, *M.* 77.

Vern. Name : *Mbubu* (small variety).

A well known grass in the Victoria Nyanza region, where it is associated with *Trichopteryx kagerensis* K. Schum., *Hyparrhenia filipendula* Stapf and *Imperata cylindrica* P. Beauv., on grassy and gravelly slopes and sandy levels. It is not a bulky grass but stands grazing well.

A. eucomus Nees, Fl. Afr. Austr. 104 (1841); Stapf in Prain, Fl. Trop. Afr. ix. 230 (1918).

Kampala: in bog near Ruboga, 1170 m., Oct. 1922, *M.* 675.

A slender grass occasionally seen in or about boggy land growing among *Imperata cylindrica* P. Beauv., *Pennisetum purpureum* Schum., and species of *Mariscus* and *Kyllinga*. Its downy heads are rather pretty and conspicuous, but the grass itself is of little importance, although grazed with other grasses by cattle.

A. shirensis Hochst. ex A. Rich. Tent. Fl. Abyss. ii. 456 (1851); Stapf in Prain, Fl. Trop. Afr. ix. 246 (1918).

Sese Islands: Bunyama Island, 1140 m., July 1925, *M.* 800. Ruwenzori: Kibuku, Dec. 1925, *M.* 1453.

This grass grows in savannah under similar conditions to *A. canaliculatus* Schum. It has not previously been recorded from Uganda.

Cymbopogon afronardus Stapf in Prain, Fl. Trop. Afr. ix. 279 (1918).

Entebbe: 1160 m., June 1922, *M.* 25.

Vern. Name: *Tete*.

A tufted grass, common in Uganda, frequent on hillsides and around native huts, where it grows in association with *Hyparrhenia cymbaria* Stapf, *H. rufa* Stapf, *Imperata cylindrica* P. Beauv., *Pennisetum purpureum* Schum., and species of *Crotalaria*, *Tephrosia* and *Vernonia*. It is slightly aromatic, and is covered with a greyish-blue bloom. The natives use it as a floor-covering for their huts. It is grazed by stock, especially goats, and Grant (1942), who collected it at Njabini on the S.E. slopes of the Aberdares in Kenya Colony, states that it is readily eaten by cattle and that horses are fond of it. It has been tried for oil but is not comparable with *C. Nardus* Rendle.

C. excavatus Stapf in Prain, Fl. Trop. Afr. ix. 285 (1918).

Andropogon excavatus Hochst. in Flora, 1846, 116.

Serere: Serere, 1110 m., July 1926, *M.* 1428. Ruwenzori: Hima-Kikorongo area, 900 m., Dec. 1925, *M.* 1027.

A spreading aromatic grass, growing sparingly in typical savannah of the dry regions, together with *Themeda triandra* Forsk., and *Heteropogon contortus* P. Beauv. It differs from *C. afronardus* Stapf in not being tufted, neither has it the vegetative bulk of that species.

C. giganteus Chiov. Gram. da Essenze, 12 (1909); Stapf in Prain, Fl. Trop. Afr. ix. 288 (1918). *Andropogon giganteus* Hochst. in Flora, 1844, 242.

Budama: Tororo, 1110-1200 m., July 1926, *M.* 1179.

On the slopes of the Tororo rock this grass, together with *Hyparrhenia variabilis* Stapf, forms a dense zone of considerable size, with a few scattered specimens of *Acacia stenocarpa* Hochst., *Albizia Zygia* Macbride, and *Grewia* spp. On the lower slopes of the rock the commoner grasses are *Hyparrhenia variabilis* Stapf, *H. rufa* Stapf, *Imperata cylindrica* P. Beauv., *Panicum maximum* Jacq., *Cymbopogon afronardus* Stapf, *Melinis tenuissima* Stapf, and *Chloris Gayana* Kunth. It is a spreading and slightly aromatic grass and similar in this respect to *C. excavatus* Stapf, but it is much stronger and larger, ranging from 4 to 8 feet high. This is the first gathering of the species in Uganda.

Hyparrhenia bracteata Stapf in Prain, Fl. Trop. Afr. ix. 360 (1918). *Andropogon bracteatus* Humb. et Bonpl. ex Willd. Sp. Pl. iv. 914 (1806).

Masaka: on plains below Minziro Hill, Oct. 1925, *M.* 762.

A similar grass to *H. rufa* Stapf and growing under the same conditions. Dummer (3284) first collected it in Uganda near Mubango in the Mabira Forest Region.

H. cymbaria Stapf in Prain, Fl. Trop. Afr. ix. 332 (1918).

Andropogon cymbarius L. Mant. Alt. 303 (1771).

Kampala: Nakasero Hill, Nov. 1922, *M.* 161.

Vern. name: *Tusimbunkokola*.

A grass similar to *H. rufa* Stapf and growing under identical conditions. It is somewhat widely spread in Uganda and is usually found in patches. A pure dense stand, however, occurs over a large area at the base of the Nawembe rock in Busoga. The inflorescences are rather striking and decorative. It is a strong tufted grass if left ungrazed, but on cutting and preventing from flowering, it produces a good deal of leaf. These remarks apply also to *H. rufa* Stapf, *H. bracteata* Stapf and *H. diplandra* Stapf.

H. diplandra Stapf in Prain, Fl. Trop. Afr. ix. 368 (1918).

Andropogon diplandrus Hack. in Flora, 1885, 123.

Sese Islands: Bwema Island, April 1925, *M.* 898.

A grass occurring on the slopes of the islands under similar conditions to *H. rufa* Stapf, and to some extent it is comparable with it.

H. filipendula Stapf in Prain, Fl. Trop. Afr. ix. 322 (1918).

Andropogon filipendulus Hochst. in Flora, 1846, 115.

Entebbe: 1160 m., June 1922, *M.* 21. Budama: Tororo, 1110 m., July 1926, *M.* 1413. Serere: on Kyere rock, 1110 m., July 1926, *M.* 1412A. Masaka: Minziro Hill, Oct. 1925, *M.* 751.

A typical savannah grass frequent on sandy gravelly soils, where it is associated with *Themeda triandra* Forsk., *Andropogon canaliculatus* Schum., and in the lake region with *Trichopteryx kagerensis* K. Schum. It is a useful feed in the dry regions and under cultivation makes a good stand.

H. rufa Stapf in Prain, Fl. Trop. Afr. ix. 304 (1918). *Trachypogon rufus* Nees, Agrost. Bras. 345 (1829).

Entebbe: 1160 m., July 1922, *M.* 15. Busoga: Buyonjo, July 1926, *M.* 1445; Gadumire, in bush and grass country, July 1926, *M.* 1447. Mt. Elgon: Bupota, 1650 m., Dec. 1926, *Snowden* 1029. Serere: on Kyere rock, 1110 m., July 1926, *M.* 1412. Kumi: Kumi camp, in savannah, July 1926, *M.* 1446. Vern. Names: *Njegala*; *Namula* (Lugishu).

A common grass on the slopes of hills and in the savannah country of the Victoria Nyanza region. It is associated there with *Imperata cylindrica* P. Beauv., *Pennisetum purpureum* Schum., *Panicum maximum* Jacq., *Cymbopogon afronardus* Stapf, *Hyparrhenia cymbaria* Stapf, *Bracharia brizantha* Stapf and species of *Crotalaria*, *Vernonia*, *Tephrosia*, *Acacia*, *Albizia*, *Bauhinia*, *Terminalia* and *Grewia*.

It grows in clumps and the stems are rather striking owing to the dark-green leaf-sheaths alternating with the bright straw colour of the stems. Although a coarse tufted grass it grazes well and then forms a good deal of leaf. *H. rufa* Stapf, *H. cymbaria* Stapf, and *H. variabilis* Stapf, are the most useful of the species of *Hyparrhenia* for planting up for silos or for feeding to stock. *H. filipendula* Stapf however, provides a great deal of fodder after the savannah has been burned over, when the young growth is readily eaten by cattle.

H. Ruprechtii Fourn. Mex. Pl. Gram. 67 (1881); Stapf in Prain, Fl. Trop. Afr. ix. 326 (1918).

Kampala: Kololo Hill, 1170 m., May 1923, *M.* 712.

This grass has the same properties as *H. filipendula* Stapf.

H. variabilis Stapf in Prain, Fl. Trop. Afr. ix. 334 (1918).

Budama: Tororo, 1110-1200 m., July 1926, *M.* 1179A.

A grass very similar to *H. cymbaria* Stapf, and, with *Cymbopogon giganteus* Chiov., covering a considerable area of Tororo rock. Previously this grass had only been recorded from Nyasaland and Rhodesia.

Heteropogon contortus P. Beauv. ex Roem. et Schult. Syst. Veg. ii. 836 (1817); Stapf in Prain, Fl. Trop. Afr. ix. 411 (1919). *Andropogon contortus* L. Sp. Pl. ed. i. 1045 (1753).

Kumi: Kumi Camp, 1170 m., July 1926, *M.* 1250. Serere: Serere, 1110 m., July 1926, *M.* 1431. Ruwenzori: Semliki Plains, 600 m., Dec. 1925, *M.* 955; Kikorongo, 1110 m., *M.* 955A.

A typical savannah grass, associated with *Themeda triandra* Forsk., and comparable with it to a certain extent as regards vegetative characters; it is, however, only eaten when young on account of the awns.

Themeda triandra Forsk. Fl. Aegypt.-Arab. cxxiii. and 178 (1775); Stapf in Prain, Fl. Trop. Afr. ix. 416 (1919).

Busoga: Namatumba, 1110-1200 m., July 1926, *M.* 1116.

Budama: Tororo, 1140 m., July 1926, *M.* 1416. Masaka: Minziro Hill, Oct. 1925, *M.* 750.

A very prominent savannah grass and probably forming the major portion of the feeding. It occurs frequently on flat stretches and slopes in gravelly areas of the Lake region, usually associated with *Trichopteryx kagerensis* K. Schum.

Digitaria abyssinica Stapf in Kew Bull. 1907, 213 and in Prain, Fl. Trop. Afr. ix. 460 (1919).

Mt. Elgon: Bupota, 1650 m., Dec. 1926, *Snowden* 1022.

Vern Name: *Lumbugu*.

A grass widely spread in Uganda where it is a most obnoxious weed in gardens and plantations. Owing to its long creeping branched rhizomes it spreads rapidly over cleared ground, rendering cotton and other cultivated areas useless if care is not exercised. It forms however very good lawns and is a useful fodder grass, but its utility is restricted on account of its spreading habit. On the slopes of Mt. Elgon at Bupota, it forms short grass land at 1200-1800 m., where it is grazed by cattle. Brown and Hunter in "Planting in Uganda," pp. 78 and 79, figure it under the name of *D. mutica*.

D. horizontalis Willd. Enum. Hort. Berol. 92 (1809); Stapf in Prain, Fl. Trop. Afr. ix. 436 (1919).

Entebbe: 1160 m., June 1922, *M.* 24. Ruwenzori: Bwamba, growing around hot springs, 840 m., Dec. 1925, *M.* 957.

Vern. Name: *Kakuku*.

An annual grass, frequent on the sides of roads and paths, especially under sandy conditions, and as a weed in coffee plantations. It is not of much importance although it serves as a fodder for cows, goats, etc. Brown and Hunter, l.c. 79, figure it under the name of *D. fenestrata* and give the vernacular name as "Kuku."

D. longiflora Pers. Syn. i. 85 (1805); Stapf in Prain, Fl. Trop. Afr. ix. 469 (1919). *Paspalum longiflorum* Retz. Obs. iv. 15 (1786). Budama: Paya, 1110-1200 m., July 1926, *M.* 1164.

A creeping grass on sandy soil. It does not provide much cover and is too superficial to be of use as a lawn grass.

D. Maitlandii Stapf et Hubbard in Kew Bull. 1927, 266.

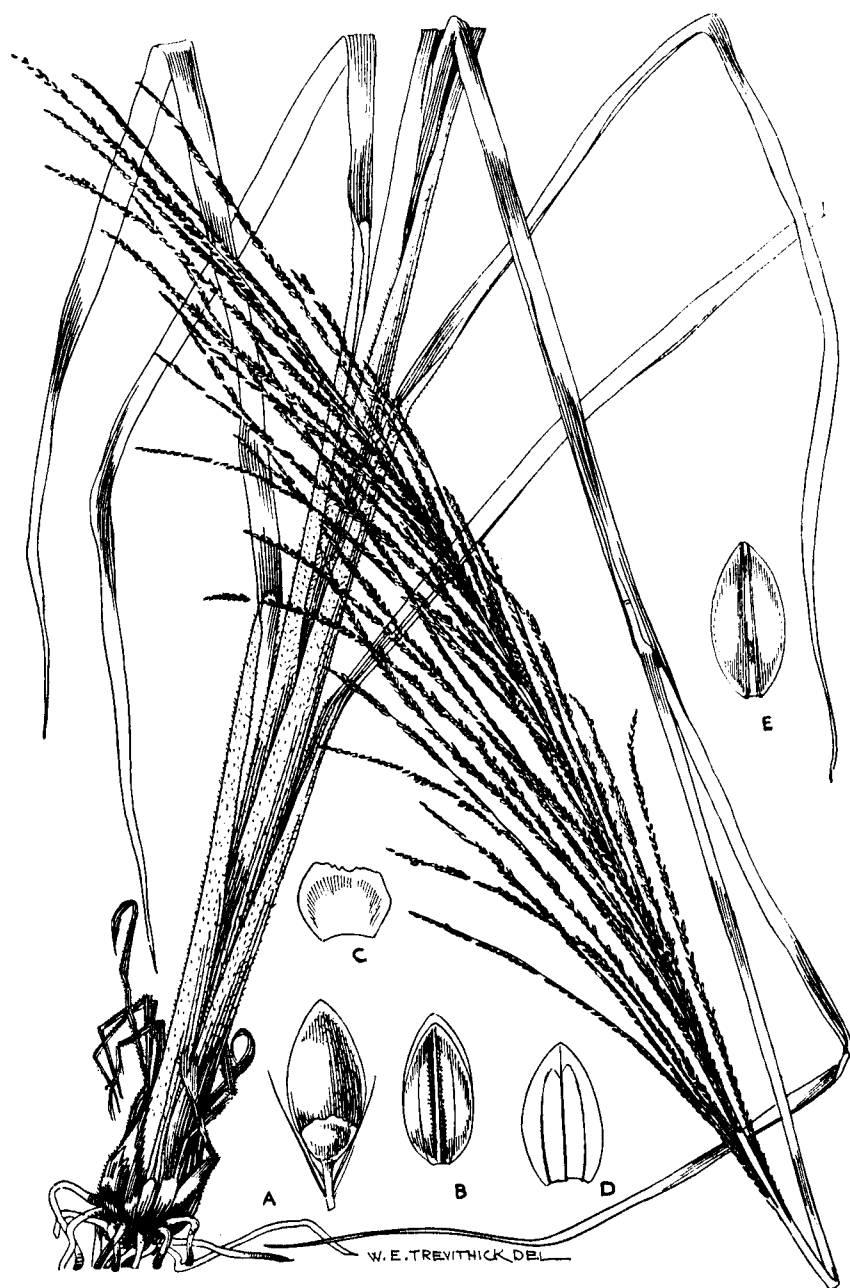
Masaka: Mbarara Road, on roadside and on plains, Oct. 1925, *M.* 766. Ruwenzori: Bwamba, Bulanga, 840 m., Dec., 1925, *M.* 928.

A typical savannah grass and subject to burning. It stands drought well and has much the same uses as *Themeda triandra* Forsk.

D. marginata Link, var. **fimbriata** Stapf in Prain, Fl. Trop. Afr. ix. 440 (1919). *D. fimbriata* Link, Hort. Berol. i. 226 (1827).

Busoga: Gadumire, 1110 m., July 1926, *M.* 1417.

A spreading grass, rooting from the nodes, and with little vegetative bulk.



Digitaria uniglumis Stapf var. *major* Stapf, showing habit. A and B Spikelet, back- and front-view ($\times 14$). C Upper glume ($\times 25$). D Lemma of lower floret ($\times 14$). E Upper floret ($\times 14$).

D. ternata Stapf in Dyer, Fl. Cap. vii. 376 (1898); and in Prain, Fl. Trop. Afr. ix. 452 (1919). *Panicum ternatum* Hochst. in Flora, 1841, i. Intell. 19. and ex Steud. Syn. Pl. Glum. i. 40 (1854). Kampala: 1140 m., Oct. 1926, *M.* 1386.

A common annual *Digitaria* with little vegetative development, occurring by the wayside in gravelly soil.

D. uniglumis Stapf in Prain, Fl. Trop. Afr. ix. 474 (1919). *Panicum uniglume* Hochst. in Flora, 1841, Intell. i. 19, and ex A. Rich. Tent. Fl. Abyss. ii. 370 (1851). Sese Islands: in grasslands on slopes of hills, June 1925, *M.* 1452.

D. uniglumis var. **major** Stapf in Prain, Fl. Trop. Afr. ix. 476 (1919).

Ruwenzori: Musandama, 1500-1800 m., Dec. 1925, *M.* 1384. Masaka: Tero Forest region, 1110 m., Oct. 1925, *M.* 748.

A rather common grass, found adjoining forest regions and near boggy places. On the slopes of Mt. Musandama it grows in grassland near the edge of forests and is there associated with *Imperata cylindrica* P. Beauv., *Festuca* sp., *Coreopsis ruwenzoriensis* S. Moore, *Rubus*, *Pycnostachys*, *Wedelia*, *Ferula* spp., etc. It may prove a suitable fodder grass for planting in boggy areas.

Alloteropsis angusta Stapf in Prain, Fl. Trop. Afr. ix. 485 (1919). Masaka: Minziro Forest area, 1140 m., Oct. 1925, *M.* 749.

This grass has previously been recorded only from Angola.

Eriochloa acrotricha Hack. ex Thell. in Viertelj. Naturforsch. Ges. Zurich, lii. 435 (1907); Stapf in Prain, Fl. Trop. Afr. ix. 499 (1919). *Helopus acrotrichus* Steud. Syn. Pl. Glum. i. 100 (1854).

Kumi: Kumi camp, in savannah, 1080 m., July 1926, *M.* 1432.

Not frequent and previously unrecorded from Uganda.

E. ramosa O. Kuntze, Rev. Gen. Pl. ii. 775 (1891); Stapf in Prain, Fl. Trop. Afr. ix. 497 (1919). *Milium ramosum* Retz. Obs. vi. 22 (1791).

Ruwenzori: Bwamba, 840 m., Dec. 1925, *M.* 945.

Found growing on the edge of hot springs under salty conditions. It has hitherto not been recorded from Uganda.

Bracharia brizantha Stapf in Prain, Fl. Trop. Afr. ix. 531 (1919). *Panicum brizanthum* Hochst. in Flora, 1841, Intell. i. 19, and ex A. Rich. Tent. Fl. Abyss. ii. 363 (1851).

Entebbe: 1160 m., Aug. 1922, *M.* 83; Oct. 1922, *M.* 256. Busoga: Nawandala, 1110 m., July 1926, *M.* 1426. Mt. Elgon: Bupota, 1650 m., Dec. 1926, *Snowden* 1025. Ruwenzori: Hima, 960 m., Dec. 1925, *M.* 971 and 972.

Vern. Name: *Kifuta*; also applied to *Melinis minutiflora* P. Beauv., and *M. Maitlandii* Stapf et Hubbard.

A grass frequent throughout Uganda, except in the savannah, and probably the best fodder grass. It withstands grazing better

than most others and is much relished by cattle. In the neighbourhood of villages where heavy grazing takes place, it is usually the only grass left and when, under these conditions, it is associated with *Pennisetum purpureum* Schum., and *Panicum maximum* Jacq., the latter grasses soon die out. Similarly on golf courses where subject to frequent cutting, it rapidly forms the major portion of the verdure.

On the slopes of Mt. Elgon at Bupota, it is associated with *Eragrostis tenuiflora* Hochst., *E. paniciformis* Steud., *Cynodon Dactylon* Pers., *Sporobolus indicus* R. Br., *Brachiaria brizantha* Stapf, *Digitaria abyssinica* Stapf, and *Hyparrhenia rufa* Stapf, forming grazing lands which are much frequented by stock (Snowden).

Both hairy and glabrous forms are found growing in the same community, often side by side, but not from the same tuft; the glabrous form being a stiffer plant. These glabrous and hairy forms in Uganda grasses are found particularly in *Setaria aurea* Hochst., *Trichopteryx kagerensis* K. Schum., and *Hyparrhenia filipendula* Stapf.

A small plot of this grass planted at the experimental plantation at Kampala when in flower was frequently visited by bees; it was the only grass among many species so visited.

B. comata Stapf in Prain, Fl. Trop. Afr. ix. 561 (1919). *Panicum comatum* Hochst. ex A. Rich. Tent. Fl. Abyss. ii. 376 (1851). Busoga: Dumba Ferry, in gravel, 1110 m., July 1926, M. 1151. Kumi: Kumi camp, 1110 m., July 1926, M. 1434.

A grass of some promise for fodder and with vegetative characters somewhat similar to those of *Brachiaria brizantha* Stapf, but not so bulky.

B. decumbens Stapf in Prain, Fl. Trop. Afr. ix. 528 (1919). Busoga: Buyonjo, 1140 m., July 1926, M. 1421.

Similar in vegetative characters to *B. brizantha* Stapf. The plants described in the Flora are rather weak examples, the specimens quoted above being up to 3½ ft. high.

B. fulva Stapf in Prain, Fl. Trop. Afr. ix. 518 (1919). Bulemezi: Luwelo, 1110 m., Oct. 1926, M. 1393. Budama: Tororo, 1140 m., July 1926, M. 1415.

In Uganda this grass is confined more to the drier regions, as for example the Eastern Provinces and Busoga. It is closely allied to *B. soluta* Stapf, and differs from that species in its much longer leaves, longer-ciliate rhachis and slightly larger spikelets. It is a more erect grass than *B. brizantha* Stapf, and does not have the same vegetative bulk; nevertheless it is quite a good fodder grass. This is the first gathering of the species from Uganda.

B. kotschyana Stapf in Prain, Fl. Trop. Afr. ix. 559 (1919). *Panicum kotschyianum* Hochst. ex Steud. Syn. Pl. Glum. i. 68 (1854).

Sese Islands: around villages, July 1925, M. 892A. Entebbe: 1160 m., Oct. 1922, M. 253. Busoga: Buyonjo, 1140 m., July 1926, M. 1419. Serere: Serere, 1140 m., July 1926, M. 1284.

An annual grass, occurring in old cultivations and garden beds. It has little vegetative bulk compared with *B. brizantha* Stapf, but would probably prove useful as an annual hay grass.

B. leucacrantha Stapf in Prain, Fl. Trop. Afr. ix. 540 (1919). *Panicum leucacranthum* K. Schum. in Engl. Pflanz. Ost-Afr. C. 102 (1895).

Kumi: Kumi Camp, 1170 m., July 1926, M. 1247.

A short, softly-hairy savannah grass of little bulk. It would be suitable for growing in dry regions where *B. brizantha* Stapf may not stand. It is a new record for Uganda, having previously been collected from Kenya Colony and Tanganyika Territory.

B. semiundulata Stapf in Prain, Fl. Trop. Afr. ix. 556 (1919). *Panicum semiundulatum* Hochst. in Flora, 1841, i. Intell. Bl. 19; and ex A. Rich. Tent. Fl. Abyss. ii. 364 (1851).

Bugishu: Lukonge, 1500-1800 m., July 1926, M. 1410.

A low spreading annual grass, previously collected on the Ruwenzori by Stuhlmann.

B. soluta Stapf in Prain, Fl. Trop. Afr. ix. 519 (1919).

Entebbe: 1160 m., Dec. 1922, M. 584. Masaka: Katera, Tero Forest, Oct. 1925, M. 756; in savannah below Minziro Hill, Oct. 1925, M. 757.

Vern. Name: *Kifuta*.

This grass approaches *B. brizantha* Stapf in general utility, but has not the same vigour or vegetative bulk, neither is it so widely distributed.

Axonopus compressus P. Beauv. Agrost., 154 (1812); Stapf in Prain, Fl. Trop. Afr. ix. 566 (1919). *Milium compressum* Sw. Prodr. 24 (1788).

Sese Islands: Sozi, on lake shore, 1110 m., Dec. 1922, M. 378; Bukasa Island, 1110 m., July 1925, M. 774.

A lake-side grass, occurring almost to the water's edge. Owing to its close habit it is a useful lawn grass, somewhat similar to *Paspalum notatum* Fluegge. It is also suitable for paddocks, golf courses, for planting on banks to prevent soil erosion, and as a fodder for stock. It withstands dry conditions well and spreads fairly quickly, growing well under plantation conditions. In the lake region it is generally associated with *Panicum trichocladum* Hack., *Cyperus Papyrus* L., *Triumfetta tomentosa* Boj., and species of *Amomum* and *Mariscus*. This grass is commonly known as "Carpet Grass" in other parts of the world and is a useful pasture grass. It has not previously been recorded from E. Africa.

Paspalum auriculatum Presl. Rel. Haenk. 217 (1830); Stapf in Prain, Fl. Trop. Afr. ix. 572 (1919).

Sese Islands : Bukasa Island, 1140 m., *M.* 791. Bududa : July 1926, *M.* 1122A.

A strong vigorous species with broad luscious leaves, occurring in small pure patches about the edge of forests and under the shade of trees. It thrives well in the open under cultivation, forming a dense cover up to 2 ft. high and is suitable for grazing, but best for feeding to stock and for silos.

P. conjugatum Berg. in Act. Helv. vii. 129, t. 8 (1762) ; Stapf in Prain, Fl. Trop. Afr. ix. 569 (1919). *Digitaria conjugata* Schult. Mant. 11. 262 (1824).

Bwamba : near Buyagu, Dec. 1926, *M.* 1392.

A grass with a close habit, occurring on the edges of roads and about Banana gardens in the low-lying region of Bwamba, between the Congo hills and the Ruwenzori range of mountains. It appears to be very suitable for sheep grazing and golf courses, being similar in habit to *Axonopus compressus* P. Beauv., but not so vigorous. This is the first record from Tropical East Africa, although the plant has been cultivated in Tanganyika Territory.

P. paniculatum L. Syst. ed. x. ii. 855 (1759) ; Stapf in Prain, Fl. Trop. Afr. ix. 577 (1920).

Bulemezi : Bukalasa, 1110 m., May 1926, *M.* 1385.

This plant was collected on the edge of a swamp in the nursery at the experimental plantation at Bukalasa, in or about a bed of *Paspalum notatum* Fluegge, which had been raised from seed received from Costa Rica. As it is a native of Tropical America, from Mexico and the West Indies southwards, it appears highly probable that it was introduced with the *P. notatum*, although it has been found apparently wild on the west coast of Africa.

P. scrobiculatum L. var. **Commersonii** Stapf in Prain, Fl. Trop. Afr. ix. 573 (1919). *P. Commersonii* Lam. Ill. i. 175, t. 43, f. 1 (1791). Sese Islands : Bukasa Island, 1140 m., June 1925, *M.* 791 A. Busoga : Nkumbi, 1110-1200 m., July 1926, *M.* 1122 ; Buyonjo, edge of lake, July 1926, *M.* 1442C. Serere : Serere, July 1926, *M.* 1442D.

A fairly widely distributed grass in the Victoria Nyanza region. Lawns originally planted up with *Cynodon Dactylon* Pers. become infested with it when they are beginning to wear out ; the leaves have the habit of withering early and thus make the lawn unsightly. It is suitable for light grazing.

P. scrobiculatum L. var. **polystachyum** Stapf in Prain, Fl. Trop. Afr. ix. 576 (1919).

Kampala : Mengo, edge of swamp, July 1926, *M.* 1442A. Bulemezi : Luwelo, swamp, July 1926, *M.* 1442. Bugishu : Lakonge, boggy place, July 1926, *M.* 1442B.

This variety occurs on the edges of swamps and is more luscious and vigorous.

Urochloa bifalcigera Stapf in Prain, Fl. Trop. Afr. ix. 588 (1920). *Panicum bifalcigerum* Stapf in Journ. Linn. Soc., Bot., xxxvii. 531 (1906).

Busoga : Kamuli, 1140 m., July 1926, *M.* 1441. Masaka : Minziro Hill, Oct. 1925, *M.* 752.

A softly-hairy tufted grass with a *Brachiaria*-like inflorescence. It is frequent on the elevated parts of Busoga above the villages, where it is associated with *Bauhinia Thonningii* Schum., *Anona senegalensis* Pers., species of *Grewia* and *Zizyphus*, *Carduus Schimperii* Sch. Bip., *Berkheya Spekeana* Oliver, *Asparagus africanus* Lam., etc., all typical of the drier regions outside the Victoria Nyanza belt. About Tororo, as elsewhere, it occurs with *Imperata cylindrica* P. Beauv., *Cymbopogon afronardus* Stapf, *Brachiaria brizantha* Stapf, *Themeda triandra* Forsk., and *Hyparrhenia filipendula* Stapf. It appears to be much liked by stock as clumps of it were picked out and grazed.

U. Helopus Stapf in Prain, Fl. Trop. Afr. ix. 595 (1920). *Panicum Helopus* Trin. in Spreng. Neue Entdeck. 11. 84 (1821).

Busoga : Gadumire, 1110-1200 m., July 1926, *M.* 1087. Budama : Busiu, 1110-1200 m., July 1926, *M.* 1203.

A grass somewhat similar to *Brachiaria brizantha* Stapf in habit and vegetative characters, but not so widely distributed or occurring under such a wide range of conditions. It appears to occur more in Busoga and the Eastern Provinces than elsewhere. Previous to these collections it had not been recorded from Uganda.

Echinochloa colona Link, Hort. Berol. ii. 209 (1833) ; Stapf in Prain, Fl. Trop. Afr. ix. 607 (1920). *Panicum colonum* L. Syst. Nat. ed. x. ii. 870 (1759).

Busoga : Buteleja, 1110 m., July 1926, *M.* 1409, Bulemezi : Luwelo, 1110 m., Sept. 1926, *M.* 1359.

Usually found in boggy situations and in rice plots. It has not much vegetative development and is of little value for fodder.

E. Crus-Pavonis Schult. Mant. ii. 269 (1824) ; Stapf in Prain, Fl. Trop. Afr. ix. 612 (1920). *Oplismenus Crus-Pavonis* H. B. et K. Nov. Gen. et Sp. i. 108 (1815).

Bugishu : Bulucheke, 1500-1800 m., July 1926, *M.* 1414. Masaka : Mbarara Road, boggy places, Oct. 1925, *M.* 764.

A strong vigorous grass, usually found on the edges of streams and in swamps. It should prove suitable for feeding to stock or for silos.

E. pyramidalis Hitchc. et Chase in Contr. U.S. Nat. Herb. xviii. 345 (1917) ; Stapf in Prain, Fl. Trop. Afr. ix. 615 (1920). *Panicum pyramidale* Lam. Ill. i. 171 (1791), excl. var. *B.* and in Encyc. iv. 735 (1796).

Ruwenzori : Hima, Dec. 1926, *M.* 1383.

A tall tufted grass amongst bushes about the edge of grassy plains. In some respects it is comparable with *Panicum maximum* Jacq.

Oplismenus hirtellus *P. Beauv.* Agrost. 54, 168 (1812); Stapf in Prain, Fl. Trop. Afr. ix. 631 (1920). *Panicum hirtellum* L. Syst. Nat. ed. x. ii. 870 (1759).

Entebbe: 1160 m., Aug. 1922, *M.* 80. Bugishu: Bulucheke, 1230 m., July 1926, *M.* 1211.

Frequently found under forest or semi-forest conditions, such as the edges of forest paths, where it forms a close cover. It is of little use for fodder.

Panicum adenophorum *K. Schum.* in Engl. Pflanzenw. Ost-Afr. C. 103 (1895); Stapf in Prain, Fl. Trop. Afr. ix. 654 (1920).

Masaka: Minziro Forest, in old cultivated patches and clearings, Oct. 1925, *M.* 753.

P. deustum *Thunb.* Prodr. i. 19 (1794); Stapf in Prain, Fl. Trop. Afr. ix. 651 (1920).

Bwamba: Hakitenge, in damp situations, Dec. 1925, *M.* 449. Mbarara: Ruisi Falls, at edge of river, Oct. 1925, *M.* 768.

Vern. Name: *Nkonsikonsi*; this name is usually applied to *Panicum maximum* Jacq.

A vigorous grass, found in patches on the banks of streams. In its young state, it is a luscious grass suitable for feeding to stock.

P. fulgens *Stapf* in Prain, Fl. Trop. Afr. ix. 668 (1920). *P. globulosum* *Mez* in Engl. Jahrb. lvii. 188 (1921).

Serere: Serere, July 1926, *M.* 1427.

An annual grass about old cultivations; it has the appearance of making good hay.

P. infestum *Peters*, Reise Mozamb. Bot. 546 (1863); Stapf in Prain, Fl. Trop. Afr. ix. 658 (1920).

Busoga: Busaba, 1110-1200 m., July 1926, *M.* 1136; near Namatumba, 1110 m., July 1926, *M.* 1418A.

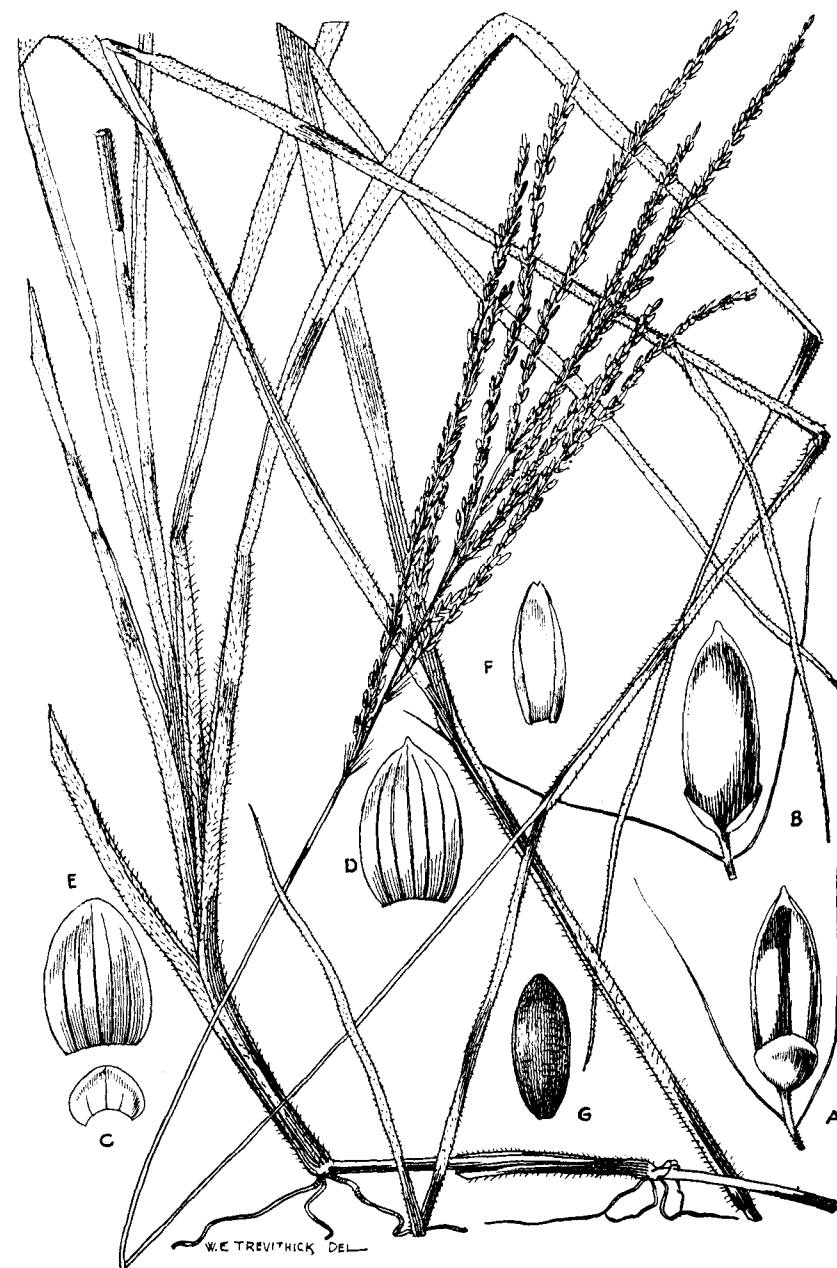
This is the first record of this species from Uganda. It is a savannah grass and in general utility is comparable with such grasses as *Themeda triandra* Forsk., and *Andropogon canaliculatus* Schum.

P. maximum *Jacq.* Ic. i. 2, t. 13 (1781); Collect. i. 76 (1786); Stapf in Prain, Fl. Trop. Afr. ix. 655 (1920).

Entebbe: Nov. 1922, *M.* 289A. Sese Islands: Bukasa Island, 1140 m., June 1925, *M.* 795. Ruwenzori: Kirabawa, Dec. 1925, *M.* 1450.

Vern. Name: *Nkonsikonsi*.

A fairly widely distributed grass under varied conditions. It occurs to a greater or less extent all over Uganda, either scattered or forming large patches, as in the Victoria Nyanza region. There, it is associated with *Pennisetum purpureum* Schum., *Imperata cylindrica*



Panicum infestum Peters, showing habit. A and B Spikelet, front- and back-view ($\times 9$). C Lower glume ($\times 8$). D Upper glume ($\times 7$). E and F Lemma and palea of lower floret ($\times 7$). G Upper floret ($\times 10$).

P. Beauv., *Brachiaria brizantha* Stapf, *Hyparrhenia rufa* Stapf and *H. cymbaria* Stapf. It is one of the best of the larger grasses; cattle relish it very much and it grazes well; the natives say that their cattle can "smell it out and make for it." Under cultivation, especially with humid conditions, it thrives well and is readily propagated by division of the root-stock.

P. repens L. Sp. Pl. ed. ii. 87 (1762); Stapf in Prain, Fl. Trop. Afr. ix. 708 (1920).

Entebbe: Dec. 1922, *M.* 280. Ruwenzori: Katwe, 1080 m., Dec. 1925, *M.* 1388A.

Fairly frequent under moist and boggy conditions in the Lake region. It is a hard stiff grass and not too tempting to stock. Owing to its deep rooting powers and rapid spread, it might be useful for planting on banks as a protection against denudation.

P. trichocladum Hack. ex Engl. Hochgebirgsfl. Trop. Afr. 119 (1892); Stapf in Prain, Fl. Trop. Afr. ix. 659 (1920).

Entebbe: 1160 m., June 1922, *M.* 17; Oct. 1922, *M.* 252.

Vern. Name: *Kakonsikonsi*; Nkonskansi = *Panicum maximum* Jacq., and the prefix *Ka* means small.

A frequent grass about the lake shore, especially in old cultivations. It grows there in large pure patches, forming a close tangled cover and smothers for a time everything around it. The natives feed it to their goats. It often makes its appearance in plantations where it is a rather obnoxious weed.

Setaria aequalis Stapf in Kew Bull. 1927, 267.

Entebbe: 1160 m., Oct. 1922, *M.* 255.

A slender grass found under forest or semi-forest conditions. In *Acacia* regions bordering swamps, it is often found in large pure stands which are frequented by stock.

S. aurea Hochst. ex A. Br. in Flora, 1841, 276; Stapf in Dyer, Fl. Cap. vii. 426 (1899).

Sese Islands: Kome Island, in large masses on old cultivated ground, July 1925, *M.* 798. Entebbe: frequent in bushland and savannah, Nov. 1922, *M.* 289B. Bulemezi: Bukalasa, 1140 m., July 1926, *M.* 1352, 1353, 1354, 1355.

A tall tufted grass, which in the young state forms very good fodder. It is frequent throughout the Victoria Nyanza region and indeed throughout all Uganda, particularly on the hill-slopes, where it is associated with *Pennisetum purpureum* Schum., *P. unisetum* Benth., *Imperata cylindrica* P. Beauv., *Panicum maximum* Jacq., *Hyparrhenia cymbaria* Stapf, *H. rufa* Stapf, *Clerodendron myricoides* R. Br., *Lantana trifolia* L., *Carduus Schimperii* Sch. Bip., *Coreopsis ruwenzoriensis* S. Moore, *Acacia stenocarpa* Hochst., *Anona senegalensis* Pers., *Bauhinia Thonningii* Schum., etc.

Several forms are often found in one community. At Bulemezi, the following forms grow together; a glaucous form (1353); a

hirsute glaucous form (1352); a glabrous non-glaucous form (1355) and a hirsute non-glaucous form (1354).

S. longiseta P. Beauv. Fl. Owar. ii. 81. t. 110, f. 2 (1807).

Masaka: on plains below Minziro Hill, Oct. 1925, *M.* 760. Busoga: Kamuli, 1110 m., July 1926, *M.* 1402; near Namatumba, 1110., July 1926, *M.* 1418. Budama: Tororo, 1140 m., July 1926, *M.* 1411.

This grass occurs on plains subject to water-logging during the rains. It is not widely spread in Uganda and has little promise as a fodder grass.

S. ramentacea Stapf in Kew Bull. 1927, 268.

Masaka: Mbarara Road, Oct. 1925, *M.* 765.

Also collected at Lugalambo in the Mabira Forest region by Dummer (3099). It is closely allied to *S. homonyma* Chiov., but differs in the smooth and glossy fertile florets, longer and narrower upper glume and slightly smaller spikelets.

S. rubiginosa Miq. Fl. Ind. Bat. iii. 467 (1859). *Panicum rubiginosum* Steud. Syn. Pl. Glum. i. 50 (1854). *Setaria imberbis* Stapf in Dyer, Fl. Cap. vii. 427 (1899) non Roem. et Schult.

Sese Islands: Komi Island, 1140 m., July 1925, *M.* 799. Busoga: Buteleja camp, 1110-1200 m., July 1926, *M.* 1097.

A short annual grass of little use, unless for making hay.

S. rubiginosa Miq. f. **penicillata** Stapf. *S. aurea* var. *penicillata* Stapf. in Cheval. Sudania, 146 (1911).

Busoga: Gadumire, 1110-1200 m., July 1926, *M.* 1086.

Vern. Name: *Mukiro mbwa*=dog's tail; this grass is very aptly named by the natives, as the spikes are brown or buff-coloured and tail like.

A grass of lax habit, characterised by its looser inflorescences; slender and often flexuous axis of the spikes; longer, finer and mostly brightly coloured bristles. It has more vegetative bulk than the type and often occurs in large patches on old cultivations, making good cover up to 2 ft. high. As far as annual grasses are concerned, it is quite a good fodder, but although widely distributed, it is not a prominent grass in the vegetation.

S. sulcata Raddi, Agrost. Bras. 50 (1823); Stapf in Dyer, Fl. Cap. vii. 421 (1899). *Panicum sulcatum* Aubl. Pl. Guian. i. 50 (1775).

Entebbe: 1110 m., June 1922, *M.* 20.

Vern. Name: *Kisogalabusa*.

A stout broad-leaved grass growing under forest or semi-forest conditions. It is fairly frequent in the Lake region and is used as fodder by the natives.

S. verticillata P. Beauv. Agrost. 51, 178 (1812); Stapf in Dyer, Fl. Cap. vii. 429 (1899). *Panicum verticillatum* L. Sp. Pl. ed. ii. 82 (1762).

Entebbe : 1110 m., Oct. 1922, *M.* 251. Busoga : Kamuli, 1140 m., July 1926, *M.* 1403.

Vern. Name : *Bikwasi* - to take hold.

A grass frequent in old cultivations and as a weed about habitations in the Lake region. In its young state it forms a good fodder, but at maturity the barbed bristles of the spikes become a nuisance as they cling to stock.

Tricholaena rosea Nees, Cat. Sem. Hort. Vratisl. 1835 and in Linnaea, xi. Lit. Ber. 129 (1837) : Stapf in Dyer, Fl. Cap. vii. 443 (1899).

Busoga : Kamuli, 1140 m., July 1926, *M.* 1423.

Common throughout Uganda, except in the mountainous regions. It often occurs in pure patches on old cotton and sweet-potato plots, etc., and on gravelly slopes. In the young condition it is a good fodder grass and at this stage the inflorescences are a rose or brownish-colour; at maturity they whiten and give a very beautiful silvery effect when the sun strikes a large patch on the hillside.

Melinis Maitlandii Stapf et Hubbard in Kew Bull. 1926, 445.

Sese Islands : Bufumira Island, in open glade near forest, 1110 m., Dec. 1922, *M.* 360.

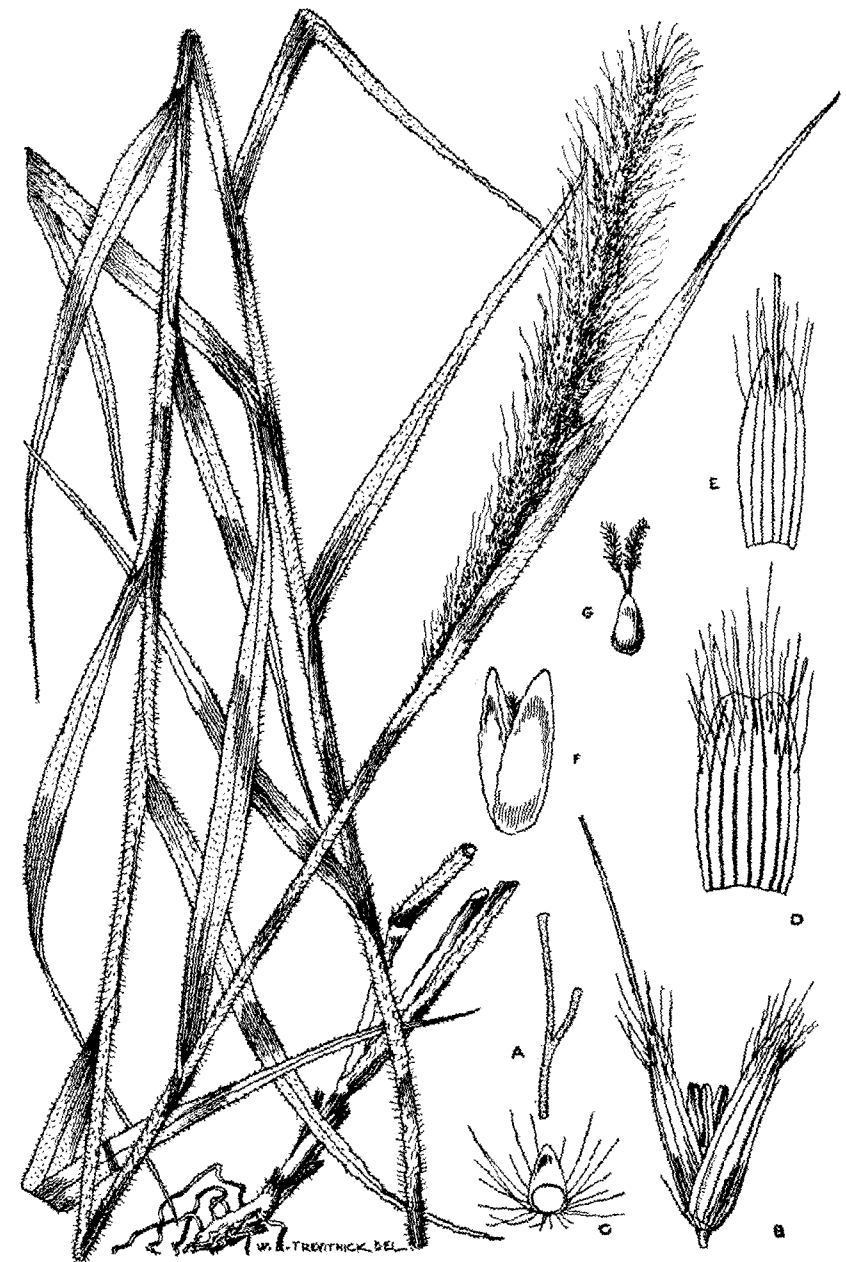
Vern. Name : *Kifuta*.

A grass very similar in its vegetative characters to *M. minutiflora* P. Beauv. It is not frequent in the Lake region and occurs more on the Sese Islands than on the mainland. It grows in small patches bordering forests on the hill slopes and is associated there with *Imperata cylindrica* P. Beauv. *Hyparrhenia filipendula* Stapf, *Trichopteryx kagerensis* K. Schum., *Lantana triflora* L., *Vernonia Smithiana* Less., *Wedelia oblonga* Hutch. It is a hirsute sticky grass giving off a peculiar linseed oil-like smell; this odour is frequently encountered when passing from a forest glade into the savannah and from it the presence of the grass may be detected. Scott Elliot (1566) also collected it in the Ruwenzori region forests. A specimen collected by Maitland (755) at Katera in the Tero Forest, is probably *M. macrochaeta* Stapf et Hubbard, an annual species.

M. tenuissima Stapf in Hook. Ic. Pl. xxvii. t. 2660 (1900).

Budama : Tororo, 1110-1200 m., July 1926, *M.* 1178.

A spreading, wiry, perennial grass, usually in small patches on the hillsides amongst *Hyparrhenia filipendula* Stapf, *Coreopsis ruwenzoriensis* S. Moore, *Lantana trifolia* L., *L. camara* L., *Clerodendron myricoides* R. Br., and associated with such trees as *Acacia stenocarpa* Hochst., *Anona senegalensis* Pers., *Albizia Zygia* Macbride, *Bauhinia Thonningii* Schum., etc. Under cultivation it has every promise of making good growth. In Tropical Africa it has a fairly wide distribution being found in Abyssinia, Kenya Colony to Rhodesia, Angola, Congo, Cameroons and Nigeria.



Melinis Maitlandii Stapf et Hubbard, showing habit. A Pedicels. B Spikelet (x16). C Lower glume (x20). D Upper glume (x13). E Lemma of lower floret (x13). F Upper floret (x17). G Pistil.

Pennisetum ciliare Link, Hort. Berol. i. 213 (1827). *Cenchrus ciliaris* L. Mant. 302 (1771). *Pennisetum cenchroides* L. Rich. in Pers. Syn. i. 72 (1805); Stapf in Dyer, Fl. Cap. vii. 433 (1899). Ruwenzori: Kasese, 900 m., Dec. 1925, *M.* 997; Katwe, 1080 m., Dec. 1925, *M.* 1396.

A grass similar to *Setaria rubignosa* Miq., in general vegetative characters.

P. polystachyon Schult. in Roem. et Schult. Mant. ii. 146 (1824). *Panicum polystachyon* L. Syst. Nat. ed. x. ii. 870 (1759). Busoga: Buyonjo, 1140 m., July 1926, *M.* 1420; Kamuli, *M.* 1420A.

An annual grass, especially frequent in the Busoga region, and to a lesser extent over the Eastern Province. In the former area it has frequently been observed forming pure stands on old cultivations and in cotton and sweet-potato patches. It occurs sparingly in the Victoria Nyanza region on a sandy stretch of savannah in the neighbourhood of Entebbe. It is a fine fodder grass, a quick grower, and is readily established from seed.

P. purpureum Schum. in Schum. et Thonn. Beskr. Guin. Pl. 44 (1827); Stapf in Kew Bull. 1912, 309. Entebbe: 1160 m., Aug. 1922, *M.* 79. Vern. Names: *Bisigazi*; "Elephant Grass."

Elephant Grass is typical of Uganda, especially of the Victoria Nyanza region, where it covers large areas. It is found in the more fertile parts from the lake level to well up the gentle slopes round about. On the Congo side of the Ruwenzori mountains it forms a dense impenetrable cover up to 14 ft. high. Its distribution on the hill slopes frequently ends suddenly, to be followed by *Imperata cylindrica* P. Beauv., and other grasses. In the dry belt south of Toro to Lake Katwe and in the Eastern Province it does not occur, unless along streams or on the edges of swamps.

Native villages and plantations are invariably found in Elephant Grass areas, unless the people are pastoral. The canes or "Muli" are used for many purposes, but principally for the making of fences around native compounds and for lathwork of houses to support the mud plaster. The canes also provide paper-pulp material from which an excellent writing paper has been made experimentally. The young growths formed after burning are very luscious and much relished by stock and their feeding value is very high.

P. trachyphyllum Pilger in Engl. Jahrb. xxx. 122 (1901). Ruwenzori: Toro; Kasingo, growing along brooks and streams, 1500-1800 m., Dec. 1925, *M.* 1390.

A vigorous grass up to 4 ft. high and comparable with *Panicum deustum* Thunb., as regards utility. Specimens collected by Maitland (1422) at Buyobo in Busoga are probably a new species of *Pennisetum* closely allied to the above.

P. unisetum Benth. in Journ. Linn. Soc., Bot., xix. 47, 49 (1881). *Gymnothrix uniseta* Nees, Fl. Afr. Austr. 66 (1841). Bulemezi: June 1925, *M.* 899. Vern. Name: *Kituntugula*.

A tall, stiff, vigorous grass with tough leaves occurring in clumps on the edge of or in Elephant Grass land in the drier regions of Uganda. It is a good fodder grass and may be readily planted up from roots to form pure stands.

Isachne Buettneri Hack. ex Buettn. in Verh. Bot. Ver. Brand. xxxi. 69 (1889). Victoria Nyanza region, *M.* 164.

T. elegans Hack. ex Engl. Hochgebirgsfl. Trop. Afr. 129 (1892). *Loudetia elegans* Hochst. in Flora, xxiv. (1841), i. Intell. 20 and ex Steud. Syn. Pl. Glum. i. 238 (1854). Busoga: Namatumba, 1110-1200 m., July 1926, *M.* 1119. A swamp grass with little leaf development.

T. kagerensis K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 109 (1895). Entebbe: 1160 m., June 1922, *M.* 22. Bulemezi: Luwelo, 1110 m., Sept. 1926, *M.* 1356. Vern. Name: *Kalensiwe*.

One of the commonest grasses on the slopes near the Victoria Nyanza and on the Sese Islands. In these parts it forms the major portion of the grazing, being found over large areas almost as pure stands. Although typical of the Lake region it has been found under boggy conditions at Luwelo and on the hill tops near Mbarara. On good soil it forms a close cover, but on gravelly or poor soils it generally exists as a clump grass. After burning it provides a good feed which is much relished by stock. Propagation may be readily effected, either by seeds or by division of the roots.

Trichopteryx superba Baglietto ex Chiov. in Nuovo Giorn. Bot. Ital. xxvi. 79 (1919). *T. gigantea* Stapf in Kew Bull. 1897, 295. *Loudetia superba* De Not. in Ann. Sci. Nat. Ser. III. xix. 369 (1853). Bugishu: Busiu, 1110-1200 m., July 1926, *M.* 1204 and 1204A. Serere: Serere, stony ground, July 1926, *M.* 1204B.

This very beautiful grass has hitherto not been recorded from Uganda. It is a tall grass, occurring in scattered clumps and covered with a bluish bloom; this, together with its large panicles of brown spikelets, gives it a very striking appearance. It is sparingly distributed, has little leaf development and is therefore of little value as fodder.

Phragmites vulgaris Crép. Man. Fl. Belg. 345 (1866). *P. communis* Trin. Fund. Agrost. 134 (1820); Stapf in Dyer, Fl. Cap. vii. 541 (1899). *Arundo Phragmites* L. Sp. Pl. ed. i. 81 (1753). *Arundo vulgaris* Lam. Fl. Franç. iii. 615 (1778).



Trichopteryx superba Baglietto, showing habit. A Spikelet ($\times 1\frac{1}{2}$). B Lower glume ($\times 1\frac{1}{2}$). C Upper glume ($\times 1\frac{1}{2}$). D and E Lemma and palea of lower floret ($\times 1\frac{1}{2}$). F Upper floret ($\times 1\frac{1}{2}$). G Lemma ($\times 1\frac{1}{2}$). H Palea ($\times 1\frac{1}{2}$). I Lodicules and Stamens ($\times 3$). J Pistil ($\times 3$).

Lake Region : Nov. 1922, *M.* 290.

Vern. Name : *Biwuewa*.

A fairly frequent grass in swampy parts and on the lake shore. In regard to habit and utility it is similar to *Saccharum spontaneum* L.

***Aristida adscensionis* L.** Sp. Pl. ed. i. 82 (1753) ; Stapf in Dyer, Fl. Cap. vii. 554 (1899).

Busoga : Gadumire, 1110-1200 m., July 1926, *M.* 1085. Ruwenzori : Hima, savannah, 900 m., Dec. 1925, *M.* 1043.

A typical grass of the dry savannah and usually associated with *Themeda triandra* Forsk., and *Heteropogon contortus* P. Beauv., but not so widely distributed.

***Tragus racemosus* All.** Fl. Pedem. ii. 241 (1785) ; Stapf in Dyer, Fl. Cap. vii. 577 (1900). *Cenchrus racemosus* L. Sp. Pl. ed. i. 1049 (1753).

Ruwenzori : between Kirabawah and Hima, 900-1050 m., Dec. 1925, *M.* 976.

A short annual grass, found occasionally on paths and roads through the savannah and in patches on sandy soil. It is of little utility.

***Perotis indica* O. Kuntze** Rev. Gen. Pl. 787 (1891). *Anthoxanthum indicum* L. Sp. Pl. ed. i. 28 (1753). *Perotis latifolia* Ait. Hort. Kew. i. 85 (1789) ; Stapf in Dyer, Fl. Cap. vii. 575 (1899).

Busoga : Budumba, July 1926, *M.* 1437A. Ruwenzori : Wasa, 1350 m., Dec. 1925, *M.* 1437. Masaka : Sango Bay, Oct. 1925, *M.* 754.

A small handsome and graceful grass found along paths and roads and in grass-lands. It is of little use for fodder.

***Agrostis lachnantha* Nees** in Ind. Sem. Hort. Vratissl, 1834, and in Linnaea, x. Litt.-Bericht. 115 (1836) ; Stapf in Dyer, Fl. Cap. vii. 549 (1899).

Ruwenzori : Toro, 1500-1800 m., Dec. 1925, *M.* 1389.

A narrow-leaved grass with little vegetative development, occurring on damp clayey soil near hillsides from the Kasingo camp to Bwamba pass.

***Sporobolus festinus* Hochst. ex A. Rich.** Tent. Fl. Abyss. ii. 398 (1851) var. ***fibrosus* Stapf** in Cheval. Sudan. 142, 155 (1911).

Ruwenzori : Kikorongo, 1080 m., Dec. 1925, *M.* 1395.

A graceful grass, but of little use ; growing on sandy or shallow soils overlying rocks.

***S. Stapfianus* Gandoger** in Bull. Soc. Bot. Fr. lxvi. 302 (1920). *S. stuppeus* Stent in Bothalia, ii. 264 (1927). *S. festinus* Hochst. var. *stuppeus* Stapf in Dyer, Fl. Cap. vii. 582 (1900).

Entebbe : 1050 m., Dec. 1922, *M.* 460.

A small, tufted, perennial grass, growing under the same conditions as *S. pyramidalis* P. Beauv., but in no way comparable with that species as regards vegetative development.

S. indicus R. Br. 170 (1810) ; Stapf. in Dyer, Fl. Cap. vii. 586 (1900). *Agrostis indica* L. Sp. Pl. ed. i. 63 (1753).

Mt. Elgon : Bupota, 1650 m., Dec. 1926, Snowden 1926.

Vern. Name : *Lisusu* (Lugishu).

A tufted perennial, common on short grassland, used for grazing cattle, etc. It is eaten by stock when young, but later when old, the tufts are left and rise above the level of the surrounding turf.

S. Molleri Hack. in Bolet. Soc. Brot. v. 213 (1887).

Entebbe : 1160 m., Aug. 1922, M. 82.

An annual grass, frequently found at low levels in old cultivations, especially near swampy ground. It is of little importance as forage.

S. piliferus Kunth, Enum. Pl. i. 211 (1833). *Vilfa pilifera* Trin. Gram. Unifl. 157 (1824).

Sese Islands : Bubembe Island, on lake shore, 1110 m., Dec. 1922, M. 401.

A grass similar to *S. Molleri* Hack., and frequently found under boggy conditions.

S. pyramidalis P. Beauv. Fl. Owar. ii. 36 (1807).

Entebbe : 1160 m., Aug. 1922, M. 81. Busoga : Namatumba, July 1926, M. 1443A ; Dumba Ferry, in gravel in railway cutting, July 1926, M. 1443C. Bugishu : Busiu, July 1926, M. 1443. Budama : Tororo, on slopes of rock, July 1926, M. 1443B.

A tough, tufted grass, growing in clumps on the lake shore, especially in gravelly areas and also on hill slopes. It is frequent in the Entebbe region and on the Sese Islands and is a useful fodder, being readily eaten by stock.

S. robustus Kunth, Rév. Gram. ii. 425, t. 126 (1829).

Ruwenzori : Bwamba, towards Bulanga, 840 m., Dec. 1925, M. 997A ; Katwe, 1080 m., Dec. 1925, M. 1388.

A tufted grass resembling *S. pyramidalis* P. Beauv., but usually much larger. It is associated with *Pennisetum purpureum* Schum., on the edge of the Bwamba plains.

S. spicatus Kunth, Rév. Gram. i. 67 (1829) ; Hook. f. Fl. Brit. Ind. vii. 250 (1896). *Agrostis spicata* Vahl. Symb. i. 9 (1890).

Kumi : Kumi camp, savannah, July 1926, M. 1433. Ruwenzori : Katwe, Dec. 1925, M. 1381.

A short grass of little utility.

Harpachne Schimper Hochst. in Flora, xxiv (1841), i. Intell. 20 and ex A. Rich. Tent. Fl. Abyss. ii. 431 (1851). *Eragrostis Schimper* Benth. in Hook. Ic. Pl. xiv. 53, t. 1371 (1881). Entebbe : 1160 m., Aug. 1922, M. 86A.

A short perennial grass of little importance, found on gravelly roadsides and on grassy slopes. It sometimes grows with *Eragrostis patens* Oliver.

Pogonarthria squarrosa Pilger in Notizbl. Bot. Gart. Berl. v. 149 (1910). *P. falcata* Rendle in Cat. Afr. Pl. Welw. ii. 232 (1899) ; Stapf in Dyer, Fl. Cap. vii. 589 (1900). *Leptochloa falcata* Hack. in Bull. Herb. Boiss. iii. 386 (1895). *Poa squarrosa* Licht. ex Roem. et Schult. Syst. ii. 553 (1817).

Busoga : Busaba, 1110-1200 m., July 1926, M. 1145.

An uncommon, tufted, perennial grass, found in the savannah adjoining bush. In its young state it would be suitable for fodder, but when old the flowering stems become very prominent.

Eragrostis aspera Nees, Fl. Afr. Austr. 408 (1841) ; Stapf in Dyer, Fl. Cap. vii. 628 (1900). *Poa aspera* Jacq. Hort. Vindob. iii. 32, t. 56 (1776).

Kampala : 1170 m., May 1923, M. 711. Busoga : Kamuli, 1110 m., July 1926, M. 1404.

An annual grass fairly frequent in the lake region, usually occurring as a weed in cotton patches, old cultivations, roadsides, etc. The large spreading panicles are very handsome, but the grass does not possess much value as fodder.

E. chalcantha Trin. in Mém. Acad. Pétersb., Sér. vi. i. 401 (1831) ; Stapf in Dyer, Fl. Cap. vii. 615 (1900). *Poa chalcantha* Kunth, Enum. Pl. i. 339 (1833).

Masaka : Kyotera, Oct. 1925, M. 871 ; between Masaka and Mbarara, on plain, Oct. 1925, M. 763.

A tufted perennial grass growing in typical savannah and subject to grass fires. It has not much vegetative development and its utility is thereby restricted.

E. ciliaris Link, Hort. Berol. i. 192 (1827) ; Stapf in Dyer, Fl. Cap. vii. 629 (1900). *Poa ciliaris* L. Amoen. Acad. v. 392 (1759). Masaka : on plain below Minziro Hill, Oct. 1925, M. 759. Busoga : Nkumbi, 1110-1200 m., July 1926, M. 1123 ; Dumba Ferry, July 1926, M. 1123A.

A grass frequent in the Busoga District and Eastern Province. It usually occurs in patches or as individual tufts in unmown lawns, old cultivations and roadsides. It is not a leafy grass and appears to be of much the same use as *E. pilosa* P. Beauv., and *E. major* Host.

E. hispida K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 114 (1895). Entebbe region : 1160 m., Nov. 1922, M. 453. Budama : Tororo, 1110-1200 m., July 1926, M. 1175.

A short, tufted, perennial grass with hairy spikelets, growing in shallow soil on grassy tablelands. It is subject to drying off during the summer months.

E. major Host, Gram. Austr. iv. 14, t. 24 (1809) ; Stapf in Dyer, Fl. Cap. vii. 620 (1900). *Briza Eragrostis* L. Sp. Pl. ed. i. 70 (1753).

A frequent annual grass along paths and roads, often occurring in small pure patches. It is eaten by stock, but is not such a sweet grass, neither does it make such good hay, as *E. tef* Trotter (*E. abyssinica* Link).

E. patens Oliver in Trans. Linn. Soc. xxix. 175 (1875).

Entebbe : 1160 m., Aug. 1922, *M.* 86. Entebbe region : Kabale, 1150 m., Nov. 1922, *M.* 540.

A short grass, frequent on roadsides and gravelly patches ; it is of little importance for fodder.

E. pilosa P. Beauv. Agrost. 71, 162 (1812) ; Stapf in Hook. f. Fl. Brit. Ind. vii. 323 (1896). *Poa pilosa* L. Sp. Pl. ed. i. 68 (1753).

Kampala : 1140 m., May 1926, *M.* 1064. Busoga : Dumba Ferry, 1110 m., July 1926, *M.* 1408.

A grass similar in many respects to *E. tef* Trotter and might serve much the same purpose. It is frequently found on paths and old cultivations, and, although not a prominent grass in the vegetation, it is widely distributed.

E. plumosa Link, Enum. Hort. Berol. i. 192 (1827). *E. tenella* var. *plumosa* Stapf in Hook. f. Fl. Brit. Ind. vii. 315 (1896). *Poa plumosa* Retz. Obs. iv. 20 (1786).

Busoga : Namwendwa, 1110 m., July 1926, *M.* 1424.

A small, spreading, annual grass, growing on sandy paths in camp compounds. It is of little or no importance for forage purposes.

E. superba Wawr. et Peyr. in Sitz. Ber. Acad. Wien, Math.-Nat. Cl. xxxviii. 584 (1860) ; Stapf in Dyer, Fl. Cap. vii. 622 (1900).

Kumi : Kumi Camp, 1170 m., June 1926, *M.* 1249.

A tall, tufted, perennial grass with large flat spikelets, frequent in the savannah country of Kumi. It grows with *Themeda triandra* Forsk., and would come in the same category as that grass as regards its uses in Uganda.

E. paniciformis Steud. Syn. Pl. Glum. i. 268 (1854). *Poa paniciformis* A. Br. in Flora, xxiv. 274 (1841).

Mt. Elgon : Bupota, 1650 m., Dec. 1926, *Snowden* 1027. Ruwenzori : Katwe, 900 m., Dec. 1925, *M.* 975.

A grass of about the same use as *E. major* Host. On the slopes of Mt. Elgon it is a constituent of short grassland used for grazing and is eaten by cattle.

E. tef Trotter in Bull. Soc. Bot. Ital. 1918, 62. *Poa tef* Zucc. Dissert. L'Estor. di una pianta panizab. Firenze, 1775. *P. abyssinica* Jacq. Misc. ii. 364 (1781). *Eragrostis abyssinica* Link, Hort. Berol. i. 192 (1827).

Kampala : Dec. 1925, *M.* 1065.

An introduced grass, which has been planted up in small plots at Kampala for trail purposes. It is light and suitable for making hay, but in Uganda suffers from the heavy rains. It grows fast and soon ripens, and while it lasts, makes a good cover.

E. tenuifolia Hochst. in Flora, xxiv, i. Intell. 20 (1841) and ex A. Rich. Tent. Fl. Abyss i. 425 (1851) ; Stapf in Hook. f. Fl. Brit. Ind. vii. 322 (1896).

Mt. Elgon : Bupota, 1650 m., Dec. 1926, *Snowden* 1024.

Vern. Name : *Lufafa lusaja* (Lugishu).

A common grass forming short grassland which is used for grazing cattle and is much relished by them (*Snowden*).

E. tremula Hochst. ex Steud. Syn. Pl. Glum. i. 269 (1854) ; Stapf in Hook. f. Fl. Brit. Ind. vii. 320 (1896). *Poa tremula* Lam. Illustr. i. 185 (1791).

Ruwenzori : Katwe region, cultivated ground, 1050 m., Dec. 1926, *M.* 1438.

An annual grass with large handsome panicles. It is of little use as a fodder grass.

E. turgida Pilger ex Jedwabnick in Bot. Archiv. v. 182 (1924). *E. rubiginosa* Trin. in Mém. Acad. Pétersb., Sér. VI. i. 401 (1831). *Poa turgida* Schum. et Thonn. Beskr. Guin. Pl. 66 (1827).

Serere : Ngora, Oct. 1926, *M.* 1382.

A short annual grass with little bulk, occurring in stony places under semi-arid conditions.

Diplache Dummeri Stapf et Hubbard in Kew Bull. 1927, 270.

Bulemezi : Luwelo, 1110 m., Sept. 1926, *M.* 1361.

A swamp grass, associated with *Mariscus* sp., and other semi-aquatic plants. It does not appear to be of much value for fodder.

Leptochloa obtusiflora Hochst. in Flora, xxxviii. 203 (1855.)

Busoga : Buyonjo, at lake side, 1110 m., July 1926, *M.* 1100.

Serere : Lohori, 1050 m., July 1926, *M.* 1345. Ruwenzori : Lake Katwe region, 900 m., Dec. 1925, *M.* 963.

A coarse grass with little leaf development, found in boggy soil.

Microchloa indica P. Beauv. Agrost. Expl. pl. xx. 13, t. 20, f. 8 (1812). *M. setacea* R. Br. Prodr. 208 (1810) ; Stapf in Dyer, Fl. Cap. vii. 636 (1900). *Nardus indica* L. f. Suppl. 105 (1781).

Masaka : Tero Forest region, on plains, Oct. 1925, *M.* 761.

A savannah grass of the Lake region and subject to grass fires. It is hardly of any importance for fodder.

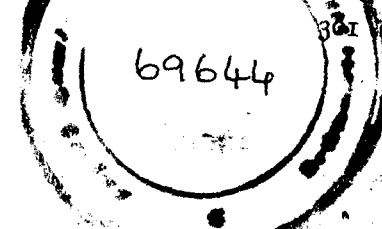
Cynodon Dactylon Pers. Syn. i. 85 (1805) ; Stapf in Dyer, Fl. Cap. vii. 634 (1900). *Panicum Dactylon* L. Sp. Pl. ed. i. 58 (1753).

Vern. Name : *Lufafa Lukazi* (Lugishu).

Bugishu : Bufumbo, 1500 m., July 1926, *M.* 1435. Mt. Elgon : Bupota, 1650 m., Dec. 1926, *Snowden* 1023. Ruwenzori : Katwe 1080 m., Dec. 1925, *M.* 1387.

A creeping grass, frequently found along roadsides and known in Uganda as " French " or " Bahama " grass. It is used a great deal for lawns as it can be mowed closely, but unless the soil is rich it soon dies out. It is usually low, but in rich damp soil it may be a

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much as 1½ ft. high. It is also suitable for planting up paddocks and for light grazing. Propagation may be effected by means of runners.

Cynodon plectostachyus Pilger in Engl. Jahrb. xl. 82 (1907).

Leptochloa plectostachya K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 112 (1895).

Entebbe: 1160 m., June 1922, *M.* 23.

Vern. Name: *Kalandalengo*, from Landa -to wander.

A frequent grass in the Victoria Nyanza region and especially abundant around refuse pits and cattle kraals. It is a more vigorous grass than *Cynodon Dactylon* Pers., although resembling that species. It spreads rapidly, provides an abundance of fodder and stands grazing well.

Enteropogon melicoides Nees in Lindl. Introd. Nat. Syst. ed. ii. 449 (1836); Hook. f. Fl. Brit. Ind. vii. 284 (1896). *Ischaemum melicoides* Koen. ex Rottl. in Ges. Naturf. Neue Fr. Schrift. iv. 211 (1803) and ex Willd. Sp. Pl. iv. 941 (1806).

Ruwenzori: Kikorongo, savannah, 1110 m., Dec. 1925, *M.* 1397.

Chloris breviseta Benth. in Hook. Niger Fl. 566 (1849).

Busoga: Dumba Ferry, in gravelly soil, July 1926, *M.* 1444.

C. Gayana Kunth, Rév. Gram. i. 89, ii. 293, t. 58 (1829); Stapf in Dyer, Fl. Cap. vii. 642 (1900).

Busoga: Kamuli, *M.* 1394A. Bugishu: Busiu, 1110-1200 m., July 1926, *M.* 1198. Bulemezi: Luwelo, 1110 m., Oct. 1926, *M.* 1394.

A fairly frequent grass in the drier parts of Uganda. It is usually found at low levels and associated with *Hyparrhenia filipendula* Stapf, *Andropogon canaliculatus* Schum., *Cymbopogon afronardus* Stapf, *Panicum maximum* Jacq., and *Imperata cylindrica* P. Beauv., and amongst or in the shade of such trees as *Anona senegalensis* Pers., *Bauhinia Thonningii* Schum., *Acacia* and *Grewia* spp.

C. myriostachya Hochst. in Flora, xxxviii, 203 (1855).

Ruwenzori: Kikorongo, 1080 m., Dec. 1925, *M.* 1398.

An annual savannah grass. At Kikorongo it is associated with *Themeda triandra* Forsk., *Heteropogon contortus* P. Beauv., *Cymbopogon excavatus* Stapf, etc. It has a fairly good leafy base and shows some promise as a fodder grass.

C. virgata Sw. Fl. Ind. Occ. i. 203 (1797) var. **elegans** Stapf in Dyer, Fl. Cap. vii. 642 (1900). *C. elegans* H.B. et K. Nov. Gen. et Spec. i. 166, t. 49 (1815).

Ruwenzori: Kikorongo, 1080 m., Dec. 1925, *M.* 1398A.

C. pycnothrix Trin. Gram. Unifl. 234 (1824); Stapf in Dyer, Fl. Cap. vii. 641 (1900).

Entebbe: 1160 m., Aug. 1922, *M.* 84. Busoga: Namwendwa, 1110 m., July 1926, *M.* 1406.

Vern. Name: *Kasibante*; applied to species of *Chloris* generally.

A frequent annual or perennial grass on paths and roadsides and often in large patches on gravelly soils. It does not possess much value as a pasture grass, but nevertheless it produces a fair amount of leaf. It roots from the nodes and on good soil might prove a useful hay grass and a good fodder during its young stages.

Ctenium elegans Kunth, Rév. Gram. i. 93 (1829).

Sese Islands: Bunyama Island, in savannah, 1110 m., *M.* 366.

A fairly frequent grass on the slopes of the Sese Islands. It is associated there with *Trichopteryx kagerensis* K. Schum., *Hyparrhenia filipendula* Stapf, and *Themeda triandra* Forsk., and is of nearly the same use as the latter.

Eleusine coracana Gaertn. Fruct. i. 8, t. 1, f. 11 (1788); Stapf in Dyer, Fl. Cap. vii. 645 (1900).

Victoria Nyanza region, *M.* 99.

There are numerous varieties and forms of this grass well known to the Uganda natives, especially the Nilotic and allied tribes, and used extensively by them as grain plants. The whole series is worthy of trial in order to ascertain their respective values. The grain is mostly used in the manufacture of beer. The grass is very subject to attacks by a species of *Striga* and in fact some of the native plots in the Ruwenzori region and in the Eastern Province were covered with it, but strange to say, there was little damage done to the crop. The *Striga* flowers just after the grain has been reaped and some of the plots were a mass of its beautiful pale mauve flowers.

E. indica Gaertn. Fruct. i. 8 (1788); Stapf in Dyer, Fl. Cap. vii. 645 (1900). *Cynosurus indicus* L. Sp. Pl. ed. i. 72 (1753).

Entebbe: 1160 m., Oct. 1922, *M.* 258.

A grass frequent on the hillsides, old cultivations, about rubbish heaps and on low-lying acid soils. It is not an important fodder grass in Uganda.

Dactyloctenium aegyptium Richt. Pl. Eur. i. 68 (1890). *D. aegyptiacum* Willd. Enum. Pl. 1029 (1809); Stapf in Dyer, Fl. Cap. vii. 646 (1900). *Cynosurus aegyptius* L. Sp. Pl. ed. i. 72 (1753).

Ruwenzori: Katwe, salt lake region, 900 m., Dec. 1925, *M.* 1023.

Frequently found in various parts of Uganda in pure patches on gravelly soil, on paths and old cultivations. It does not appear to be much eaten by stock.

Oryza latifolia Desv. Journ. Bot. i. 77 (1813) var. **collina** Hook. f. Fl. Brit. Ind. vii. 93 (1896).

Masaka: Kaisi Forest, in ditches along roadside, 1140 m., Oct. 1925, *M.* 758.

This variety was originally described from Ceylon plants and it is the first record from Tropical Africa. In Uganda it is confined to damp forest and has also been found under somewhat similar conditions in the Bwamba Forests on the Congo side of the Ruwenzori. It is of little use for forage.

Leersia hexandra Sac. Prod. Veg. Ind. Occ. 21 (1788); Stapf in Dyer, Fl. Cap. vii. 659 (1900).
Entebbe region: 1150 m., Dec. 1922, *M.* 523. Busoga: Namwendwa, 1140 m., July 1926, *M.* 1401.

A grass of damp or aquatic situations. It forms a fairly good cover, but its aquatic requirements rather restrict its uses.

Streptogyne gerontogaea Hook f. in Trimen. Handb. Fl. Ceylon. v. 301 (1900).
Sese Islands: Damba Island, 1110 m., April 1925, *M.* 801.

A sparingly distributed forest grass, which has little importance as fodder. It has so far not been observed in other parts of Uganda.

Centotheca mucronata O. Ktze. Rev. Gen. Pl. 765 (1891). *Poa mucronata* P. Beauv. Fl. d'Oware, i. 5, t. 4 (1804).
Entebbe: Kitubulu region, 1150 m., Dec. 1922, *M.* 585.

An annual grass, found under forest or semi-forest conditions. It does not appear to be of much value for fodder.

Olyra latifolia L. Amoen. Acad. v. 408 (1759); Stapf in Dyer, Fl. Cap. vii. 746 (1900).
Victoria Nyanza region, *M.* 189.

A fairly frequent grass on the edge of and in forests of the Lake region. Its vegetative parts are hard and brittle and its uses as fodder are therefore somewhat restricted.

Leptaspis conchifera Hack. in Bolet. Soc. Brot. v. 211 (1887).
Entebbe: Oct. 1922, *M.* 171.

A common plant as forest undergrowth in the Lake region, where it forms almost pure stands over large areas. Its vegetative parts are hard and brittle and not attractive to stock.

Oxytenanthera abyssinica Munro in Trans. Linn. Soc. xxvi. 127 (1868). *Bambusa abyssinica* A. Rich. Tent. Fl. Abyss. ii. 439 (1851).
Mt. Elgon: Bulugenyi, 1350-1650 m., in forest, Snowden 1051.
Vern. Name: *Nkawo* (Luganda); *Madeza* (Lugishu).

A bamboo 20-30 ft. high, with solid culms 3-4 inches in diameter at the base (Snowden).



Centotheca mucronata O. Ktze. showing habit. A Spikelet ($\times 4$). B Lower glume ($\times 7$). C Upper glume ($\times 7$). D Lemma ($\times 7$). E Palea ($\times 7$).

XXXV.—PAPHIOPEDILUM AND PHRAGMOPEDILUM.

T. A. SPRAGUE and V. S. SUMMERHAYES.

At the present day the generic name *Paphiopedilum* (Orchidaceae) is applied by most authors to a group of Asiatic species represented by *P. insigne* (Wall.) Pfitz., but is used by Ames (Sched. Orch. ii. 2: 1923) for an American genus commonly known as *Phragmopedilum* or *Phragmipedium*. It seems desirable, therefore, to determine the correct application of the name *Paphiopedilum*, and, if possible, the type species. The generic name was first proposed by Pfitzer in 1886 (Morph. Stud. Orchideenbl. 11) to include (1) a number of Asiatic species of which he mentions *P. insigne* (Wall.) Pfitz. and *P. spicerianum* (Rchb. f.) Pfitz., and (2) the species of *Selenipedium* Sect. *Acaulia coriifolia* Rchb. f. Three years later, when he validated the name *Paphiopedilum* by the publication of a generic description (Engl. & Prantl, Nat. Pflanzenfam. ii. Abt. 6. 84), he proposed two Sections: A. *Genuina*, including only Asiatic species, among them *P. insigne*; and B. *Caudata*, including the American group *Selenipedium* Sect. *Acaulia coriifolia* Rchb. f.

Obviously the type species of *Paphiopedilum* Pfitzer must be one of the Section *Genuina* Pfitzer, and as *P. insigne* (Wall.) Pfitz. is the only species mentioned by Pfitzer in both works it may be regarded as the type.

In 1894 Pfitzer (Engl. Jahrb. xix. 40), proposed the sectional names *Coelopeditum* and *Phragmopedilum* in place of *Genuina* and *Caudata* respectively. Sect. A. *Coelopeditum* included 46 species from the Old World while Sect. B. *Phragmopedilum* comprised 15 species from Tropical America.

Rolfe in 1896 (Orch. Rev. iv. 331), raised Sect. B. *Phragmopedilum* to generic rank under the name *Phragmipedium*, recognising 10 species, and restricted *Paphiopedilum* to Sect. *Coelopeditum* (l.c. 363). In 1903 Pfitzer (Engl. Pflanzenr. Orch.-Pleonandr. 42, 54), accepted the new genus and applied the names *Paphiopedilum* and *Phragmopedilum* in precisely the same way, and in this he was followed by Schlechter (Die Orchideen, 27, 31: 1915).

In 1912 Rolfe (Orch. Rev. xx. 2), pointed out that *Paphiopedilum* Pfitz. emend. Rolfe (1896) was antedated by the three generic names *Cordula* Raf., *Stimegas* Raf. and *Menephora* Raf. (all 1836), and adopted the first of these as the most suitable. In this he has been followed by Ames (Orchidaceae, vi. 6: 1920). In view of the extreme rarity of Rafinesque's Flora Telluriana, in which these names appeared, it seems desirable to reproduce the original descriptions of the three genera, the words abbreviated by Rafinesque being spelt in full.

"933. STIMEGAS R. (stigma large) differt [a *Cypripedio*] petalis inaequalibus, superiore reniformi cucullato; 2 interioribus ciliatis

cuneatis obtusis, labello pandurato basi cucullato apex calciforme, columna apex dilatata in stigma trilobo, antheris 2 ad basis lateralis. *Scapo unifloro, foliis radicalibus distichis*.—Type *St. venustum* R.; *Cypripedium venustum* Hook. Bot. Mag. t. 2129; Lindl. Bot. Reg. t. 788; foliis lanceolatis oblongis acuminatis canaliculatis enervis maculatis, scapo villosa. Fine species of Nepal, leaves with purple dots beneath, flowers varied of purple and green."

"934. CORDULA R. (nymph) differt petalo superiore fornicato emarginato, 2 lateralibus ellipticis undulatis, labello brevi saccato integro non fisso, columna obcordata sine appendice dorsalis, filamentis 2 pendulis antheriferis inaequalibus bilobis. *Scapo unifloro*.—Type *C. insignis* R.; [*Cypripedium insigne*] Hook. Exot. Fl. t. 34; Bot. Mag. t. 3412; Lodd. Bot. Cab. t. 1321; foliis ligulatis, scapo piloso, bractea oblonga obtusa flori aequali. Also from Nepal, large green flower with purple spots and veins."

"935. MENEPHORA R. (moon bearing) differt labello basi canaliculato apex auriculato saccato, appendice lunato. *Scapo unifloro*. Type *M. bicolor* Raf., foliis oblongis acutis maculatis, scapo pubescens, petalo superiore ciliato margine revoluto, ceteris oblongis undulatis. Borneo and Java, seen alive in gardens, flower dull purple but petal white, broader, ovate."

Under International Rules (Art. 46) Rolfe's choice of *Cordula* in preference to *Stimegas* and *Menephora* cannot be modified by subsequent authors, and it will replace *Paphiopedilum* unless the latter name is conserved. The case for its conservation is stated on page 309. Pfitzer, who had evidently not seen Rafinesque's Flora Telluriana, cited *Cordula*, *Stimegas* and *Menephora* erroneously as synonyms of *Cypripedium*, having misinterpreted the entry in the Index Kewensis, in which *Cypripedium* was understood in a wider sense.

In his second paper Rolfe stated (Orch. Rev. xx. 1: 1912) that "Pfitzer originally based his genus [*Paphiopedilum*] upon the *Selenipedia acaulia coriifolia* of Reichenbach" and further on (l.c. 3) that the *Selenipedia* cultivated "are the *Selenipedia acaulia coriifolia* on which *Paphiopedilum* was primarily based by Pfitzer, and to which it had better be limited."

Apparently misled by these statements, Ames (Sched. Orch. ii. 2: 1923) has recently used the name *Paphiopedilum* for this group, that is, as synonymous with *Phragmopedilum*. But in the first place Pfitzer did not base *Paphiopedilum* either solely or primarily on the *Selenipedia acaulia coriifolia*; as has been shown above, he mentioned *P. insigne* and *P. spicerianum* as belonging to the genus, adding in a footnote that he also included the section in question. In the second place the effective publication of

Paphiopedilum dates from 1889, when he first supplied a generic diagnosis, and he then clearly indicated by the sectional name *Genuina* that he regarded the Asiatic species with unilocular ovaries as typical. Hence Ames's application of the name *Paphiopedilum* is inadmissible under the type-method, although it might be justified under the residue-method.

Some confusion has been caused by the fact that in many collections of living Orchids the name *Selenipedium* has been retained for the genus *Phragmopedilum*. *Prima facie* this application of the generic name *Selenipedium* might appear to be justified since *Phragmopedilum* coincides with Reichenbach's first section of *Selenipedium* and comprises eight out of his ten species. But as pointed out by Rolfe (Orch. Rev. iv. 366: 1896), the generic name alludes to the small lip (*selenis*, a little crescent), and moreover, the character of having round crustaceous vanilla-like seeds mentioned in Reichenbach's diagnosis is restricted to his second section, that is, *Selenipedium* Rchb. f. emend. Pfitz., which comprises only three species, *S. chica* Rchb. f., *S. palmifolium* (Lindl.) Rchb. f. and *S. isabelianum* Barb. Rodr.

The synonymy and principal references of the three genera in question are as follows:—

Selenipedium Rchb. f. Xen. Orch. i. 3 (1854), partim, emend. Pfitz. in Engl. & Prantl, Nat. Pflanzenfam. ii. Abt. 6. 83 (1889); Pfitz. in Engl. Jahrb. xix. 39 (1894); Rolfe in Orch. Rev. iv. 331 (1896); Pfitz. in Engl. Pflanzenr. Orchid.-Pleonandr. 27 (1903); Schlechter, Die Orchideen, 23 (1915); Schlechter, Syst. Orch. in Notizbl. Bot. Gart. Berlin, ix. 582 (1926).
Selenipedium Series *Foliosae* Benth. & Hook. f. Gen. Pl. iii. 635 (1883).

Three species from Tropical America. Type: *S. chica* Rchb. f.

Cordula Rafin. Fl. Tellur. iv. 46 (1836); Rolfe in Orch. Rev. xx. 2 (1912); Ames, Orchidaceae, vi. 6 (1920); Ames in Journ. Asiat. Soc. Straits. Br., Spec. Vol. 135 (1921); Ames in Merrill, Enum. Philipp. Fl. Pl. i. 253 (1924).

Stimegas Rafin. l.c. 45.

Menephora Rafin. l.c. 46.

Paphiopedilum Pfitz. Morph. Stud. Orchideenbl. 11 (1886), sine descr., partim; Pfitz. in Engl. & Prantl, Nat. Pflanzenfam. ii. Abt. 6. 84 (1889), descr., partim; Pfitz. in Engl. Jahrb. xix. 40 (1894), partim; Hallier in Ann. Jard. Bot. Buitenzorg, xiv. 34 (1896), partim; emend. Rolfe in Orch. Rev. iv. 363 (1896); Pfitz. in Engl. Pflanzenr. Orchid.-Pleonandr. 54 (1903); Schlechter, Die Orchideen, 31 (1915); Schlechter, Syst. Orch. in Notizbl. Bot. Gart. Berlin, ix. 582 (1926).

47 species in Asia and New Guinea. Type: *C. insignis* (Wall.) Raf.

Phragmopedilum (Pfitz.) Rolfe in Orch. Rev. iv. 330, 331 (1896), (*Phragmipedium*); Pfitz. in Engl. Jahrb. xxv. 527 (1898); Pfitz. in Engl. Pflanzenr. Orchid.-Pleonandr. 42 (1903); Schlechter, Die Orchideen, 27 (1915); Schlechter in Fedde, Repert. Beih. vi. 46 (1919); l.c. vii. 207 (1920); l.c. viii. 111 (1921); l.c. ix. 119 (1921); l.c. x. 55 (1922); Schlechter, Syst. Orch. in Notizbl. Bot. Gart. Berlin, ix. 582 (1926).

Uropedium Lindl. Orch. Linden. 28 (1846), nomen rejiciendum (Internat. Rules, Art. 51, 3).

Selenipedium Sect. *Acaulia coriifolia* Rchb. f. Xen. Orch. i. 3 (1854).
Selenipedium Series *Coriaceae* Benth. & Hook. f. Gen. Pl. iii. 635 (1883).

Paphiopedilum Sect. *Caudata* Pfitz. in Engl. & Prantl, Nat. Pflanzenfam. ii. Abt. 6. 84 (1889), excl. spp. asiat.

Paphiopedilum Sect. *Phragmopedilum* Pfitz. in Engl. Jahrb. xix. 41 (1894); Hallier in Ann. Jard. Bot. Buitenzorg, xiv. 44 (1896).
Paphiopedilum Pfitz. emend. Rolfe in Orch. Rev. xx. 3 (1912), in obs.; Ames, Sched. Orch. ii. 2 (1923), in obs.; non Pfitz. emend. Rolfe (1896).

13 species in Tropical S. America. Type: *P. caudatum* (Lindl.) Rolfe.

The case for the conservation of *Paphiopedilum* versus *Cordula* may be presented as follows:

The name *Paphiopedilum* possesses the advantage of indicating the relationship of the genus with the other genera of *Cypripedilinae*, namely *Cypripedium*, *Selinipedium* and *Phragmopedilum*, whereas *Cordula* does not.

Paphiopedilum was adopted by Pfitzer in Engl. & Prantl, Nat. Pflanzenfam. (1889); and in Engl. Pflanzenr. (1903); Kerchove, Livre Orch. (1894); Hallier in Ann. Jard. Bot. Buitenzorg, xiv. 18-52 (1896); and by Schlechter, Die Orchideen (1915), and "Das System der Orchidaceen" in Notizbl. Bot. Gart. Berlin, ix. 582 (1926). It has been used also in the following floras: Forbes & Hemsl. Enum. Pl. Chin. (1903); J. J. Smith, Orch. Java (1905); Koorders, Exkursionsfl. Java (1911); Schlechter, Orch. Deutsch-Neu-Guin. (1911); Schlechter, Orch. Sino-Jap. Prodr. (1919); Ridley, Fl. Mal. Penins. (1924).

Many figures have been published under *Paphiopedilum* in the Orchid Review, Botanical Magazine, Orchis, and various horticultural journals, and none under *Cordula*.

Cordula has been adopted by Ames in the following works: Ames, Orchidaceae (1920); Merrill, Bibliogr. Enum. Bornean Pl. (1921); Merrill, Enum. Philipp. Fl. Pl. (1924).

The genus includes nearly 50 species, natives of Tropical Asia and New Guinea. Many species and hybrids are in cultivation.

XXXVI.—CONTRIBUTIONS TO THE FLORA OF BURMA:
IV*.

Manglietia utilis Dandy [Magnoliaceae]; affinis *M. Hookeri* Cubitt et Sm., sed alabastris spatha in pedunculo sub perianthii segmentis intervallo nullo inserta facile distinguenda.

A medium-sized tree; branchlets glabrous in fruit; leaf-buds appressed-shining-tawny-pubescent. Leaves oblanceolate-oblong to oblong, cuneate or obtuse at the base, acuminate at the apex, up to about 27 cm. long and 9 cm. broad, coriaceous, glabrous; lateral nerves about 15-16 on each side of the midrib, not very prominent; petiole up to about 3.5 cm. long, finally glabrous, with a scar on the upper surface reaching about $\frac{3}{4}$ of the way up; stipules appressed-shining-tawny-pubescent outside. Flowers not seen. Perianth-segments 12 (from scars). Fruit ovoid-globose, cordate at the base after dehiscence of the mature carpels, about 9 cm. long.

Tavoy District, Nwalabo, about 3200 ft., fr. Dec., R. N. Parker 2320.

Parker states that the tree is known as "Sanga po" and is used for planks.

Michelia Baillonii Finet et Gagnep. [Magnoliaceae]; *Magnolia Baillonii* Pierre; *Talauma spongocarpa* King; *T. phellocarpa* King; *Michelia phellocarpa* Finet et Gagnep.; *Aromadendron spongocarpum* Craib; *A. Baillonii* Craib.

Katha District, Bilumyo Reserve, 1000 ft., fr. Aug., C. G. Rogers 987. Mandalay District, near Maymyo, 3500 ft., fl. July, fr. Aug., J. H. Lace 3284, Badal Khan 102, Ba Pe 1744, A. Rodger 77.

Also in Assam, S. Yunnan, Siam, and Indo-China. The species was originally described by Pierre as a *Magnolia*, but is correctly placed in *Michelia*; in fact it is easily mistaken in the absence of fruit for *M. champaca* or *M. alba*. The fleshy syncarpous fruit is exceptional in the genus *Michelia*, and caused King to describe the plant in *Talauma* and Craib to refer it to *Aromadendron*. The numerous specimens now available show that King's *Talauma spongocarpa* and *T. phellocarpa* can no longer be retained as distinct from each other or from Pierre's species.—(J. E. Dandy).

Elaeodendron subrotundum King [Celastraceae].

Hitherto known from the Malay Peninsula and the Andamans, S. Tenasserim, Pakchen River Forests, March, C. E. Parkinson 2060. "Small tree 8-15 ft. high in Mangroves. Flowers white."

Glyptopetalum quadrangulare Prain [Celastraceae].

Known from the Malay Peninsula only.

S. Tenasserim, Ngawun valley, 300 ft., Jan., C. E. Parkinson 1616. "Flowers brownish."

Vernacular name:—*Ka Mak* (Shan).

Kokoona filiformis Fischer nov. comb. [Celastraceae].
Lophopetalum filiforme Laws.

Lawson had no fruit or seeds when describing the species; as the seeds are long winged and exarillate, ovary 3-celled and the stigma faintly 3-lobed, it must fall in the genus *Kokoona*. As the fruits have not been described the description is appended.

Pedicels and stalk of fruit jointed, latter stout. *Capsule* 3-gonous, oblong, hardly narrowed upwards, bluntly apiculate, 9-10 cm. long, 2.5-3 cm. across, surface granulose. *Seeds* 6 in each cell, exarillate, semicircular, flat, wing oblong, rounded at the apex, with the seed 8-8.5 cm. long, about 1.8 cm. wide.

South Tenasserim, Browning Island, Victoria Point, at sea-level, March, C. E. Parkinson 2019. "Tree 30-40 ft. high. The outer bark burns readily when green. Flowers pale-yellow."

Vernacular name:—*Ja-Wee* (Malay).

Xerospermum ferrugineum Fischer [Sapindaceae].

Since the publication of the original description (K.B. 1927, p. 82) fruit and more advanced flowers have been received.

Stigma 2-lobed, lobes subulate, densely papillose. *Fruit* 2-lobed (or 1 suppressed), parts ellipsoid diverging, muricate, puberulous, 7 mm. long, 4.5 mm. wide. *Seed* oblong ellipsoid, more or less compressed, glabrous, 4 mm. long.

South Tenasserim. Nyaungbinkwin, about sea-level, Feb. C. E. Parkinson 1935. "Flowers white."

Vernacular names:—*Kala Min Gyin* (Burmese), *Law Gaw Tan* (Karen).

Connarus Maingayi Hook. f. [Connaraceae].

Known only from the Malay Peninsula.

South Tenasserim. Victoria Island, at sea-level, March, C. E. Parkinson 2046. "A climber with very pale pinkish flowers."

Bauhinia Parkinsonii Fischer [Caesalpiniaceae].

Since the publication of the original description (K.B. 1927 p. 87) fruits have been received.

Legume oblanceolate, apex oblique, acute, terminated by at least a portion of the persistent style, tapering to an acute base, 4-6 cm. long, 1-1.2 cm. wide, valves smooth, glabrescent or sparingly pubescent, at first minutely yellow-glandular, the glands tending to disappear at length.

Mandalay District. Maymyo-Mandalay Road, 2500 ft. June, C. E. Parkinson 2077.

Vernacular name:—*Zi-Palau* (Burmese).

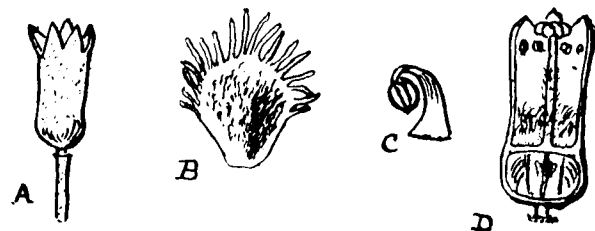
Pellacalyx Parkinsonii Fischer [Rhizophoraceae-Legnotidae]; affinis *P. Sarcadiano* Scort., sed pubescentia foliorum membranaceorum florumque majorum et calyce 5-6-lobato differt.

Tree 60 ft. high; branchlets round and somewhat corky, pale-brown; twigs dark brown, sparsely pubescent with minute fascicled

* Continued from K.B. 1927, p. 212.

hairs. *Leaves* membranous, elliptic, abruptly acutely cuspidate, base rounded or cuneate, 10-16 cm. long, 5-7 cm. wide, nearly glabrous above except the pubescent midrib, thinly white-hairy below, thinly white-ciliate, midrib impressed above; prominent and reddish-brown below, primary nerves 8 pairs, subprominent and reddish-brown below, ascending, arched, ultimate reticulations very fine, margin slightly undulate and distantly minutely apiculate; petioles pubescent 7-9 mm. long; stipules minute, triangular-lanceolate, densely pubescent. *Flowers* in axillary fascicles, 1-1.3 cm. long, white; pedicels puberulous with minute fascicled hairs, 6-7 mm. long, jointed below the flower with a ring of minute hairs at the joint. *Calyx* tubular 7-9 mm. long, minutely puberulous without, within densely villous at the base, glabrous above, lobes 5 or 6, thick, ovate lanceolate, half the length of the tube, keeled and glabrous within. *Petals* 5 or 6, at the mouth of the calyx tube, fleshy, suborbicular with a long fringe, minutely puberulous and shallowly keeled without, glabrous within, red. *Stamens* 10-12, inserted with the petals, minute; filaments broadly ensiform, incurved; anther subrotund. *Ovary* inferior, 3-4 mm. long, 10-celled, ovules many; style columnar, slightly exserted, puberulous below glabrous above; stigma capitate, flat, 10-lobed, minutely puberulous. *Fruit* not seen.

S. Tenasserim. Victoria Island, 200 ft., March, C. E. Parkinson 2051.



Pellacalyx Parkinsonii Fischer.

A Flower $\times 14$; B Petal, exterior aspect $\times 10$; C Stamen $\times 5$; D Section through flower $\times 2$.

***Jambosa pseudo-laeta* Fischer** [Myrtaceae]; affinis *J. laetae* Bl., sed foliis paulo longioribus, abruptius angustiusque acuminatis, nervis rectis primariis nervo marginali distincte angulatis, calycis-tubo petalisque majoribus distincta.

Large shrub or small tree; twigs slender, terete, smooth, pale-brown. *Leaves* chartaceous when dry, elliptic or ovate-elliptic, abruptly bluntly acuminate or subacutely caudate, base acute, 9-18 cm. long, 2.5-6.5 cm. wide, quite glabrous, dark-green and shining above, olivaceous below, densely pellucid-punctate, midrib and primary nerves impressed above, prominent beneath, primary nerves clearly horizontal, straight 10-12 pairs, occasionally with a more slender parallel one between uniting at a definite angle with a distinct looped marginal vein 2-7 mm. within the slightly

crenulate-sinuate margin, secondary nerve irregular, horizontal and variously curved, with a finer network between; petioles channelled above, 3-5 mm. long. *Inflorescence* 3-5-flowered, terminal, trichotomous cyme shorter than the leaves; peduncle very short; petioles slender, jointed below the flower, 1.5-2 cm. long, lengthening in fruit. *Bud* globose above the narrowly funnel-shaped calyx-tube. *Flowers* large, glabrous, white or pink. *Calyx* 1.5 cm. long, funnel-shaped in flower, covered with glands, tube produced above the ovary, lobes subcoriaceous, hemispherical, about 5 mm. long. *Petals* suborbicular, densely glandular, about 1 cm. long. *Stamens* very many on a thickened staminal disk, 2.5-3.5 cm. long; filaments slender; anthers elliptic 1 mm. long. *Style* long, slender, overtopping the stamens by about 1.5 cm. *Mature fruit* not seen.

North Pegu. Thebyusan, Baingda Reserve, Jan. Maung Ba Pe per C. E. Parkinson 775 (type).

Tavoy, Zimba Valley, Nov. R. N. Parker 2244. "Shrub 2.5 m. high in dense evergreen forest. Flowers white pendulous." (R. N. Parker).

***Syzygium lineatum* Duthie** [Myrtaceae].

Known from the Malay Peninsula and Archipelago and possibly Siam.

S. Tenasserim. Maliwun, Victoria Point at sea-level, March, C. E. Parkinson 2035. "Tree 40 feet high. Flowers white."

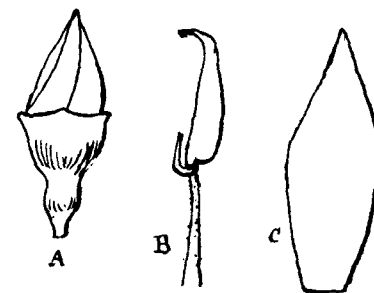
Vernacular name:—*Thabye* (Burmese).

There is also in the Kew Herbarium, a sheet of Helfer's collected in Tenasserim which appears to be this species.

***Pachycentria tuberculata* Korth.** [Melastomaceae].

Known from the Malay Peninsula and Archipelago. S. Tenasserim, Mayinng, Tenasserim River at sea-level, March. C. E. Parkinson 1998. "Epiphytic shrub. Petals white in the upper portions, orange red in the lower part; branches of the inflorescence orange-coloured" (Parkinson).

The leaves attain to 16 cm. long and 6.2 cm. wide, and the petioles to 1.2 cm. long. The rhachis of the inflorescence, the pedicels, and calyx are covered with a fine yellow or orange meal.



Pachycentria tuberculata Korth.

A Bud $\times 4$; B Stamen $\times 7$; C Petal $\times 5$.

Vernonia javanica DC [Compositae].
Known from Java and the Malay Archipelago.
Myitkyina District. Taungin, Mogaung, 1500 ft., March, *Saw Maung Mya* per C. E. Parkinson 2822.

Diospyros brachiata King et Gamble var. **atra** Fischer [Ebenaceae]; a typo foliis floribusque majoribus et inflorescentiae indumento fusco differt.

The type has been reported from the Malay Peninsula. The leaves reach to over 30 cm. long and 10 cm. wide. The flowers are up to 1.6 cm. long, the calyx 0.7 cm. long. The indumentum of the inflorescence, calyx and corolla without is very dark brown, in places almost black. Only the ♂ flowers are present in the specimens received and no fruit. The flowers seem to be all 4-merous and not 5-merous as described for the type, but in the type sheets I find 4-merous flowers also present.

Tenasserim. Banks of the Tenasserim River at sea-level. Feb. C. E. Parkinson 1957. "Tree 50-60 ft. high. Flowers pale-yellow with black pubescence outside corolla" (Parkinson).

Litsea robusta Bl. [Lauraceae].

Known hitherto from Malay Peninsula and the Malay Islands.

Katha District. Namakyaing chaung, Petseit Reserve, 650 ft., April, *Maung Mya* per C. E. Parkinson 2333.

"Tree 44 ft. high, Flowers light yellowish" (Mg. Mya).

Griffiths 4326 (2 sheets in Herb. Kew.) from Burma are also this species.

Reidia gomphocarpa Fischer nov. comb. *Phyllanthus gomphocarpus* Hook. f. [Euphorbiaceae].

Known hitherto only from the Malay Peninsula.

S. Tenasserim. Kyeinchaung forest, 100 ft., Feb., C. E. Parkinson 1937. "Under shrub 2-3 feet high. Flowers yellowish" (Parkinson).

Ficus consociata Bl. var. **Murtoni** King [Moraceae].

Known from the Malay Peninsula and Archipelago.

S. Tenasserim. Victoria Island, at sea-level, March, C. E. Parkinson 2043. "A tree 30-50 ft. high. Figs yellow, sessile."

Quercus Kingiana Craib [Fagaceae].

Known from Siam.

Maymyo Plateau. Wakoye chaung, 3000 ft., Oct., *Maung Ba Pe* per C. E. Parkinson 3188. "Tree 30-50 ft. high."

Vernacular name:—*Wun-tha-bok* (Burmese).

In the ripe fruit the gland is half free. The interior surface of the cupule is densely grey-silky. The gland is depressed-globose or subglobose, glabrous except for the thinly silky apical depression and the short persistent styles.

XXXVIII.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. G. W. ST. C. THOMPSON to be Curator, Game Preservation Department, Tanganyika; Mr. G. F. CLAY, M.C., B.Sc., Agricultural Officer, Uganda, to be Geneticist on the Staff of the Amani Institute, Tanganyika.

We learn that Mr. GEOFFREY EVANS, C.I.E., M.A., has been appointed Principal of the Imperial College of Tropical Agriculture, Trinidad, in place of Dr. H. Martin Leake, who has resigned (*K.B.* 1924, p. 299).

SIR HARRY HAMILTON JOHNSTON, who died at Woodsetts House, near Worksop, Notts, on the 31st of July, had long been a correspondent of Kew. He was born at Kennington, London, on the 12th of June, 1858, and educated at the Stockwell Grammar School and King's College, London. At first he intended to adopt a career as an artist and spent four years in the Royal Academy Schools, some of his pictures being exhibited in the Royal Academy. His artistic ability is shown in his water-colour drawings reproduced in his books mentioned below. In 1879 he visited Tunis to study art and architecture, and from this time onwards his life was connected more or less with Africa.

In 1882 he went to Southern Angola and extended his journey to the Congo, where in 1883 he met Stanley. The plants from this journey reached Kew in September, 1883, and he published his account of this tour under the title of "The River Congo." In 1884 under the combined auspices of the Royal Society and the British Association (chiefly through the influence of Sir J. D. Hooker), Johnston was appointed leader of an expedition to Kilimanjaro, one object of which was to study the subalpine flora, and in 1884 and 1885 he sent two collections from this region to Kew. This mountain had previously been climbed in 1861 and again in 1862, by Baron von den Decken, who once reached an altitude of 14,043 feet, and by the Rev. Chas. New in 1871. The collections of the last named formed the basis of a paper "On the subalpine vegetation of Kilimanjaro," published by Sir J. D. Hooker in the Journal of the Linnean Society (Botany), xiv. 141 (1875). During this expedition Johnston showed his resource by giving a display of fireworks, when the natives were hostile, and was thereafter known as the man who brought the stars down on his enemies. In 1886 he published his results in a volume "The Kilimanjaro Expedition."

In 1887 he sent to Kew the plants collected in the Cameroons, where he had been Vice-Consul, and in 1888 those from the Cross River Expedition. In 1888 he became Consul in Portuguese East Africa, and afterwards made a journey to the south end of Lake Nyasa, and it was at this time that a British Protectorate over

Nyasaland was proclaimed, over which Johnston was Commissioner and Consul-General from 1891 to 1897. Here, largely through his encouragement, large collections of plants were made by John Buchanan (Vice-Consul) and Alex. Whyte, and these have been enumerated in the various volumes of the "Flora of Tropical Africa," as well as by Mr. I. H. Burkill on pages 233-284 of Johnston's "British Central Africa." While in this country he met Cecil Rhodes.

In 1897 Johnston was Consul-General in Tunis, where outside official duties he devoted his attention to the study of Roman Ruins and of the Berber tribes.

Perhaps Johnston's chief work was accomplished in Uganda, where he went as Special Commissioner in 1899 and remained until 1901. Accounts of his administration and pacification of this region, which has now become an important asset of the British Empire and in which many Kew-trained men are now working, have been recorded elsewhere; but in addition he made valuable investigations into the natural history of the country, amongst them being the discovery of the Okapi and, with the assistance of Mr. W. G. Doggett, the vast collection of plants, which reached Kew in 1901. During this period he explored Ruwenzori and the Semliki Forest. On returning to England he wrote "The Uganda Protectorate," published in two volumes, one chapter being devoted to the botany, and pages 329-351 being occupied by a list, compiled by Mr. C. H. Wright, of all the plants then known from Uganda.

Johnston visited Liberia in 1904 and again in 1905-6, the outcome being another book in two volumes, to which Dr. O. Stapf contributed a list of the plants and Miss M. Smith twenty-four botanical drawings. With this Johnston's botanical work appears to have closed, and he devoted himself to writing novels and a book on the Bantu. In 1903 and 1906 he unsuccessfully attempted to enter Parliament as an advanced Liberal, and in 1908 he visited the United States and the West Indies.

Although of small stature, Johnston possessed vast energy, which enabled him not only to carry out great undertakings himself, but also to stimulate others to similar efforts. His work brought him many honours, amongst them being the C.B. in 1890, K.C.B. in 1896, G.C.M.G. in 1901, Doctorate of Science of Cambridge, and medals from many learned societies.

C. H. W.

CHARLES FORD.—We learn with great regret of the death at the age of 83 of Mr. Charles Ford, I.S.O., for 32 years Superintendent of the Botanical and Afforestation Department of Hong Kong. His appointment in 1871 was on the recommendation of Kew, and it was one of Ford's chief objects all through his time in China to obtain fine and interesting plants from the neighbourhood of Hong Kong and to send them back in Wardian cases to the Royal Botanic Gardens, Kew. No better indication of the success of this part of his

work could be found than in the dedication to him by Sir Joseph Hooker of volume 50 (1894) of the Botanical Magazine because so many interesting and beautiful Chinese flowers introduced by him had been figured therein. The Hong Kong Gardens and the afforestation of the island practically grew up under his eye. It was in fact largely due to his remarkable enterprise and energy that the colony became such a pleasant place to live in. Among the many works of which he never lost sight was the establishment of a fine herbarium of Chinese plants which has been maintained in good condition up to the present time.

During the whole of his service he was in constant touch with Kew, the succession of his official letters was continuous and the annual exchanges of living plants, seeds and herbarium specimens show what was the centre of his horticultural and botanical aims.

S. T. D.

THE REV. JOHN ROFFEY.—We regret to record the death of the Rev. John Roffey, which occurred suddenly on July the 1st while on a holiday at Riva-sul-Garda, Tyrol. Mr. Roffey graduated B.A. at Oxford in 1884 and proceeded to M.A. in 1888. Ordained in 1885, he became curate of Long Eaton, Notts, and after holding several clerical posts in the same county he came to London in 1894 and in 1924 became a Licensed Preacher in the diocese of Southwark, at the time of his death being attached to St. Alphege, Southwark.

Although he was a keen student of British plants, he published very little. Most of his work was done at the British Museum, but during recent years he has been a frequent visitor at Kew, where he was as recently as June 10th. His attention was concentrated chiefly on the genus *Hieracium*, of which he compiled the list of species for the 1925 edition of the London Catalogue, and in the Journal of Botany for the same year, pp. 315-322, he published critical notes on that list.

C. H. W.

Royal Botanic Gardens, Trinidad*.—The new illustrated Guide has been written by Mr. R. O. Williams, the Superintendent. In a brief Introduction he traces the history of the Gardens from their foundation in 1818. The general arrangement of the Guide is the description of each Section of the Gardens in turn, the principal trees and plants being mentioned together, with notes of general and economic interest.

The Sections are bounded by the principal roads through the Gardens, and by reference to the Key Plan at the end of the Guide the position of any plant or point of interest can be easily ascertained. From the site of "The Cottage," where Charles Kingsley in 1869-1870 wrote "At Last," many of the trees which he described can

* Guide to the Royal Botanic Gardens, Trinidad, by R. O. Williams, The Government Printer, Port-of-Spain, Trinidad, 1927. Pp. vi. 30, plates xii, map 1. Price 1s.

still be seen. The photographs give general views of the Gardens and also illustrate trees and palms of special interest. By means of the Index ready reference can be made to any particular specimen and its location, and the Guide will prove a useful companion to visitors.

Tree Euphorbias in South Africa as a Source of Rubber and Resin.—An article, entitled "Eenige opmerkingen over exploitatie van Euphorbia's in Zuid-Africa; winning van hars en caoutchouc" by Ir. W. Spoon*, which has recently been published in pamphlet form, gives an account of attempts in past years at commercial rubber-production from wild tree Euphorbias in South Africa and points out some of the difficulties that have to be faced. A large number of references to the subject including analyses and reports on Euphorbia rubber and resin are given in the opening pages.

The most important species referred to from the rubber-yielding point of view are *Euphorbia Tirucalli* L. (Natal chiefly), *Euphorbia Dregiana* E. Mey. (Namaqualand chiefly), *Euphorbia grandidens* Haw. and *Euphorbia tetragona* Haw. occurring chiefly in the Eastern Cape Province. It is interesting to note that a certain amount of preliminary experimental tapping has already been done, enabling conclusions to be formed as to the probable behaviour of the trees if run on plantation lines. It has been demonstrated, with *Euphorbia Tirucalli* for instance, that there is no wound response, consequently tapping cannot be carried out at short intervals. A suitable age for tapping is thought to be about five years and according to Noyes the system likely to give the best results is the "half herring bone." For this five or six oblique cuts spaced not less than nine inches apart and at an angle of 75 to the perpendicular cut should be made. For tapping ordinary tapping knives may be used, and as in *Hevea* care has to be exercised not to injure the cambium. Difference of opinion exists as to how frequently tapping should be done: forty times per year being one of the figures put forward. With regard to yield, Noyes estimates with *E. Tirucalli* an average daily yield of 20 lbs. of latex from 80 trees, which works out at 100 gms. of latex per tree per tapping. Tapping figures from the Kingwilliamstown (Cape) and Greytown (Natal) districts are given. From these it would seem that *E. grandidens* and *E. tetragona* may be expected to give a much higher yield than *E. Tirucalli*.

In sections 3 and 4 of the pamphlet the composition of latex and coagulum is discussed. One of the most striking features from the figures given is the high percentage of resin present in the latex of all the *Euphorbia* species investigated. The resin content is in fact generally several times greater than that of caoutchouc, and varies

as would be expected with different species. The proportion of resin to caoutchouc in *E. Tirucalli* is 11 to 2 and in *E. tetragona* and *E. grandidens* it is found to be about 3 to 1. The percentage of resin in a sample of latex from young trees (in the Transvaal) is given at 46 per cent. as against 29 per cent. for older trees from the same source. This suggests the interesting possibility of an abnormally high resin content being peculiar to young trees; a problem which subsequent investigation will no doubt solve. The best coagulant, at least in so far as *E. Tirucalli* is concerned, is stated to be tannic acid. The working up of the coagulum, which is pale yellow or greenish in colour, to a commercial product is stated to present no very great difficulty. Methods whereby the resin can be separated from the caoutchouc are described and the advantages of effecting this separation in South Africa instead of exporting the crude coagulum are outlined. The Euphorbia resin is described as brittle, not altogether transparent, with colour varying from yellow to dark brown. Opinion differs considerably as to the commercial value of the resins. This may be due in a large measure to mixing of the latex of different species in the samples that have been reported on, as in many of the reports no indication is given of the species concerned and it is known that in many areas different rubber-yielding Euphorbias grow intermixed. With regard to the quality of the rubber, that from *E. Tirucalli* has on several occasions been reported to be poor and very much lacking in elasticity, but that of *E. grandidens* and *E. tetragona* is reputed to be superior and is considered by Ph. Schidrowitz to be worth from 70-80 per cent. of the value of first grade plantation rubber.

It is pointed out that owing to the uneven distribution of the trees and the fact that tapping can only be done periodically the factories or depots for receiving and working the latex would probably have to be transferred to new tapping areas from time to time. This, however, would not apply to the central factory dealing with the separation of the resin from the caoutchouc, which would be centralised. This factory would have more extensive mechanical installations and would need to be near a suitable water supply, and if possible cheap source of power. The companies which started exploitation of Euphorbia rubber during the period 1910-1915, and which proved unsuccessful exported their product in the form of crude coagulum (resin and rubber). It is the proposal of present undertakings to effect separation of resin and rubber in South Africa and therefore to market two distinct commodities. With the improved methods that have been devised since the earlier attempts in commercial production were made, it seems possible that greatly improved products should result. Naturally for success much will depend upon the quality of these products, the practical usefulness of which has not yet been fully demonstrated. F. N. H.

* Berichten van de Afdeling Handelsmuseum van de Kon. Vereeniging Koloniaal Instituut. No. 32. Obtainable from Kon. Ver. Koloniaal Instituut (Centrale Boekerij), Mauritskade 62, Amsterdam.

Genera of South African Flowering Plants*.—Until a few years ago botanists in South Africa were not very well provided with literature relating to their varied and interesting flora. Harvey's "Genera of South African Plants," the last edition of which appeared in 1868, was practically out of date, as well as the earlier volumes of the "Flora Capensis," a work only recently completed. In 1915, however, the English edition of Thonner's "Flowering Plants of Africa" was published, and proved a great boon to workers in Africa away from large herbaria. This contained in key-form descriptions of all the known genera of plants of the whole African continent, including North Africa and the Mascarene Islands. Dr. Phillips has now carried out a similar plan and has provided a book devoted only to the South African genera of flowering plants. In addition to the analytical keys, however, he has given a detailed description of each genus, thus rendering reference to other works unnecessary. The present volume is about equal in size and weight to Thonner's work, and will no doubt prove rather too large and heavy for general field work. In consequence it would appear desirable for the key-portion to be issued as a separate booklet.

The families and genera are arranged after the System of Engler and Prantl. Although the author states in his preface that the subdivision of the families into tribes follows the arrangement in the later volumes of the "Flora Capensis" and Bentham & Hooker's "Genera Plantarum," this is not the case with some families such as *Leguminosae*, *Euphorbiaceae* and *Gramineae*. For the benefit of students it would have been preferable to have followed either the one or the other system without modification.

Dr. Phillips has accepted *en bloc* and apparently without question the numerous genera separated from *Mesembryanthemum*† by Mr. N. E. Brown, so that South African botanists will now have an opportunity of observing whether they be tenable in the field. This question of *Mesembryanthemum* and its segregate genera will probably provide a battle-ground for Cape botanists for many years to come.

It is difficult in a book of this kind to avoid a certain number of misprints such as occur on p. 57, where *Brachiaria* is misspelt four times. Dr. Phillips deserves the thanks of all students of the flora of South Africa for this most useful book, the compilation of which must have involved a great amount of labour and patient research.

J. H.

* The Genera of South African Plants; by E. P. Phillips. Botanical Survey of South Africa, Memoir No. 10. Cape Times Limited, Cape Town, 1926, pp. 702. 20s. net.

† This is the original and correct spelling of the name, not *Mesembrianthemum*.

BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1927 ROYAL BOTANIC GARDENS, KEW

XXXVIII.—GOSSYPIUM. SIR GEORGE WATT.

The following notes (continued from *Kew Bulletin*, 1926, page 210) complete the observations, intended to be here offered, on certain specimens of Cultivated and Wild Cottons, preserved in the Herbaria of the Royal Botanic Gardens of Kew and Edinburgh. [The references cited below are to Watt's Wild and Cultivated Cotton Plants of the World.]

SECTION I.—SPECIES WITH FUZZ BUT NO FLOSS: BRACTEOLES FREE.

G. Stocksii Mast.; Watt, l.c. p. 73, plate 6.
INDIA, Sind. A wild species.

SECTION II.—SPECIES WITH BOTH FUZZ AND FLOSS: BRACTEOLES UNITED.

*Leaves $\frac{3}{4}$ rd palmately (sometimes almost pedately) 3-7-lobed: lobes curvilinear, bristle-tipped: base distinctly cordate, usually central vein only with a gland.

Gossypium anomalum Watt, sp. nov.

Ramuli teretes, leves, glabri, canescentes, punctis minutis inconspicuis. *Folia* levia, canescentia, rotundata, subcordata, acuta, in 3-7 lobos angustos curvilineares profunde incisa, lobo medio lateralibus longiore, sinibus elevatis, costa in petiolum decurrente; glandulae infra nervos 1-3 sitae; lobi exteriores saepe lobulis supernumerariis instructi; petiolus lobo medio brevior. *Ramuli floriferi* 1-2-flori, axillares. *Bracteolae* breves, ovatae, cordatae, subliberae, conniventes, superne 3-5 dentibus brevibus, punctis glandulosis fere carentes, cordaturis etiam eglandulosis. *Petala* flava sine maculis purpureis. *Semina* atra, lana duplici vestita, brevior ("fuzz") basin et apicem seminis tantum vestiente, longior ("floss") brevi alba sericea.

AFRICA. "Chickenfoot"; seeds selected from Chinese Cottons and grown at Giza, Cairo (C. 853 and C. 854).

Twigs round smooth glabrous and canescent, dots minute and inconspicuous. *Leaves* smooth canescent, rotund, the older ones sparingly cordate acute, deeply incised into 3-7 narrow curvilinear lobes, much as in *G. arboreum* var. *neglectum*, central lobe a little longer than the laterals and with the sinuses thrown up, central vein running through into the petiole; glands 1-3 on veins; lower pair of lobes often bear supplementary teeth; petioles a little shorter

than the central lobe. *Inflorescences* 1- or 2-flowered, axillary. *Bracteoles* short, ovate cordate almost free, but connivent and bear 3-5 short teeth on the apex, almost devoid of gland-dots, and glands within the cordature also absent. *Flowers* yellow, without purple spots. *Seeds* black but with an imperfect tuft of fuzz at both ends, *floss* short white silky.

At first glance this looks like a glabrescent and canescent *G. arboreum* var. *neglectum* but on closer study is recognisable as a distinct species (or a distinctive hybrid). The seed is most remarkable being quite unlike that of any other Asiatic cotton and the bracteoles are almost free. Indeed it might have to be placed with the naked seeded cottons though in most respects it is an Asiatic form. It brings to mind the plant dealt with by me (Watt, l.c. p. 153) under the name of *Tellapatti*, a cotton which in South India is sometimes called the Black-seeded *Jowarihathi*, a hybrid stock, very possibly a cross between Uppam and Bourbon. The anomalous Chinese cotton would appear to be a cross between *G. arboreum* var. *neglectum* x *G. purpurascens* (Bourbon cotton) and is well worthy of special consideration.

SECTION III. FUZZY-SEEDED COTTONS WITH FREE BRACTEOLES.

Leaves generally large, 3-5 or 7-palmatifid, pilose, rarely tomentose, or still more rarely glabrous: *peduncles* thicken upwards and usually carry conspicuous external and internal glands: union of the *bracteoles* (when met with) seems a consequence of hybridisation, otherwise they are quite free: *seeds* large with a distinct and mostly complete fuzz and firmly adhering *floss*.

American, West Indian and African species (none of them Asiatic); they constitute a parallel assemblage to the Asiatic Cottons of Section II.

**Leaves* broad, pilose-tomentose (rarely glabrescent), one-half segmented on the apex into 3 (imperfectly and only occasionally 5) ascending lobes, the lobes broad triangular: *petals* mostly with purple claws.

†*Leaves* thick granularly tomentose; *bracteoles* with long linear ciliate teeth; capsule 3-celled.

G. mustelinum Miers; Watt, l.c. pp. 167-8, plate 26.

Twigs, peduncles and petioles purple, angled. *Leaves* broad thick leathery, 3- (very occasionally 5-) lobed, 3 inches long by 4-5 broad, lobes broad, the centre one often 2 inches across, oblong-deltoid acute granularly tomentose and matted especially on the under surface of the young leaves, sinus between the lobes open spreading, leaves of the flowering branchlet often small entire ovate-oblong acute hardly cordate but sometimes 2-lobed and borne on short slender petioles, glands prominent on one or three nerves. *Bracteoles* ovate-rotund free auriculate and with long narrow linear ciliate teeth, the lower pair often seemingly thrown across the cordature, gland within the cordature not very distinct, on the calyx none.

Flowers very large. *Calyx* loose campanulate, cut square across or undulate. *Corolla* tomentose externally, yellow with purple claw and becoming tinged purple. *Capsule* short 3-celled prominently beaked. *Seeds* with coarsely formed fuzz white green or rusty which, in cultivated states, often becomes reduced to a rusty tuft around the beak. The seeds usually free but in certain hybrid forms seem to adhere in consequence of the firm interlacing of the floss.

A wild species only recently identified as met with under cultivation and some of the specimens of which have hitherto been placed under the allied species, *G. peruvianum*. Leaves thick granularly tomentose (in cultivated hybrids sometimes becoming almost glabrescent), 3- (rarely 5-) lobed with the sinus open wide and not thrown up in a fold, bracteoles rotund, at first small with short teeth, but enlarging rapidly as the fruit forms and then having long narrow linear ciliate teeth, capsule ovate beaked 3- (sometimes 4-) celled, seeds with coarse fuzz.

SOUTH AMERICA. The type of the species may be said to be the plant collected in 1838 in Ceará, Brazil, Gardner, 1463, and stated by him to have been found in the woods; also Colombia in 1853, Holton, 749. The cultivated forms, recently identified, extend the area very considerably.

The following have to be placed under this species:—*Sparingly tomentose forms*; the plant collected by Mr. Jose Maria Fernandes at Maranhao Coroata, Brazil (1, 2 & 4 of 18th May, 1922), of which he remarks that the fuzz is confined to the apex of the seed and that the capsule is sometimes 4-valved (leaves less tomentose than in the type, lobes bristle-tipped, stipules linear, flowers large); also in Bolivia by Dr. Otto Buchtien, 3220. Then crossing the Atlantic the same plant re-appears in Africa. The Director of Agriculture, Ibadan, N. Nigeria (Dec. 1913) sends it as one of the forms of the cottons there known as *Meko* and Mr. W. H. Johnson found it cultivated in Moçambique (8 of 21st Oct., 1906). He speaks of it as attaining a height of 6 feet and adds that the young leaves show oil glands.

It would seem highly probable that *G. mustelinum* has contributed to the formation of some of the cultivated pilose cottons often placed under *G. peruvianum*, *G. brasiliense*, *G. microcarpum*, and possibly also of *G. hirsutum*. The forms with broad thick (leathery) 3-lobed leaves, more especially those which show a tendency to glandular hairs, are doubtless traceable to this species. The variability of the seed, from a coarse though complete fuzz to a black and seminaked condition, with a tuft of fuzz around the beak, and so again the seeds free or agglutinated, are features that occur so frequently as to render the separation of *G. microcarpum*, *G. peruvianum*, *G. brasiliense* and even *G. barbadense* often extremely difficult. Nevertheless a glabrous condition of foliage, in association with a naked (or practically naked) seed (whether agglutinated or free) and where the floss separates readily from the seed, are the best

eye-marks in the determination of *G. barbadense* from *G. peruvianum* and its associates.

†2. Leaves trifid (3 triangular lobes) veins 5, prominently arching upwards, sparsely coated below with strong hyaline stellate hairs; dots inconspicuous; bracteoles deeply gashed, teeth linear and with the veins prominent, becoming glabrous: capsule rotund 4-celled apiculate: seeds large irregular with fuzz and floss rufous.

Gossypium nervosum Watt, sp. nov.

Folia versus apices ramulorum approximata, parva, 2.5-4 cm. longa, ovato-rotundata, breviter cordata, indivisa vel breviter triloba lobis triangularibus, obscure punctata, subtus et marginibus pilis firmis stellatis hyalinis induta praesertim inferne; nervi 5, sursum conspicue arcuati, eglandulosi vel nervus medius tantum glandulam infra gerens; petiolus quam lamina longior, stellato-pilosus; stipulae parvae, lineares, mox caducae. *Ramuli floriferi* breves, compacti, acute angulati, internodiis brevibus, cicatricibus prominentibus, purpurei, praecipue versus apices villosi; pedicelli breves, crassi, triangulares, apice glandulis crassis intra bracteolarum cordaturas sitis. *Bracteolae* liberae, sessiles, auriculatae, apice profunde incisae, dentibus longis linearibus apice ciliatis, dente medio ceteris multo longiore paene lineari; nervi valde prominentes primo stellato-pilosi deinde glabri. *Calycis dentes* triangulares, acuminati. *Capsula* rotundata, 4-locularis, valvis planis subito apiculatis. *Semina* magna, irregularia, erostrata, lana rufa duplici vestita, longiore ("floss") firme affixa, aspera, sparsa.

AMERICA. This, which would appear to be a wild species and presumably a small densely branched bush, was collected 20th April, 1910, by Dr. Edward Palmer 351 (type) in the vicinity of Panuco, Vera Cruz, Mexico.

Leaves clustered on the extremities of the twigs and flowering-spurs, small, 1 to 1½ inches, ovate-rotund, slightly cordate, entire or shortly 3-lobed, the lobes triangular, veins 5 prominently arching upwards, surface only obscurely punctate, glands on the veins usually none but sometimes one on the central vein, sparsely coated below, and on the margin, with strong hyaline stellate hairs, especially at the base and along the petiole which is longer than the blade: *stipules* small, linear, early caducous. *Flowering-spurs* short, compact, sharply angled, with short internodes and prominent leaf-scars, purple coloured and, especially near the extremities, bearing shaggy hairs: *pedicels* short thick triangular, terminating in thick glands within the cordatures of the bracteoles. *Bracteoles* quite free, sessile, auriculate, deeply gashed on apex, teeth long linear, with the tips ciliate, central tooth much the longest and nearly linear, veins very prominent and stellately hairy but becoming glabrous. *Calyx* teeth triangular, acuminate. *Capsule* rotund, 4-celled, valves flat suddenly apiculate: *seeds* large irregular coarse, not beaked; *fuzz* and *floss* rufous, the latter firmly adhering, harsh and scanty.

The plant collected by A. H. Curtiss in Key West, Florida, (5655, May 11th, 1896) and named by him as *G. uliginosum* Linn. may be this species. So also Mr. Lyster H. Dewey 11, from the Experimental Grounds of Georgia, which he calls "King" and speaks of as an early drought-resisting variety, may be a cultivated state of *G. nervosum*. In some respects it approximates to *G. Darwinii* Watt; the bracteoles being quite free would bring it into Section I.

†3. Leaves villous (especially below), 3-lobed, sinus flat open, often conspicuously punctate; bracteoles with the teeth fimbriate; capsule mostly 3-celled: seeds large with grey or rust coloured fuzz.

G. punctatum Sch. et Thonn.; Watt, l.c. 168-182, plates 27 and 28.

Twigs, peduncles and petioles slender smooth round, purple-tinted: shoots, young leaves, and bracteoles stellately hairy, the hairs long and spreading but becoming less abundant on maturity, generally conspicuously punctate. *Leaves* often pilose on the veins and petioles, *upper leaves* ovate-cordate, entire, slightly longer than broad, 3- (or in cultivated states and hybrids 5-7) nerved, the middle one running straight through into the petiole and carrying an excavated gland: *lower leaves* one-third segmented, on the apex, into 3-5 (or in hybrids 5-7) ovate deltoid lobes.

A large woody shrub with twigs quite round; a wild species but one which is met with under cultivation and often completely acclimated or even ferine. In cultivated states it merges, in the hairy forms, into *G. hirsutum* and, in the glabrous, into *G. mexicanum*. With regard to the segmentation of the leaf: broad-leaved forms, with the lobes only triangular teeth, are suggestive of *G. mexicanum* (and sometimes even of *G. purpurascens*): intermediate states, with 3 (or occasionally 5) ovate lobes on the apex, approach very closely to *G. hirsutum*: while the more deeply segmented forms can often, with difficulty, be distinguished from *G. peruvianum*.

It may be helpful to contrast the diagnostic features of this plant with those of *G. hirsutum* as follows:—

Gossypium punctatum Sch. et Thonn.

Leaves ovate-oblong 3-lobed, the lobes deltoid acute sinus flat open, pale green, stellately villous on the veins, the hairs often long and spreading but becoming less abundant on maturity, veins ascending, upper leaves ovate frequently entire slightly longer than broad, faintly cordate, middle nerve carries a large excavated gland. *Flowers* medium-sized wide from a short tube, yellow with small irregular purple spot and pink tinge. *Bracteoles* membranaceous in certain forms glabrous and fimbriate ovate-oblong, deeply auricled with 9-11 rigid ascending teeth the central one much the longer but not accrescent. *Calyx* large loose truncate entire or rarely toothed still more rarely tailed. *Capsule* ovate oblong suddenly and sharply beaked 3-4 celled. *Seeds* very large bent and irregular: *fuzz* abundant coarse grey to rust coloured: *floss* white and silky.

Gossypium hirsutum Linn.

Leaves ovate, 3- (occasionally 5-)lobed, the lobes ovate-deltoid acute, sinus thrown up in a fold, coarse brownish-green, persistently hirsute (often glandularly) and dust coated, veins spreading, cordate, sometimes almost auricled, upper leaves soon lose the habit of being entire and are mostly 3- (occasionally 5-)lobed. *Flowers* small to large yellow with purple tinge rarely (and only in hybrids) with purple spot on the claw. *Bracteoles* ovate with many narrow flaccid teeth. *Capsule* usually 4-celled. *Seeds* large coarse often with green fuzz and floss woolly.

There may be said to be two varieties of *G. punctatum* :—

(I) var. *nigeria* Watt, l.c. 170, plates No. 27A and 28A.

Leaves softly tomentose to pilose, ovate-cordate acute or acuminate, entire or shortly 3-lobed, the lobes divergent, margins often stained brown, stipules large ovate-oblong-awled. *Bracteoles* small ovate acute toothed round the upper half. *Flowers* small, not much larger than the bracteoles, pale yellow, sometimes with a purple spot on the claws or purple-tinted. *Calyx* teeth acute or tailed (in hybrids often truncated). *Seeds* large with white or rufous fuzz and scanty white floss.

This would appear to be mainly an African plant and very possibly the ancestor (or one of the ancestors) of *G. hirsutum* Linn. *G. punctatum* in all its forms, may be described as an exceedingly variable plant. In the case of variety *nigeria*, departures are common in degree of hairiness, until some forms have to be described as almost glabrescent; departures are frequent in the shape of leaf and length of the petiole; so again departures occur in the form of the calyx from tailed to acute or even truncate; and departures both in texture and colour of fuzz and floss are common until a rufous worthless staple is ultimately met with, in the wild or ferine forms. This variability, however, has given rise, no doubt, to the diversity found among many of the cultivated stocks, and given birth to some of the most important staples of modern commerce. In fact it would appear almost certain that this plant is closely connected with the success attained in the U.S.A. in the production of Short Staple and Upland cottons.

The following recent collections may be specially mentioned :—

TROPICAL AFRICA. N. Nigeria, the Kano annual cotton, known in the Hausa language as *Labai*; P. H. Lamb (2nd May, 1913, no. 15), speaks of it as “? semi-wild *G. hirsutum*.” The flowers are small hardly exceeding the bracteoles and the calyx is cut square across; a specimen, contributed by the Imperial Institute and which came from North Nigeria, 1258/13, collected at Kazauk in February 1913, has large purple tinted flowers and with the calyx teeth terminating in long linear tails while the seeds are large with a distinct tuft of rufous fuzz and a long white silky floss. A sample from N. Bank, Gambia (communicated by the Imperial Institute), collected in Jan. 1909 has the brown tinted foliage of *G. hirsutum* but the calyx is truncate (not even toothed) and the seeds large

coarse, densely coated with rufous fuzz and a short inferior floss. It would appear to exist both wild and cultivated. The plant has also been sent to Kew by the Agric. Department of the Gold Coast where it is known as *Sagai*. It has khaki lint and fuzz and was collected by F. N. Howes 1100 dated Jan. 1926. Specimen contributed by W. H. Johnson III, from the Anum Cotton Farm, Gold Coast, is spoken of as “probably introduced many years ago.” It is a hybrid of *punctatum* x *mexicanum*.

A collection of specimens made by the Director of Agriculture, Ibadan, N. Nigeria, raised mostly from imported American seed is as follows :—American Upland, Georgia, is *G. punctatum* var. *nigeria*: Long Staple American Griffin is *punctatum* var. *nigeria*: Mebane “introduced” is *G. punctatum* var. *nigeria*: Long Staple American Allen is *G. punctatum* var. *nigeria*: Upland American, introduced from Nyasaland is *G. punctatum* var. *nigeria*.

EGYPT. Dr. W. Lawrence Balls, 209-3—the Moqui cotton, as grown in Egypt is *G. punctatum* var. *nigeria*: N. D. Simpson, C. 283 said to be “Nigeria indigenous,” is a hybrid, very possibly, of this variety with *G. mexicanum*. It has the pilose (almost felted) condition of var. *nigeria* with the broad leaf and small yellow flowers of *G. mexicanum* Tod., but the leaves are deeply segmented into 5 long deltoid acuminate lobes, the veins of which often carry more than one gland and the petioles are greatly elongate and faintly winged: mention may also be made of Simpson C. 289 described as “Nigeria exotic.” This is nearer, botanically, to variety *nigeria* than is the co-called “Nigeria indigenous.”

INDIA. Watt 13819 collected at Sauner, Nagpur, C.P.—a plant that much resembles Mollango cotton: Duthie 12312 collected at Gilgit, Kashmir (where it is known as *Keas*), the same form apparently, viz., var. *nigeria*: lastly a specimen discovered by R. P. Mehta 1749, at the Bhavnagar Exper. Farm, may be described as having bractlets protecting the internal glands. It is a hybrid of *punctatum* x *hirsutum*.

SIAM. Dr. Kerr sends a sample (8035) which he says is there known as *Fai Chan* and is cultivated.

(II.) var. *jamaica* Watt, l.c. 170, plates 27B and 28B. (Is strongly suggestive of *G. Birkenshawii* mihi). *Leaves* sub-glabrous (petioles sometimes pilose) more deeply lobed than in var. *nigeria* and stipules small linear awled. *Bracteoles* ovate-oblong acuminate gashed on the apex. *Calyx* teeth triangular acute or dentate. *Corolla* longer than the bracteoles, deep purple tinted. *Seeds* small irregular with rust coloured fuzz and a small quantity of dirty white wool.

An American or West Indian plant and one of the ancestors, very probably, of *G. mexicanum* Tod.: collected by Jose Maria Fernandes Maranhao, Coroata (3, 1916): Jamaica by Dr. McNab: Jamaica “ex legato Alexander Prior, April, 1903, cultivated”: A. H.

Curtiss (135, March, 1903) found near Nassau, N. P., Bahamas : and J. Brown-Lister (59, 1901) Gambia Boundary Commission.

†4. Leaves coarse, brownish green 3- or 5-lobed, sinus thrown up in a fold, persistently hirsute (often glandular and dust-coated) veins spreading; flowers medium and purple tinged. Bracteoles ovate with many narrow flaccid teeth. Fruit 4-celled. Seeds large coarse often with green fuzz.

G. hirsutum Linn. ; Watt, l.c. pp. 183-200. plates 29, 30 and 31.

The Green Seeded Cotton, New Orleans, Georgian, Short Staple American, Saw-ginned Dharwar, the only American cotton acclimatised in India, &c., is practically only a cultivated state of *G. punctatum*.

A coarse, stunted, much branched, erect, greenish-red, with leaves bronzed on margin, dust coated bush, the last mentioned peculiarity being in consequence of the abundance, length and strength of the hairs with which the shoots, leaf-stalks and veins are clothed. The hairs are, in fact, sometimes glandular. Twigs coarse thick strongly angled and furrowed. The leaves rapidly lose the habit of being entire, and become, across the apex, one half segmented into 3 lobes, and, as the result very possibly of hybridisation or simply of luxuriant cultivation, sometimes even become partially 5-lobed and occasionally even auricled. Flowers yellow becoming purple-tinted but not, as a rule, possessing purple blotches on the claws. Capsule usually 4-celled. Seeds always large, coarse, ovate truncate and with a pronounced and coarse fuzz of a greyish rusty or green colour, the green colour fading into grey with age, floss woolly.

The following examples may be mentioned :—

GREECE. A plant (named *G. indicum* Lam.) is almost pure *G. hirsutum*

SIAM : Dr. Kerr 10089. COCHIN CHINA : L. Pierre 390. CHINA : Yunnan West, Tali Range, 7,000 ft. *G. Forrest* 11554 (cultivated) is a hybrid of *G. hirsutum* x *mexicanum*.

INDIA. Watt 21828, Manjri Farm, Poona : Bangalore, 4 : Akola, Berar, 1780A : Bhavnagar, 1750 : Ellichpur, 10513 : Jameson, Saharanpur (1849) said to be "*G. arborescens*" x "*G. aegypticum*."

TROPICAL AFRICA. S. Simpson 2, said to be "cultivated as a perennial near Ediva, Mossamedes, Angola, and originally imported from America"—is typical : H. H. W. Pearson 2009, said to be "the American King," and cultivated near Ediva, S. Angola : from the Director of Agriculture, Ibadan, N. Nigeria, 2281-15, leaves tending to become 5-lobed and bracteoles with very long flaccid teeth; the Director sends also a series of American cottons grown in Ibadan such as "Jones' Improved" (= *G. mexicanum* x *hirsutum*) : Truitts Big Boll (*G. hirsutum* x *mexicanum*) : Hawkins Extra Prolific (*G. hirsutum* x *mexicanum*).

AMERICA. U.S.A. ; Mr. Lyster H. Dewey contributes a specimen of Mexican cotton, grown in Washington from seed procured from

Durango, Mexico, which is a hybrid of *G. mexicanum* x *hirsutum*; lastly Mr. Dewey 616, which he names Hinganghat, comes very near to Molango and is *G. hirsutum* x *G. punctatum* var. *nigeria*.

EGYPT. W. Lawrence Balls 50 (Dec. 1906) said to be American Upland-Southern Hope, is more glabrous than in typical *G. hirsutum*.

C. 62—"Cyprus II."—*G. hirsutum* is suggestive of some of the so-called Meko cottons : C. 73—*G. hirsutum* x *mexicanum* or *peruvianum*—known as Cambodia, seed obtained from C. P. Ind., grown in Egypt : C. 81—*G. hirsutum* hybrid x ? *punctatum*—known as "Webb," seed obtained from Texas : C. 97—*G. hirsutum* x *mexicanum*—known as "Nigeria Exotic," is suggestive of *G. punctatum* : C. 98—*G. hirsutum* x *mexicanum* or *punctatum* (almost glabrescent), flowers small, seed procured from Nyasaland : C. 99—"Bhuri"—*G. hirsutum* var. : C. 119—"American King I",—is *G. hirsutum* x *punctatum*—strongly *punctatum*; C. 131—"Durango," *G. hirsutum* x *mexicanum* x *G. punctatum*, is very like "Cluster cotton" : C. 132—*G. hirsutum* x *peruvianum*; known in Egypt as "White Brazil" : C. 135—*G. hirsutum* x *mexicanum* Russel Big Boll; has very large seeds, irregular, with grey-brown fuzz : C. 285—"Darwar II"—*G. hirsutum* Linn. (very near C. 99).

C. 781—*G. hirsutum* x *mexicanum*, "Amrit" : C. 788—*G. hirsutum* x *mexicanum*, Gold Coast : C. 796—"Lightning Express," is *G. hirsutum* with suspicion of *G. punctatum*; seed Cocker's pedigree : C. 797—*G. hirsutum* x *mexicanum*—known as Dixie II; Cocker's Pedigree Seed : C. 798—*G. hirsutum* x hybrid? with *G. vitifolium*; (seed with grey-green fuzz); "Webber 49"; Cocker's Ped. Seed : C. 800—*G. hirsutum* x ? *mexicanum* or *purpurascens*—known as Cleveland III; Cocker's Ped. Seed : C. 802—*G. hirsutum* x *mexicanum*; "Mexican Big Boll VI," from Cocker's Pedigree Seed (leaves large, sinus deeply infolded; flowers large; bracteoles oblong, teeth few, coarse; seeds large coarse white-grey fuzz and good floss) : C. 803—*G. hirsutum* x *mexicanum*; named "Trice I 1/16"; Cocker's Pedigree Seed; is probably the same as C. 131 and C. 135.

C. 820—*G. hirsutum* ? x *peruvianum*—known as Tendric No. 2 B (pilose form) : C. 825—*G. hirsutum* x *mexicanum*—said to be "Nigeria Indigenous" (826 B is glabrous form, a hybrid? *mexicanum* x *hirsutum*); seed obtained from Empire Cotton Growing Committee, 1920 : C. 829—*G. hirsutum* x *mexicanum*—known as Durango Cotton; C. 830—*G. hirsutum* x *mexicanum* known as Durango Cotton; C. 831—*G. hirsutum* (typical)—known as "Webber 49"; Cocker's Pedigree Seed : C. 835—*G. hirsutum* x *mexicanum* named "*G. hirsutum* v. *nankin*"—but no trace of *G. nanking* Meyen : C. 836—*G. hirsutum* x *mexicanum*, named "*G. hirsutum* v. *nankin*," no trace of *G. nanking* Meyen.

†5. Leaves small entire or 3-lobed, sinus shallow open, glabrous; petioles longer than the blades; glands of the veins absent; flower small yellow, tinged purple; seeds coarse, with rufous fuzz and dirty oily floss.

Gossypium Birkinshawii Watt, sp. nov.

Planta tota glabra; ramuli ascendentes, recti, subteretes, cortice saepe longitudinaliter fissis, punctis nigris in innovationibus conspicuis inferne inconspicuis; ramuli pedunculi petiolique purpurascens. *Folia* ovata, cordata, acuta, integra vel 3-lobata, lobis latis triangularibus interdum acuminatis, sinibus apertis, glabra vel juvenilia supra breviter irregulariterque pilosa; nervi 3-5 eglandulosi; petiolus laminae aequalis, rotundatus, glaber, conspicue nigro-punctatus, demum verrucis atris elevatis tectus; *stipulae* parvae, lineari-lanceolatae, eae pedunculorum breves, latae, lunatae. *Flores* solitarii, ramulos breves unifolios axillares secus ramos dispositos terminantes. *Bracteolae* ovatae, apice profunde incisae dentibus lanceolato-subulatis, extra glandulis inconspicuis instructae, intus eglandulosae; pedicelli pedunculis multo breviores. *Calyx* dentibus quadratis abrupte minuteque apiculatis. *Petala* breviter, flava, purpureo-tincta, ultra bracteolas $\frac{1}{2}$ producta, extra breviter tomentosa. *Capsula* rotundata, acuminata, 4-locularis. *Semina* lana duplici vestita, brevior ("fuzz") pro rata longa dense rufo-villosa, longior ("floss") sordida oleosa. *G. punctatum* Schum. et Thonn. var. *jamaica* Sprague in Kew Bull. 1914, p. 199, non Watt.

WEST INDIES. Mr. Birkinshaw speaks of the plant as rather straggly and from $3\frac{1}{2}$ to 5 feet in height. It was found (Jan. 15th 1915) growing wild on the cliffs about Billy Hole, near Point de Jour, Canouan, St. Vincent, West Indies (type).

This interesting wild species stands between *G. punctatum* Sch. et Thonn. var. *jamaica* and *G. mexicanum* Tod. but seems sufficiently distinct to justify specific rank. In the interest that attaches to the possible discovery of the great Short Staples of the United States it would appear desirable to set forth the features that separate this plant from its nearest allies.

Whole plant practically glabrous; the shoots ascending, straight, rounded, smooth but with the epidermis frequently splitting off in lines, thus causing the twigs here and there to appear angled, black epidermal glands very evident on the youngest parts, inconspicuous below, twigs, peduncles, and petioles purple tinted. *Leaves* ovate cordate acute, entire or 3-lobed, lobes broad triangular, sometimes becoming acuminate and with the sinus open, glabrous or with a very few short irregular hairs on the upper surface of young foliage: *veins* 3-5, glands of the veins absent: *petiole* equalling the blade, rounded, glabrous, dots abundant and conspicuous, becoming elevated black warts: *stipules* small linear-lanceolate, those on the peduncles short broad sickle-shaped. *Flowers* solitary terminating short, axillary shoots, bearing a single leaf, and produced all along the branches, not crowded near the extremities. *Bracteoles* ovate, deeply gashed on the apex into lanceolate-awl-shaped teeth, external glands inconspicuous internal absent: *pedicels* much shorter than the peduncles. *Calyx* cut

into square teeth, suddenly and minutely apiculate. *Petals* small, yellow, tinged purple, one quarter protruding beyond the bracteoles, shortly tomentose, externally. *Capsule* rotund, acuminate, 4-celled. *Seeds* coarse with shaggy long dense rufous fuzz and dirty oily floss.

†6. Leaves glabrescent, 3-lobed, lobes linear oblong, glands 1-3 on veins, petiole shorter than the blade: flowers fairly large turning purple; bracteoles less than half the corolla: seeds large irregular densely coated with rufous fuzz and sparse short floss.

Gossypium Harrisii Watt, sp. nov.

Folia glabrescentia vel sparse stellato-pilosa, late ovata, 3-lobata; lobi ovato-oblongi, acuminati; glandulae infra nervos 1-3; petiolus lamina brevior, paullum alatus. *Flores* solitarii, ramulos breves axillares terminantes. *Bracteolae* dimidium corollae haud aequantes, ovato-oblongae, apice dentibus paucis longis irregularibus, vix cordatae, eglandulosae. *Calyx* magnus, latus, truncatus, fructu accrescente fissus. *Petala* magna, purpurascens vel purpureo-maculata. *Capsula* ovata, oblonga, rostrata, 4-locularis. *Semina* magna, irregularia, lana duplici vestita, brevior ("fuzz") densa rufa, longior ("floss") sparsa brunneo-alba molli pro rata brevi.—*G. hirsutum* Fawc. et Rendle, Fl. Jam. v. 148 (1926), partim, non Linn.

WEST INDIES. A wild plant found on "the coast line between Portland Point and Rocky Point, Jamaica." Collected by W. Harris, and identified in the Kew Bulletin (1914 p. 199) as *G. punctatum* var. *jamaica* (Flora Jamaicaensis 10179).

Leaves glabrescent or with a few stellate hairs, broad-ovate 3-lobed, lobes ovate-oblong acuminate 1-3 glands on the veins below, petiole shorter than the blade, slightly winged. *Flowers* solitary terminating short axillary spurs. *Bracteoles* less than half the corolla, ovate-oblong with a few long irregular teeth on the apex, cordature hardly visible and no glands present. *Calyx* large loose, cut square across and ruptured by the enlarging fruit. *Petals* fairly large turning purple or bearing small purple spots. *Capsules* ovate oblong tailed 4-celled. *Seeds* large irregular, densely coated with rufous fuzz and carrying sparingly a brown-white soft short floss.

In view of its being a wild species belonging very possibly to the *G. peruvianum* series I think it preferable to suggest a name for this plant. It can hardly be *G. punctatum* var. *jamaica*. Its closest affinity is with *G. Marie-Galante* Watt, sp. nov.

**Leaves tomentose or glabrescent entire or deeply segmented (three-fourths of the diameter or more) into 3-5 linear oblong lobes, which are generally constricted below and much narrower than long: petals in most species devoid of purple claws.

† Leaves large, broad when young tomentose below half or three-quarters pinnately segmented into oblong mucronate lobes; flowers very large, petals usually tomentose and drying into a greenish yellow tint; calyx obscurely toothed: fruit 3-celled; seeds large free and with a distinct though often only partially formed fuzz, green, grey or rust coloured with the floss copious and often silky.

EGYPT. These have been drawn from the splendid collection made by the Botanical Section of the Ministry of Agriculture in Egypt, under the direction of Mr. N. D. Simpson. The specimens are examined in the sequence of the numbers assigned to them: where no observations are offered they may be accepted as representative of *G. peruvianum*, var. *aegyptiacum*:—

C. 96, "Massey's Cotton," (is a hybrid of var. *aegyptiacum* x *zaria*): *C. 101*, "Balls' 310," (fuzz irregular, race?): *C. 102*, "Pilion," (*aegyptiacum* with a strain of *vitifolium*): *C. 103*, "New type of Sakel," (is typical *aegyptiacum*): *C. 104*, (ditto): *C. 105*, (ditto): *C. 107*, "Brittania," (seeds large fuzz on both ends floss white good): *C. 109*, "New Type derived from 95": *C. 110*, "Contaroudi" (floss reddish white): *C. 112*, "Assili from Korashia," (hybrid with teeth of bracteole numerous, awl-shaped): *C. 113*, "Zagora," (hybrid of *aegyptiacum*, young foliage tomentose, suggestive of *Irvingianum* and *barbadense* with a strain of *pedatum*): *C. 116*, "New Voltos," (hybrid of *aegyptiacum* and *barbadense*, strongly the latter): *C. 120*, "Affifi," (hybrid *aegyptiacum* and *barbadense*, foliage often sharply 3-lobed, floss reddish white): *C. 121*, "Toudri," (hybrid of *aegyptiacum* x *zaria* or possibly *vitifolium*, upper leaves 3-lobed, seeds round with fuzz on both ends). *C. 122*, "Jannovitch, Domains," (hybrid of *G. peruvianum* var. *aegyptiacum* x *vitifolium* or *barbadense*, seeds rounded fuzz irregular, floss reddish tint): *C. 125*, "Abbassi," (hybrid *G. peruvianum* var. *aegyptiacum* x *zaria*, lobes of the leaves becoming narrow and sharply pointed, floss white): *C. 130*, "Migahid," (hybrid suggestive of *zaria*): *C. 133*, "Penia I," (seeds large fuzz at both ends): *C. 271*, "Fittiadis," (hybrid of var. *aegyptiacum* x *pedatum*, is generally placed with *Affifi*, seed obtained from Behera Inspectorate in 1918 and reported to have been derived from Theodora Cotton, said to be not a fixed type): *C. 780*, "Malta II," (is a hybrid of *aegyptiacum* x *pedatum*, veins of the larger leaves web-footed, auricles pedate, and seeds free, rounded, with a rufous tuft of fuzz and reddish tinted floss): *C. 792*, "Yuma," (hybrid of *aegyptiacum*): *C. 793*, "Gila," (hybrid of var. *aegyptiacum* x *pedatum*, larger leaves with the veins web-footed and auricle pedate, while the floss is remarkably good): *C. 807*, "New Brown," (hybrid of *aegyptiacum* x *pedatum*, leaves large coarse with web-footed veins, fuzz white and at both ends of the free seed, floss good): *C. 808*, "Unnamed, from Fashn," (hybrid of var. *aegyptiacum* x *pedatum*): *C. 809*, "Matamir Brown," (var. *aegyptiaca* x *vitifolium*, seed ovate with fuzz at both ends, floss poor, woolly): *C. 816*, (=Balls III) = *G. peruvianum* Cav. var. *aegyptiacum* hybrid x *mexicanum* x *pedatum*, (leaves faintly web-footed, fuzz at both ends slightly green tinted): *C. 818*, "Nahdah, selected from Assili," *G. peruvianum* var. *aegyptiacum* x *pedatum*: *C. 819*, "Malaki Mumtaz," = *G. peruvianum* var. *aegyptiacum* with a strain of *zaria* x *pedatum*: *C. 822*, "Harland's Sea Island," = *G. peruvianum* Cav. var. *aegyptiacum* x *Irvingianum* and a strain of *G. barbadense*: *C. 823* (=Balls 95)

= *G. peruvianum* Cav. var. *aegyptiacum* x *mexicanum* x *barbadense*, (fuzz slight at both ends white): *C. 837*, "Sakelaridis," = *G. peruvianum* var. x *pedatum*: *C. 842*, "Zagora, Upper Egyptian Cotton" = *G. peruvianum* var. *Irvingianum* x *barbadense* x *pedatum*, (leaves pilose, very slight web-footed, fuzz at both ends of the seed, imperfect, white, floss poor): *C. 847*, "Maarad," = *G. peruvianum* Cav. var. *aegyptiacum* x *zaria* x *pedatum*.

***G. peruvianum* var. *zaria* Watt, var. nov.**

Frutex saepe usque ad 3 m. altus, fere glaber, levis; ramuli seniores teretes, juniores angulati, ut petioli nervique saturate purpurascentes. *Folia* oblonga, conspicue cordata, profunde acuteque in lobos 3-5 linearilanceolatos vel deltoideo-acuminatos incisa, lobo medio ceteris longiore glandula instructo, fere pilosa vel nervis petiolisque pilis paucis tantum instructis; folia ramulorum floriferorum stellato-tomentosa, ovato-oblonga, non cordata, integra vel 2-lobata, petiolis gracillimis; nervi basi membrana non connexi; sinus acutus, in plicam non elevatus. *Ramuli floriferi* axillares pedunculis 2 vel pluribus, pedicellis brevibus crassis axillaribus acute angulatis. *Bracteolae* liberae, ovato-oblongae, subcordatae, glandulis intra sinus obscuris, fere glabrae; dentes irregulares, deltoideo-acuminati vel caudati, interdum sparse hirsuti. *Calyx* laxus, cupularis, truncatus. *Petala* bracteolis duplo longiora, citrina unguibus purpureo-maculatis. *Capsula* ovato-oblonga, breviter rostrata, 3-4 locularis. *Semina* libera, ovata, atra, lana duplici vestita, breviora ("fuzz") e coma parva ferruginea circum rostrum constante, longiora ("floss") copiosa sordide alba fere sericea.

Shrub (often attaining a height of ten feet), almost glabrous and smooth, the older twigs round, the younger angled and like the petiole and veins are of a deep purple tint. *Leaves* of the flowering branchlets stellately tomentose and ovate-oblong, not cordate, entire or 2-lobed, borne on very slender petioles; other leaves oblong, distinctly cordate, deeply and sharply incised into 3-5 linear-lanceolate to deltoid acuminate lobes, the central one the longest and carrying an obscure gland, almost pilose or simply with a few scattered hairs on the veins and petioles. *Veins* not web-footed. *Sinus* acute, not thrown up in a fold. *Inflorescence* axillary spurs with two or more peduncles and short thick axillary sharply angled pedicels. *Bracteoles* free, not very strongly cordate, contained glands obscure, almost glabrous, ovate-oblong, teeth irregular mostly deltoid acuminate or tailed sometimes carrying a few hairs. *Calyx* loose cup cut square across. *Petals* fully twice the length of the bracteoles, lemon-yellow with small purple blotches on the claws and becoming purple tinted. *Capsule* ovate-oblong shortly beaked 3-4-celled. *Seeds* free, ovate, black, naked except for the small rusty tuft of fuzz around the beak: *floss* abundant dull white almost silky.

This is possibly the source of some of the finer African and Egyptian Cottons such as most of the so-called *Abbassi*. I accept

it as a hybrid of *peruvianum* rather than of *barbadense* but it manifests a strong strain of *brasiliense*. I suggest a varietal name for it, since it seems fairly constant and is easily recognised. It doubtless is the plant which Dr. Irving (see below) thought might be *G. barbadense*.

AFRICA. Dr. E. G. Irving (Lond. Journ. Bot. vii, 1855) called it the *Owu* of the Yoruba, on the W. Coast; he tells us that there are two forms, the one having the leaves with "elongate lanceolate lobes" and there seems little doubt the plant in question was that here isolated as var. *zaria* which has thus been known and valued in Africa for many years. More recent collections are: Mr. P. H. Lamb, 7, November, 1912, which he speaks of as "The annual cotton in general cultivation around Zaria," Illorin, Northern Nigeria, (type): certain of the specimens named "*Ishan*" Cotton, contributed by the Director of Agriculture, Ibadan, Northern Nigeria, Dec., 1913: the *Ishan* and *Meko* cottons of to-day are doubtless two of the forms described by Dr. Irving seventy years ago: W. H. Johnson, Moçambique, 3, 16th Oct., 1906, "Flowers sulphur yellow with purple blotches"; he then speaks of it as "a cultivated race often called 'Egyptian cotton': J. Stocks, Portuguese West Africa, 17 and 52, Nov., 1907, "A cultivated bush ten feet high with stem four inches in diameter."

EGYPT. Mr. Laurence Balls contributed a cotton, on the 8th Dec., 1906, which he appears to have regarded as *Abbassi*. In the *Wild and Cultivated Cottons* (page 224) that plant is alluded to as one of the Egyptian forms of *G. peruvianum*. That description may now be amplified by classing it as an example of var. *zaria*. But in Balls' specimens the twigs, petioles and veins, do not appear to assume the deep purple tint of more typical examples. Two other specimens, contributed by Mr. Balls, are obviously the same variety, but he speaks of them as being *Affifi*. The most obvious difference between these examples of *Abbassi* and *Affifi* would appear to be in the wool—pure white in the former and slightly tinted in the latter. Lastly Mr. Simpson sends me a plant known in Egypt as "Nigeria Indigenus" which may have to be accepted as a hybrid with a strain of *zaria*.

WEST INDIES. *Small and Carter* 8554, Jan., 1910, from the Bahamas, near Deep Creek, Andros.

SOUTH AMERICA. Bolivia, *Britton and Rusby*, described by them as *G. maritimum*, 647, 1890: Brazil, B. G. C. Bolland contributes a specimen with white fuzz and woolly floss.

INDIA and CEYLON. A specimen collected in the Royal Botanic Gardens, Peradeniya, Ceylon and contributed by C. F. Baker 116, May 10th, 1907 (and which he named *G. barbadense*), seems to find its place rather under the *Abbassi* cottons and had better be accepted as *G. peruvianum* var. *zaria*. So again two sheets of a plant named *G. barbadense* in Sir A. G. and Lady Bourne's herbarium of Indian plants, 4807, is doubtless the present form.

The Director of Agriculture of Northern Nigeria furnished a specimen which, in point of foliage etc., is *G. peruvianum* var. *zaria*, but the seeds are large, free, densely coated with rusty fuzz below an abundant soft white woolly floss, and the flowers purple tinted. It is spoken of as being "Brazilian Cotton" but is certainly not *G. brasiliense* and if it cannot find a place under *G. peruvianum* will very likely have to be carried to *G. microcarpum* Tod.—a much misunderstood plant. Mr. G. B. C. Bolland sends from Brazil a plant which matches exactly the Nigeria "Brazilian Cotton" except that it has an abundant floss and green coloured fuzz. The presence of a fuzz in both these plants might be viewed as bringing to mind some of the recessive manifestations of Egyptian cotton that are thrown into the ferine plant known as "Hindi Weed." (See p. 353).

G. peruvianum var. *Irvingianum* Watt, var. nov.

Ramuli teretes, purpurei. *Folia* fere glabra, late rotundata, basibus nervorum hirsutis; novella subcordata, lamina saepe vix lobata; adulta distincte cordata, majora pedata ad $\frac{2}{3}$ in lobos 2-3 (raro 5) divisa, lobo medio latissimo, auriculis lateraliter extensis interdum dentatis, in apicem acuminata, petiolo duplo longiora, nervo medio infra glandulifero; sinus angustus, in plicam paullo elevatus; nervi foliorum seniorum quasi compressi basi membrana conjuncti; nervus medius infra glanduliferus. *Ramuli floriferi* axillares, 1-2-flori; pedunculi angulati, petiolis multo longiores, 7-10 cm. longi; pedicelli acute angulati, usque ad 2.5 cm. longi, glabri vel ad apicem sparse stellato-hirsuti; folia ramulorum floriferorum indivisa, ovata, subcordata, stipulis hamatis saepe fimbriatis. *Bracteolae* corolla dimidio breviores, compressae, nunc hirsutae, nunc glabrescentes, late ovato-rotundatae, paululo connatae, profunde dentatae, dentibus hamatis longitudine sensim accrescentes, glandula exteriore parva ovata. *Calyx* laxis dentibus brevibus rotundatis. *Petala* saepe magna citrina, purpurascentia, extra stellato-tomentosa. *Capsula* ovato-pyriformis vel lineari-oblonga, breviter rostrata, 3-locularis, reflexe dehiscens. *Semina* libera, magna, oblonga, atra, lana duplici vestita, breviora ("fuzz") rufa circum rostrum breve sita, longiora ("floss") copiosa laniformi sordide alba.

Twigs round smooth purple. *Leaves* almost glabrous, when young densely tomentose, and hirsute at the base of the nerves, broad rotund, young leaves faintly cordate and often almost reduced to the central lobe, older leaves distinctly cordate and becoming pedate, two-thirds segmented into 2-3 (rarely 5), lobes, the central one abnormally broad and with the auricles produced laterally (and sometimes toothed), acuminate to the apex, twice the length of the petiole: sinus narrow and slightly thrown up in a fold, older leaves web-footed (as in *G. pedatum*) that is to say a special fold of the epidermis is thrown across the axilla between the bases of the veins, and the veins look as if compressed or flattened out, central

vein carries a gland below. *Inflorescence* one- or two-flowered axillary spurs, consisting of a very long peduncle and a much shorter pedicel; peduncles much longer than the petioles (being 3-4 inches long), angled; pedicels acutely angled and less than one inch long, glabrous or with a few stellate hairs near the apex; leaves of the spurs entire ovate hardly cordate; stipules hooked and often fimbriate. *Bracteoles* compressed together, in some instances hirsute, in others glabrescent, broad ovate rotund very slightly attached together, deeply toothed and hooked around the margin, only one half the length of the corolla, teeth elongating as the flower matures, external gland small obovate. *Calyx* loose with short rounded teeth. *Petals* often very large, lemon-yellow, tinted purple, with outer surface stellately tomentose. *Capsule* ovate-pyriform to linear-oblong, shortly beaked, 3-celled, opening completely backwards. *Seeds* free, large oblong, black with a tuft of rusty fuzz around the short beak (in hybrid forms there may be a complete fuzz): *floss* abundant, woolly and dirty white.

This is the chief source of the *Owu* cotton of Dr. Irving who speaks of it as the "Common Cotton" of West Africa (in 1855) and in a like manner it embraces the chief examples of the *Ishan* and *Meko* cotton of to-day, and the Soucho or Deti-tor-Togoland.

WEST INDIES & SOUTH AMERICA. Collected by *Frank Birkinshaw* n.º dated Jan. 11th, 1914, "Carriacou Marie Galante," Union Island, St. Vincent: VENEZUELA, Island of Margarita, collected by *Miller & Johnson* 207, 7th Jan., 1901: BOLIVIA, collected by *Britton & Rusby* 647, Yungas, 1890.

TROPICAL AFRICA, contributed by the Director of Agriculture, Ibadan, N. Nigeria, and named "*Ishan* cotton, *G. vitifolium*," Dec., 1913, a further sample named "*Meko* cotton," (seeds large coarsely covered with grey to green fuzz, has probably a strain of *G. mustelinum*): by *P. H. Lamb* 6, Nov., 1912, collected at Mawpa, Kabba, and described as "the annual cotton in general cultivation throughout Illorin and Kabba, seed covered with brown fuzz, lint of various tints sometimes rusty brown" and a further sample 17, Feb., 1913, is described as "*Bassa* cotton (*G. barbadense*?)," seeds naked, lint white, collected at Ankpa (is strongly suggestive of *Lawrence Balls* 56, C.2): by *N. W. Thomas* 305, 1911, the *Owulu* cotton of Agolo, South Nigeria: *F. N. Howes* 1095, Gold Coast and Togoland.

EGYPT. *Lawrence Balls* 56, C.2, (a hybrid close to the *Abbassi* cotton), seeds striped black, veins of the leaf compressed or flattened: C.99, "*Malaki Mumtaz*"—a selection from *Ashmouni*, seems a hybrid with *G. mustelinum* and which corresponds largely with the *Bassa* Cotton of N. Nigeria: *Lawrence Balls* "*Abbassi*" (1906), also "*Affifi*": C.55 (= *Balls* 77 is var. *Irvingianum* x *zaria* or *brasiliense* is spoken of as a "*Brown Jannovitch*"): C.56 (= *Balls* 95): C.90 "*Nigeria Indigenous*" = *G. peruvianum* var. *Irvingianum* x *zaria*.

INDIA & CEYLON. By *C. F. Baker* 116, from Royal Botanic Gardens, Ceylon (is a hybrid of *G. peruvianum* var. *Irvingianum* x *zaria* or *G. brasiliense* and taken by the contributor to be *G. barbadense*).

Many of the plants thrown into this position are hybrids of *G. peruvianum* var. *aegyptiacum* x *G. punctatum* var. *nigeria*, some with, in addition, a strain of *G. pedatum*. Many of them approach *G. Marie-Galante* such, for example, as the Egyptian C.828 and again others come near to Birkinshaw's "*Carriacou Marie-Galante*" of the Union Island.

In a note signed by *C. O. Farquharson* of the Agricultural Department, Ibadan, Nigeria, the *Ishan* and *Meko* cottons of that country are discussed collectively. They are spoken of as the "Native Cottons" and it is stated that the only difference between them is in the condition of the seed, fuzzy in *Meko* and black naked in the *Ishan*, that is to say fuzz confined to a rust coloured tuft around the beak. Some seventy years ago Dr. E. G. Irving studied the cottons of the Yoruba country on the West Coast of Africa. He sent his specimens and a report on the same to Kew and Sir William Hooker published it in the London Journal of Botany (vol. vii. 1855). The *Owu* cotton of Dr. Irving was doubtless the *Ishan-Meko* of to-day. Dr. Irving thought so highly of it that he presumed it might be *G. barbadense* Linn. But he tells us there were two or three forms, one with seeds black and clean, except for a small fawn or greenish-white tuft on one extremity; the second, fuzz covered; and the third intermediate or with an imperfect fuzz. Accordingly he suggested that experiments might be conducted to ascertain whether these plants came up from seed true to type. He then asks: "Are all the different varieties of seed given above ever found on the same plant? The few observations I have made, since asking myself this question, incline me to answer in the negative and I have hitherto found only clean black seeds on one bush, fuzz covered seeds on another. Are there any marked differences in the habit, form of leaves, etc., of plants producing these different seeds? I believe I can readily distinguish the black naked-seeded plant by its greater coarseness of stalk and leaf, the darker colour of the latter, and its more elongate lanceolate lobes." These are the very features that would seem to isolate the *Ishan* from the *Meko* cottons and to establish the variety *zaria*. It is thus somewhat remarkable that we are confronted to-day with the self-same problem viz., whether or not the presence or absence of fuzz marks recognisable forms of this species.

G. peruvianum Cav. belongs to a group of *Gossypia* that possess a well marked fuzz (such as *G. hirsutum* and *G. mexicanum*), but by hybridisation the fuzz frequently breaks down and is reduced to a tuft around the beak. In the case of *G. peruvianum* it serves a useful purpose to recognise, as already suggested, at least three varieties: (a) *aegyptiacum*, (b) *zaria* and (c) *Irvingianum*. But hybrids

between these varieties are frequent and, in recessive manifestations, the tendency seems ever present to throw back to the fuzzy seed. Still I think Irving's observation quite correct, viz., "I have hitherto found only clean black seeds on one bush and fuzz covered seeds on another." He separated unmistakably the naked seeded form with its dark purple twigs and narrow pointed leaf lobes, one of Africa's most interesting cottons. In fact the attempt to trace out the possible evolution or progression of the African forms of *G. peruvianum* may prove to be very much the history of the Egyptian Cottons of to-day, if indeed it be not the story of the formation of what might be described as the hybrid species *G. peruvianum* itself, a plant far more closely associated with Africa than Peru.

While examining hybrids of *G. peruvianum* the following circumstances may be borne in mind: the hirsute forms met with having fuzzy seeds and leaves with broad elliptic radiating lobes, are hybrids with *G. punctatum* and *G. hirsutum*, and those with glandular hairs are traceable to *G. mustelinum*: glabrous (or glabrescent) forms with fuzzy seeds are due to *G. mexicanum* influence; while glabrous forms with naked seeds and the lobes of the leaves sharp, narrow, linear-lanceolate acuminate, indicate *G. brasiliense*, *G. purpurascens* and *G. pedatum*: lastly, hybrids with soft pilose foliage, the lobes of the leaves ascending and the seeds often completely naked, denote possible hybridisation with *G. vitifolium* and *G. barbadense*—the most highly valued forms of Egyptian Cottons.

†2. Leaves pilose, almost split into 3-5 linear cuneate lobes, base hardly cordate, petiole about equal in length to the blade (stipules and scars not conspicuous); flowers fairly large; fuzz rust coloured.

G. Schottii Watt, l.c. 206-09, plate 35.

This plant mostly appears as a recessive hybrid in fields of other stocks. Mr. Simpson speaks of it in Egypt as being "Union Cotton" and tells us that it appeared as a weed in South Africa, near Rustenberg, and that it was collected by Mr. Lugard of the Royal Agricultural Society of Egypt. It has the habit of appearing when least expected; hence its being found in the Royal Botanic Gardens, Calcutta.

The type of the species was collected by Schott in Yucatan, and subsequently we learn of its having appeared in the U.S.A. as a weed in fields of "Kings Improved." It would thus seem possible that it may have been one of the stocks from which had originated the American large coarse seeded forms with irregular dense rufous fuzz.

The Egyptian grown example (C.846) is almost glabrous, has the twigs deeply furrowed and the leaves large much segmented almost pedatifid, with the central lobe often prominently toothed on one or both sides, has the lateral veins arching upwards and uniting some distance within the margin, while one (or sometimes even two) small glands appear on the central nerve below and

occasionally one on one or both of the laterals. The flowers are a little larger than the deeply gashed bracteoles, yellow tinged with purple, but claw not blotched. The capsules are ovate-oblong shortly beaked. Seeds large coarse, blunt at both extremities, fuzz coarse woolly grey or dirty greenish white, floss softly woolly about $\frac{3}{4}$ inch long.

*** Leaves very broad, quite glabrous (except when young or on the veins) segmented for hardly more than one-third the diameter into 3-7 radiating lobes (the lower pair often teeth rather than lobes), lobes triangular, much broader than long.

† Flowers small on short deflexed pedicels (usually pale yellow coloured) capsule mostly 5-celled; seeds with a complete (or only partial) grey white fuzz.

G. mexicanum Tod.: Watt, l.c. pp. 226-44, plates 39, 40 & 41.

This species exists mostly in hybrids. The more frequent forms show some degree of influence from *G. hirsutum* or *G. punctatum*, less frequently from *G. peruvianum*, *G. vitifolium* and *G. pedatum*. It is the so-called Mexican Cotton or Upland American.

Leaves very broad smooth quite glabrous (except when young or on the veins), entire or segmented on the apex, for hardly more than one-third the diameter, into 3-7 radiating lobes, with the veins arching upwards from the base (the lower pair of lobes rather teeth than lobes), lobes triangular much broader than long, glands one to three on the veins below. Flowers small, usually pale yellow and almost completely embraced by the bracteoles, peduncles short. Capsule mostly 4-5 celled. Seeds with a complete dense grey (sometimes partial) fuzz, floss usually white and silky.

No botanist has recorded the existence of this plant in a wild or even ferine state. It is a cultivated plant, and as already observed, exists in hybrid conditions.

SIAM: Banson, "C.", Aug. 11th, 1926, cultivated "Dr. Kerr 4229 (described as "American Upland"). SIERRA LEONE (vern. name *Inande*), 468, Feb., 1923. YUNNAN: *Forest* 11554.

EGYPT—an extensive assortment, some from Egyptian old stocks, others said to be raised from seed procured recently from the U.S.A., so that they may be accepted as representative of certain American cottons. They have been taken up in the sequence assigned to them by the Egyptian authorities:—

C.95—"Acala," seed obtained from Texas (strongly suggestive of hybridisation with *punctatum*): C.114—"Red Leaf," (suggestive of Willet's Red") grown at Giza in 1922 (whole plant tinted with purple, flowers small deep purple flushing): C.117—"Wrinkled Leaf," raised from seed procured from Fashn (leaves generally toothed on the apex, or shortly lobed, 5-7 radiating nerves, epidermis transversely corrugated, bracteoles rotund bearing 12-15 teeth round the apex, flowers large yellow with small blotches on the claws, seeds short, broad-ovate, brown with grey tuft of fuzz around the beak; might be worthy of a varietal name and I suggest

var. *rugatum*, var. nov.): C.136—"Lone Star I," suggestive of influence from *purpurascens*: C.137—"Express 350," is possibly *mexicanum* x *hirsutum*: C.138—"Foster II," is strongly suggestive of *Birkinshaeii* influence: C.287—"Triumph," seed procured from the U.S.A. and grown at Giza in 1921 (leaves blotched with purple and white; seed large with grey fuzz), *mexicanum* x *hirsutum* hybrid: C.288—"Truitt," seed procured from the U.S.A. and grown at Giza in 1923 (leaves blotched with purple; flowers small purple tinted, fuzz coarse grey, floss good white): C.782—"White Brazil," suggestive of Truitt Cotton (flowers large yellow; seeds large with a coarse dense grey fuzz; gland dots of the leaf-stalk minute): C.784—"Russel II.A," seems a hybrid of *mexicanum* x *peruvianum* (leaves large, the auricles very nearly becoming pedate, flowers almost clustered, large tinted purple; seeds coarse, fuzz grey brown, floss poor): C.785—"Lone Star II," hybrid *mexicanum* x *hirsutum* (margin of the leaf-lobes blotched purple, seeds small ovate grey fuzz and poor floss): C.786—"Rowden van Zanott," hybrid *G. mexicanum* x *hirsutum* (twigs etc., green-brown, seeds oblong and with a coarse white fuzz): C.789—"Abyssinian I," very nearly pure *G. mexicanum* (leaves with 3-5 short lobes on the apex and sometimes an extra tooth, flowers small, pale yellow): C.790—"Abyssinian II" (stems etc., greenish purple, flowers large and purple tinted, seeds ovate with scanty grey fuzz and poor floss): C.799—"Hartsville No. 19" (twigs etc., green, flowers purple tinted, seeds with coarse green fuzz, and good floss. May possibly have a strain of *G. peruvianum*): C.801—"Foster III," hybrid *mexicanum* x *hirsutum* or *peruvianum* (flowers small purple tinted, seeds coarse with dense coat of grey fuzz): C.804—"Salisbury," Cocker's pedigree (flowers large purple tinted, seeds small ovate, grey fuzz, leaves often with extra tooth): C.805—"Dixie Triumph" (twigs etc., purple green, flowers small purple, tinted with grey, and poor floss), is a hybrid of *mexicanum* x *hirsutum* and comes near to C.287: C.806—"Council Tooll," hybrid *mexicanum* x *hirsutum* or *peruvianum* (twigs green purple; flowers small purple tinted; seeds obovate brown-grey floss short): C.815—"Webber Delta Type III," a hybrid *G. mexicanum* x *hirsutum* (flowers small yellow): C.821—"Tendick No. 2," seeds obtained from the Nubar Mountains (leaves uniform cordate, lobes very short and often toothed on lower margin and with a conspicuous black glandular patch at the junction of the nerves with the petiole; bracteoles hardly cordate, central tooth greatly elongate hooked, protruding beyond the pale yellow corolla), slightly hybridised with *hirsutum*: C.826—"said to be 'Nigeria Indigenous,' raised from seed obtained from the Empire Growing Cotton Committee 1920, hybrid with *hirsutum* (seeds large coarse, dense grey fuzz, good white floss): C.832—"Cleveland IV," seed obtained from Cocker's Ped. Seed Company, Hartsville, U.S.A. (floral leaves 3-lobed, flowers purple tinted, seeds coarse cylindric dense grey fuzz, floss short pure white silky): C.833—"Cleveland I₁₆," hybrid? *peruvianum* from Cocker's seed as above (flowers

purple tinted): C.834—"Cleveland I₁₈," from Cocker's seed as above (seeds coarse with dense grey fuzz and poor floss): C.848—"Tangale No. I," Nubar Mountains, Sudan, almost pure *mexicanum* (twigs green-purple dotted, leaves purple tinted): C.849—"Trinidad Native I," hybrid x *peruvianum* (twigs dark purple): C.850—"Trinidad Native II," hybrid with *peruvianum* (leaves rotund lobes round deltoid tailed): C.851—"Trinidad III," *mexicanum* x *peruvianum*, might possibly be x *pedatum* (twigs etc., dark purple, leaves with 5 short broad lobes and sinuses on either side of central lobe thrown up in deep folds, margin slightly purple tinted and with occasional teeth, auricles becoming pedate).

SECTION IV. NAKED-SEEDED COTTONS (IRREGULAR AND PARTIAL FUZZ IN CERTAIN HYBRID FORMS OF *G. PEDATUM*), WITH THE BRACTEOLAS FREE OR NEARLY SO AND CONTAINED GLANDS USUALLY CONSPICUOUS.

Bracteoles only slightly united below or free; possessed of large conspicuous external glands within the auricles and often also between the bracteoles and the calyx. *Seeds* naked or nearly so and floss easily removable. *Leaves* often very large, mostly glabrous.

There are both Old and New World forms in this section, but only one, so far as at present known, has been met with in what appears a truly wild condition, and that species might be spoken of as Polynesian. Two others have been occasionally seen either as wild plants or as escapes from cultivation, namely *G. brasiliense* and *G. vitifolium*.

* *Twigs* strongly angled, glabrous and purple coloured; *leaves* ovate faintly cordate, entire or three-lobed across the apex; *flowers* small, only slightly exceeding the bracteoles; *petals* yellow tinged with purple.

G. purpurascens Poir.; Watt, l.c. pp. 250-5 plate 44.

Bourbon and Porto Rico Cottons: (a cultivated state of the Polynesian *G. taitense* Parl). It is often described as "Red Siam Cotton," the form from which Nanking was originally made.

Twigs angled, purplish, subglabrous glaucous. *Leaves* small and for the most part having 3 lobes, the laterals of which point outwards and upwards, glands one on the middle vein near the bottom. *Bracteoles* sub-rotund deeply gashed and peduncles terminated in 3 small glands within the auricles of the bracteoles. *Calyx* large loose, truncate or shortly toothed but never tailed, teeth 3-veined. *Petals* small slightly exceeding the bracteoles, yellow tinted purple. *Capsule* oblong acuminate 3-4 celled. *Seeds* rounded smooth (not angled) large and nearly naked though true wool copious, silky and easily separable.

Dr. Kerr sends a specimen (13) from Siam which seems possibly hybridised with *G. mexicanum*, he speaks of it as a straggling shrub. It is also fairly frequently met with in S. India (usually ferine) as for example Sir A. G. Bourne 5160. Although met with in Africa it is much less frequent in that country than in India, Siam and

China. There is no record of any systematic (commercial) cultivation in any country though its close association with *G. mexicanum* makes it of special interest.

**** Twigs angled smooth glabrous: leaves thick, ovate-oblong, 2-3 (rarely 5) lobed, deeply cordate auriculate, the 3 central veins ascending, central lobe long and broad, petiole angled and hirsute at its junction with the veins; flowers small lemon coloured, bracteoles irregular coarsely toothed; calyx accrescent; seeds naked black, floss easily separable, silky.**

Gossypium Marie-Galante Watt, sp. nov.

Ramuli adulti angulati, leves, glabri, minute glanduloso-punctati. *Folia* crassa, levia, ovato-oblonga, 2-3- (raro 5) lobata, profunde cordato-auriculata, subtus secus nervos et in eorum axillis hirsuta; lobi sinus acutos obtegentes, elliptico-deltoidi, acuminati, seta terminati; lobus medius ceteris longior latiorque ita ut lamina petiolo angulato longior; nervus medius infra glandulosus, nervi 2 intermediarii ascendentes, nervi 2 exteriores patentes. *Ramuli floriferi* axillares, breves, 1-2-flori; pedunculus 5 cm. longus; pedicelli vix 2.5 cm. longi. *Bracteolae* leves, membranaceae, glabrae, ovato-oblongae, liberae, ad apicem profunde grosseque incisae 3-5 dentibus late linearibus acutis prominenter nervosis. *Calyx* laxus, truncatus, demum accrescens patulus. *Petala* parva paullulo bracteolas excedentia, pallide flava. *Capsula* pyriformis, breviter rostratus, 3-locularis. *Semina* parva, curvata, elliptica, atra, breviter rostrata, lana duplici vestita, breviora ("fuzz") brevissima rufa circum rostrum sita, longiora ("floss") mollissima sericea facilius detergibili.

WEST INDIES. Collected by *Frank Birkinshaw* (type), January 11th, 1914, in Union Island, St. Vincent, West Indies; Found by *Mrs. Rev. J. J. Ricksecker* in St. Croix, Danish West Indies, 62, January 28th, 1897.

Mature *twigs* angled smooth glabrous carrying minute gland dots. *Leaves* thick smooth, ovate-oblong, 2-3- (rarely 5) lobed, deeply cordate auriculate, lobes overlapping the acute sinus, elliptic-deltoid acuminate bristle tipped, the central lobe the longest and broadest making the blade longer than the petiole, which is angled, hirsute at the junction of the veins and along the veins; the three central veins ascending, the bottom pair imperfect and spreading, gland present below, on the central vein. *Flowering branchlets* axillary short, one to two flowered; peduncles two inches long, pedicels hardly half that length. *Bracteoles* smooth membranaceous glabrous ovate-oblong, free, deeply and coarsely gashed on the upper half into 3-5 broad linear acute and prominently veined teeth. *Calyx* loose truncate becoming accrescent and spreading. *Petals* small hardly exceeding the bracteoles, pale yellow. *Capsule* pyriform, shortly beaked 3-celled. *Seeds* small bent elliptic, black, with a short beak, almost devoid of fuzz, but having a very short imperfect rufous tuft around the beak; *floss* easily separable, very soft silky small in quantity but of good quality.

"Silk Cotton Marie-Galante" of Union Island, St. Vincent, W. Indies.

An interesting plant with small lemon coloured flowers, irregular coarsely toothed bracteoles, large much accrescent sepals and naked black seeds with easily separable silky floss. In some respects it recalls *G. Birkinshawii* but with the young foliage and petioles almost stellately pilose, especially on the veins below. It approaches *G. punctatum* var. *nigeria* hence comes near to *G. hirsutum* (except that the seeds are naked). So also it approaches in structure of the bracteoles and nature of the floss *G. Harrisii*. In fact it might easily have contributed towards the formation of *G. barbadense*.

A cotton grown in Egypt and described as *Bamia* (C.828) might be accepted as a cultivated hybrid of this plant, except that it has a more distinct fuzz and poor floss. So also Mr. N. D. Simpson's Egyptian plant, which he calls "Ashmouni," (C.124) and which at first I took to be a hybrid of *G. peruvianum* x *vitifolium*, might after all prove a cultivated state of the West Indies plant *G. Marie-Galante*.

***** Twigs faintly angled on the young growing parts and pedicels, green or brown coloured; leaves ovate-oblong, more or less cordate, entire or 3-5 deeply palmately lobed; flowers large, nearly twice the length of bracteoles or more, petals pure yellow but with conspicuous purple claws.**

† Leaves pilose-tomentose below, lobes somewhat irregular but more or less ascending, broad, usually only 3, and the central one often much longer than the laterals; flowers frequently three times the length of bracteoles, and the fruit 3-4, (often 5) celled; seeds free brown, glabrous.

G. vitifolium Lamk.; Watt, l.c. pp. 245, 255-65, plate 45.

The Vine Leaved Cotton.

Stem perennial, often bent and twisted; *twigs* more or less angled. *Leaves* thin, soft, pilose-tomentose below, especially at the base, ovate-oblong, sub-cordate, entire or 3- (rarely 5) deeply palmately lobed, the lobes somewhat irregular but with a pronounced tendency to be ascending, broad, the central one often very much the longer. *Inflorescence* axillary shoots with long peduncles bearing one or a few flowers and small though normal leaves. *Bracteoles* free or only slightly united but possessed of large external glands. *Calyx* large truncate many veined ciliate. *Petals* often very large, frequently three times the length of the bracteoles. *Capsule* 3-5-celled, ovate-rotund embraced by the accrescent bracteoles. *Seeds* free, brown-black naked or nearly so though in hybrid forms sometimes with an imperfect fuzz.

Very possibly a native of Central and South America and of the Lesser Antilles; widely distributed by cultivation. Indeed it would seem highly probable that it is the primary stock from which may have been evolved all the finer hybrid long staple cottons. It has been spoken of, by some observers, as having been seen in a wild state but perhaps ferine rather than indigenous. In cultivation it never exists pure but merges, on the one side, into *G. peruvianum* and its associates, or on the other into *G. barbadense* and

G. brasiliense. A distinctly cordate base of the leaf, in association with a fuzzy seed, indicates the former tendency, while sharply cut glabrous foliage, having oblong-linear acuminate lobes, denotes the latter.

The following examples may be accepted as approaching the specific type in foliage, though the seeds have a pronounced tuft if not a complete though coarse fuzz. Certain samples of "Ishan Native Cotton" received from the Director of Agriculture, Ibadan, N. Nigeria, dated December, 1913, and 18th November, 1914, also a specimen from the same contributor but described as "Meko Native Cotton": Whitford and Hutchison 9147, Philippines, Nov., Dec., 1907.

Hybrid Forms—Dr. Parnell's Jamaica plant collected in 1840, *G. vitifolium* x *peruvianum*; Mr. C. B. Robinson's 494 from Amboina—perhaps a hybrid of *G. vitifolium* x *peruvianum*; Madagascar, Scott Elliot 2103 and possibly also Western Mexico, Frank H. Lamb 448—the last two being possibly *G. vitifolium* x *hirsutum*.

†2. Leaves very nearly glabrous, half or more segmented into 3–5 spreading oblong acuminate lobes; flowers hardly more than twice the bracteoles, and fruit 3–4- (mostly 3) valved; seeds free, brown, almost glabrous.

G. barbadense Linn.; Watt, l.c. pp. 245, 265–85, plates 46, 47 and 48.

The Sea Island Cotton of the West Indies: the Long Staple Cotton of the U.S.A.: and possibly the Gallini and Jannovitch Cottons of Egypt.

A perennial shrub cultivated as an annual. Twigs slender, round, smooth, glabrous or nearly so, of a greenish-purple tinge, and faintly gland dotted. Leaves smooth, compact (in texture), pale green, glabrous except on the petiole, veins and under surface of young foliage half or more segmented into 3–5 spreading oblong acuminate lobes, the centre one not materially longer than the others (an eye-mark in the separation of *G. peruvianum*). Flowers hardly more than twice the bracteoles, peduncles usually shorter than the petioles, rigid and strongly angled. Bracteoles free, ciliate and eglandular. Capsule ovate, beaked, mostly 3-celled. Seeds free, brown, ovate, beaked, almost quite naked of fuzz but with a long silky white and readily separable floss.

Stems and branches slender rigid smooth round (angled while young), greenish-blue, not prominently gland dotted, except on the petioles, nodes thickened so as to appear to embrace the peduncles and petioles. Leaves, in texture, smooth, almost quite glabrous; upper ones reduced to the central lobe or 3-lobed, cordate; lower leaves with the sinus (between the lobes) thrown up in a fold, half or more segmented into 2, 3 to 5 lobes, the lobes oblong-deltoid acuminate bristle tipped, the central one not much exceeding the laterals but bearing a distinct gland (sometimes the laterals carry glands also), veins, in typical examples, not web-footed (a character of *G. pedatum* that now and again becomes manifest in certain

hybrids of *G. barbadense* and *G. peruvianum*), petioles longer than the peduncles which are rigidly angled and petioles faintly winged near the apex; floral stipules small linear caducous. Inflorescence axillary, solitary on special leafy shoots that become much elongated and carry large broad oblique, obtuse stipules; pedicel one inch long, strongly angled and more or less winged, often thrown into an extra-axillary position, almost opposite the leaf, but does not carry distinct glands within the cordature of the bracteoles. Bracteoles usually quite free, relatively small, cordature not pronounced, glabrate with prominent parallel veins and reticulations, ovate-rotund and having 5–10 coarse irregular teeth the central one usually 3-nerved. Calyx wide campanulate, crenate or entire, many veined and with rows of prominent gland dots between. Petals not quite twice the bracteoles (occasionally large), ciliate, pale yellow with purple tinge and often with a large purple spot on the claws. Capsule ovate-acuminate mostly 3- (more rarely 4) valved. Seeds 6–9 in each cell, ovate beaked smooth brown-black, free almost quite naked; floss long, fine, silky and easily separable from the seed.

The type of the species was described as "an annual cotton with 3-lobed leaves" but it may be said that the tendency to become quite glabrous and to have large broad deeply cordate leaves, with 5-spreading lobes, marks the advance from *G. vitifolium* through *G. barbadense* to the variety distinguished as *maritimum*. The type of *barbadense* is seen on plate n. 46A (Watt l.c.) and the variety on plate n. 47. But it may be questioned how far the variety can be upheld botanically. All the better qualities of *G. barbadense* are variety *maritimum*. There are no definite features that can be singled out as separating the variety, and what is more, both are unstable hybrids that change rapidly under favourable or unfavourable environment.

In the *Wild and Cultivated Cottons* (pp. 275–294, plates 47 and 48) I endeavoured to separate the variety but it was more the commercial fibre than the botanical form. Since then the world's stock has deteriorated and the cultivation been threatened by the spread of the boll-weevil. The story that has now to be told is one of failure, except perhaps within the narrow limits of its insular production. The Sea Island Cotton proper is a glabrous annual with spreading branches and large, broad, deeply 3–5-lobed, cordate leaves, and with an ovate, 3-celled capsule which opens freely and exposes naked free seeds which carry a long floss (1½ to 2½ inches) of a somewhat creamy colour but very fine strong and silky, superior in fact to all other cottons.

Though commonly affirmed to be a native of the West Indies there is no direct evidence in support of that opinion. Richard Ligon (History of Barbados, 1657) makes no mention of it. The botanical specific name *barbadense* was founded by Linnaeus on the description and plate given by Plukenet (who lived from

1642-1706) "an annual cotton with 3-lobed leaves, met with in Barbados" was his account of it. It is not, therefore, separable from *G. vitifolium* or even from *G. peruvianum*. Plukenet's actual specimen, is, however, preserved in the British Museum and it, therefore, is the absolute type of the species. There is no specimen of it in the Linnean herbarium though two plants in Linnaeus' handwriting are named *G. barbadense* but these are *G. obtusifolium* and *G. herbaceum* and both show 5-lobed leaves and have little or no resemblance to Plukenet's *G. barbadense*. The plant is, however, so closely associated with *G. vitifolium* as to suggest its indigenous habitat being somewhere in South America, not in the West Indies. But it is fairly certain that the modern stock is a hybrid. The plant, as originally produced in North America (according to Wright) was intermediate between the Pernambuco (*G. brasiliense*) and the Barbados or Bourbon cottons. The precipitate expansion of its cultivation in the United States, Egypt and elsewhere, would seem to have been in defiance of the requirements of the plant. The failure which has ensued might have been anticipated, for even the spread of the boll-weevil no doubt, to some extent, is a consequence of the unsuitability of the plant to its new environment. The acclimatisation of special stocks (more especially hybrids) to new areas is ever a risky undertaking. It is preferable, in each country, to attempt the production (or evolution) of its own new stocks. No more telling illustration of this fact could be given than the story of the enlightened endeavour, made by the Egyptian Government, to extend and improve its cotton production. Seeds had been procured from a great many cotton growing countries and these were experimentally grown at the Giza Cotton Farm. The enumeration presently to be given sets forth some of the endeavours that were made with *G. barbadense*—more especially the Sea Island Cottons—both were imported and indigenous (or perhaps rather long acclimatised) stocks. Degeneration rapidly ensued with nearly all the recently imported plants. The most striking retrogressions were found to be toward *G. peruvianum* one of the varieties of which, from its close association with Egypt, I have given the varietal name of *aegyptiacum*. But in addition to the demonstration of *G. peruvianum* as an element in the composition of several Sea Island Cottons, the manifestation of *G. pedatum* in others is very striking, such for example as the *Olga*, the *White Jannovitch*, the *Garofallon*, the *Gallinos*, and the *Fathi* cottons which were shown to be hybrids of *G. barbadense* that tend to revert to *G. pedatum*.

The following examples of the species *G. barbadense* or of hybrids with a strain of that species and also of *G. vitifolium* may be specially mentioned:—

EGYPT. The specimens may be discussed in sequence of the numbers assigned to them in the Egyptian cotton herbarium; C. 77 "Superfine Sea Island," (seeds coarse brown-black with tuft of fuzz at both extremities, leaves almost glabrous, veins web-

footed at the base, upper leaves not cordate—a hybrid of *barbadense* with *G. peruvianum* var. *Irvingianum* x *pedatum*): C. 87—"Nubari": C. 88—"Sea Island Cotton": C. 89—"Sea Island": C. 100—"Casulli" (perhaps a hybrid with *G. peruvianum*): C. 106—"New type from Balls 77," (a hybrid with *G. peruvianum*): C. 118—"Enan's Brown" (hybrid with *G. peruvianum* var.?): C. 123—"Fathi" (a hybrid of *G. peruvianum* var. *aegyptiacum* x *G. vitifolium*): C. 126—"Nyam-Nyam" (a hybrid very close to C. 123): C. 127—"Balls 111" (a hybrid of var. *aegyptiacum* x *vitifolium*): C. 134—"Montserrat Sea Island" (almost typical *G. barbadense*): C. 139—"St Kitt's Sea Island" (a hybrid with *peruvianum*—early foliage hirsute, bracteoles many toothed): C. 270—"Olga Cotton" (a hybrid with a strain of *G. pedatum*—fruit linear-oblong, leaves often pale coloured on the margin and veins prominent—is spoken of as being of the *Abbassi* type): C. 274—"White Jannovitch" (is a hybrid of *G. peruvianum* x *G. barbadense* with a strain of *G. pedatum*, comes very near to C. 270 *Olga* Cotton, and like that form shows strongly the marbling of the foliage): C. 279—"Garofallon" (a hybrid of *G. barbadense* with possibly *G. hirsutum* and *G. pedatum*—approaches the *Sakel* Cottons): C. 281—"Gallinos Cotton" (comes near to the *Garofallon* and is a hybrid of *G. barbadense* x *peruvianum* with a possible strain of *G. pedatum*): C. 282—"Fathi Cotton" (is a hybrid of *G. peruvianum* x *barbadense* with a strain of *G. pedatum*—hence the coarse foliage (on the upper surface) with raised and infolded veins—is quite different from C. 123, which is also named *Fathi*—, is probably near to *Ashmouni* Cotton): C. 286—"Charleston Sea Island," as grown in Egypt (seed obtained from Carolina in 1921, is a hybrid with *G. peruvianum*.)

†3. Leaves large coarse quite glabrous (except a few hairs on the veins below) 3-7-lobed (and sometimes also toothed), the lower pair pedate and overlapping the petiole, veins imperfectly winged and web-footed, they also carry 1-3 glands below and the veins and reticulations are prominent; bracteoles very large deeply gashed fully half the length of the corolla; seeds free black or with an imperfect easily separated fuzz which may be reduced to a rufous tuft.

***Gossypium pedatum* Watt, sp. nov.**

Ramuli teretes vel inconspicue angulati, glabri, minute glanduloso-punctati, brunnei, purpurascens. *Cotyledones* transverse ellipticae longitudine duplo latiores, nervis 3-5 alatis alis in petiolum decurrentibus. *Folia inferiora* late ovata, breviter cordata, acuminata, 3-5-nervia. *Folia intermedia* trilobata, cordata, lobo medio lateralibus multo longiore. *Folia superiora* pedatim 5-7-loba, lobis interdum conspicue dentatis, extimis petiolo parallelis, 20-25 cm. longa, 25-37.5 cm. lata, nervis imperfecte alatis basi membrana connexis, 1 vel 3 eorum glandulam linearem gerentibus, auriculata, auriculis foliorum majorum petiolum obtegentibus, matura glabra nervis subtus sparse stellato-pilosis exceptis; petiolus alis nervorum decurrentibus elevato-lineatus, 2.5-12.5 cm. longus. *Ramuli floriferi* axillares, 2-3-flori; stipulae latae deflexae, interdum

dentatae. *Bracteolae* magnae, latae, ovatae, rotundatae liberae vel subliberae, margine ubique in dentes 15-20 latos fere aequales profunde incisae; dens medius iterum in partes 3 incisus glaber, non maculatus, dimidium corollae saltem aequans; glandulae apice pedicelli sitae paullo prominentes; pedicelli sulcati, angulati. *Calyx* latus, cupularis, truncatus. *Corolla* citrina demum purpureo-vittata. *Capsula* ovata, acuta, bracteolis accrescentibus fere amplexa. *Semina* libera, atra, oblique striata lana duplici vestita, breviora ("fuzz") imperfecta facile detergibili rufa, interdum tantum circum rostrum sita, longiora ("floss") striis affixa.

The foliage is most striking and seems to change as the plant matures, hence it may be examined as follows:—

(a) *Cotyledons* transversely elliptic (twice as broad as long) entire, obtuse but not at all cordate, with 3-5 veins, which are winged and form a web-footed attachment to the winged petiole, foliage quite glabrous but prominently punctated with black dots;

(b) *Early leaves* broad ovate entire acuminate or apiculate, becoming faintly cordate but not pedate, 3-5 veined and winged, as already described, when young with minute stellate hairs but turning quite glabrous and stipules narrow linear early caducous; 1-3 veins may each carry a small linear gland near the base;

(c) *Later leaves* cordate, 3-toothed or lobed on the apex (as in *G. mexicanum*), teeth broad deltoid acuminate, central one much the longest, petiole and young shoots winged, and web-footed within the cordature, but not pedate;

(d) *Ultimate leaves* much as in *G. peruvianum*, very large coarsely-formed (not cut sharply and uniformly as in *brasiliense*) 5-7-lobed, bottom short pair pedate and parallel to the petiole, lobes sometimes conspicuously toothed on the margin, blade from apex of the petiole to tip of the central lobe 8-10 inches and across from tip to tip 10-15 inches, veins imperfectly winged but prominently web-footed and carry 1-3 glands that look like slits, with a tongue of epidermis within, veins and reticulations prominent above, pale coloured, deeply auricled (the auricles in the larger leaves overlapping the petiole) and the whole surface quite glabrous (except on the veins below where a few stellate hairs may be seen but the leaves as they unfold from the bud are almost tomentose soon becoming glabrous), petiole round but showing lines representing the wings and prominently gland-dotted, petiole 1-5 inches long.

Twigs and shoots, rounded or only faintly angled, quite glabrous, minutely gland-dotted, brown flushing purple. *Inflorescence* mostly axillary spurs which carry two to three flowers, floral stipules broad deflected, sometimes toothed. *Bracteoles* very large broad ovate rotund, free, or nearly so, deeply gashed around the entire margin into 15-20 broad nearly equal teeth, the central one again gashed into 3 but not abnormally elongated, quite glabrous, not maculate (as in *brasiliense*) but fully half the length of the corolla which is

lemon-yellow streaked with purple (as it matures); *glands* on the apex of the pedicel not very prominent; pedicels furrowed and angled. *Calyx* a loose cup cut square across. *Capsule* ovate acute (not elongate acuminate as in *brasiliense*) almost entirely embraced by the accrescent bracteoles. *Seeds* free, black, with an imperfect easily separating fuzz which may be reduced to a rufous tuft around the beak, obliquely striated, the furrows giving attachment to the floss. According to a note on the Cuban plant, collected by C. F. Baker, "the seeds are of the kidney type" and one of Forrest's Chinese specimens shows the seeds distinctly kidneyed.

The following specimens may be recorded:—

Collected by C. Wright, Cuba (seeds free): by C. F. Baker, Santiago de las Vegas, Cuba (more tomentose than in the recent collections and possibly hybridised with *G. mustelinum*), April, 1906, 103 and again Nov., 1909, 23—he speaks of it as being a "tree cotton 12-15 feet high with broad spreading top" and of the seeds being of the "kidney type" and "late yield being destroyed by Boll Weevil," but he does not definitely say whether or not the plant is wild or cultivated though probably cultivated: by Harris, the Cauto plant (type) grown in the Hope Gardens, Jamaica, 4th May, 1914, also his Cuban plant collected 31st March, 1914: by Spruce 6541, in Chanduy, South America; by B. G. C. Bolland in Brazil (specimen just to hand) matches Baker's Cuban plant exactly except that the seeds are quite free: found in Bolivia by Britton and Rusby, in 1890, 647 and in 1891 1201, which I now transfer from *G. peruvianum* where I placed it in the "Wild and Cultivated Cottons": discovered in Siam by Kerr 10087, (R) a specimen showing the seeds free but with the fuzz reduced to a rusty tuft around the beak, also (M) seedlings; in Siam it is not a crop, but is spoken of as a cultivated perennial shrub or small tree: in Yunnan, China, it was three times collected by Mr. George Forrest during his explorations in 1917-19 16608 and 16912; Mr. Forrest tells us that he found the plant on the Tong Shan (lat. 27° 12' N.) and at an altitude of 9,000 feet above the sea; he speaks of it as a "semi-shrubby plant 4-7 feet, flowers light yellow, and found in dry situations in thickets"; it was thus collected in a locality one would hardly have expected to find a cotton, one of the specimens shows the fruit almost linear and the seeds naked and distinctly kidneyed, while another has the flowers larger than is customary and the stipules very large but the web-footing of the veins obscure: collected in the Belgian Congo by H. L. Shantz, on 12th Feb, 1920 (663) and which he says was found "growing wild about the Lake": by M. T. Dawe "native cotton found throughout Portuguese Congo in semi-wild state—collected at Lembe 72, 24/9/21": lastly in addition to numerous hybrids not a few of the plants collected in Egypt belong to this species, such as N. D. Simpson C. 824, named *G. brasiliense*.

A tree cotton with very large coarsely formed leaves, the central, and often the other lobes, with prominent lateral teeth, the auricles

forming large supplementary pedate lobes and the veins web-footed, stipules very large and often toothed, flowers not much exceeding the bracteoles, fruit ovate, seeds free or adnate and with a coarse irregular fuzz. *G. brasiliense* Macf. var. *apospermum* Sprague in Kew Bull. 1914, pp. 198-99.

The Cauto Cotton of south-eastern Cuba and the *Fai Wang* of Siam.

Attention to this plant was first pointedly drawn by Mr. W. Harris, Supt. of Public Gardens and Plantations in Jamaica. He speaks of it as a tree cotton apparently found wild (or semi-wild) and tells us that it is a perennial likely to prove of considerable value for cultivation in dry districts within the tropics. Mr. Harris further observes that it is estimated to yield at least 1200 lbs. of seed-cotton per acre and since the wool has been sold at prices varying from 18-20 cents. per lb. in the American market, the plant gives promise of being of considerable value. Sprague, who published an account of it in the Kew Bulletin, gives it the above mentioned provisional name (*apospermum*) and says that it agrees, in most of the technical characters, with *G. brasiliense*, from which he thinks it differs in the seeds being free from one another, in consequence he observes that, in view of its being wild or semi-wild, it may represent the wild stock of that species, but he adds that, "the possibility of its being a hybrid of *brasiliense* with some other species cannot be entirely excluded."

At first I was disposed to concur with Mr. Sprague but on more careful study and with extended material came to see that this somewhat remarkable plant had better be accepted as a distinct species for which it might be desirable to assign a distinctive name. Apparently it embraces some of the forms included under Todaro's protean *G. microcarpum* and is possibly the plant Miers meant to denote by his *G. congestum*. But if it be viewed as only a hybrid then it would have to be accepted as a cross between *G. microcarpum* or *G. mustelinum* and *G. peruvianum*, certainly not *G. brasiliense*—a species at once recognised by the mature leaves being quite glabrous and sharply and neatly cut, the lobes oblong-linear-deltoid spreading acuminate, the auricles not pedate and the flowers very large, corolla often twice the bracteoles, fruit oblong tapering, beaked, seeds large naked and kidneyed. These are the best eye-marks of *G. brasiliense* and at once separate it from the plant here considered.

A specimen was sent to me from Siam, in 1925, by Dr. A. F. G. Kerr 10087 which, not having then seen the Cuban plant, I identified as possibly *G. peruvianum* but the material was not satisfactory and I asked for further supplies to enable me to finally determine it. In consequence additional specimens have now come to hand (10087R) and I find that it matches, in every detail, Mr. Harris' Cuban plant, even to the seedlings, which in both cases have been supplied. But in addition Mr. N. D. Simpson has furnished me with several plants, under the so-called Hindi-weed of Egypt that

approximate very closely to the Cauto cotton, an observation which suggests that its influence in stock breeding may be pernicious.

On the other hand Mr. Simpson has sent me several specimens of hybrids of value that all manifest a strain of *G. pedatum* in their composition, such as the cotton known in Egypt as Sultani (C. 794=*G. peruvianum* x *pedatum*). In fact many of the hybrids of *G. peruvianum* are of the same nature, for example C. 780 Malta II., C. 793 Gila, C. 807 New Brown, and C. 824 almost typical *G. pedatum*. It would be interesting therefore to learn from Jamaica of the success that has been attained in the endeavour to make the pure Cauto cotton of commercial value. I may add that in Siam the plant is well-known and bears the vernacular name of *Fai Wang* but while cultivated is not a regular crop.

Hindi Weeds mostly hybrids with a more or less pronounced strain of *G. pedatum*.

Splitting hybrids or rogues appear in most cotton fields throughout the cotton area. In Egypt they are collectively designated "Hindi Weeds." How the name arose I have been unable to discover, but it does not appear to have anything to do with India. There are several significant features of the Hindi Weeds collectively: they are nearly all glabrous; the flowers are remarkably small and the bracteoles large; they are hybrids that manifest more than two strains in their composition but one seems almost universally present, viz., *G. pedatum*. To that influence is attributable the large coarse leaves that they nearly always manifest. *G. pedatum* has, for the first time, been separately recognised in these notes, and the suspicion that it is responsible for the production of plants that rapidly degenerate gives the subject exceptional interest to the cotton grower; a warning to avoid such hybrids.

The following are the chief examples of Hindi Weeds met with in Egypt:—

(a) *Plants in which G. mexicanum* is the chief strain, but some show *G. hirsutum*.

- C. 41. "Hindi hybrid" derived from Commercial *Ashmouni* grown for M. Egolin in 1923=*G. mexicanum* x *hirsutum* x *pedatum* (veins of mature leaves web-footed, bracteoles recalling *G. brasiliense*.)
- C. 42. "Hindi hybrid" from Commercial *Ashmouni*=*G. mexicanum* x *peruvianum* x *pedatum*. Very much like some of the Upland American Cottons.
- C. 43. "Hindi hybrid from Commercial *Ashmouni*." (Same as C. 41 only leaves very markedly *pedatum*, fruit and bracteoles as in *G. brasiliense*.)
- C. 44. "American—a rogue from Commercial *Ashmouni*"=*G. mexicanum* x ? *hirsutum*; *Ashmouni*, as seen by me, has uniformly been a form of *G. peruvianum* which this splitting hybrid most certainly is not.

- C. 45. "American, a rogue from Commercial *Ashmouni*" = C. 44.
- C. 46. "Hindi from Commercial *Ashmouni*"—same as C. 44 and C. 45 with margins of the leaves turning purple—a frequent condition in *G. mexicanum*.
- C. 47. "Hindi hybrid—a rogue from Commercial *Ashmouni*." This is a very different plant from C. 41-C. 46 and is possibly a hybrid of *G. mexicanum* x *barbadense*—seems a higher standard of hybrid—faintest trace of *G. pedatum* the older and larger leaves having the veins only slightly web-footed.
- C. 48. "American type—a rogue from Commercial *Ashmouni*" = *G. mexicanum* x ? *hirsutum*.
- C. 810. "Hindi from *Balls'* 95." = *G. mexicanum* almost pure. Had it not been sent to me as a Hindi Weed I could not have picked it out as a weed. The seed is large densely coated with grey-green fuzz; the floss seems to originate in tufts, the stipules are ovate tailed and the calyx teeth are very large rounded. In some respects it is suggestive *G. Darwinii*.
- C. 811. "Hindi from a single plant in *Balls'* 95." I cannot separate this from C. 810—both are apparently splitting forms from *mexicanum* = glabrous plants with large open calyx and short purple (not pale yellow) flowers—it is possible that they are hybrids *G. mexicanum* with a trace of *G. pedatum*.
- C. 814. "Hindi from a single plant from *Balls'* 95" = *G. mexicanum* x *pedatum* with a trace of *G. peruvianum*.
- (b) *Plants in which G. peruvianum is the chief strain.*
- C. 777 and C. 778. "Dakker (*Thakker* male)." This seems to be a non-fruiting plant and appears to be a hybrid *G. peruvianum* var. *Irvingianum* x *mexicanum*.
- C. 812. "Hindi from a single plant in *Balls'* 95." Is a hybrid of *G. mexicanum* x *peruvianum* x *pedatum*. The very large bracteoles and remarkably small flowers, large seeds with green fuzz and tangled floss, are striking features. The older leaves are distinctly those of *pedatum*.
- C. 813. "Hindi from a single plant from *Balls'* 95." Is a hybrid of *G. peruvianum* x *mexicanum*. I see little to separate this from C. 42. The stock may have sprung from generations of hybrids. One seed may revert to one specific type, another to another.

†4. Leaves almost quite glabrous, and in herbarium specimens usually drying into a brown colour, deeply cordate, very broad and large, cut into five palmately spreading acuminate lobes, the central one the longest, and often from 4-8 inches in length; flowers very large, and bracteoles sometimes maculated on the inner surface; fruit elongated, 3-celled, and seeds almost quite naked, striated, and usually united into a kidney mass.

***G. brasiliense* Macf. ; Watt, l.c. pp. 245, 295-315, plates 49 and 50.**

Leaves almost quite glabrous and sharply and neatly cut, the lobes oblong-linear-deltoid spreading acuminate, deeply cordate but the auricles not pedate, the central lobe the largest and often 4-8 inches in length; stipules usually large linear. *Flowers* very large, corolla often twice the bracteoles. *Bracteoles* very large ovate sub-acute, deeply gashed, the middle tooth often the larger and longer, sometimes maculated on the inner surface. *Capsule* linear-oblong tapering beaked 3-celled. *Seeds* almost quite naked, striated and usually united into an elongated kidney mass.

Kidney, Chain, Brazilian, Guianan, Bahia, Pernambuco, &c., &c., Cottons.

A sub-arboreous bush associated with Brazil. Leri, who wrote a history of that country, in 1557, speaks of it as having the seeds much pressed together after the form of a man's kidney. Marcgraf describes it as growing in damp warm places, especially on cultivated ground. No botanical specimen, seen by me, is stated to have been collected from a truly wild plant, though not a few are recorded as ferine. And Branner, who wrote a special report on the Cottons of Brazil, states that there are two indigenous and one exotic cottons found in that country. The former are the *crioulo* or kidney cotton and the *quebradinho*, or cotton with free black seeds (? *G. vitifolium*), while the exotic, which he calls *riqueza*, or wealth-giving, was most probably *G. hirsutum* or *G. peruvianum*. It is thus highly likely that *G. brasiliense* is actually indigenous to Brazil and Koster (Travels in Brazil 1816) speaks of the "Wild Cotton" of the country—but he preserved no specimen. The early writers would thus seem to have admitted the existence of an indigenous or wild species in Brazil.

The following specimens may be specially cited:—

INDIA: Watt, Ponnur S. Mahratta; Ahmedabad; Bangalore, &c. MASCARENE ISLANDS: *Balfour fil.* AFRICA: H. L. Shantz, Belgian Congo 635 and 643, "as a wild plant alongside of paths in native grass." SIAM: Dr. Kerr 10087, also 3148 "cultivated" (vern. *Fai Luang*). PHILIPPINES: *Bureau of Science* 256.

It is somewhat remarkable that, while *G. brasiliense* stands every chance to have been one of the ancestors of Sea Island Cotton, no recent experimenter has attempted the investigation of that species. Moreover, in herbaria, it is the least represented of all the species of *Gossypium*. I have in these notes separated a fairly distinct plant (as *G. pedatum*) hitherto treated as *G. brasiliense* and the effort to do so has convinced me that the seeds adhering into a kidney-like mass is by no means an invariable characteristic. In *G. pedatum* the seeds are both free and united. The union, however, in most cases is more a close interlacement of the floss than actual adhesion of the seeds.

Not a few of the examples of *G. pedatum*, recorded by the collectors as being *G. brasiliense* are further stated to be wild indigenous plants.

A very considerable number of the hybrids grown at the Giza Experimental Farm Egypt show an undoubted strain of *G. pedatum* (conf. with *G. peruvianum*).

XXXIX.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXVIII.

1171. *Onobrychis prolifica* Dunn [Leguminosae-Hedysareae]; ab *O. nummularia* Stocks distat legumine ubique setis tecto non margine tantum.

Herba annua, globosa, omnino griseo-tomentosa, 10 cm. diam. *Caules* abbreviati, plures, racemos foliaque e basi emittentes. *Folia* 1-5-foliolata, racemis breviora. *Foliola* rotundata, basi obtusa vel cuneata, 1-3 cm. longa, stipulis membranaceis elongatis ad petiolos adnatis. *Racemi* pluriflori. *Flores* subsessiles. *Calyx* fere ad basin in dentes lineares acuminatos divisus, 5 mm. longus. *Vexillum* ovatum, basi attenuatum, 5 mm. longum. *Alae* minutae. *Carina* vexillo et calyci aequalis, apice oblique truncata, lamina basi auriculata. *Stamina* ut carina et stylus abrupte inflexa, primo in tubum coalita, tandem diadelphea. *Ovarium* sessile, 1-ovulatum; stylus filiformis, stigmate parvo terminatus. *Legumen* indehiscens, compressum, orbiculatum, lacunoso-rugosum, ligneum, aculeis innocuis ubique tectum, 7 mm. diam., aculeis fere diametrum leguminis aequantibus araneoso-gossypinis.

BRITISH BELUCHISTAN. Gustoi, 28th May, 1897, *Duthie* 20513.

1172. *Scaevola scaberula* Summerhayes [Goodeniaceae]; affinis *S. hispidae* Cav., sed floribus minoribus, antheris nudis, et *S. collari* F. Muell., a qua ramis foliisque scaberulis, floribus pedunculatis et corolla extra stellato-pilosa differt.

Herba rigida; caules erecti vel suberecti, fere simplices, usque ad 30 cm. alti, leviter longitudinaliter striati, scaberuli et breviter glanduloso-pilosuli, internodiis brevibus. *Folia* patentia, sessilia, lineari-lanceolata vel oblongo-lineararia, obtusa, 1-2 cm. longa, 1.5-4 mm. lata, margine leviter revoluta, interdum subdentata, utrinque praesertim supra breviter glanduloso-pilosula, scaberula. *Flores* solitarii, in axillis foliorum superiorum (bractearum) dispositi; pedunculus gracilis, 7-12 mm. longus; bracteolae lineares, obtusae, 7-14 mm. longae, indumento foliis similes, ad (vel prope) apicem pedunculi. *Calycis* tubus brevis, inferne ovario adnatus; lobi 5, lineari-lanceolati, obtusiusculi, 5-6 mm. longi, 1-1.4 mm. lati, utrinque glanduloso-pilosuli. *Corollae* segmenta oblongo-lineararia, superne leviter dilatata, acuta, utrinque alis latis albidis non-venosis instructa, ita ut videantur spathulata, 11-13 mm. longa, cum alis 5-6 mm. lata, extra stellato-pilosa, intus inferne pilis retrorsis induta. *Filamenta* anguste lineararia, 4 mm. longa; antherae oblongae, 2 mm. longae; connectivum apice nudum. *Stylus*

pilosus, 7 mm. longus, indusio cupulari dense ciliato extra piloso; stigma compressum, breviter bilobum. *Ovarium* uniloculare, ovulis duobus. *Fructus* non visus.

NEW SOUTH WALES. Ettrema River, south-west of Nowra, on poor sandstone country, Feb. 1927, *F. A. Rodway*.

1173. *Rupicola gnidioides* Summerhayes [Epacridaceae-Epacraeae]; ab *R. styphelioide* Maiden et Bêche ramulis hirsutis, foliis minoribus hirsutis, floribus minoribus, filamentis valde longioribus facile distinguenda.

Frutex nanus, ramis ramulisque procumbentibus vel adscendentibus usque ad 25 cm. longis; ramuli tenues, albido-hirsuti. *Folia* imbricata, breviter petiolata, lanceolata, apice obtusa, basi angustata, 5-8 mm. longa, 1-2 mm. lata, supra concava, subtus convexa, utrinque albido-hirsuta, siccitate subtus nervis prominentibus. *Flores* solitarii, in axillis foliorum supremorum dispositi, pedunculati. *Bractee* numerosae, imbricatae, lanceolatae, acutae, pubescentes, a basi ad apicem pedunculi dispositi eumque omnino obtegentes, supremae sepalis subsimiles sed breviores. *Sepala* 5, lanceolata, acuta, 2.5-3 mm. longa, 0.7-0.8 mm. lata, ciliata, extra pilosa, intus glabra. *Corolla* subrotata, extra glabra, intus pilosa; tubus brevis, 1-1.2 mm. longus; lobi late lanceolati, acutissimi, 2.7-3 mm. longi. *Stamina* fauce corollae inserta; filamenta filiformia, apice applanata, circiter 2 mm. longa; antherae exsertae, basi excepta adnatae, oblongae, 1 mm. longae. *Ovarium* late cylindricum, quinquelobum, 5-loculare, pubescens; stylus gracilis, 3-3.5 mm. longus, stigmate minuto; ovula pro loculo numerosa. *Capsula* latissime ellipsoidea, apice depressa, circiter 2 mm. longa, pubescens, loculicide dehiscens; semina numerosa, falcatis breviterque fusiformia, flavo-brunnea, 0.5-0.6 mm. longa.

NEW SOUTH WALES. Ettrema River, south-west of Nowra, in cleft in sandstone cliff, Feb. 1927, *F. A. Rodway*.

1174. *Stapelia Tapscottii* Verdoorn [Asclepiadaceae]; affinis *S. Cooperi* N.E. Br., sed floribus albidis, caulis dentibus 1-3 cm. longis differt.

Caules carnosii, glabri, 5-9 cm. longi, obtuse 4-angulati, dentibus 1-3 cm. longis robustis ad apicem acutum planum attenuatis minute bidenticulatis interdum purpureo-maculatis. *Flores* in pedunculo brevi crasso 3 vel plures; pedicelli 5-6 mm. longi, circiter 2 mm. crassi. *Sepala* lineari-lanceolata, acuta, circiter 1 cm. longa, glabra. *Corolla* a basi stellato-patens, albida, circiter 5 cm. diametro; tubus 7 mm. longus, in disco annulatus; lobi ovati, acuti, 2 cm. longi, 1.3 cm. lati, pilis vibratilis clavatis ornati, extra laeves et inconspicue 5-7-nervi, supra dense papilloso-verrucosi. *Corona* exterior patens, 5-loba, lobis 2 mm. longis bilobis, interior incumbens, dorso breviter cornuta apice erecto subulato-clavato.

SOUTH AFRICA. Bechuanaland: Lobatsi, *S. Tapscott* (Herb. Kew and McGregor Mus., Kimberley).

1175. *Arrabidaea* (Macrocarpaea, Indutae, Discolores) *calodictyos* Sprague [Bigoniaceae-Bignoniaceae]; affinis *A. candidi* DC., a qua rete venularum paginae superioris foliolorum crebro conspicuo elevato differt.

Frutex ope cirrhorum simplicium scandens. *Rami* seniores exstantes teretes, circiter 6 mm. diametro, multicostatuli, minutissime puberuli vel glabrati, fusco-grisei, defoliati. *Ramulus* florens unicus exstans patens, 50 cm. longus, costatulus, minute pubescens, nigrescens; internodia 6-12 cm. longa. *Folia* bifoliolata, cirrho simplici terminata; petioli 3.5-8 cm. longi, minute pubescentes; petioluli 1.2-4 cm. longi; foliola ovato-oblonga (rarius elliptico-oblonga), acute acuminata, basi rotundata, 9-15 cm. longa, 4-7 cm. lata, tenuiter coriacea, supra purpurascens-brunnea, nitida, primo visu glabra revera secus nervos venulasque minute puberula mesophyllo minute sparse lepidoto, rete venularum conspicuo creberrimo satis elevato, subtus juventute minute sordide cano-tomentella, mesophyllo tandem plusminusve glabrato nitidulo saepe purpurascens nervis venulisque maxime intricatis minute pubescentibus; nervi laterales utrinsecus 5-7, arcuato-ascendentes, inferiores quam superiores magis obliqui, supra paullulum elevati subtus prominentes. *Thyrus* pyramidalis, multiflorus, 12 cm. longus, pedunculo 7.5 cm. longo excluso; pedicelli 4-5 mm. longi, pilis fulvis dense furfuraceo-pubescentes. *Calyx* campanulatus, minute crasse obtuse 5-dentatus, circiter 5 mm. longus, extra minute pubescens, purpurascens, intus glaber. *Corolla* (expansa non visa) in alabastro circiter 2 cm. longa, subacuta, pilis ferrugineis extra furfuraceo-velutina; tubus basalis 2.5 mm. longus. *Stamina* apice tubi basalis inserta; filamenta basi pilis longis glanduloso-capitatis dense induta, longiora in alabastro circiter 1.3 cm., breviora circiter 1 cm. longa, antherarum thecae in alabastro ab apice filamenti pendulae vel leviter divergentes, 2.5-3 mm. longae; connectivum in appendicem triangularem acutum productum. *Staminodium* vix 5 mm. longum. *Discus* pulvinaris, vix 1 mm. longus, apice leviter excavatus. *Ovarium* oblongum, 2 mm. longum, minute densissime lepidotum. *Ovula* 12-16 pro loculo, biseriata.

VENEZUELA. Locality unknown, Pittier 11883 (type in Herb. Kew.). Miranda: on the road from La Guaira to Caracas, near Las Trincheras, in thickets, Pittier 10377 (Herb. Mus. Comerc. Venez.).

The number of ovules is very difficult to determine owing to their being minute and easily detachable. It may be larger than stated.

1176. *Rhynchosyilis latifolia* Fischer [Orchidaceae]; *R. retusae* Bl. affinis, foliis minoribus planis oblongis, floribus valde minoribus differt.

Planta epiphytica. *Caulis* brevis, crassus, foliorum marcidorum vaginis vestitus. *Radices* multae, longae. *Folia* coriacea, oblonga, plana, sub-carinata, 4-7 cm. longa, 1.7-2.4 cm. lata, apice aequaliter vel inaequaliter obtuse biloba. *Racemi* vel *paniculae* infra folia



Rhynchosyilis latifolia. A and B side and front aspects of whole flower ($\times 7$). C pollinia and caudicle ($\times 9$). D bract ($\times 8$).

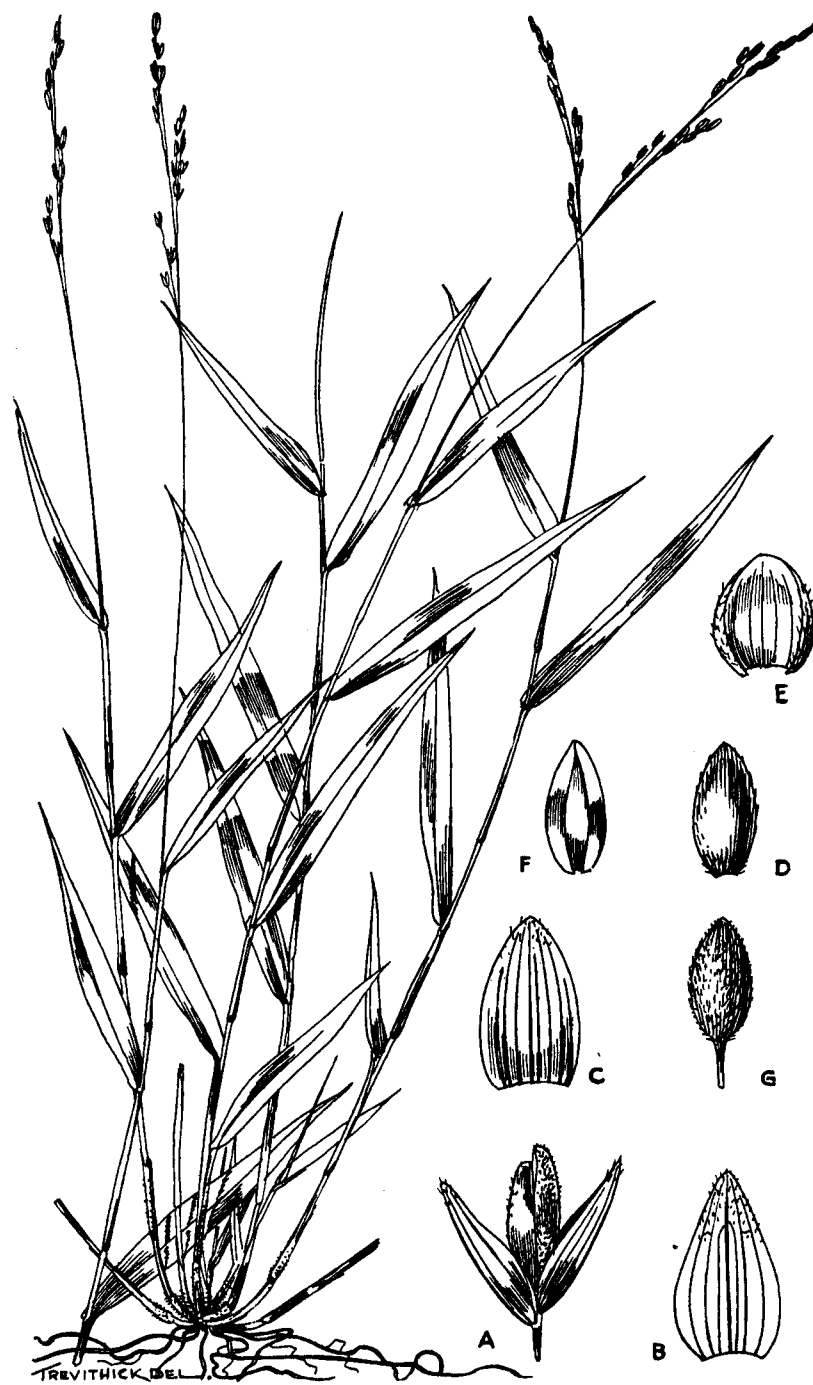
laterales, 7-14 cm. longi; vaginae 1-2, cupulares, ore obliquae, subacutae, 4 mm. longae. Flores circiter 3 mm. longi; bractae ovato-lanceolatae, acuminatae, 1.5-3 mm. longae; pedicelli brevissimi. Sepala et petala similia, ovato-oblonga, obtusa, uninervia, subcarinata; sepala lateralia ceteris majora, 3 mm. longa, basi columnae adnata. Labellum in basi columnae sessile. Calcar scrotiforme, horizontale, glabrum. Epichilium calcar aequilongum, recurvum, carnosum, lineari-oblongum, supra profunde canaliculatum, apice in conum deflexum incrassatum. Columna brevis; rostellum breviter rostratum. Pollinia 2, sulcata; caudicula ligulata elongata. Capsula non visa.

SOUTH INDIA. Cardamonai, Mysore, Sept. 1903, C. A. Barber 6093.

1177. *Isachne Vaughanii* C. E. Hubbard [Gramineae]; affinis *I. angustae* Stapf, sed culmis altioribus, foliorum laminis longioribus, paniculis angustis, ramis erectis appressis, spiculis majoribus differt.

Gramen perenne, laxe caespitosum. Culmi erecti vel geniculato-ascendentes, graciles, 10-45 cm. alti, teretes, simplices, multinodi, innovationibus extravaginalibus, dense appresseque pubescentes. Foliorum vaginae arctae, subpersistentes, tenuissime striatae, 1.2-2.5 cm. longae, internodiis breviores, breviter pubescentes, ore breviter barbatae, marginibus ciliatae; ligulae nullae vel ad seriem ciliarum brevium reductae; laminae lineares vel lineari-lanceolatae, subobtusae vel tenuiter acutae, 3-6 (raro 1 cm.) longae, planae, distantes, patentes, rigidulae, supra virides glabrae laevesque, infra glaucae asperulaeque vel minute pubescentes, marginibus minute scaberrulae, tenuissime nervosae. Panicula angustissima, gracilis, longe exserta, 3.5-8 cm. longa, ad 7 mm. lata; rhachis gracilis, sparse pubescens vel fere glabra; rami 3-4, solitarii, erecti appressique, 2-8-spiculati, 0.75-4 cm. longi, glabri laevesque; pedicelli 1-5 mm. longi, appressi, glabri laevesque, ad apicem incrassati. Spiculae hiantes, pallidae vel glauco-virides, 2-6 mm. longae. Gluma inferior late ovata vel elliptico-ovata, obtusa vel subacuta, 2.4-2.6 mm. longa, 5-7-nervia, membranacea, superne sparse pubescens; gluma superior elliptica, obtusa, 2.5 mm. longa, 7-9-nervia, membranacea, apice breviter pubescens. Anthoecium inferius ♂, ellipticum, subacutum, 2 mm. longum, albido-viride, sparse et breviter pubescens vel fere glabrum; lemma applanatum late ellipticum et rotundato-obtusum, chartaceum, 7-nervium; palea elliptica, subacuta; antherae oblongae, 1.4 mm. longae. Rhachillae internodia 0.5 mm. longa. Anthoecium superius ♀, inferiori simile, sed totum appresse pubescens. Caryopsis oblonga, fusca, 1 mm. longa, 0.5 mm. lata.

MAURITIUS. Stream banks near Grand Bassin, rare, 13th Nov., 1926, Vaughan A.102.



Isachne Vaughanii C. E. Hubbard, showing habit. A Spikelet ($\times 10$). B Lower glume ($\times 10$). C Upper glume ($\times 9$). D Lower floret from back ($\times 9$). E Lemma of lower floret partially opened out ($\times 7$). F Palea of lower floret ($\times 9$). G Upper floret ($\times 8$).

1178. *Stipa Clelandii* Summerhayes & Hubbard [Gramineae]; affinis *S. aristiglumi* F. Muell., a qua glumis lemmatibus aristisque longioribus, lemmatibus densius pilosis pilis apice usque ad 5 mm. longis differt.

Gramen perenne, caespitosum. *Culmi* erecti, circiter 1 m. alti, modice graciles, simplices, firmi, teretes, glabri, laeves, 4-nodi, nodis et partibus internodiorum infra nodos breviter retrorseque albido-sericeo-pubescentibus. *Foliorum* vaginae arctae, internodiis breviores, inferiores asperulae, superiores glabrae laevesque, ciliatae, apice linea transversa dorsali pilorum albidorum instructae; ligulae truncatae, 1 mm. longae, ciliatae; laminae anguste lineares, in acumen longe attenuatae, involutae, 11-36 cm. longae, applanatae 3-3.5 mm. latae, firmae, rigidulae, supra breviter denseque pubescentes, subtus setoso-pilosae demum glabrescentes, scaberulae. *Panicula* erecta, stricta, angusta, 20-25 cm. longa, 1.5-3.5 cm. lata, subdensa; rhachis teres, tenuiter striata, scaberula, nodis inferioribus sericeo-pilosis; rami plus minusve erecti, usque ad 6 cm. longi, ad 4-nati, graciles, scaberuli. *Spiculae* 1.8-2 cm. longae, leviter turgidae, pallide stramineae vel purpureo-suffusae. *Gluma* inferior anguste lanceolata, acuminata, tricuspidata, 1.8-2 cm. longa, tenuiter chartacea, glabra, trinervia, nervis lateralibus manifestis; gluma superior anguste lanceolato-oblonga, apice 3-5-fida, 1.1-1.6 cm. longa, 5-nervia. *Lemma* oblanceolato-oblongum, apice integrum, cum callo 7-8 mm. longum, cylindricum, leviter turgidum, pilis adpressis sericeis fulvis apice usque ad 5 mm. productis dense indutum; callus 2 mm. longus, indumento lemmati similis; arista in toto circiter 5 cm. longa, bigeniculata, scaberula, columna ad 1.4 cm. longa, cum parte inferiore setae adpresse pubescente. *Palea* lemma aequans, indumento similis. *Caryopsis* anguste obovoideo-fusiformis, pallide brunnea.

SOUTH AUSTRALIA. Kinchina, Nov. 1924, J. B. Cleland S.40.

1179. *Stipa congesta* Summerhayes & Hubbard [Gramineae]; ab affini *S. aristiglumi* F. Muell. panicula densa, gluma superiore trinervia, lemmatis apice brevissime lobato, aristae columna breviter pilosa satis distinguenda.

Basis ignotus. *Culmus* unus a nobis visus erectus, moderate validus, plus 40 cm. longus, teres, dense pubescens. *Foliorum* vaginae arctae, 11-15 cm. longae, tenuissime striatae, firmae, breviter pubescentes interdum glabrescentes; ligulae rotundato-truncatae, 2 mm. longae, ciliolatae; laminae anguste lineares convolutae vel involutae, 18-35 cm. longae, applanatae 3.5 mm. latae, rigidulae, firmae, puberulae, minute tuberculatae, tenuiter striatae. *Panicula* oblonga, densa, 11 cm. longa, ad 3 cm. lata; rhachis teres, puberula; rami 2-3-nati, erecti, usque ad 2.5 cm. longi, graciles, scaberuli; pedicelli filiformes, 1-5 mm. longi. *Spiculae* 1.3-1.4 cm. longae, nitidae, albido-stramineae. *Glumae* subaequales, anguste lanceolatae, tenuiter acuminatae, 1-1.4 cm. longae, membranaceae, pubescentes, trinerviae, nervis lateralibus

ad mediam glumam attingentibus. *Lemma* oblongum, subcylindricum, cum callo 5.5 mm. longum, apice brevissime bilobulatum, lobulis obtusis 0.25 mm. longis, adpresse albido-pilosum; callus 1 mm. longus, dense pilosus; arista 2.5-3.5 mm. longa, fere stricta vel bigeniculata, parte inferiore sparse sericeo-pilosa, pilis adscendentibus. *Palea* lemma aequans. *Antherae* lineares, 2.75 mm. longae.

SOUTH AUSTRALIA. Morialta, near Adelaide, Oct. 1925, J. B. Cleland S.33.

1180. *Stipa variegata* Summerhayes & Hubbard [Gramineae]; a *S. pubescente* R.Br. culmis brevioribus gracilioribusque, panicula brevior, glumis tenuiter acuminatis, anthoecio brevior apice piloso, aristae columna valde brevior recedit.

Gramen perenne, caespitosum. *Culmi* erecti, ad 35 cm. alti, simplices, graciles, teretes, laeves, 2-nodi, nodo summo exserto, nodis brevissime pilosis exceptis glabri. *Foliorum* vaginae arctae, inferiores imbricatae, auriculatae, firmae, glabrae, laeves, ore breviter barbatae; ligulae truncatae, 0.5 mm. longae, ciliolatae; laminae erectae, cylindrico-filiformes, in acumen durum longe attenuatae, 7.5-19 cm. longae, 0.5-1 mm. diametro, involutae, praeter margines scaberulos laeves, glabrae. *Panicula* secunda, laxiuscula, aristis exclusis 8-16 cm. longa, 2.5-3.5 cm. lata; rhachis gracilis, teres, scaberula; rami pedicellique filiformes, scaberuli, pedicelli 2-8 mm. longi. *Spiculae* 1.6-2 mm. longae, purpureo-suffusae. *Gluma* inferior angustissime lanceolata, tenuissime acuminata, spiculam aequans, membranacea, glabra, trinervia, nervis lateralibus manifestis; gluma superior inferiori similis, 1.3-1.6 cm. longa. *Lemma* ut videtur lineari-teres, cum callo 7 mm. longum, apice bilobulatum, lobulis 0.3 mm. longis, subdense sericeo-pilosum, pilis albidis adpressis vel adscendentibus; callus 2-3 mm. longus, pallide fulvo-pilosus; arista 4.5-8 cm. longa, bigeniculata et interdum fere stricta, gracilis, pallide straminea, columna circiter 1 cm. longa breviter pilosa. *Palea* lemma aequans.

SOUTH AUSTRALIA. Sandergrrove near Lake Alexandrina, Oct. 1926, J. B. Cleland S.36.

XL.—APLOSTELLIS AND CORYMBIS. T. A. SPRAGUE AND C. E. C. FISCHER.

In connection with the continuation of Gamble's "Flora of the Presidency of Madras" it was necessary to decide what names should be adopted for several of the genera of *Orchidaceae*, in particular *Nervilia* Gaud. and *Corymbis* Thou. *Nervilia*, which was treated in Benth. & Hook. f. Genera Plantarum and Hook. f. Fl. Brit. Ind. as congeneric with *Pogonia* Juss., is now regarded as an independent genus, for which the name *Aplostellis* Thou. has been adopted by some authors.

The generic name *Aplostellis* was attributed in the Index Kewensis to Thouars, Orch. Iles Austr. Afr. t. 24 (1822), doubtless because it had been cited by Lindley (Orch. Gen. & Sp. 411: 1840) as a generic synonym of *Haplostellis* Endl., and by Bentham (Gen. Pl. iii. 615: 1883) as a synonym of *Nervilia* Gaud., which he treated as a section of *Pogonia* Juss. Pfitzer (Engl. & Prantl, Nat. Pflanzenfam. ii. Abt. 6, 219: 1889) and Schlechter (Engl. Jahrb. xlv. 399: 1911) also appear to have regarded *Aplostellis* Thou. as a generic name; and Ridley (Fl. Mal. Penins. iv. 203: 1924) has adopted it in place of *Nervilia* Gaud. on the ground of priority of publication.

Aplostellis Thou. was, however, not a generic name but the name of a species. A critical examination of Thouars's preliminary paper "Sur l'histoire des plantes orchidées des îles australes d'Afrique" (Nouv. Bull. Soc. Philom. Paris, i. 314-319: 1809) and of his Orch. Iles Austr. Afr. (1822) shows that his system of nomenclature has been completely misunderstood by Lindley and other authors. He attempted to introduce two innovations into the nomenclature of Mascarene Orchids: (1) that all generic names of *Orchidaceae* should end in *-orkis* (*-orchis*); and (2) that each Mascarene species of that family should be known by a *single name* instead of a *binary combination*. These innovations were not accepted by other botanists, and when Thouars published his plates of Mascarene *Orchidaceae* in 1822 he employed a double system of nomenclature in the tables and plates, the names of genera and species according to his own peculiar method being followed by corresponding names in accordance with the established system. Thus *Aplostellis* Thou. was the uninominal name of a new *species* from Mauritius, which he placed under the new genus *Stellorkis* (*Stellorchis*); he appended the new binary combination, *Arethusa simplex*, for those who preferred to follow the generally accepted methods of nomenclature.

The mode of formation of the uninominal names of species was explained in Thouars's preliminary paper. The first half was an abbreviation or Greek translation of the trivial name; and the second half was composed of the first part of the generic name with the suffix *-is*. Thus *Aplostellis* is a portmanteau word composed of *aplo-*, the Greek equivalent of *simplex*, and *stellis* a contraction of *Stellorkis*.

Aplostellis as a generic name was proposed by A. Richard in 1828, but this is antedated by *Stellorkis* Thou. (1809) and *Nervilia* Comm. ex Gaud. (1826). Under Art. 20 of the International Rules, the name *Nervilia* has been conserved for the genus.

The generic name *Corymbis* has also been attributed to Thouars, but *Corymbis* Thou., like *Aplostellis*, was the name of a species, the corresponding generic name proposed by Thouars being *Corymborkis* (*Corymborchis*). *Corymbis*, as a generic name, should apparently be attributed to Lindley, Veg. Kingd. 183 (1846), who there merely mentioned it by name, as a genus about which nothing certain was known; or to H. G. Reichenbach in Bot. Zeit. 1849, 868, who

indicated that it was very closely related to *Chloidia* Lindl. (1840). The earliest name for the genus is *Corymborkis* Thou. (1809), which Thouars corrected to *Corymborchis* in 1822.

A statement of the generic synonymy of *Nervilia* (*Aplostellis*) is appended.

***Nervilia* Commerson ex Gaud.** in Freyc. Voy., Bot. 421, t. 35 (1826), *nomen conservatum*.

Stellorkis Thou. in Nouv. Bull. Soc. Philom., Paris, i. 317 (1809).

Stellorchis Thou. Orch. Iles Austr. Afr., Tabl. Genres, g, t. 24 (1822)

Cordyla Blume, Bijdr. 416 (1825), non Lour. (1790).

Aplostellis A. Rich. in Mém. Soc. Hist. Nat. Par. iv. 36 (1828).

Roptrostemon Blume Fl. Jav., Praef. p. vi. (1828), sub nomine *Cordyla*.

Haplostellis Endl. Gen. 219, n. 1603 (1837).

Rophostemon Endl. l.c. 216, n. 1578 (1837).

Haplostelis Reichb. Nomencl. 1. 56 (1841).

XLI.—MISCELLANEOUS NOTES.

We learn that DR. B. T. DICKSON, Professor of Botany, Macdonald College, Quebec, has been appointed by the Australian Government to be Chief Mycologist on the Council of Scientific and Industrial Research.

MR. J. ROBBIE, Student Gardener, Royal Botanic Gardens, Kew, has been appointed by the Government of the Sudan, Assistant Superintendent of Gardens, Khartoum Province.

The following appointments have been made by the Secretary of State for the Colonies:—MR. J. L. B. KINCAID, B.Sc., and MR. A. DE K. FRAMPTON, Superintendents of Agriculture, Nigeria; MR. J. P. WALTERS, Produce Inspector, Nigeria; MR. C. HARVEY and MR. A. S. STENHOUSE, B.Sc., District Agricultural Officers, Tanganyika Territory; MR. J. A. CRAIG and MR. R. G. HEATH, B.Sc.(Agric.), to be Agricultural Field Officers, Federated Malay States.

***Euphorbia caducifolia*.**—In Kew Bull. 1925, p. 341, it was stated that figure 486 of W. A. Talbot's Forest Flora of the Bombay Presidency and Sind, ii, 434, under *Euphorbia nerifolia* Linn. was probably the above named species. Through the courtesy of Mr. E. M. Hodgson, C.I.E., Chief Conservator of Forests, Bombay Presidency, specimens have been received which were collected in the locality quoted by Talbot, at elevations from 1935 to 2360 feet. As anticipated, they are of *E. caducifolia* Haines. The local vernacular name is *Gootgalli* (Kanarese); the milky juice of the plant is used locally as a cure for rheumatism.

C. E. C. F.

Botanical Magazine.—Part i of Vol. clii (1926) of the Botanical Magazine, which was published in August, 1927, contains the following illustrations:—

Magnolia Sprengeri diva Stapf (t. 9116), from China; *Cypripedium manchuricum* Stapf (t. 9117), a new species from Siberia; *Anagallis collina* Schousb. (t. 9118), a native of South Europe and North Africa; *Rhazya orientalis* DC. (t. 9119), an Apocynaceous genus from N.W. Asia Minor and Thrace; *Rhododendron megeratum* I. B. Balf. & Forrest (t. 9120), from the mountains of the Yunnan-Tibetan frontier; *Primula effusa* W. W. Smith & Forrest (t. 9121), a native of North Yunnan; following the description of this species a key to the *Malacoides* series of *Primula* is given which is of considerable value. It is also of interest to record here that *Primula effusa* has already produced double flowers under cultivation at Kew, though it has only been grown as a garden plant for a few years. *Salix gracilistyla* Miq. (t. 9122), from Japan and Korea, is the next plant figured and is followed by *Aster Forrestii* Stapf (t. 9123), a new species from S.W. China and Tibet; *Acacia marginata* R. Br. (t. 9124), a native of S.W. Australia; *Spartina Townsendii* H. & J. Groves (t. 9125), the grass which has spread over the mud flats of Southampton Water, etc.; and *Habranthus robustus* Herb. ex Sweet (t. 9126), a native of Uruguay or Argentina.

Pritzel's Iconum Botanicarum Index.—The Royal Horticultural Society of London have been engaged for some years in preparing a continuation of the *Iconum Botanicarum Index* of Georg August Pritzel, the first edition of which was published in 1855, with a supplementary list of references up to the end of 1865 which was issued in 1866.

These two volumes, which contain over 107,000 references to illustrations of Flowering Plants and Ferns, have remained till now the standard Alphabetical Register or book of reference to the illustrations of plants which have appeared in botanical, horticultural and other publications.

Owing to the enormous development in the facility of reproducing illustrations and the vast number of new plant figures which have been published since the appearance of Pritzel's supplementary volume, the Council of the Royal Horticultural Society decided in 1917 to undertake the revision and continuation of Pritzel's Index.

The work has been carried out at the Royal Botanic Gardens, Kew, where accommodation has been placed at the disposal of the Society in the Herbarium and Library, and the resources of the Library and the use of the Kew manuscript supplement of the Pritzel Index, which has been continued at Kew, have been granted to the Society.

The work of editing this important undertaking is in the hands of Dr. O. Stapf, F.R.S., late Keeper of the Herbarium. The task is now nearing completion, and the first portion is ready for press.

The new edition, which will also include the references in the original Index, will contain 450,000 references to illustrations of Flowering Plants, Ferns and Fern Allies published in botanical, horticultural, and other works and journals between the years 1753 and 1920 (inclusive). Further it is proposed to issue periodic supplements at intervals, the first being already in preparation.

The new work will bear the title

Iconum Botanicarum
INDEX LONDINENSIS

sive

G. A. Pritzelii

Iconum Botanicarum

Index locupletissimus

Emendatus auctus et ad annum MCMXX productus

The following principles have been adopted in connection with the revision:—

All botanical plates and figures are cited as they are given in the respective publications, and no attempt has been made to correct the name of a plant which may now be known under some other name. Obvious errors, other than taxonomic, have, however, been corrected. In order to obviate the disadvantage of the lack of uniformity in nomenclature those generic names which are now regarded as synonyms are cited under the generic names now generally accepted. For example, *Amygdalus* and *Cerasus* are cited under *Prunus* and cross-references are given from them to the latter genus.

References to figures of some of the more important hybrids have been included, but illustrations of the numberless garden varieties and forms of cultivated plants are not registered.

In citing the works in which the illustrations were published the system of abbreviations adopted for the *Index Kewensis* has been followed and a special list of titles in full is not included in the work.

Not only has the original Pritzel Index with its Supplement and the Kew Manuscript Supplement been typed out in card catalogue form for the purpose of preparing the present revision, but all the relevant literature in the libraries at Kew, the British Museum (Natural History), and elsewhere has been examined, and the necessary entries made. In addition very valuable assistance has been given by Botanists, particularly in France, Italy, Germany, Switzerland, Sweden, Austria, and the United States, and references to a very large number of figures, not readily available in this country, have been added, which will render the citations in the new Index almost complete.

The work is being printed and published by the Clarendon Press at Oxford and applications for copies should be sent to the Secretary, Royal Horticultural Society, Vincent Square, London, S.W.1.

Alfalfa Growing*.—A comprehensive work under this title has recently been published in the United States. "Alfalfa" is, in general, the common name of *Medicago sativa* Linn. in Spain, South America and the United States; but in England, France and other countries the plant is better known as "Lucerne." It is probable that there is no other crop so widely grown in arid, semi-arid and humid climates. It is believed to be a native of Persia and from there the plant has spread over nearly the whole of the agricultural world and its cultural forms are recognised by such geographical names as "Provence," "Turkestan," "Arabian" and "Peruvian." "Grimm" Alfalfa is a hardy strain acclimatised by selection from seed taken by Wendelin Grimm from Baden in Germany to Minnesota. It is understood to be a hybrid between the "purple-flowered" or "common" Alfalfa and the "yellow-flowered" or "sickle" Alfalfa (*Medicago falcata* Linn.), a native of Europe, Siberia and Northern China, particulars of which the author includes in his work. These strains represent varying degrees of hardiness. It is possible to grow "Grimm" in the more rigorous climates, "Provence" and "Turkestan" are less resistant to cold and more suitable for the Temperate regions, whilst "Peruvian" and "Arabian" are classed as non-hardy and best adapted to Tropical and Sub-tropical areas. Given suitable conditions the plant is unequalled for feeding value, especially when supplemented by Maize, other grain, or grass-hay, and no country where cattle are bred on a large scale for "dairying" or "beef" can afford to be without it.

The author gives full particulars of the life-history and cultivation of this important crop, and the value of the book is greatly enhanced by a bibliography which includes about 650 references to the subject.

It may be mentioned in reference to the cultivation at home, covering perhaps more than 50,000 acres, that the Ministry of Agriculture have had from time to time various papers on the subject in their Journal and have issued a Leaflet (No. 160) on "The Cultivation of Lucerne." Notes on *Medicago sativa* have appeared in the Kew Bulletin, 1919, pp. 3 and 4, and Additional Series ix. pp. 186-190.

J. H. H.

* Alfalfa-Growing in the United States and Canada, by G. Stewart. The Macmillan Company, New York, 1920, pp. xxiii + 517, ill. 118. Price 15s. net.

BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1927 ROYAL BOTANIC GARDENS, KEW

XLII. — AGRICULTURE AND HORTICULTURE IN MAJORCA. W. DALLIMORE.

At the beginning of September an opportunity occurred of visiting Majorca and although the visit was a hurried one, the kindness of several persons in the Island enabled me to see a good deal of the country and to obtain an insight into the activities of the people.

Primarily my business was connected with the Almond industry for which the Island is famous, but through the kindness of Engineer Director Don Filipe Fuster Rosenol, of the Estacion Arboicultura y Fruti-Cultura, Palma de Mallorca, of Mr. F. G. Short, an Englishman who conducts tourist and other agencies in Palma, and of Captain Munn, an Englishman resident in Puerto Alcudia, I was able to see and learn a good deal of other matters that concern the Islanders.

The greater number of country people are engaged in agricultural pursuits, although there are other small industries that absorb some of the workers; blankets, lace, basket and tile making are a few of the manufactures. In the towns tourists make work for many people, whilst a good many men are employed by the shipping firms in the ports.

The agricultural people appear to be thrifty and industrious, and although they are working under considerable difficulties they are said to be happy and contented, and many of them are reputed to be well-to-do. Perhaps the greatest difficulty the Islanders have to face is the shortage of water. No rain falls between early May and September, there are no lakes in the Island and the streams dry up during summer. From certain springs in the mountains some water is conducted to the towns, but most of the people have either to rely upon rain water storage tanks, or wells, for their water. Farmers and gardeners in the mountains collect and store water during the rains for summer use, whilst their brothers of the plains pump theirs from wells. A pump may be worked by a windmill, or a water wheel, turned by a mule or donkey, may be employed in places where water can be obtained within easy distance of the surface of the ground. In some places water may be found at a depth of a few feet, at others wells may have to be bored to a considerable depth.

With this water shortage it may only be expected that by the end of summer a good deal of land becomes parched. This was the case at the time of my visit and a great deal of the vegetation on

non-irrigated land was burnt up. There were few herbaceous plants to be seen and trees and shrubs were burnt and shrivelled. Everywhere about the towns and near the roads plant life was thick with white dust, of which there was a considerable depth on many of the roads. Bright spots amongst wild and cultivated plants, however, were seen in the Carob or Locust (*Ceratonia Siliqua* L.), and in the Mastic (*Pistacia Lentiscus* L.). In both cases the leaves were as fresh and green as if there had been frequent rain, whilst the Carob was bearing both ripe fruit and flowers and the Mastic abundant red berries. The Aleppo Pine (*Pinus halepensis* Mill.), and two evergreen Oaks (*Quercus Ilex* L. and *Q. Ballota* Desf.) had also withstood the drought very well.

The most important crop of the Island is undoubtedly the Almond. Of this a large number of varieties are cultivated. There is a doubt, however, as to whether many of these varieties are distinct and whether one variety may not be known under different names in different districts. This is one of the problems that Don Filipe Fuster Rosenol is setting himself to solve. He intends to collect all the named sorts and if possible reduce the number by grouping those that are alike under one definite name. A great deal of trouble is taken with the cultivation of Almond trees. In some cases they are planted in orchards many acres in extent, in others a few trees are grouped on a small terrace held up by stone walls. In almost all cases the trees are widely spaced and it is unusual for the branches of two trees to meet. The ground beneath the trees is cultivated and from it a crop of broad beans or corn is taken during the winter and spring months. It lies fallow during summer and is ploughed as soon as the Almonds are gathered. Both chemical and farmyard manures are used as fertilisers, and in many places the land appears to be on the poor side. Very often the orchards are composed entirely of Almonds but in some there may be a mixture of Almonds, Olives, Carobs, or Figs. Mixed orchards are more common on the higher land than on the plains. When the Almonds are ripe they are knocked off the branches by means of long bamboo poles and are then picked up by women and children. After drying in heaps, the nuts are separated from the husks, and the shells are then broken either by hand or machinery and the kernels extracted. The different forms do not appear to be kept separate in the gathering and shelling but the kernels are graded for marketing. There appears to be little waste in the Island. The shells of the Almonds even are carefully saved and used for burning for heating purposes. As soon as the crop is gathered the trees are carefully pruned, all inside wood and broken branches being cut away. All prunings are kept, tied in faggots and used in the bakeries. The same pruning is carried on with Olives, Carobs and Figs, thus a tree with a dense head is rarely seen. When a large Almond branch is broken it is cut off and grafts are inserted the following spring. The trees are usually between 20 and 30 feet high and always

standards with trunks 5 or 6 feet high. Most of the trees are said to be white-flowered. So prosperous is the Almond industry at the present time that as old Olive trees die they are replaced by Almonds and several newly-planted fields of Almonds were noticed on land recently reclaimed from the wild mountain side. A good deal of trouble is taken in preparing places for new trees. Old trees are grubbed up by the roots and I noticed in several orchards holes 4 to 5 feet across excavated for the coming planting season.

Next to the Almonds come the Olives. These trees also cover a considerable area of ground and they are carried higher up the mountains than the Almonds. Very often they are found on terraced ground and there are many instances of walls being built to support one or two trees. Most of the Olive trees are old, some very old, with curiously twisted and gnarled trunks, often hollow but usually with good heads of healthy branches. The Olive season follows the Almond season. The fruits are allowed to fall and are then picked up on frequent occasions by women and children. The first expression of oil usually takes place in the Island, the pulp afterwards being sent to the Mainland for further treatment.

The fruit of the Carob is collected and used as food for cattle, horses, mules and other animals. Figs are plentiful and at the time of my visit the second gathering was in progress. The fruits were opened and spread out on reed screens to dry. After the bulk of the fruit of these several trees has been collected, pigs are allowed to run over the ground and gather up anything they can find before the crop of beans or grain is sown. Fat pigs, by the way, are exported in large numbers from the Island to Barcelona during the winter months. A good deal of lard is prepared in Barcelona.

Grapes form another valuable agricultural crop in the Island. Several varieties are grown, white, black and red. Many are eaten, but there is a wine industry of considerable proportions in Majorca. Naturally, green fodder is very scarce in the summer months. Cattle are stall fed and I saw very few cows out of doors; goats, however, are plentiful. Alfalfa appears to be the chief fodder plant and that is irrigated.

Market garden crops are numerous and irrigated land is both well cropped and well cultivated. In the wet season cabbages, peas, beans, &c., are grown, and early potatoes are a source of income. During the summer large numbers of melons are grown, also sweet potatoes, peppers (*Capsicum*) which are used both green and ripe, whilst they are also dried for winter use. The egg plant (*Solanum Melongena*) is a common vegetable; spinach is widely grown as are also several salads; lettuce, however, is rather tough, endive is better; dandelions are found in the markets, there are quantities of large tomatoes which have a less pleasing appearance than those grown in England, whilst the potatoes look to be of poor quality; perhaps that is the reason why they are served in so many guises in the hotels. There is a considerable trade in a small variety of

tomato, known under the name of "Ramillete." This is extensively grown in Banalbufar, and is planted to trail over sticks in the way of peas; the large fruited varieties are allowed to trail on the ground. The fruits of "Ramillete" are oval, 1-1½ inch long and they are gathered when ripe with the stalk attached. They are then threaded through the stalks in ropes, each about one metre long, about 100 fruits going to form one rope, the fruits being arranged in three rows in the rope. They are then hung vertically in an airy room where they keep in good condition for several months and are marketed during winter. The fruits are inspected every few days and any that show signs of decay are removed. Fruits that lose their stalks are marketed at once.

In addition to grapes, there are other fruits, notably peaches, apricots, pomegranates, oranges, lemons, apples, pears, plums and cherries. Fruits such as thrive out of doors in England have not the quality of the best English fruit. Probably lack of moisture may be the reason. Moreover there appear to be troublesome pests amongst some kinds of fruit trees. The formation of the Fruticetum at Palma marks a step taken by the Government towards demonstrating improved methods of fruit culture to the Islanders. It is intended to form collections of all kinds of fruit trees and to encourage visits from interested people. Eventually agricultural problems will also be investigated. One of the subjects engaging the attention of the Director at the present time is the study of the various varieties of Almond, another is an attempt to revive the silk industry of the Island, whilst a third is a test of the relative egg-laying value of various kinds of fowls. Fruit trials are to begin as soon as arrangements are completed for irrigating the ground. To aid in this purpose a well 32 metres deep has been sunk and a large reservoir is being built. One of the Director's duties is to go about the Island and lecture on horticultural questions.

There appears to be little or nothing done in the way of a cut flower industry and on several occasions I heard the comment that there was a good opening for some person to engage in that branch of horticulture.

Market gardening is practised on both the plains and mountain slopes. The mountains are terraced, and water for irrigation is stored in large tanks. At Banalbufar the steep mountain side is terraced for several hundreds of feet in height, narrow terrace after narrow terrace held up by stone walls; these walls are built wherever sufficient soil can be found to sustain plant life, and water is conserved by means of a very elaborate system of reservoirs.

Very few serious attempts appear to have been made with decorative gardening. The gardens attached to houses are usually small and the water problem in the summer months discourages householders from attempting extensive garden operations. In one garden I saw a number of interesting climbers in full bloom, notably *Bignonia venusta*, *Tecoma grandiflora*, *Bougainvillea glabra*, and one

or two others. Species of *Eucalyptus*, *Acacia*, *Cinnamomum*, *Schinus mollis*, *Pittosporum Tobira*, *Casuarina* spp., *Phoenix* spp. and a few other trees and large shrubs were noticeable but not abundant. The Oleander was the finest flowering shrub at the time of my visit and there were some good bushes of *Hibiscus rosa-sinensis*. One of the commonest climbers was *Ipomoea rubrocoerulea*, and it was flowering freely. In several places I saw good examples of *Magnolia grandiflora*. Public gardens are restricted to small squares about the streets. They are furnished with Date Palms, *Schinus mollis*, Oleanders, *Hibiscus rosa-sinensis*, Acacias, and a few other subjects, with sometimes a carpet of *Achillea Millefolium* in place of grass. This plant is also much used in Barcelona in place of grass, and is propagated by division. The wider streets are lined with trees, notably *Phoenix dactylifera*, *Platanus orientalis*, *Robinia Pseudacacia*, *Ligustrum lucidum*, *Schinus mollis*, and a few *Sophora japonica*. The *Ligustrum* appears to be very popular, both green and variegated. It is encouraged to form a trunk 6-8 feet high and then to form a round head. The Date Palm bears fruit but it does not ripen well.

The chief forest tree in the Island is *Pinus halepensis*, but there is a goodly number of oaks, *Quercus Ballota* and *Q. Ilex*, some elms and occasional trees of *Celtis australis*, *Crataegus Azarolus*, *Pyrus Sorbus*, *Fraxinus* sp., *Pinus Pinea*, etc. The Aleppo Pine, *Pinus halepensis*, is everywhere on uncultivated land. Usually below 50 feet in height, the trunk rarely exceeds 12 inches in diameter, and is often not more than 8 or 9 inches when felled. Natural regeneration appears to be relied upon for reproduction and trees grow under what would appear hopeless conditions, almost upon bare rock where other vegetation is parched up. In some places a good many young trees are to be found, in others they are not plentiful. In some places there are areas of almost pure pine but more often the pines are mixed with oaks and other trees. Beneath the pines there is considerable undergrowth, the shrubs including *Pistacia Lentiscus*, Rosemary, *Cistus* spp., several spiny Leguminous shrubs, two or more species of *Asparagus*, *Arbutus Unedo*, *Myrtus communis*, *Erica multiflora*, here and there *Erica arborea* never very tall, two Lavenders, *Phillyrea angustifolia*, *Juniperus Oxycedrus*, *Smilax aspera* forming with other spiny plants a rare tangle, *Clematis Flammula*, in some parts *Chamaerops humilis*, and *Hypericum balearicum*. The last named was conspicuous as a shapely bush 2-3 feet high and fresh in appearance in spite of the drought that had dried up many other shrubs. The remains of various herbaceous plants were noticed but little could be recognised, except a species of *Veratrum* which seemed to be a weed everywhere. Two bulbous plants were in flower, *Pancratium maritimum*, on the outskirts of the woods in the deep sand of the seashore, and a Squill, *Urginea* sp., probably *U. Scilla*, which was seen in thin woods, with inflorescences of white flowers 3 feet or more long.

The woods are managed on the selection system and very considerable economy appears to be practised. The pines are stripped of their lower branches and the branches are collected and tied in faggots for heating baking ovens. In the same way small wood of other trees and shrubs is saved. There is nothing left to rot. The bark is removed from the pines, collected and sent to the tanneries, of which there are several in the Island. Timber that cannot be utilised in any other way is made into charcoal, for which there is a home demand. Any wood, however, that can be manufactured, be it pine, olive, oak, or anything else, is saved. The oak trees are not very large and are of less importance for timber than the pines. In one place I saw a small plantation of *Platanus orientalis* that was doing very well. The trees had formed long, straight trunks and were very healthy. In some parts of the Island Poplars are also being grown. The two largest trees I saw in the Island were *Celtis australis* in a garden, with a very large head and a trunk over four feet in diameter, and a specimen of *Pinus Pinea* on the road side near Soller which had a very fine long, stout trunk and a shapely head of branches.

In parts where *Chamaecrops humilis* is plentiful the leaves are collected and shredded into strips, the strips are then plaited, often by peasants, shepherds and other country people, and the plaits are sold to the hat- and basket-working people in the towns. In some parts where this palm had begun to form a stem the stem had been burnt, apparently to induce a mass of leafy growths from the base.

Two trees which are sometimes thought to be plentiful in the Balearic Islands, *Buxus balearica* Willd., and *Ilex platyphylla* var. *balearica* (*I. balearica* Desf.), are indeed very scarce. I only saw one bush of the Box and did not find the Holly either wild or cultivated. Captain Munn told me of a small grove of the Box growing in the mountains near the Port of Pollensa and we found a locality for the Holly in a Spanish Flora, but so far Captain Munn has not found the plant. Apparently if these species were at any time common they have succumbed in the onward march of cultivation.

From a botanising point of view my visit was ill-timed, being just at the end of the dry season. From the commencement of the rains in September to the beginning of dry weather in May, flowering plants are said to abound, whilst the climatic conditions are ideal, occasional wet days alternating with long sunny intervals.

XLIII.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXIII.

Castanola glabrifolia Schellenb., comb. nov. [Connaraceae].

Agelaea glabrifolia Hance in Journ. Bot., xiv. p. 257 (1876).

Chantabun, Lêm Sing, 20 m., scrub jungle, Kerr 6945.

Distr. Cambodia (*type*).

*Continued from K.B., 1927, p. 220.

Connarus Planchonianus Schellenb. [Connaraceae]; species *C. grandi* Jack affinis sed foliis oblongis ployneuris necnon ovatis sensim acuminatis oligoneuris, staminibus 10 fertilibus folliculisque haud oblique hamatis facile distinguenda.

Frutex scandens, ramis verruculose lenticellatis, novellis subglabris. *Folia* imparipinnata, 1-2-iuga, rhachi 6-20 cm. longa crassa; foliola 7-30 cm. longa, 4-12 cm. lata, oblonga, apice obtuse vel acutius acuminata, basi subrotundata, rigide coriacea, nitida, glabra, supra in siccitate obsolete venosa, subtus tenuiter graciliterque transversim venosa; costae secundariae utrinque 8-9, tenues, patentes, ante marginem obsolete confluentes. *Inflorescentiae* terminales, paniculatae, paniculis ramorum axillarium auctae, multiflorae, ramosae, rhachibus adpresse ferrugineo-tomentosis; flores atro-rubri. *Sepala* 3.5 mm. longa, 2.3 mm. lata, ovalia, subacuta, extus intusque tomentosa, punctata. *Petala* 6 mm. longa, 1 mm. lata, glabra, margine glandulose ciliata, punctata. *Filamenta* longiora glanduligera. *Folliculus* (ut videtur haud bene maturus) ad 4.5 cm. longus, 2 cm. latus, a latere compressus, basi in stipitem crassum 5 mm. longum contractus, apice obsolete apiculatus, sutura dorsali basi concava apicin versus leviter convexa ventrali convexa; pericarpium sublignosum, extus glabrum (glabratum), oblique nervoso-striatum, intus tomentosum; semen (immaturum) arillo basem amplexente dorso vix evoluto lateribus protracto itaque bilobo ornatum.—*C. grandis* Hook. f. in Fl. Brit. Ind. II. p. 53 (1876), Kurz, For. Fl. Brit. Burma, I. p. 328 (1877), atque King in Journ. As. Soc. Beng. LXVI. 2, p. 7 (1897) pro parte, haud Jack.

Chumpawn, Ta Ngaw, 200m., evergreen forest, Kerr 11585.

Lower Burma. Tenasserim, Helfer 1269.

Malay Peninsula. Perak, King's Collector 4932, 6178, 7699, 10721, 10793, Wray 2370. Malacca, Griffith 1268, Maingay 504, 505. Singapore, Wallich Cat. 8538A (*type*) 8538B ex parte. Changi, Ridley 7590.

Castanola villosa Schellenb., comb. nov. [Connaraceae].

Erythrostigma villosum Zoll. in Nat. Tijdschr. Ned. Ind., xiv. p. 175 (1857).

Pulau Rawei (ex Ridl.).

Distr. Java (*type*).

Castanola Wallichii Schellenb., comb. nov. [Connaraceae].

Agelaea Wallichii Hook. f. in Fl. Brit. Ind., ii. p. 47 (1876).

Pattani, Banang Sta, 50 m., evergreen forest, Kerr 7271.

Distr. Singapore (*type*).

Roureopsis stenopetala Schellenb., comb. nov. [Connaraceae].

Cnestis stenopetala (sphalm. steriopetala) Griff., Not., iv. p. 433 (1854).

Prê, Hui Kammi, 270-300 m., Kerr 2349. Pak Chawng, 300 m., Marcan 1516.

Distr. Tenasserim (*type*).

Santaloides rubellum Schellenb., comb. nov. [Connaraceae].

Rourea rubella Pierre, Fl. For. Cochinch., t. 379, fig. F (1898).

Sriracha, 5 m., Mrs. D. J. Collins 84, 768.

Distr. Cochinchina (*type*).

Santaloides siamense Schellenb. [Connaraceae]; species nova ad gregem foliolis dense areolatis pertinens, foliolis latioribus subovatis, terminali basem versus cuneato distincta.

Frutex scandens, ramulis puberulis. *Folia* imparipinnata, 1-3-iuga, rhachi 3-12 cm. longa glabra; foliola 3.5-12.5 cm. longa, 2-5 cm. lata, elliptica, longe (usque ad 1 cm.) acuminata, basem versus cuneatim angustata, chartacea, glabra, dense prominulo reticulata, supra nitidula, subtus opaca et glaucescentia; foliola lateralia dimidio paginae superiore producto obliqua; costae secundariae utrinque circa 5, basillares erectae, ceterae patentes. *Inflorescentiae* paniculatae, in axillis foliorum fasciculatae, rhachibus circa 5 cm. longis subglabris; flores albi, fragrant. *Sepala* 2.5 mm. longa, 1.6 mm. lata, late oblonga, obtusa, glabra, apice barbata, margine ciliata. *Petala* 6 mm. longa, 2 mm. lata, glabra. *Folliculus* arcuatus, 2 cm. longus, glaber, tenuiter longitudinaliter striatus, sutura ventrali dehiscens, basi sepalis accretis 5 mm. longis glabris arcte cinctus; semen modo generis arillo amplo tenui libero involutum.

Doi Sutep, 1500 m., evergreen forest, Kerr 1771 (*type*). Pa Miang, Chê Sawm, 1100 m., evergreen forest, Kerr 3109.

Afgekia Craib, gen. nov. [Leguminosae-Galegeae]; a *Millettia* Wight et Arn. et a *Fordia* Hemsl. cui ovulis duobus simile, inflorescentia racemosa iuventute comosa, calyce bilabiato lobis conspicuis, antheris et apice et basi pilosis, legumine turgido lignoso, funiculo mox elongato indurato distinguendum.

Calyx bilabiatus, labio postico tubo paulo brevior, lobo infimo tubo longior. *Vexillum* amplum, basi medio callosum et paululo altius bicallosum; alae oblongae, basi hastatae; carina incurva, obtusa; petala omnia unguiculata. *Stamen* vexillare ima basi ab aliis liberum, altius cum aliis connatum, filamentis inter se subaequilongis, antheris uniformibus et apice et basi pilosis longitudinaliter dehiscentibus. *Ovarium* stipitatum, stylo inflexo terete, stigmate parvo terminali, ovulis 2. *Legumen* ambitu oblongum, turgidum, dehiscens, valvis lignosis; semina 2, ambitu orbicularia, paulo compressa, glabra, funiculo elongato duro persistente, hilo elongato pallido.—*Frutex* volubilis. *Folia* imparipinnata; stipulae conspicuae, diutius persistentes, basi productae; foliola opposita; stipellae evolutae, diutius persistentes. *Racemi* axillares, mox folia superantes, conspicue bracteati. *Vexillum* et *carina* pilosa.

Afgekia sericea Craib.

Frutex volubilis; ramuli nonnulli aphylli, cirrhiformes, primo densius adpresse molliter pilosi, mox fere glabri, teretes, inconspicue sulcati, straminei vel brunneo-straminei. *Folia* pinnatim

15-17-foliolata, petiolo 2-3.5 cm. longo incluso 18-22 cm. longa, petiolo basi incrassato cum rhachi indumento ei ramulorum simili tecto supra parum canaliculato, rhachi inferne supra canaliculata apicem versus complanata subalata; stipulae diutius persistentes, dimidio ovatae vel lanceolatae, apice longius acute attenuatae, basi productae, usque ad 20 mm. longae et 5 mm. latae, pagina utraque pilosae, ciliatae; foliola opposita, oblonga vel oblongo-lanceolata, apice longius mucronata, basi inferiora parum inaequalia, superiora aequalia, truncata vel truncato-cordata, 2-5 cm. longa, 1-2.5 cm. lata, chartacea vel coriaceo-chartacea, supra primo subsericea, mox sparse pilosa, subtus sericea, nervis lateralibus utrinque 8-10 supra vix conspicuis subtus subprominentibus, nervulis paucis subtus prominulis, margine densius ciliata, petiolulo 2-3 mm. longo adpresse piloso suffulta; stipellae diutius persistentes, petiolulis aequilongae vel iis paulo breviores. *Racemi* axillares, sub anthesin foliis aequilongi, infructescentes pedunculo communi incluso ad 50 cm. longi, folia longe superantes, pedunculo communi petiolo paulo brevior suffulti, rhachi inferne bracteis sterilibus stipuliformibus instructa, cum pedunculo primo pilis longis divaricatis instructa praeterea puberula mox lignosa pilosa; bractee deciduae, ante anthesin flores longe superantes, ad 3.5 cm. longae, apice longius attenuatae, pilosae; flores singulatim dispositi, pedicellis 5 mm. longis suffulti. *Calycis* bilabiati extra longius pilosi tubus 6 mm. longus, lobi postici approximati, lanceolati, acuti, 4.5 mm. longi, basi 1.5 mm. lati, laterales a posticis sat distantes, lineari-lanceolati, acuti, 7 mm. longi, basi 1.5 mm. lati, antico subulato acuto 8 mm. longo basi 1.5 mm. lato, omnibus longius ciliatis et intra pilosis. *Vexillum* ellipticum, apice breviter acuminatum, basi cordatum, 22 mm. longum, 17 mm. latum, ungui valido 4 mm. longo suffultum, intra basi medio callo orbiculari concavo instructum et paululo altius bicallosum, intra glabrum, extra longius densius pilosum, margine inferne ciliatum; alae oblongae, basi hastatae, apice rotundatae, 19 mm. (ungui 4.5 mm. longo excluso) longae, 7 mm. latae, apicem versus longius ciliatae; carina, ungui circa 10 mm. longo excluso, 15 mm. longa, apice 15 mm. lata, obtusa, basi in unguem angustata, extra longius pilosa. *Stamina* monadelpha, vexillari ima basi tantum ab aliis libero, filamentis inter se subaequilongis paulo supra antherarum bases insertis, antheris oblongis longitudinaliter dehiscentibus et apice et basi pilosis. *Ovarium* sericeum, circa 4 mm. longum, stipite circa 7 mm. longo suffultum, stylo 21 mm. longo inferne adpresse pubescente, stigmate parvo terminali capitato, ovulis 2. *Legumen* lignosum, sat crassum, dehiscens, ambitu oblongum, 7 cm. longum, 3 cm. latum, brunneum, sparse pilosum, pedicello 1.5 cm. longo et stipite 7 mm. longo ambobus lignosis suffultum; semina 2, ambitu orbicularia, paulo compressa, 15 mm. diametro, testa nitida pallide brunnea atro-maculata; hilum seminis partem dimidiam involvens, pallidum; funiculus lignosus, persistens, circa 2 cm. longus.

Korat, *Anuwat* 4 (*type*). Korat, Chantûk, 300 m., savannah, *Kerr* 8057.

Mucuna brevipes *Craib* [Leguminosae-Phaseoleae]; a *M. pruriens* DC. foliolis subtus subadpresse albo-pubescentibus haud sericeis, bracteis oblongo-ellipticis haud lanceolatis recedit.

Caules annui (?), volubiles, primo dense pubescentes, mox plus minusve glabrescentes, striati. *Folia* trifoliolata, petiolo 5-7 cm. longo breviter pubescente basi incrassato suffulta; stipulae deciduae, lineari-lanceolatae, acutae, circa 5 mm. longae; foliola lateralia inaequilateralia, latere superiore dimidio oblanceolata, basi rotundata, inferiore dimidio late ovata, basi truncata, terminali subrhombico, omnibus apice apiculatis ad 12 cm. longis et 8 cm. latis chartaceis inventute pagina utraque dense molliter adpresse pubescentibus mox superiore pilis brevibus sparse instructis inferiore pallidioribus pubescentibus vel interdum subadpresse pubescentibus, nervis lateralibus utrinque 6-8 ad marginem currentibus supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, petiolulo circa 5 mm. longo sat valido breviter pubescente suffultis, terminali a lateralibus circa 2 cm. distante; stipellae angustae, petiolulis breviores. *Racemi* apicem versus ramulorum axillares, solitarii vel interdum gemini, pedunculo communi brevi incluso ad 15 cm. longi, pedunculo cum rhachi dense longius fulvo-pubescente; bractae deciduae, oblongo-ellipticae, ad 2.5 cm. longae et 1.2 cm. latae, pagina utraque adpresse cinereo-pubescentes; flores atropurpurei (ex *Kerr*), pedicellis circa 5 mm. longis indumento ei pedunculi simili obtectis suffulti. *Calyx* extra breviter cinereo-pubescentis praeterea pilis longioribus brunneis rigidis instructus, intra adpresse pubescens; tubus 5 mm. longus; lobi postici in unum apice rotundatum 3 mm. longum 5 mm. latum connati, laterales deltoidei, 2.5 mm. longi, 2 mm. lati, antico lanceolato-deltoideo 4.5 mm. longo 3 mm. lato. *Vexillum* late ovatum, apice emarginatum, basi cordatum, ungui brevi incluso 2 cm. longum, 1.6 cm. latum; alae basi latere altero auriculatae vel cordato-auriculatae, altero cum ungui dense ciliatae, ungui 5 mm. longo incluso 3 cm. longae, 9.5 mm. latae; carinae petala basi cordata, apice paulo curvata, ungui 9 mm. longo incluso 4.5 cm. longa, 5.5 mm. lata. *Stamen* vexillare ab aliis liberum, filamentis apicem versus alternatim conspicue latioribus et paulo latioribus summo apice angustatis, antheris alternatim oblongis et brevioribus glabris. *Pistillum* 4 cm. longum, ovario subsessili basi disco breviter tubulari cincto sutura postica praesertim superne longius hirsuto aliter pubescente, stylo apicem versus indurato glabro aliter pubescente, stigmatibus capitato breviter piloso, ovulis 5-6.

Doi Sutep, 1650 m., climbing over bushes on old clearing, *Kerr* 1572B.

Mucuna gracilipes *Craib* [Leguminosae-Phaseoleae]; a *M. hirsuta* Wight et Arn. floribus multo maioribus recedit.

Caules annui (?), prostrati (ex *Winit*), pilis longiusculis sat rigidis fulvis saepissime reflexis tecti, striati, angulati. *Folia* trifoliolata, petiolo 8-10.5 cm. longo basi incrassato indumento ei caulium simili tecto suffulta; stipulae lineari-oblongatae, acutae, 8 mm. longae, dorso hirsutae, intra glabrae, hirsuto-ciliatae; foliola lateralia inaequilateralia, latere superiore dimidio oblongo-oblongata, basi cuneato-rotundata, inferiore dimidio late ovata, basi truncata, terminali oblongo-elliptico vel oblongo-obovato, omnibus apice rotundatis vel obtusis costa excurrente longius apiculatis 9-13 cm. longis 5.5-9.5 cm. latis chartaceis supra ad costam nervosque laterales albo-hirsutis aliter pilis albis adpressis sparse instructis subtus pallidioribus indumento simili sed paulo longiore et tenuiore instructis, nervis lateralibus utrinque 7 ad marginem currentibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis subtus prominulis, margine ciliatis saepissime undulatis, petiolulis 3-4 mm. longis fulvo-pilosis suffultis, terminali a lateralibus 1.5-2 cm. distante; stipellae filiformes, petiolulis paulo longiores, apice pilosae. *Racemi* axillares, pedunculo communi gracili 7-12 cm. longo incluso 10-17 cm. longi, pedunculo inferne glabro superne pilis ferrugineis reflexis instructo, rhachi adpresse hirsuta; bractae deciduae, oblanceolato-oblongae, apice acutae, fere 1.5 cm. longae, 8 mm. latae, dorso sparse adpresse hirsutae, intra sparse pubescentes, ciliatae; flores ad nodos gemini, pedicellis circa 1 cm. longis sericeis suffulti. *Calyx* utrinque sericeus praeterea dorso pilis brunneis rigidis instructus; lobi postici in unum deltoideum apice rotundatum interdum paululo emarginatum 7 mm. longum 10 mm. latum connati, laterales lanceolati, acuti, 5-6 mm. longi, 2.5-3 mm. lati, antico late lanceolato inferne paulo angustato apice acuto 10 mm. longo 4 mm. lato, omnibus ciliatis. *Vexillum* fusco cyaneo-purpureum (ex *Winit*), oblongo-ellipticum, basi auriculato-cordatum, ungui brevi incluso 3.2 cm. longum, 2 cm. latum; alae fusco cyaneo-purpureae (ex *Winit*), suboblongae, basi subtruncatae, apice rotundatae, ungui 2 mm. longo incluso 6.3 cm. longae, 1.3 cm. latae, inferne latere altero albo-ciliatae, altero parce breviter pilosae; carinae albae (ex *Winit*) petala apice curvata, basi auriculata, ungui 6 mm. longo incluso alis subaequilonga, 6 mm. lata. *Stamen* vexillare ab aliis liberum; filamenta superne alternatim conspicue latiora et paulo latiora, apice angustata, antheris alternatim oblongis et brevibus glabris. *Pistillum* 6.5 cm. longum, ovario subsessili suturis albo-pubescente faciebus subglabro basi disco conspicuo cincto, stylo nisi apice indurato adpresse pubescente, ovulis 5-6.

Lampun, Mê Kaw, 250 m., *Winit* 1541

Pueraria barbata *Craib* [Leguminosae-Phaseoleae]; a *P. stricta* Kurz caulibus conspicue angulatis et ad angulos barbatis recedit.

Caules herbacei, volubiles, conspicue angulati, ad angulos longe et dense brunneo-barbati, aliter pilis paucis longiusculis instructi.

Folia trifoliolata, petiolo 9-13.5 cm. longo supra canaliculato in sulco pilis reflexis adpressis dense tecto lateraliter barbato subtus piloso suffulta; stipulae lanceolatae vel late lanceolatae, basi haud productae, vix 1 cm. longae, costatae, dense pubescentes, diutius persistentes; foliola lateralialia inaequilateralialia, latere altero dimidio lanceolata vel oblanceolata, basi rotundato-cuneata vel subrotundata, altero dimidio subrhombea, basi latissime cuneata vel subtruncata, omnibus apice acute acuminatis usque ad 19.5 cm. longis et 12 cm. latis chartaceis sicco viridibus subtus pallidioribus supra ad costam nervosque densius adpresse albo-hirsutis aliter parce setosis subtus sericeis, nervis lateralibus utrinque 5-6 intra marginem ipsam anastomosantibus cum costa supra conspicuis subtus prominentibus, nervis transversis inter se parallelis supra subconspicuis subtus prominulis, margine cartilagineis ciliatis; petioluli ad 7 mm. longi, densius hirsuti, foliolo terminali a lateralibus ad 3 cm. distante; stipellae persistentes, angustae, petiolulis subaequilongae. *Racemi* axillares, pedunculo communi ad 8 cm. longo incluso ad 23 cm. longi, et pedunculo et rhachi longius longitudinaliter barbatis; bractae angustae, 5 mm. longae; bracteolae binae, ad pedicelli apicem positae, lineari-subulatae, calycis tubum paululo superantes, parce setosae, ciliatae; pedicelli 2 mm. longi, breviter hirsuti. *Calycis* extra parce hirsuti tubus 2 mm. longus, lobi postici in unum late deltoideum acutum 1.25 mm. longum, 1.5 mm. latum connati, laterales deltoidei, acuti, 1 mm. longi et lati, antico lateralibus simili iisque vix longiore. *Vexillum* subrotundatum, apice retusum, basi auriculatum, ungui 1 mm. longo incluso vix 5 mm. longum, 4 mm. latum, glabrum; alae oblongae, superne paulo latiores, apice rotundatae, basi auriculatae, ungui 1.5 mm. longo incluso 4.5 mm. longae, 1.5 mm. latae; carinae petala basi cordata, vix auriculata, ungui 1.5 mm. longo incluso 4 mm. longa, 1.25 mm. lata. *Stamen* vexillare saltem sub anthesin ab aliis liberum, filamentis alternatim longioribus et brevioribus. *Ovarium* sessile, 1.75 mm. longum, breviter adpresse hirsutum, stylo pro longitudine valido superne gradatim angustato, stigmatibus capitato, ovulis 6. *Legumen* iuvenile sicco viride, parce plus minusve adpresse hirsutum, ad 4.5 cm. longum et 6 mm. latum, sessile, styli basi persistente apiculatum.

Doi Sutep, 900 m., evergreen forest, *Kerr* 2653.

***Pueraria rigens* Craib** [Leguminosae-Phaseoleae]; species foliis sub anthesin maturis subtus sericeis, stipulis basi haud productis, ramulorum iuvenilium et inflorescentiae indumento ferrugineo distincta.

Ramuli volubiles, lignosi, breviter adpresse ferrugineo-pubescentes, primo angulati, mox teretes. *Folia* trifoliolata, petiolo 2.5-8 cm. longo basi incrassato supra canaliculato dense ferrugineo-vel pallide ferrugineo-pubescente suffulta; stipulae deltoideae, subacutae, 2.5 mm. longae, basi incrassatae, haud productae, indumento ei ramulorum simili tectae; foliola lateralialia inaequi-

lateralialia, latere altero dimidio ovata, basi cuneato-rotundata vel truncato-rotundata, altero dimidio lanceolata, terminali ovato, obovato, vel fere rotundato, usque ad 11 cm. longa et 8.7 cm. lata, omnibus apice obtusis vel breviter acute acuminatis chartaceis sicco subtus pallidis supra tenuiter sericeis mox ad costam nervosque tantum adpresse pubescentibus subtus sericeis nervis lateralibus utrinque 8-9 intra marginem ipsam anastomosantibus cum costa supra conspicuis subtus prominentibus, nervis transversis inter se parallelis supra conspicuis, nervulis interdum rete laxum supra conspicuum efficientibus, margine cartilagineo saepe anguste recurvo, petiolulis 4-8 mm. longis dense subadpresse ferrugineo-pubescentibus suffultis, terminali a lateralibus 1-2.3 cm. distante; stipellae 2 mm. longae. *Inflorescentia* axillaris vel terminalis, iuventute spiciformis, pedunculo communi incluso ad 15 cm. longa, floribus purpureis (ex *Kerr*) ramulis brevibus lateralibus gestis, partibus omnibus dense breviter ferrugineo-vel pallide ferrugineo-pubescentibus; bractae deciduae, vix 3 mm. longae; bracteolae binae, ad pedicelli apicem positae, 1.25 mm. longae, deciduae; pedicelli 2-3 mm. longi. *Calycis* extra adpresse ferrugineo-pubescentis intra sericei tubus 2 mm. longus, lobi postici in unum apice emarginatum circa 2.5 mm. longum et latum connati, laterales oblongi, 2.25 mm. longi, 1.25 mm. lati, antico lateralibus simili sed paulo longiore. *Vexillum* oblato-rotundatum, apice emarginatum, basi auriculatum, 7 mm. longum, 8 mm. latum, ungui 1.75 mm. longo suffultum; alae basi acute auriculatae, apice oblique emarginatae, suboblongae, 6.5 mm. longae, 3 mm. latae, ungui 2 mm. longo suffultae; carinae petala basi acute auriculata, 7.5 mm. longa, 3.5 mm. lata, ungui 2.5 mm. longo suffulta. *Stamen* vexillare sub anthesin ab aliis omnino liberum; filamenta alternatim longiora et breviora, antheris oblongis longitudinaliter dehiscentibus. *Ovarium* sessile, 5 mm. longum, adpresse hirsutum, stylo terete basi parce hirsuto aliter glabro, stigmatibus parvo capitato.

Sukotai, Kao Luang, 1100 m., on rocks, *Kerr* 5924.

***Dalbergia errans* Craib** [Leguminosae-Dalbergieae]; ab affini *D. Oliveri* Gamble floribus multo minoribus inter alia recedit.

Arbor circa 15 m. alta (ex *Kerr*); ramuli hornotini sicco fusci, glabri vel saepe pilis paucis ferrugineis cito deciduis instructi, vetustiores cortice cinereo vel brunneo-cinereo tecti, lenticellis conspicuis. *Folia* iuvenilia tantum visa, 7-15-foliolata, petiolo 2-2.5 cm. longo incluso circa 15 cm. longa, petiolo cum rhachi sicco fusco glabro vel subglabro; stipulae cito deciduae, lineares, apiculatae, 7-8 mm. longae, pluricostatae, dorso glabrae, intra sparse pubescentes, apicem versus pauperius ciliatae; foliola ovata, lanceolato-ovata, vel suboblonga, apice rotundata, retusa, basi cuneato-rotundata vel truncata, ad 3 cm. longa et 1.8 cm. lata, sicco iuvenilia fusca, paulo vetustiora viridia, pagina inferiore glabra, superiore primo densius mox sparsius adpresse pubescentia, nervis lateralibus utrinque circa 8 intra marginem anastomosantibus, petiolulo ad

5 mm. longo suffulta. *Paniculae* e ramulis annotinis defoliatis ortae vel saepissime ramulis hornotinis infra folia gestae, circa 6 cm. longae, rhachi cum ramulis et pedicellis sicco fusca et pilis paucis ferrugineis brevibus instructa; flores punicei (ex *Kerr*), pedicellis 3-4 mm. longis suffulti; bracteae bracteolaeque cito deciduae. *Calyx* dorso sparse fulvo-pilosus, intra glaber; tubus 1.75 mm. longus; lobi postici rotundati, 1 mm. longi, 1.5 mm. lati, laterales vix 1 mm. longi, antico circa 2 mm. longo, omnibus ciliatis. *Vexillum* reflexum, ungui 2 mm. longo excluso 7 mm. longum, 7 mm. latum, suborbiculare, apice emarginatum, basi callosum; alae obliquae, basi auriculatae, ungui 1.5 mm. longo incluso 8 mm. longae, 4.5 mm. latae; carinae petala basi auriculata, ungui 1.5 mm. longo incluso 5 mm. longa, 2.75 mm. lata. *Stamina* saepissime isodiadelpha sed in exemplis paucis monadelpha. *Ovarium* 2.5 mm. longum, ad suturas pubescens, stipite circa 2 mm. longo pubescente suffultum, stylo 1.75 mm. longo, ovulis 4.

Lôi, Kao Krading, 800 m., bamboo forest, *Kerr* 8643.

***Dalbergia floribunda* Craib** [Leguminosae-Dalbergieae]; species *D. ovatae* Graham habitu similis sed calycis lobis posticis saltem ad medium connatis, lobo antico lateralibus longiore, stylo longiore tenuiore differt.

Arbor circa 10 m. alta (ex *Kerr*); ramuli annotini glabri, cortice cinereo-brunneo striato obtecti, lenticellis angustis vix prominulis. *Folia* 5-7-foliolata, petiolo 2-3 cm. longo incluso 13-20 cm. longa, petiolo cum rhachi terete vel parum angulato glabro; stipulae deciduae; foliola saepissime ovata, late ovata, vel elliptica, apice acuminata, summo apice costa excurrente apiculata, basi late rotundata, rotundata, vel cuneato-rotundata, usque ad 10 cm. longa et 6 cm. lata, coriaceo-chartacea, matura glabra, nervis lateralibus utrinque circa 8 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervulis rete pagina utraque subconspicuum efficientibus, petiolulo ad 8 mm. longo suffulta. *Paniculae* vel terminales, ad 25 cm. longae et 18 cm. diametro, efoliatae vel minores, axillares, paniculam foliatam terminalem formantes, primo ferrugineo-tomentosae, cito plus minusve glabrescentes; flores luteo-albi (ex *Kerr*), pedicellis 2-2.5 mm. longis suffulti; bracteolae binae, ante anthesin deciduae, apicem versus pedicelli positae, oblongae vel elliptico-oblongae, apice rotundatae, 2 mm. longae, 1-1.5 mm. latae, dorso ferrugineo-pubescentes. *Calyx* extra sparse ferrugineo-pilosus, intra glaber; tubus 2 mm. longus; lobi laterales cum antico deltoidei, subobtusiusculi, 1.5 mm. longi, 1.25 mm. lati, antico 2 mm. longo et 1.5 mm. lato, postici 1.25 mm. longi, ad medium connati, apice rotundati, omnibus breviter ciliatis. *Vexillum* reflexum, ungui 2 mm. longo incluso 6 mm. longum, 2.25 mm. latum, oblongum vel anguste ellipticum, apice rotundatum, paululo emarginatum; alae ungui 2 mm. longo incluso 5 mm. longae, 1.5 mm. latae, basi truncato-cordatae; carinae petala ungui 2 mm. longo incluso 5 mm. longa, 2.75 mm. lata, basi longius

obtusiusculi auriculata. *Stamina* monadelpha. *Ovarium* glabrum, vix 2.5 mm. longum, stipite 3 mm. longo sparse pubescente suffultum, stylo cylindrico vix 2 mm. longo, ovulis 2-3.

Prê, Hui Kammi, 200 m., mixed forest by stream, *Kerr* 4845.

***Dalbergia verrucosa* Craib** [Leguminosae-Dalbergieae]; ab affini *D. polyphylla* Benth. bracteolis angustis, calyce pubescente maiore recedit.

Frutex volubilis; ramuli primo dense ferrugineo-tomentosi, mox glabri, fusco-corticati, conspicue lenticellati. *Folia* iuvenilia tantum visa, petiolo ad 1.5 cm. longo incluso ad 6 cm. longa, petiolo rhachi et petiolulis indumento ei ramulorum simili tectis; stipulae deciduae; foliola circa 17, oblonga, apice costa excurrente apiculata, basi rotundata vel truncato-cordata, ad 1.6 cm. longa et 0.6 cm. lata, supra ad costam impressam pilosa, subtus pilosa, nervis obscuris, margine revoluta, petiolulo 1 mm. longo suffulta. *Paniculae* ramis annotinis gestae, pedunculo communi brevi incluso circa 3 cm. longae, 3 cm. diametro, pedunculo rhachi ramulis et pedicellis indumento ei ramulorum simili tectis; bracteae lineares; pedicelli 2 mm. longi, bracteis paululo longiores; bracteolae 2, lineares, ad pedicelli apicem positae, sub anthesin persistentes. *Calyx* extra et superne intra ferrugineo-pilosus, 4 mm. longus, lobis inter se subaequilongis circa 2.25 mm. longis deltoideis vel late deltoideis acutis 1.75-2 mm. latis ciliatis. *Vexillum* refractum, ungui 2.5 mm. longo lamina paulo brevior suffultum; alae oblongae, apice rotundatae, basi latere altero auriculatae, altero obtuse denticulatae, ungui 3 mm. longo incluso 6.5 mm. longae, basi 2 mm. latae; carinae petala basi truncata vel auriculato-truncata, ungui 3 mm. longo incluso 7 mm. longa, 2.25 mm. lata. *Stamina* monadelpha. *Pistillum* glabrum, ovario 3 mm. longo stipite 2 mm. longo suffulto, stylo gracili fere 2 mm. longo, ovulis 2.

Nan, Doi Pu Ka, 1700 m., savannah, *Kerr* 4930.

***Derris exserta* Craib** [Leguminosae-Dalbergieae]; species ab aliis asiaticis vexillo bicalloso, filamento vexillari ab aliis libero distincta.

Arbor circa 4 m. alta (ex *Kerr*); ramuli iuventute breviter adpresse ferrugineo-pubescentes, sicco plus minusve fusci, mox glabri, cortice cinereo obtecti, foliorum cicatricibus prominentibus, lenticellis conspicuis numerosis conspicue longioribus quam latioribus. *Folia* sub anthesin iuvenilia, 9-foliolata, petiolo 9.5-13.5 cm. longo incluso 28-52 cm. longa, petiolo basi incrassato cum rhachi supra canaliculato et iuventute densius adpresse ferrugineo-pubescente cito glabro; stipulae circa 2 mm. longae, fugaces; foliola opposita vel subopposita, rarissime alterna, ovata, oblongo-ovata vel late lanceolata, rarius subrotundata, terminali oblongo-oblancheolata, apice rotundata vel obtuse subacuminata, summo apice emarginata, basi cuneata vel rotundata, lateralia plus minusve sed vix conspicue inaequilateralia, usque ad 20 cm. longa et 7.7 cm. lata, chartacea, iuvenilia pilis paucis brevibus ferrugineis instructa, sicco fusca, mox

glabra et sicco viridia, nervis lateralibus utrinque 6–10 intra marginem anastomosantibus supra conspicuis vel saepe subprominulis subtus prominentibus, nervulis rete gracile pagina utraque prominulum efficientibus, margine anguste recurva, petiolulo ad 8 mm. longo suffulta, terminali a lateralibus ad 4.5 cm. distante. *Paniculae* ex axillis foliorum delapsorum ortae, iuvenes thyrsoidae, sub anthesin thyrsoidae vel sat latae, pedunculo communi saepissime brevi incluso usque ad 65 cm. longae, ramis lateralibus ad 9 cm. longis flores primo sat approximatos racemosim dispositos gerentibus vel his usque ad 25 cm. longis iterum ramosis ramulis ultimis ad 6 cm. longis; rhachis primo angulata, mox fere glabra, sat valida, brunneo-corticata, lenticellis pallidis angustis conspicuis, iuventute cum ramulis et pedicellis densius adpresse ferrugineo-pubescentibus; bracteae ovatae, 1.5 mm. longae, cito deciduae; bracteolae parvae, etiam cito deciduae; pedicelli 8 mm. longi, indumento ei calycis simili instructi; corolla vexillo pallide viridi excepto alba (ex Kerr). *Calyx* 7 mm. longus, extra adpresse ferrugineo-pubescentibus, dentibus parvis, antico et lateralibus postico latioribus. *Vexillum* reflexum, 11 mm. longum, 14 mm. latum, apice emarginatum, basi subcordatum, bicallosum, glabrum, ungui 5 mm. longo apice 5 mm. lato suffultum; alae oblongae, basi obtuse auriculatae, ungui 4 mm. longo incluso 17 mm. longae, fere 5 mm. latae; carina basi truncato-auriculata, ungui 5 mm. longo incluso 17 mm. longa, 5 mm. lata. *Stamen* vexillare ab aliis omnino liberum, filamentis alternatim longioribus et brevioribus, longioribus ad partem liberam dorso puberulis brevioribus glabris, antheris oblongis apiculatis. *Ovarium* 1 cm. longum, stipite 3 mm. longo suffultum, adpresse ferrugineo-pubescentibus, stylo exserto nisi apice breviter ferrugineo-pubescente, stigmate parvo, ovulis 9.

Muang Lôi, 200 m., scrub, Kerr 8785.

***Derris reticulata* Craib** [Leguminosae-Dalbergieae]; species nova ramulis lenticellatis, foliis 5-foliolatis, leguminibus brevibus oblongis ambitu alatis ad semina incrassatis et reticulatis distincta.

Frutex scandens; ramuli annotini glabri, conspicue lenticellati, cortice cinereo vel stramineo-cinereo obtecti, mox prominenter lenticellati, pallide brunneo-corticati. *Folia* 5-foliolata, petiolo 1.5–4 cm. longo basi incrassato incluso ad 18 cm. longa, petiolo cum rhachi supra canaliculato glabro; stipulae deciduae; foliola opposita, oblongo-ovata, ovato-lanceolata vel oblongo-lanceolata, lateralia saepissime parum inaequilateralia, acuminata, summo apice retusa vel rotundata, basi rotundata vel cuneata, 5–10 cm. longa, 2–4 cm. lata, subcoriacea vel chartaceo-coriacea, supra subnitida, viridia, subtus pallidiora, matura pagina utraque glabra vel inferiore pilis perpaucis ad costam nervosque laterales instructa, nervis lateralibus utrinque 6–8 intra marginem anastomosantibus supra conspicuis subtus prominulis, nervulis rete gracile pagina utraque efficientibus, petiolulo ad 4 mm. longo supra canaliculato suffulta, terminali a lateralibus ad 1.5 cm. distante; stipellae non

visae. *Legumen* substramineum, oblongum vel anguste oblongum, ad 4 cm. longum, 1.7–2 cm. latum, glabrum, ambitu alatum, ala altera ad 7 mm. lata altera ad 3 mm. lata, ad semina incrassatum et prominenter reticulatum, pedicello circa 7 mm. longo suffultum.

Kanburi, 50 m., climbing on bamboo by stream, Kerr 10142.

***Derris truncata* Craib** [Leguminosae-Dalbergieae]; ab affini *D. malaccense* Prain floribus multo minoribus recedit.

Frutex volubilis; ramuli hornotini sicco fusi, pilis brevibus ferrugineis adpressis sparse instructi, lenticellati, annotini glabri, cinereo-corticati, striati, lenticellis prominulis, vetustiores copiose tuberculati. *Folia* iuvenilia tantum visa, 9–11-foliolata, petiolo 7–10 cm. longo incluso 14–20 cm. longa, petiolo cum rhachi indumento ei ramulorum simili tecto cito glabro; stipulae deltoideae, circa 3 mm. longae, dorso adpresse ferrugineo-pubescentes; foliola oblongo-oblancheolata, apice obtuse acuminata, basi cuneata, ad 5.5 cm. longa et 2 cm. lata, tenuiter chartacea, supra glabra, subtus pallidiora, pilis brevibus inconspicuis adpressis instructa, ciliata, nervis lateralibus utrinque 8–11 supra subprominulis subtus conspicuis, nervulis rete gracile sub oculo armato conspicuum efficientibus, petiolulo 5–6 mm. longo supra canaliculato iuventute pilis paucis adpressis ferrugineis instructo suffulta; stipellae deficientes. *Paniculae* thyrsiformes, axillares, ramulis brevibus lateralibus vel terminalibus gestae, foliis breviores, paniculam terminalem foliatam efficientes, pedunculo communi 1.5–4.5 cm. longo cum rhachi indumento ei ramulorum simili tecto suffultae; ramuli laterales circa 5 mm. longi, basi bractea solitaria parva instructi, apice flores 3–4 approximatos gerentes; pedicelli 4 mm. longi, basi parvi-bracteati, apice paulo infra calycem bracteolis duabus parvis oblongis ciliatis sub anthesin persistentibus instructi. *Calyx* 4 mm. longus, lobis posticis approximatis fere obsoletis, lateralibus cum antico brevibus, extra glaber, intra inferne glaber, apice adpresse ferrugineo-pubescentibus, margine ciliatus. *Vexillum* mox refractum, apice emarginatum, ungui 3 mm. longo excluso 10 mm. longum, 8 mm. latum, ad unguis apicem bicallosum, glabrum; alae anguste oblongae, basi subauriculato-truncatae, apice obtusae, ungui 4 mm. longo excluso 8.5 mm. longae, 2.5 mm. latae; carinae petala suboblonga, basi truncata, ungui 4.25 mm. longo excluso 7 mm. longa, 3.5 mm. lata. *Stamina* monadelphia. *Ovarium* circa 3.5 mm. longum, adpresse ferrugineo-pubescentibus, in stylum glabrum angustatum, ovulis 2.

Pitsanulok, Nakawn Tai, 300 m., evergreen forest by stream, Kerr 8898.

***Pterolobium integrum* Craib** [Leguminosae-Eucaesalpineae]; a *P. micrantho* Gagnep. pinnis subtus haud armatis, foliolis integris, inflorescentia breviori magis rigida, filamentis glabris, ovario villosa, fructu haud glabro recedit.

Frutex vel *arbuscula*, ramulis iuventute crispatis puberulis sulcatis cortice brunneo vel fusco-brunneo obtectis ad petiolorum

bases armatis. *Folia* petiolo 1.5-2 cm. longo incluso 12-17 cm. longa, et petiolo et rhachi primo parce crispatis puberulis, rhachi subtus ad pinnarum bases armata; pinnae 5-8-iugae, 4-6 cm. longae, breviter petiolatae, haud armatae, rhachi parce crispatis puberula; foliola utrinque 7-9, oblonga vel oblongo-obovata, apice rotundata, truncata vel parum retusa, mucronulata, basi lateralibus oblique truncata, valde inaequilateralibus, terminalibus obtuse cuneata, ad 12 mm. longa et 6.5 mm. lata, chartacea, glabra, subtus parvipunctata, costa obliqua supra conspicua subtus prominula, nervis lateralibus obscuris utrinque circa 6 intra marginem anastomosantibus, integra, breviter petiolulata. *Paniculae* et axillares et terminales, ad 10 cm. longae et 10 cm. diametro, et rhachi et ramulis crispatis puberulis; bracteae angustae, circa 2 mm. longae, deciduae; pedicelli circa 4 mm. longi, apicem versus articulati, subglabri. *Sepala* inter se subaequalia, oblonga, apice rotundata, 2.5 mm. longa, 1.5 mm. lata, parce ciliolata, exteriore cucullato. *Petala* alba, inter se subaequalia, 2 mm. longa, 0.75 mm. lata, glabra. *Filamenta* glabra, 3 mm. longa, antheris fere 1 mm. longis. *Ovarium* 1 mm. longum, pubescens, stylo 3.5 mm. longo basi sparse pubescente, ovulis 2. *Fructus* ad 3.6 cm. longus, parte seminifera 1.3 cm. longa 0.8 cm. lata puberula, ala ad 1 cm. lata inferne et ad suturas puberula.

Ratburi, under 50 m., scrub, *Kerr* 9001, *Marcan* 1740, 1774.

Caesalpinia macra Craib [Leguminosae-Eucaesalpineae]; a *C. parviflora* Prain pinnis foliolisque paucioribus recedit.

Arbor circa 7 m. alta (ex *Marcan*); ramuli primo breviter tomentelli, teretes, angulati, aculeis 1-2 mm. longis rectis vel reflexis subsparsis armati, lenticellis conspicuis. *Folia* bipinnata, petiolo 1-2 cm. longo incluso 13-26 cm. longa, petiolo et rhachi indumento ei ramulorum simili tectis, rhachi subtus armata, aculeis geminis ad pinnarum bases aliis robustioribus; pinnae 7-11-iugae, oppositae, ad 9 cm. longae, rhachi subtus inferne vel usque ad apicem aculeis geminis reflexis ad foliolorum bases armata; foliola utrinque 6-12, oblonga, apice retusa, basi valde inaequilateralibus, truncata, ad 15 mm. longa et 6 mm. lata, sicco viridia, subtus pallidiora, subtus punctata, ad costam crispatis puberula, aliter fere glabra, supra ad costam similiter puberula, aliter sparse puberula vel mox fere glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 6 intra marginem anastomosantibus supra parum impressis vel vix conspicuis subtus prominulis, nervulis paucis subtus conspicuis, margine revoluta, pauperius breviter ciliata, subsessilia. *Paniculae* partiales ex axillis foliorum normalium vel redactorum solitariae vel saepius per paria ortae, paniculam foliatam terminalem formantes, ad 20 cm. longae, ramis lateralibus usque ad 15 cm. longis pedunculo communi 4.5-6 cm. longo cum rhachi saepe sparse armato et indumento ei ramulorum simili tecto suffultis; flores lutei (ex *Marcan*), pedicellis circa 6 mm. longis suffulti; bracteae deciduae.

Calycis lobus anticus cucullatus, 5 mm. longus, lobi laterales et postici oblongi, apice rotundati, ad 3.5 mm. longi et 2.25 mm. lati, ciliolati. *Petala* lateralibus et antica subaequilongae, obovata, apice rotundata vel parum retusa, breviter unguiculata, ad 5.5 mm. longa et 3.25 mm. lata, postico aliis paulo brevioribus ungui brevi lato ciliato suffulto. *Stamina* 7 mm. longa, filamentis villosis, antheris parvis. *Ovarium* 2.5 mm. longum, breviter stipitatum, pilosum, stylo 4.5 mm. longo piloso, ovulis 2. *Legumen* ad 4.3 cm. longum et 2 cm. latum, stramineum, ad suturas pilosum, aliter puberulum vel fere glabrum, apice oblique truncatum.

Saraburi, Muak Lek, 200 m., evergreen forest, *Marcan* 1866. Pak Chawng, 300 m., secondary growth, *Marcan* 1532.

Bauhinia calcicola Craib [Leguminosae-Bauhineae]; ab affini *B. Curtisii* Prain foliis subtus haud glabris, floribus minoribus, petalis haud glabris recedit.

Frutex scandens, cirrhosus; ramuli iuventute dense ferrugineo-pubescentes vel sparse griseo-pilosi, mox adpresse griseo-pilosuli, demum glabri, sulcati, rubro-brunnei, lenticellis haud conspicuis. *Folia* ambitu ovata, late ovata, vel oblongo-ovata, basi truncata vel cordata, apice integra, obtusa, emarginata, apiculata vel bilobulata, lobulis ad 1.5 cm. longis obtusis divergentibus, 3.5-8 cm. longa, 2.5-5.5 cm. lata, rigide chartacea, supra pilis brevibus inconspicuis albis sparse instructa, mox glabra, subtus pallidiora, subsparsis adpresse pubescentia, e basi 7-nervia, nervis supra conspicuis vel parum impressis subtus prominentibus, nervis transversis subtus conspicuis, petiolo 1-1.7 cm. longo ferrugineo-pubescente suffulta; stipulae deciduae. *Racemi* terminales, primo foliis minoribus duplo longiores, mox ad 17 cm. (pedunculo communi ad 2.5 cm. longo incluso) longi, in ramulis solitarii vel saepius paniculam foliatam terminalem efficientes, rhachi nodosa breviter fulvo- vel griseo-fulvo-pubescente vel tomentella; bracteae deciduae, circa 2 mm. longae; bracteolae parvae, ad pedicelli apicem posita; pedicelli 7 mm. longi, breviter pubescentes; receptaculi tubus circa 1 mm. longus, extra breviter pubescens; alabastra ambitu anguste ovata, obtusa vel breviter obtuse subacuminata, sparse adpresse pubescentia. *Calyx* 3 mm. longus, sub anthesin in segmenta duo fissus. *Petalum* posticum lateralibus subsimile nisi paulo latius, ungui 3 mm. longo incluso 5.5 mm. longum, 2.5 mm. latum; antica ungui 1 mm. longo incluso 4 mm. longa, 1.25 mm. lata, cum aliis dorso pilosa. *Stamina* fertilia 3, filamentis 4 mm. longis glabris. *Discus* circa 0.5 mm. supra staminum insertionem productus, glaber. *Ovarium* glabrum, 2.75 mm. longum, stylo 1.5 mm. longo glabro. *Legumen* rubro-brunneum, glabrum, ad 6 cm. longum et 1.5 cm. latum, valvis tenuibus.

Pattani, Banang Sta, 100 m., climbing over open rocks on limestone hill, *Kerr* 7718.

Bauhinia decipiens Craib [Leguminosae-Bauhineae]; species nova primo aspectu *B. purpureae* Linn., similis sed volubilis foliis membranaceis, antheris multo longioribus recedit.

Frutex volubilis (ex *Kerr*), cirrhis deficientibus; ramuli primo ferrugineo-tomentelli, mox puberuli, demum glabri, cortice rubro-brunneo obtecti, lenticellis conspicuis. *Folia* ambitu oblonga vel oblato-oblonga, basi cordata vel truncata, apice ad medium vel vix ad medium bilobata, lobis triangularibus apice rotundatis 1.5–2.5 cm. longis 2.5–5 cm. latis saepissime divergentibus sinu late triangulari, 4.7–11.5 cm. longa, 5.5–11 cm. lata, membranacea, pagina superiore viridia, puberula, inferiore pallidiora, puberula et paucisquamata, e basi 11-nervia, nervis supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et sat distantibus supra saepissime subtus prominulis vel subprominentibus, nervulis rete gracile sub oculo armato pagina utraque conspicuum efficientibus, petiolo 3–4 cm. longo supra late canaliculato crispatis puberulo suffulta; stipulae deciduae. *Flores* albi, petalo posteriore medio luteo-maculato (ex *Kerr*); receptaculi tubus 3 cm. longus, indumento ei calycis simili tectus. *Calyx* spathaceus, 4 cm. longus, dorso dense breviter adpresse pallide ferrugineo-pubescent praeterea squamosus, intra glaber. *Petalum* posticum ovato-oblongum, stipite ciliato 1 cm. longo incluso 5.5 cm. longum, 2.4 cm. latum, aliis conspicue maius, lateralibus infimis paulo maioribus cum iis stipite glabro suffultis, omnibus dorso parce squamosis et pilosis. *Stamina* fertilia 3, filamentis 5.5 cm. longis glabris, antheris linearibus 1.5 cm. longis glabris. *Pistillum* hirsutum et squamosum, ovario paulo ultra 1 cm. longo stipite 2 cm. longo suffulto, stylo 3 cm. longo, stigmate capitato, ovulis 8.

Krat, Baw Rai, 200 m., evergreen forest, *Kerr* 9463.

Bauhinia detergens Craib [Leguminosae-Bauhineae]; ab affini *B. bassacense* Gagnep., foliis angustioribus longioribus, lobis apice obtusis vel obtuse acuminatis distinguenda, habitu *B. rufae* Graham, similis sed foliorum indumento et petalis longius unguiculatis facile distinguenda.

Frutex scandens, cirrhosus; ramuli iuventute plus minusve fulvo-tomentosi, mox plus minusve glabrescentes, sulcati. *Folia* ambitu oblongo-elliptica vel rotundato-elliptica, basi cordata, apice ad medium vel ultra medium lobata, lobis triangularibus apice obtusis vel obtuse acuminatis 5–12.5 cm. longis 4.5–6.3 cm. latis, sinu saepe angusto, 7.5–19 cm. longa, 7–14.5 cm. lata, chartacea vel rigide chartacea, supra glabra vel saepissime hic et illic flocculosa, subtus ferrugineo-tomentosa, cito plus minusve glabrescentia, e basi 9-nervia, nervis apice intra marginem anastomosantibus supra conspicuis vel saepe parum impressis subtus prominentibus, nervis transversis inter se parallelis supra conspicuis vel saepe parum impressis subtus prominulis, petiolo 2–5 cm. longo primo ferrugineo-tomentoso suffulta; stipulae deciduae. *Racemi* oppositifolii, pedunculo communi brevi incluso ad 10 cm. longi,

ferrugineo-tomentosi; bractee lineares, longius acuminatae, circa 1 cm. longae, deciduae; bracteolae binae, angustae, circa 1 cm. longae, bene infra medium pedicelli insertae; pedicelli 5 cm. longi; alabastra ambitu oblonga, obtuse acuminata, acumine densius pilosa, aliter sparse pilosa; flores sublutei, petalis atro-purpureo-venosis (ex *Winit*). *Calyx* sub anthesin in segmenta duo saepissime fissus, 1 cm. longus, intra glaber, dorso parce pilosus, apice dense ferrugineo-pilosus. *Petala* inter se subaequalia, lamina ovata obtusa basi truncata vel cordato-truncata fere 1 cm. longa 7–8 mm. lata utrinque sed praesertim dorso pilosa, ungui 1.5–2.5 cm. longo breviter piloso. *Discus* haud productus. *Stamina* fertilia 2; filamenta 2.3 cm. longa, parce pubescentia, antheris 2.5 mm. longis; staminodia glabra. *Ovarium* circa 7 mm. longum, cum stipite 4 mm. longo dense fulvo-pilosum, stylo 1 cm. longo apicem versus glabro inferne fulvo-piloso, ovulis 6. *Legumen* iuvenile pedicello lignoso 7 cm. longo et stipite 5 mm. longo suffultum, 12.5 cm. longum, 3.2 cm. latum, styli basi persistente acuminatum.

Lampang, Mûang Lawng, 210 m., open mixed forest, *Winit* 1240.

Bauhinia media Craib [Leguminosae-Bauhineae]; a *B. comosa* Craib foliorum lobis apice rotundatis, bracteis brevioribus, petalis longius unguiculatis, a *B. Harmsiana* Hoss., petiolis pedicellis et receptaculi tubo longioribus, floribus maioribus, ovario longius stipitato recedit.

Frutex scandens, cirrhosus; ramuli iuventute ferrugineo- vel griseo-tomentosi, mox glabri, cortice brunneo vel fusco-brunneo obtecti, conspicue lenticellati. *Folia* saepissime ambitu subquadrata, basi truncata, interdum acuminata vel rotundato-truncata, apice bilobulata, lobulis apice rotundatis circa 5 mm. longis, saepissime divergentibus sinu triangulari, 2.5–6 cm. longa, 3.3–7 cm. lata, rigide chartacea, matura supra glabra, subtus pilis brevibus ferrugineis adpressis instructa, e basi 7–9-nervia, nervis supra conspicuis subtus prominulis, reticulatione gracili sub oculo armato pagina utraque conspicua, petiolo 2–3.3 cm. longo, indumento ei ramulorum simili tecto vel glabro suffulta; stipulae deciduae. *Racemi* et terminales et ex axillis foliorum superiorum orti, simplices vel furcati, pedunculo communi petiolo subaequilongus vel eo paulo brevior incluso ad 11 cm. longi, et pedunculo et rhachi ferrugineo-tomentosis; bractee lineari-lanceolatae, acutae, circa 2 mm. longae, alabastra iuvenilia paululo superantes, ferrugineo-pubescentes, deciduae; bracteolae binae, circa 1.25 mm. longae, pedicelli medium versus insertae; pedicelli 4–5 mm. longi, cum receptaculi tubo 3 mm. longo ferrugineo-pubescentes; alabastra anguste ovoidea vel ellipsoidea, obtuse acuminata, adpresse ferrugineo-pubescentia. *Calyx* 4.5 mm. longus, sub anthesin reflexus, saepissime in segmenta duo apice cucullata fissus, extra pilis ferrugineis instructus, intra glaber. *Petala* 5, inter se subaequalia, oblanceolata, apice obtusa, basi in unguem attenuata,

ungui 3-4 mm. longo incluso 7-7.5 mm. longa, 1.5 mm. lata, inferioribus dorso apice pilosis aliter glabris, aliis glabris. *Stamina* fertilia 3, filamentis 9.5 mm. longis glabris, antheris 2 mm. longis glabris. *Ovarium* 3 mm. longum, stipite 2 mm. longo suffultum, stylo 1.5 mm. longo glabro, et ovario ad suturas et stipite pilis paucis ferrugineis longis instructis cito glabris, ovulis circa 8.

Korat, Chantuk, Kao Sisiat A, Noe 103.

Bauhinia pulla Craib [Leguminosae-Bauhineae]; species nova foliis bilobulatis, racemis terminalibus subsessilibus densifloris sicco fuscis, receptaculi tubo brevi, petalis utrinque pubescentibus staminibus fertilibus 3, pistillo pubescente distincta.

Frutex scandens; ramuli primo dense ferrugineo-pubescentes, mox glabri vel fere glabri, fusco-corticati, striati vel fere sulcati. *Folia* ambitu elliptica vel ovato-elliptica, basi cordata, apice ad medium bilobata, ad 11.5 cm. longa et 9.5 cm. lata, lobis apice obtusis interdum subacuminatis, sinu triangulari, chartacea, supra sicco fusca, nitida, matura glabra vel subglabra, subtus pallidiora, primo dense adpresse fulvo-pubescentia, matura ad nervos adpresse pubescentia, aliter glabra vel sparse adpresse pubescentia, 9-11-nervia, nervis supra conspicuis vel parum impressis subtus prominentibus, nervis transversis subtus prominulis, petiolo 2-3 cm. longo indumento ei ramulorum simili tecto suffulta; stipulae deciduae, falcatae, circa 5 mm. longae, dorso adpresse pubescentes, intra glabrae. *Racemi* terminales, ad 19 cm. longi, subsessiles vel pedunculo brevi suffulti, rhachi sulcata dense fulvo-pubescente, nodis prominentibus; flores virides (ex Kerr), singulatim dispositi, pedicellis 6 mm. longis adpresse pubescentibus suffulti; bractae deciduae; bracteolae 2, angustae, 5 mm. longae, adpresse pubescentes, apicem versus pedicelli positae; receptaculi tubus circa 2 mm. longus, vix a pedicello distinctus. *Sepala* 5, oblonga vel oblongo-lanceolata, apice rotundata vel obtusa, 5 mm. longa, 3 mm. lata, libera vel saepissime basi inter se breviter connata. *Petala* 5, oblanceolata vel oblongo-oblanceolata, apice rotundata, basi cuneata, ad 1.3 cm., ungui 4 mm. longo incluso, longa et 4 mm. lata, extra adpresse hirsuta, intra brevius adpresse pubescentia. *Stamina* fertilia 3, filamentis 1.6 cm. longis glabris, staminodiis brevibus evolutis. *Ovarium* 5 mm. longum, fulvo-hirsutum, stipite vix 4 mm. longo antice indumento simili tecto postice fere glabro suffultum, stylo ovario paulo longiore eique similiter tecto, ovulis numerosis.

Saraburi, Muak Lek, 200 m., evergreen forest, Kerr 9155.

Bauhinia sepis Craib [Leguminosae-Bauhineae]; ab affini *B. lakhonense* Gagnep. receptaculi tubo longiore, petalis maioribus haud glabris recedit.

Frutex scandens, cirrhosus; ramuli primo rufo-pubescentes, costati, demum puberuli vel glabri, virides vel rubri, lenticellis haud conspicuis. *Folia* ambitu saepissime suboblato-rotundata,

basi cordata, apice ad medium vel paulo ultra medium bilobata, lobis apice rotundatis ad 2 cm. longis et latis, sinu angusto, ad 4 cm. longa et 5 cm. lata, chartacea, supra viridia, primo pilis ferrugineis sparse instructa, mox glabra, subtus ferruginea, primo praesertim ad nervos ferrugineo-pubescentia, indumento plus minusve persistente, nervis e basi 11 supra conspicuis vel subconspicuis subtus prominentibus, nervis transversis paucis subtus conspicuis, petiolo 1.5-2 cm. longo indumento ei ramulorum simili tecto suffulta; stipulae lineares, circa 3 mm. longae, saepissime deciduae, paucis tantum persistentibus, erectae vel reflexae. *Racemi* folia paulo vel duplo superantes, ferrugineo-pubescentes, pedunculo communi petiolo subaequilongo suffulti; bractae angustae, 3 mm. longae, deciduae, ferrugineo-pubescentes; pedicelli 1 cm. longi, rufo-pubescentes, medio bracteolis duabus suboppositis angustis 4 mm. longis rufo-pubescentibus instructi; receptaculi tubus 2.5 cm. longus, costatus, rufo-pubescent, in pedicellum subitius angustatus. *Sepala* 5, sub anthesin reflexa, inter se plus minusve libera, oblonga, apice acuta vel acuminata, 5.5 mm. longa, 2 mm. lata, intra glabra, dorso sparse breviter rufo-pubescentia. *Petala* subelliptica, apice rotundata, ungui brevi vel vix distincto incluso 10 mm. longa, 6.5-8 mm. lata, intra glabra, dorso medio sparse sed conspicue longius pilosa. *Stamina* fertilia 3, filamentis 9 mm. longis glabris, antheris 2.75 mm. longis, staminodiis evolutis ad 3 mm. longis. *Pistillum* glabrum, 5 mm. longum, stigmatibus discoideo, ovulis circa 17. *Legumen* rubescens, 13 cm. longum, 2 cm. latum, valvis reticulatis subtenuibus.

Nakawn Panom, 200 m., hedgerow, Kerr 8429.

Bauhinia similis Craib [Leguminosae-Bauhineae]; ab affini *B. involucellata* Kurz ovario dense griseo-pubescente haud glabro differt.

Frutex scandens, cirrhosus; ramuli primo dense breviter molliter griseo- vel ferrugineo-pubescentes, mox velutini, sulcati. *Folia* ambitu late ovata vel subrotundata, basi truncata vel saepius late cordata, apice paulo ultra medium bilobata, lobis subtriangularibus obtusis ad 4.5 cm. longis et 3.8 cm. latis saepissime divergentibus, ad 7.5 cm. longa et 7 cm. lata, chartacea, supra primo velutina, matura glabra vel fere glabra, subtus pallidiora, iuventute sericea vel dense adpresse ferrugineo-pubescentia, matura breviter adpresse pubescentia, nervis a basi 11-13 supra conspicuis subtus prominentibus, nervis transversis subtus prominulis, nervulis rete gracile pagina utraque sub oculo armato conspicuum efficientibus, petiolo ad 1.7 cm. longo densius ferrugineo-pubescente suffulta; stipulae deciduae. *Racemi* vel axillares vel terminales, breviter pedunculati, simplices et pauciflori, foliis breviores vel saepius bifidi et mox foliis multo longiores, interdum pauci-ramosi et paniculam terminalem formantes; bractae deciduae; bracteolae etiam deciduae, medium versus vel paulo infra medium pedicelli insertae; pedicelli 3.5-4 cm. longi, dense breviter pubescentes; alabastra sericea,

ambitu suboblunga, apice obtuse apiculata; receptaculi tubus calyce dimidio brevior, costatus, indumento ei pedicelli simili tectus. *Calyx* circa 1.2 cm. longus, sub anthesin saepissime in segmenta dua fissus, extra breviter adpresse pubescens, intra subglaber. *Petala* pallide viridia (ex *Kerr*), lamina oblanceolata vel oblongo-oblanceolata apice rotundata circa 15 mm. longa et 7.5 mm. lata utrinque pilosa basi in unguem 10–13 mm. longum parce pilosum cuneatim angustata. *Stamina* fertilia 2–3, filamentis puniceis (ex *Kerr*) 3 cm. longis parce pilosis. *Pistillum* dense pubescens, ovario circa 6 mm. longo, stylo 12 mm. longo, stipite ovario paulo longiore.

Saraburi, Muak Lek, 200 m., *Kerr* 10007, *Marcan* 1860.

***Bauhinia subsessilis* Craib** [Leguminosae-Bauhineae]; habitu *B. loranthae* Pierre ex Gagnep ex descr. similis sed staminibus fertilibus 3 tantum, ovario hirsuto inter alia differt.

Frutex volubilis, ecirrhusus; ramuli iuventute rufo-tomentosi praeterea pilis sparsis longiusculis divergentibus instructi, annotini cortice brunneo vel fusco-brunneo obtecti, conspicue lenticellati. *Folia* ambitu rotundata vel oblato-rotundata, basi cordata, apice vix ad medium (saepissime ad partem trientem) bilobata, lobis apice rotundatis 2.5–5 cm. longis 3.5–6 cm. latis sinu triangulari, usque ad 12 cm. longa et 13 cm. lata, subcoriacea, pagina superiore puberula, inferiore praesertim ad nervos crispatis ferrugineo-pubescentia, e basi 13–15 -nervia, nervis supra conspicuis subtus prominentibus, nervis transversis inter se parallelis et sat distantibus supra interdum conspicuis subtus prominulis, petiolo 2–3.5 cm. longo indumento ei ramulorum simili tecto supra canaliculato suffulta; stipulae deciduae. *Racemi* terminales, usque ad 10 cm. longi, breviter pedunculati, rufo-tomentosi; bractee deciduae, lanceolatae, acutae, 4 mm. longae; pedicelli 7 mm. longi, rufo-tomentosi, basi vel saltem infra medium bibracteolati; receptaculi tubus 3 cm. longus, sulcatus, rufo-tomentosus, in pedicellum angustatus; alabastra cylindrica. *Calyx* receptaculi tubo subaequilongus, extra rufo-tomentosus, intra glaber, sub anthesin unilateraliter fissus, sepalis inter se cohaerentibus. *Petala* alba (ex *Kerr*), inter se subaequilonga, ungui brevi incluso 5–5.5 cm. longa, 1–2 cm. lata, postico aliis latiore, lanceolata vel oblongo-lanceolata, apicem versus angustata, basi in unguem cuneata, dorso pauci-squamosa. *Stamina* fertilia 3, filamentis glabris paulo ultra 5 cm. longis, antheris 1 cm. longis. *Ovarium* hirsutum, circa 1 cm. longum, stipite vix 2 cm. longo pilis longiusculis divaricatis sparse squamoso et inferne parce piloso, ovulis 4.

Kaw Chang, Klawng Mayom, under 10 m., scrub, *Kerr* 9207.

***Acacia siamensis* Craib** [Leguminosae-Mimoseae]; ab affini *A. Myaingii* Lace foliolis maioribus inter alia recedit.

Arbor circa 8–20 m. alta (ex *Kerr*); ramuli annotini glabri, cortice rubro-brunneo vel fusco obtecti, striati, conspicue lenticellati, spinis geminis rectis oblique prorsus directis ad 8 mm. longis armati, internodiis haud armatis. *Folia* petiolo 1.5–3.5 cm. longo incluso ad 8 cm. longa, petiolo et rhachi sicco stramineis supra plus minusve canaliculatis glabris, petiolo eglanduloso, rhachi apice inter pinnarum ultimarum bases glandula parva sessili circulari instructa; pinnae 1–3-iugae, oppositae vel haud rarius suboppositae, 4–8 cm. longae, rhachi straminea glabra supra canaliculata ad foliolorum bases saepe parvi-glandulosa; foliola utrinque 4–7, opposita, suboblunga, basi oblique cuneata vel latere altero cuneata, altero rotundata, apice oblique rotundata, truncata, vel retusa, mucronulata, 1.5–2.9 cm. longa, 0.4–1.3 cm. lata, subcoriacea, sicco viridia, glabra, costa obliqua supra conspicua subtus prominula, e basi 3–5-nervia, nervis supra subconspicuis subtus prominulis, nervulis subtus prominulis, breviter petiolulata. *Capitula* in paniculas ramis puberulis disposita; flores deficientes. *Legumen* ad 12.5 cm. longum et 1 cm. latum, glabrum, sicco stramineum, valvis subcarnosis.

Buriram, Nang Rawng, 100 m., savannah, *Kerr* 8221.

***Nimiria Prain* mss.** [Leguminosae-Mimoseae]; genus novum ab *Acacia* Willd., pedunculis medio bracteatis, filamentis basi plus minusve inter se connatis, leguminis valvis elastice secedentibus differt.

***Nimiria siamensis* Craib** [Leguminosae-Mimoseae]; ab affini *N. inopinata* (Prain) ramulis pallidioribus armatis, legumine breviori inter alia differt.

Frutex circa 2.5 m. altus (ex *Kerr*); ramuli iuventute parce puberuli, sicco fusci, cito glabri, cortice rubro-cinereo conspicue parvi-lenticellato obtecti. *Folia* bipinnata, petiolo incluso 6–12 cm. longa; petioli 7–10 mm. longi, supra canaliculati, paulo supra medium glandula prominente ambitu elliptica rarissime etiam glandula minore addita instructi; rhachis supra canaliculata, apice glandulis 2–3 ad pinnarum superiorum bases instructa; pinnae utrinque 10–11, oppositae, ad 4 cm. longae; foliola utrinque circa 30, linearia, apice obtusa, basi truncata, circa 5 mm. longa et 1 mm. lata, subtus pallidiora, costa subcentrali pagina utraque conspicua, nervis lateralibus paucis subtus subconspicuis; stipulae spinescentes, 0.6–2.2 cm. longae, rectae vel saepissime parum decurvatae. *Capitula* in racemos axillares paniculam terminalem formantes disposita, infructescentia pedunculo 1 cm. longo paulo infra medium bracteato suffulta. *Legumen* anguste oblongum, suturis anguste alatum, paulo curvatum, apice obtusum, styli basi persistente obliqua, 5.5–9 cm. longum, 1.6–1.8 cm. latum, stipite ad 1 cm. longum suffultum, brunneo-stramineum, glabrum, valvis tenuibus sat duris elastice secedentibus; semina 13–15, ambitu

oblonga, 5 mm. longa, 2.5 mm. lata, glabra, funiculo circa 4 mm. longo apice torto suffulta, hilo parvo circulari.

Kanburi, Sisawat, 150 m., open deciduous forest, *Kerr* 10180.

***Pithecolobium conspicuum* Craib** [Leguminosae-Mimoseae]; species nova pinnis 1-iugis, foliolis inter maiora, petiolo paulo infra medium glandula permagna instructo distincta.

Arbor ad 8 m. alta (ex *Kerr*); ramuli iuventute pilis brevibus ferrugineis adpressis hic et illic instructi, angulati, sicco fusci, cito glabri, mox cortice plus minusve brunneo obtecti, lenticellis haud conspicuis. *Folia* bipinnata, petiolo ad 11 cm. longo iuventute pilis brevibus ferrugineis adpressis tecto cito glabro striato supra parum canaliculato 3-4.5 cm. supra basem glandula ambitu elliptica 8-10 mm. longa 4 mm. alta concava instructo suffulta; pinnae 1-iugae, ad 35 cm. longae, petiolulo 4-6 cm. longo eglanduloso suffultae, rhachi etiam eglandulosa cum petiolulo indumento ei ramulorum simili tecta; foliola opposita, 3-4-iuga, oblongo-oblongata, apice acuminata, basi inaequilateralia, latere inferiore cuneata, superiore subtruncata vel cordatula, usque ad 23 cm. longa et 9 cm. lata, chartacea, iuventute indumento ei ramulorum simili instructa, cito glabra, nervis lateralibus utrinque 11-14 intra marginem anastomosantibus cum costa supra conspicuis subtus prominentibus, nervis transversis supra conspicuis vel subconspicuis subtus prominulis, petiolulo 3-5 mm. longo suffulta. *Capitula* vel supra-axillaria, 4-6 lineatim fasciculata, vel in paniculas racemiformes vel terminales vel e ramulis defoliatis ortas ad 28 cm. longas pedunculis fasciculatis disposita, pedunculis ad 3.5 cm. longis suffulta, et rhachi et pedunculis iuventute indumento ei ramulorum simili tectis; flores albi (ex *Kerr*), sessiles; bracteae 0.75 mm. longae. *Calyx* 3 mm. longus, apice denticulatus, extra inferne subglaber, superne pilis brevibus fulvis sparse instructus. *Corolla* 7.5 mm. longa, fere ad medium lobata, lobis oblongis obtusis ad 1.75 mm. latis, dorso superne pilis brevibus fulvis adpressis instructa. *Filamenta* basi ad 4 mm. inter se connata. *Ovarium* 2 mm. longum, cum stipite 2 mm. longo glabrum; stylus 11 mm. longus, tenuis, glaber; ovula circa 14.

Kanburi, Baw Noi, 700 m., evergreen forest, *Kerr* 10252.

***Pithecolobium tenue* Craib** [Leguminosae-Mimoseae]; species nova ramulis armatis, petiolis alatis, pinnis 1-iugis 4-6-foliolatis, leguminis valvis tenuibus distinguenda.

Arbor circa 5 m. alta (ex *Kerr*); ramuli glabri, iuventute flexuosi, conspicue angulati vel fere subalati, cortice rubro vel viridi-rubro mox cinereo-brunneo obtecti, lenticellis mox conspicuis, stipulis spinescentibus ad 4 mm. longis rectis prorsus directis armati. *Folia* bipinnata, petiolo 1.3-2 cm. longo viridi-alato glabro apice glandula circulari stipitata suffulta; pinnae 1-iugae, rhachi 2-5 cm. longa viridi-alata glabra vel supra medio parce crispatis puberula subtus parcissime puberula supra saltem apice

inter foliola terminalia glandula circulari instructa vel saepe etiam inter foliola inferiora similiter glandulosa; foliola utrinque 2-3, opposita, subrhombea, apice obtusa, apiculata, basi inaequilateralia, latere superiore cuneata, inferiore rotundato-cuneata, inferiora 1.5-2.7 cm. longa, 0.8-1.5 cm. lata, terminalia ad 9 cm. longa et 4.7 cm. lata, chartacea, sicco viridia, supra ad costam pauperius puberula, subtus subglabra, nervis lateralibus utrinque 6-7 intra marginem anastomosantibus supra subconspicuis subtus prominentibus, nervulis subtus prominulis, sessilia. *Inflorescentia* terminalis, rhachi flexuosa saepius simplice conspicue angulata armata glabra, pedunculis 2-4-fasciculatis 1-2 cm. longis glabris apice bracteatis, capitulis e floribus 3 sessilibus constitutis; alabastra glabra. *Calyx* 2.5 mm. longus, lobis deltoideis subacutis tubo dimidio brevioribus. *Corolla* 6 mm. longa. *Filamenta* circa 17 mm. longa. *Ovarium* 2 mm. longum, glabrum, stipite 1 mm. longo suffultum. *Legumen* sicco rubro-brunneum, ad 23 cm. longum et 2.3 cm. latum, inter semina parum constrictum, valvis tenuibus reticulatis glabris, basi angustatum, stipite vix 1 cm. longo suffultum.

Kampëngpet, Mê Lamung, 500 m., scrub jungle by river, *Kerr* 6095.

XLIV.—THE TYPE OF VERONICA TRAVERSII.

V. S. SUMMERHAYES.

Veronica (Hebe) Traversii was first described by J. D. Hooker in 1864 (*Handb. N.Z.Fl.* 208), the species being based primarily on specimens collected by Travers in Canterbury Province. With these specimens were cited others collected in the Southern Alps by Haast and also two specimens from Otago collected by Hector and Buchanan.

In 1873 Masters (*Gard. Chron.* 1873, p. 1046) identified certain cultivated plants as *V. Traversii* but unfortunately we have no specimens available of these. In 1878, however, Hooker figured in the *Botanical Magazine* (t. 6390) a cultivated plant known at that time as *V. Traversii*, which was presumably the same as the plants dealt with by Masters.

Hooker mentions in his original description that the corolla-tube varies in length, stating that it is from 2-5 times as long as the calyx.

In the *Manual of the New Zealand Flora*, Ed. i, Cheeseman, who had realised that a number of different plants were included under the name *V. Traversii*, adopted as the type of the species the form with short corolla-tube figured in the *Botanical Magazine*, while he apparently gave the varietal name *elegans* to those specimens with a longer corolla-tube.

An examination of the material which Hooker had available in 1864, however, shows that the form with the long corolla-tube was

undoubtedly Hooker's type of the species. At Kew there are 6 specimens collected by Travers from Canterbury with long corolla-tubes while there are an equal number, also collected by Travers, with short ones. A careful comparison of these two sets of plants with Hooker's description reveals three points in which it agrees with the "long corolla" forms while not agreeing with the others, while there is no single character in which the reverse is the case.

In the form with short corolla-tubes, the tube is either equal to or up to twice as long as the calyx, whereas the description states that the tube is 2-5 times as long as the calyx. The sepals themselves are about 2 mm. long in the short-tubed forms, while the description says 1.5 mm. long. Finally the fruit can only have been described from the long-tubed form (a specimen collected by Sinclair and Haast), since there are no fruits present on any of the short-tubed specimens. Furthermore the capsule of the plant figured in the Botanical Magazine is only 2-2½ times as long as the calyx instead of 3-4 times.

Hooker's original description of the species therefore was drawn up from the long-tubed specimens and not from those with short corolla-tubes, and is a satisfactory description of the type.

As further evidence that Hooker regarded the long-tubed forms as typical, it may be remarked that he wrote up the short-tubed specimens as "*V. Traversii*?", as if he were not sure of the accuracy of his determination at some point in the investigation.

There seems to be no doubt that the short-tubed specimens represent two or more distinct species, for as pointed out by Cockayne and Allan (Trans. N.Z. Inst. lvii. 29: 1927), they do not agree among themselves. All the long-tubed specimens of *V. Traversii* Hook. f., on the other hand, seem to belong to a well-marked and constant species which appears to be confined to Canterbury Province. An interesting point in distinguishing the species in the Herbarium lies in the fact that true *V. Traversii* dries light brownish-green, whereas the short-tubed forms usually dry nearly black or in any case a much darker brown.

In accordance with modern views *Veronica* sect. *Hebe* Benth. is here given independent generic rank. The shrubby Veronics form a very natural group distinguished not only by their habit and austral distribution, but by the capsule being compressed parallel to the septum and dehiscing septicidally. They constitute the genus *Hebe* Commers. ex Juss., which is now recognised as generically distinct from *Veronica* L. by Pennell, who has made extensive studies in the family *Scrophulariaceae*, and by representative New Zealand botanists such as W. R. B. Oliver, L. Cockayne and H. H. Allan.

From the mixture of short-tubed forms it is possible to separate the species figured by Hooker in Bot. Mag. t. 6390, to which it is proposed to give the name *Hebe brachysiphon* in allusion to the short corolla-tube. The species is well described by Hooker except that

sometimes the capsule is up to 2½ times as long as the sepals while the sepals are often less rounded at the apex. A number of wild specimens in the Kew Herbarium can be referred to this species, the distribution being Nelson, Marlborough, Canterbury and Otago (northern part) Provinces.

The short-tubed specimens collected by Travers in Canterbury Province should probably be referred to *Veronica darwiniana* Col., as they apparently had glaucous leaves while the throat of the corolla is hairy within. They agree fairly well with Colenso's type of that species, but are quite different from *H. brachysiphon*.

The following clavis summarises the floral differences between *Hebe Traversii* and *H. brachysiphon*.

Sepala 1.5 mm. longa. Corollae tubus gracilis, cylindricus, sepalis 2-5-plo longior. Capsula 5 mm. longa, sepalis 3-4-plo longior1. *H. Traversii*

Sepala 2-3 mm. longa. Corollae tubus amplius, sursum sensim dilatatus, sepalis aequans vel iis usque ad duplo longior. Capsula 5-6 mm. longa, sepalis 2-2½-plo longior.....2. *H. brachysiphon*

The synonymy of the two species is as follows:—

1. ***Hebe Traversii*** (Hook. f.) Cockayne & Allan in Trans. N.Z. Inst. lvii. 29 (1927).

Veronica Traversii Hook. f. Handb. N.Z. Fl. 208 (1864), sensu restricto;

V. Traversii var. *elegans* Cheesem. Man. N.Z. Fl. ed. i. 518 (1906), ed. ii. 804 (1925).

SOUTH ISLAND. Canterbury Prov.: Hurunui Mts., 900-1200 m., Travers (lectotype*); river banks, 300 m., Travers 3, 4, 7, 8; Valley of Selwyn, on grass flats and hill sides, 450-900 m., Jan. 1864, Haast 26; Gorge of Waimakariri, on island, 300 m., Jan. 1864, Haast 13; without definite locality, 1860-61, Sinclair & Haast; Broken River, T. Kirk 631; no definite locality, T. Kirk 1044; Craigieburn Mts., 750 m., Cheeseman 1574.

2. ***Hebe brachysiphon*** Summerhayes, nom. nov.

Veronica Traversii Masters in Gard. Chron. 1873, 1046; Hook. f. Bot. Mag. t. 6390 (1878); Cheesem. Man. N. Z. Fl. ed. i. 518 (1906), et ed. ii. 804 (1925), excl. var. *elegans*; non Hook. f. (1864).

SOUTH ISLAND. Canterbury Prov.: Craigieburn Mts., 750 m., Cheeseman 1575. Nelson Prov.: Lake Rotoiti, Cheeseman 1569; Clarence Valley†, 750 m., T. Kirk 1577. Otago Prov.: Lake Wakatipu, Petrie 1578.

*When an author in publishing a new name cites two or more specimens under it without indicating which is the type, one of them may be chosen subsequently, and is then termed the *lectotype* (selected type). For this and other terms for types see Bull. U.S. Nat. Mus. No. 53, part 1 (1905); Ann. Mag. Nat. Hist. xvi. 102-104 (1905); Journ. Bot. 1923, 137.

†This locality appears to be in Marlborough or Canterbury Province but is labelled Nelson in Cheeseman's writing.

CULTIVATED: From Sir J. D. Hooker's garden, March-June 1893. (Type). Edinburgh Bot. Garden, Aug. 1893; Royal Botanic Gardens, Kew, Sept. 1882; July 1890; Aug. 1927.

XLV. MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies: Mr. C. O. OATES, Assistant Agricultural Officer, Kenya; Mr. B. F. MARTIN, Agricultural Officer, Uganda; Mr. J. G. REYNARD, Superintendent, Agricultural Department, Nigeria; Mr. C. L. NEWMAN, B.Sc., Agricultural Field Officer, Federated Malay States.

ARTHUR EVERETT SHIPLEY.—We record with very deep regret the death of Sir Arthur Shipley, G.B.E., F.R.S., which occurred at the Lodge, Christ's College, Cambridge, on September 22nd.

Sir Arthur was a frequent correspondent of Kew, and one of his earliest papers, on "Beetles destructive to Rice Crops in Burma," was published in the Kew Bulletin, 1889, p. 13. Sir Arthur could always be relied upon for help and advice in any matter of scientific importance which came within his more special fields of knowledge, and in many indirect ways through his wide experience and extensive acquaintance with men and affairs he was able to help forward matters of botanical as well as of zoological interest.

He came more intimately in touch with Kew and its Directors in his latter years in connection with the Imperial College of Tropical Agriculture, Trinidad, in his capacity as Chairman of the Governing Body. The many purely botanical matters which concerned the College always received his ready support and encouragement, and his loss will be felt very deeply in many spheres of scientific activity.

Official Guide to Museum No. III, Colonial Timbers and Gymnosperms*.—A third edition of the Official Guide to Museum No. III has just been published. It differs from the two former editions by including descriptions of the systematically arranged economic products of Conifers and other Gymnosperms, and by the specimens in the Main Building being described in numerical sequence instead of in geographical order. The Guide is divided into two parts. Part 1, ending at page 95, describes some 600 kinds of timbers which are chiefly Empire grown. Common and scientific names of the timbers are given, together with native countries and short descriptions of the trees, timber and uses. Part 2 deals with the Gymnosperms which are arranged in cases in the Annex to the main building. The families *Gnetaceae*, *Taxaceae*, *Pinaceae*,

*Official Guide to the Museums of Economic Botany: No. 3, Timbers and Gymnosperms. Obtainable from the Royal Botanic Gardens, Kew. Price 1s. net (by post, 1s. 1½d.).

Ginkgoaceae, and *Cycadaceae*, are dealt with in turn, the 101 special descriptions taking up 36 pages. An index is given of common and scientific names.

East African Pasture Plants*.—The favourable reception of the first Part of this work, which appeared last year, has warranted an early continuation of the series. The second Part, which has now been published, contains descriptions and black and white illustrations of thirty species of grasses, most of which occur generally throughout Tropical East Africa. As in the first Part, the needs of the agriculturist have been kept in view, the species selected being mainly those of economic importance, and which constitute a considerable portion of the vegetation. The notes accompanying the descriptions have been enriched by observations in the field of Mr. T. D. Maitland. Amongst the grasses figured are *Digitaria abyssinica* Stapf, which although sometimes a pestilent weed, may be used for lawns and for fodder; *Panicum trichocladum* Hack., *Penisetum polystachyon* Schult., and *Chloris Gayana* Kunth, three of the more important fodder grasses; also *Melinis minutiflora* P. Beauv., which may be of value in the control of the Tsetse fly.

The Propagation of Hardy Trees and Shrubs.†—This small volume of one hundred and twenty pages should prove of considerable value to cultivators of trees and shrubs, a branch of horticulture in which interest is spreading widely. The various methods of propagation by seeds, cuttings, layering, and grafting and budding are dealt with in separate chapters, with a special chapter dealing with the propagation of conifers. Chapter IV on propagation by cuttings is particularly interesting and should be instructive to amateurs whose particular hobby happens to be hardy shrubs. A useful feature at the end of the book is an alphabetical list of the principal genera of trees and shrubs, excluding conifers, with the methods of propagation recommended. The book is well illustrated with eight full page reproductions of photographs depicting in a very helpful manner the various operations connected with the several methods of propagation.

South African Trees.‡—Dr. Sim's object in this volume is to render available for the farmer all necessary information concerning the growing of a forest crop on a quick rotation in comparatively small lots on a farm. He discusses the general position of South Africa

*East African Pasture Plants. II. East African Grasses. The Crown Agents for the Colonies, 4, Millbank, London, S.W., 1927, pp. 56, text figs. 30. Price 3s.

†By G. C. Taylor, assisted by F. P. Knight. Dulau & Co., 32, Old Bond Street, London, W.1. 1927, pp. 120, pl. 8. Price 5s.

‡Tree planting in South Africa, by T. R. Sim. The Natal Witness, Ltd., Pietermaritzburg, South Africa, 1927, pp. 454, ill. 74.

to the world's timber supply, and what the farmer can do to help himself and his country. He provides a mass of information and statistics of all trees that have proved to be of value in South Africa, or which are likely to be successful. The selection of trees and the sites best suited to particular kinds are discussed and details are given for planting and arrangement of farm plots. Southern Rhodesia and Portuguese East Africa are considered separately. The chief points of interest of the principal trees mentioned are shown in a series of line drawings grouped at the end of the volume. The work provides a very interesting treatise on the subject for a special situation, which will not be common to all countries. It purposely avoids the science and application of forestry proper, and at the same time it is much fuller and a more extensive treatment than a work on arboriculture only. It is a work of reference primarily for the home and farm, but should equally find a place in the college and office library. The comprehensive bibliography and full index have particular value in a work of this nature.

The Book of Bulbs.*—The object of this book is to introduce and further the cultivation of bulbs in the home garden. It is written in popular style and is intended for American readers. The photographs are of general views and individual specimens and are well produced. The numerous text figures illustrate different phases in bulb cultivation and the variety of garden forms of common flowers. It is a comprehensive and handy volume which will appeal to the amateur in the United States.

We record with great regret, as this number goes to the printers, the death on the 12th of October of Dr. B. DAYDON JACKSON. A notice of his contributions to botany will appear in the next number of the Bulletin.

*By F. F. Rockwell. Macmillan & Co., Ltd., 1927. Pp. xv+264, pl. 30, text figs. Price 12s. 6d.

BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1927 ROYAL BOTANIC GARDENS, KEW

XLVI.—WATER-COLOUR SKETCHES OF THE ROYAL BOTANIC GARDENS, KEW, BY THE LATE MRS. EMMA HUBBARD.

Mr. George Hubbard has very generously offered to lend the water-colour sketches made by his mother, the late Mrs. Emma Hubbard, to the Gardens, and his offer has been accepted by the Director, with the approval of the Minister of Agriculture and Fisheries.

The sketches, 37 in number, were made at the close of the XIXth Century by Mrs. Hubbard, who then resided in Kew, and are faithful representations of the Gardens at that time.

Mrs. Hubbard was a sister of Sir John Evans and Dr. Sebastian Evans. As the pictures show, she was a talented artist, and at the time of her death, in June, 1905, the obituary notice in the *Times* contained the following reference to this collection of drawings:—

“Mrs. Hubbard was a not infrequent correspondent of *Nature* and other scientific periodicals, more particularly on the subject of birds and their ways, and several of her poems, either with or without her name, have appeared in Longman's Magazine and elsewhere. She was also an artist of considerable power, and her delineations of some of our rarer insects, drawn from the life, are remarkable for the knowledge they indicate of insect habits and attitudes, as well as for their scrupulous anatomical accuracy. Her principal pictorial work, however, consists of a series of water-colour sketches in Kew Gardens, for many years one of her favourite haunts. These drawings, remarkable not only for their artistic merit, but as an historic record of the garden woodlands at the beginning of the 20th Century, may, it is hoped, like those of Miss North, find a permanent and appropriate home in one of the Museums in the Gardens themselves.”

Since there was no suitable place for the display of the sketches in any of the Museums, Their Majesties The King and Queen have been graciously pleased to approve of their being exhibited in the long gallery on the first floor of Kew Palace, where they are now available for inspection.

A portrait of Mrs. Hubbard, with a short descriptive notice of the sketches, has also been hung on the wall of the gallery.

The pictures represent the following subjects :—

1. Cedar of Lebanon near Brentford Ferry Gate.
2. Cedar of Lebanon near Flag Staff.
3. Ruined Arch near North Gallery (Built 1759-60).
4. Beech Tree near Rhododendron Dell.
5. Autumn Scene in Kew.
6. Beeches. Old Deer Park in distance.
7. Seven Sisters Elms. Last of them blown down, March, 1916.
8. Old Oak Avenue near Cypress Collections.
9. Cedar of Lebanon, S.W. end of Rhododendron Dell.
10. Cedar of Lebanon on Mosque Hill near Tokyo Gate.
11. Pond and Campanile (Built 1847-48).
12. Beeches, N.E. end of Rhododendron Dell.
13. Campanile, Deodar Terminals.
14. Cart Road through wood near Temperate House.
15. Autumn Scene, S.W. end of Rhododendron Dell.
16. Beeches.
17. Bluebells, Queen's Cottage Grounds.
18. Bluebells, Queen's Cottage Grounds.
19. Woodland Scene, Kew Gardens.
20. Woodland Scene, Kew Gardens.
21. Woodland Scene, Kew Gardens.
22. Woodland Scene, East of Rhododendron Dell.
23. Temple of Bellona (Built 1760). Daffodils.
24. Entrance—East side of Bamboo Garden.
25. Lake with *Gunnera* in foreground.
26. Lake Scene.
27. Lake Scene—Deciduous Cypresses.
28. Lake Scene.
29. Lake Scene.
30. Tow path—Thames Side.
31. Old Kew Bridge (1896). Built 1783-89 ; demolished 1899.
32. Beeches, Kew Gardens.
33. Lake Scene.
34. Haystacks, Kew Gardens.
35. Ha-ha and Towing Path—Thames Side.
36. View of Thames from end of Sion Vista.
37. Woodland Scene, Kew Gardens.
38. Portrait of Mrs. Hubbard and descriptive notice.

These pictures, like the historical pictures of the Gardens and Village of Kew, which are exhibited, by the gracious permission of Their Majesties, in the rooms of the Palace leading out of the gallery (see *Kew Bulletin*, 1926, p. 369), are on loan to the Lord Chamberlain's Department.

XLVII.—*HISTORY OF PLANT NOMENCLATURE.

M. L. GREEN.

A University graduate with an average knowledge of systematic Botany starting to work in a great Herbarium and given a collection of living or dried plants to name finds himself as it were in a different world. In order to perform his work efficiently he has to become acquainted with the special bibliography of the subject—the different floras and monographs that have to be consulted. Armed with these he sets to work, and attempts to identify one of the specimens. He soon finds that he has to extend his knowledge of botanical terminology in order to make successful use of the keys and descriptions. When at last he succeeds in identifying a species he will probably have to decide which of two or more competing names assigned to it may be the correct one, and this demands a knowledge of Nomenclature, and in particular of the International Rules. Thus a special knowledge of plant nomenclature, terminology and special bibliography is essential for his work.

To the student of plant anatomy, or physiology, still more of cytology or ecology, the work of previous centuries possesses little more than an academic or historic interest, the knowledge of these subjects being comparatively modern, but the growth of systematic botany and nomenclature is traceable back to the distant past, and their origins are lost in the mists of antiquity. Hence a knowledge of the history of the subject is part of the equipment of the complete systematist. In a primitive stage of Society the average individual possesses a far greater hand-and-eye knowledge of plants, than the average civilized man. He has to know the different kinds of roots, grains, fruits and seeds that can be used as food, the plants that yield fibres for making clothing, mats and ropes, those that make good weapons, and the various medicinal and poisonous plants, the latter being of special importance in connection with the manufacture of arrow poisons for hunting and warfare. Each of these plants will bear a special name.

As an illustration of the extensive knowledge of plants possessed by relatively primitive peoples the Menomini Indians of Wisconsin may be cited. According to Huron H. Smith they use about one hundred and twenty different species as medicines and forty-five for food. They had separate names for two critical species of *Amelanchier* which, until quite recently, were not distinguished by botanists.

Primitive man grouped plants into three categories, trees, shrubs and herbs, and this primary systematic division of the vegetable kingdom was retained by botanists for 2,000 years. Even at the beginning of the eighteenth century John Ray, who first recognised the two great classes of Dicotyledons and Monocotyledons, made

*This paper is the outcome of a lecture delivered in connection with the Board of Education, Short Course (Botany) for Teachers in Secondary Schools. Held at Kew, 1927.

Herbs and Trees his two primary divisions (*Historia Plantarum* 1686-1704), each of which had Dicotyledons and Monocotyledons as subordinate groups.

The earliest names of plants were the common names. A good example is the name clover—the term was used for all plants with a cloven leaf, it was used in fact as a generic name, and the species were distinguished on account of a secondary character such as the colour of the flower, e.g. white clover, red clover, etc. These names are just as much specific as if they were latinised. Again the very old word “pulse” was used to represent all peas, beans, vetches and lentils, and it was restricted to plants with edible seeds belonging to the family now known as *Papilionaceae*. It is obvious that the early botanists did not consider the floral structure at all, in fact they knew nothing about the essential organs of the flower. To them the flower consisted chiefly of the “corolla,” with the result that classification was based only on vegetative characters. Thus all plants with leaves divided into three received the name of *Trifolium*—*Oxalis Acetosella* was called *Trifolium acetosum* both by Dodoens in 1583 and by Bauhin in 1623, also *Menyanthes trifoliata* was called by them *Trifolium palustre*. Very many similar examples could be given.

Scientific names of plants have great advantages over common names. They express relationship, they are international, and they are relatively unambiguous. Common names, on the other hand, frequently give a misleading clue to relationship, e.g. Yellow Loosestrife is *Lysimachia vulgaris* (*Primulaceae*) and Purple Loosestrife, *Lythrum Salicaria* (*Lythraceae*). Again several species of one genus may have entirely unconnected names, e.g. Yellow Pimpernel, Creeping Jenny, Yellow Loosestrife, all species of *Lysimachia*. Common names are also frequently very local—one plant being called by one name in one county and by another in the next. The same name also is given to several quite different plants.

An interesting feature of early botany compared with the science of the present day, is that at least as much attention was paid to the underground parts of the plant as to the leaves and the stem, and that the flower was comparatively neglected. Even in the figures of the early sixteenth-century botanists such as Brunfels and Fuchs, the underground parts of the plants form a conspicuous feature. This was due to the fact that the roots were used in medicine even more than the rest of the plants, and the study of Botany at first practically coincided with the study of medicinal plants.

Botanical grouping began with prehistoric man and has gone on ever since; even in the days of Theophrastus (B.C. 370) there was a certain plant nomenclature.

To study the evolution of modern nomenclature we cannot do better than take some outstanding botanists in chronological order and find out what contributions each one made to it. Nomenclature is so intimately connected with classification, description,

terminology and bibliography, that the gradual development of each of these branches must also be followed in outline.

Theophrastus has been termed the Father of Botany, because he was the author of the earliest extant treatise on the Science. He was born at Lesbos in B.C. 370, and died at the age of 85 in B.C. 285. He studied under Plato along with Aristotle, whose assistant and successor he afterwards became. He was primarily a philosopher and is said to have written 227 separate treatises on Religion, Politics, Ethics, Education, Rhetoric, Mathematics, Astronomy, Logic, Meteorology and Natural Sciences. His wide knowledge of Botany was derived partly from life-long study in his Botanic Garden, and partly from the accounts of exotic plants, given by scientifically-trained observers attached to the expeditions of Alexander the Great.

When reading his “Enquiry into Plants” it is difficult to realise that it was written over 2,000 years ago. His list of the members of the plant—root, stem, branch, twig, leaf, flower, fruit—might almost have come from the pages of a modern work on morphology. He drew a distinction between fibrous and tap roots, and doubted whether corms, bulbs, and rhizomes really ought to be called roots, in spite of the fact that they are underground. He described the aerial roots of the Banyan, and the adventitious roots of the Ivy. His classification of leaves is almost modern. He distinguished the whorled and scattered arrangements, the petioled and sessile condition, the simple and compound types, and the pinnate and palmate arrangements, arriving at the conclusion that the pinnate leaf of the ash, for example, was a single leaf because it fell off as a whole. Before his time the “flower” was merely a *brightly-coloured perianth*. Theophrastus drew attention to a second type of flower—the “capillary”—including those that have conspicuous stamens such as the grape, ivy, and the mulberry. Flowers like the rose, the violet and the lily he called “double” because inside the “leafy” flower, they had a “capillary” flower (Androecium). Both Theophrastus and his predecessors regarded *green perianth* leaves as belonging to the foliage leaves, and it was only many centuries later that they were recognised as forming part of the flower. He distinguished polypetalous and gamopetalous corollas and superior and inferior fruits. His knowledge of fruits and seeds was extensive, and he was aware that the “date stone” was a seed, whereas the olive and the plum, he pointed out, had true stones. He implicitly recognised such groups as families, genera and species, but had no special terms for these categories. Nor did he propose any new systematic nomenclature, but used the common Greek names of the plants about which he wrote.

Very many of these common names have been perpetuated as the scientific names of genera, such as *Acanthus*, *Aconitum*, *Anemone*, *Antirrhinum*, *Aristolochia*, *Arum* and *Asparagus*, to mention merely a selection of the best known beginning with the letter A. Most of

these were names of single species representing genera which were then monotypic. Sometimes he used the name of a common species as a generic name followed by distinctive epithets for each of the other species. Thus *Drys* (proper) was *Quercus Robur*, the common oak; *Drys agria* *Quercus Aegilops* (Valonia Oak); *Drys platyphyllos* *Quercus lanuginosa* (Scrub oak) etc. This system of nomenclature persisted until the beginning of the eighteenth century, and is seen in the works of Rivinus (1652-1723), who for example, called the Garden Chervil, *Cerefolium*, and the other species *C. sylvestre*, etc.

Theophrastus recognised certain of our modern Families such as *Umbelliferae* ("Narthecodes"), *Gramineae* (with *Cyperaceae*, *Palmae*, etc.) ("Calamodes"), *Cichoriaceae* (Compositae with milky juice) ("Cichoriodes"). Altogether he mentions about 500 different species by name.

In reading Theophrastus care should be taken not to attach the modern conception of the term genus to his "genos." He used it in the sense of our word "kind," frequently for what are now called species, as in his account of the different kinds of oak. It can be seen, therefore, that Theophrastus had a very shrewd idea of the value of botanical classification. During the next three centuries he was recognised as the chief authority on Botany.

After Theophrastus the next outstanding figure in the history of Botany was the learned Greek physician, Dioscorides, who flourished some 350 years later, in the time of Nero, about 64 A.D. He was a native of Asia Minor, and travelled very widely in the Mediterranean Region. His fame rests on his great work describing about 600 plants, chiefly medicinal, with their properties and uses. This book was the standard treatise both of Botany and Medicine for over 1,500 years. The plants were grouped according to their properties, but it is evident that he recognised such families as the *Labiatae*, *Papilionaceae*, *Umbelliferae*, *Compositae* and *Solanaceae*.

With the revival of learning at the end of the Middle Ages the physicians of Europe attempted to identify the plants which were growing about them with those of Dioscorides. As many of the species and even some of the genera were different from those of the Mediterranean Region, their efforts were not very successful, and great differences of opinion arose as to the identity of many of the plants described by Dioscorides.

Owing to the absence of recognisable descriptions and figures it is frequently impossible to determine the plants mentioned in their works until 1530, when a new era in Systematic Botany was inaugurated by Brunfels. He published excellent wood engravings of over two hundred German plants along with extracts from Theophrastus, Pliny and others, describing the plants and their uses. Brunfels was born at Mainz in 1464. He was for many years a Carthusian monk, then a schoolmaster and Protestant theologian, and finally a physician. As a botanist he does not rank high, many of his identifications being erroneous, e.g. his identification of *Corydalis* with the

Aristolochia of the Ancients. The text of his work is practically a treasury of select quotations from Theophrastus, Dioscorides, Pliny and others, with hardly anything that is original.

The great service, however, which he rendered to Botanical Science was the provision of recognisable pictures of the plants with which he dealt, thus enabling other botanists to identify the species and so placing systematic botany on a relatively firm basis. His classification was based on medicinal properties, so that in some cases he associated widely different plants such as *Anemone Hepatica* and *Marchantia polymorpha* in the same genus. He recognised two species of *Verbena*, *V. mas* and *V. foemina*, the former being *Verbena officinalis*, the common Vervain, and the latter *Senecio vulgaris*, the groundsel. In a German edition published two years later he substituted *Sisymbrium officinale* for *Senecio vulgaris* as *Verbena foemina*.

Brunfels has been credited by E. L. Greene with having commenced the reform of botanical nomenclature by rejecting certain generic names composed of two words in favour of others consisting of a single word. Actually he seems to have thought one name as good as another, and to have used them more or less indifferently. In many cases he adopted one name in the text and a different one for the illustration. Thus for the Wood Sanicle he used both *Sanicula* (text) and *Diapensia* (figure), for Fumitory, *Capnos* and *Fumus terrae*, for the Germander Speedwell *Gamandraea* and *Chamaedrys*.

The next botanist who requires mention was Leonard Fuchs, a Bavarian physician who in 1542 published his *Historia Stirpium*, a fine volume containing over 500 excellent wood engravings of plants, for which he had employed two draughtsmen and the best engraver in Strasbourg. In order to save space he condensed the descriptions, and to make them intelligible supplied a glossary of botanical terms, including such words as internodium, scapus, apices (anthers), filamenta (filaments and styles). He proposed several new genera, including *Digitalis*. In reading Fuchs' *Historia* it is important to remember that he used some technical terms in a very different sense from their modern application. Thus by "genera" he meant what are now called species and varieties, and some of the genera bore binary names: thus *Vitis vinifera* (the vine), *Vitis alba* (white bryony) and *Vitis nigra* (Clematis) were not three species of *Vitis* but three different genera for him.

Contemporary with Fuchs is Hieronymus Tragus (1498-1554), the third great German botanist. He was the first who actually described plants. He had no money to employ draughtsmen and engravers, so was compelled to write descriptions of the less known plants in his book, so that his readers might be able to identify them. Illustrations were added, however, in the later editions. Tragus was the first to recognise the stamens and pistil as definite organs and thus inaugurated the scientific study of the flower. As far as nomenclature is concerned Tragus followed on the lines then in

vogue. He does not seem to have attached special importance to the Latin names which are sometimes mere translations of the German. Fuchs convinced that the genus *Plantago aquatica* is identical with *Alisma* of the Greeks uses the latter name in his text. Tragus however restored the original name *Plantago aquatica*, apparently because it corresponded with the German name "Wasser Wegerich" at the same time pointing out that the plant should not be placed among the other plantains. "Haec Germanis Wasser Wegerich, id est, *Plantago aquatica* (tametsi inter *Plantagines* non videatur communeranda)".

An interesting example of Tragus substituting a binary generic name for a Fuchsian name is *Digitalis* for which he substituted *Campanula sylvestris*. His remarks show well the idea prevailing at the time that generic and other names could be altered if desired. "Let anyone name this plant what he will, we, in consideration of the form of the flower shall name it *Campanula sylvestris*, at least for the time being, and until a more appropriate name shall arise. There are those that call it *Digitalis*."

Up to this time names were either single, binary or sometimes composed of three words, this being due to the fact that the first two would constitute the generic name and the third the specific. There is as yet no trace of those phrase names that burdened botanists of the seventeenth and eighteenth century.

Whereas Brunfels and Fuchs figured plants and Tragus described them, Valerius Cordus (1515-44) introduced scientific terminology. Euricius Cordus, his father, had pointed out that very many plants grew in Germany that were unknown to the Greeks and Romans, and Valerius described many of them. He was the first man in history to establish many new genera, very few men between Dioscorides and Valerius Cordus made more than two or three. Cordus proposed so many that his book is a land-mark. A few of those mentioned by E. L. Greene are:—

Balsamella Cordus, now known as *Impatiens*, Coralloides (*Dentaria*), Helianthemum (*Helianthemum*), Moschatella (*Adoxa*), Oxy-coccus (*Oxycoccus*), Pneumonanthe (*Pneumonanthe*), Sagitta (*Sagittaria*).

Cordus introduced certain improvements into the classification and nomenclature of genera. He pointed out that the Ground Ivy (*Glechoma hederacea*), which was then commonly called *Hedera terrestris*, had nothing to do with the Ivy but had flowers like those of "*Chamaedrys*" [*Teucrium*] and "*Galeopsis*" [*Lamium*], thus implicitly recognising the family *Labiatae*. He proposed the new name *Chamaeclema* in place of *Hedera terrestris*.

It is interesting to note that Cordus had a certain regard for priority of names. Thus he found the name *Eupatorium* as employed by Dioscorides had been displaced by *Agrimonia*, and he proceeded to restore it.

Cordus though very young—he died at the age of twenty-nine—had a great knowledge of morphology. He agreed with Theophrastus that not everything below ground is necessarily a root, and he defined a rhizome as a "coliculus" or little stem. Inflorescences also received the first scientific treatment since the days of Theophrastus, for instance he appreciated that the fig was an inflorescence, and described it in detail. He mentioned the involucre—bracts subtending the flower. The calyx he distinguished from the corolla by its position, and united ovary, stamens and pistil under the term "flower".

He was the first to draw attention to the peculiar habit of the Sundew, and also was the first to mention the tubercles on the roots of *Leguminosae*.

How ferns multiplied had always been a mystery to the Ancients. Cordus writes "Trichomanes grows abundantly on moist shaded rocks, although it produces no stem or flower or seed. It reproduces itself by means of the dust that is developed on the backs of the leaves, as do all kinds of ferns: and let this statement of the fact once and for all suffice."

In the period of 93 years from the appearance of Brunfels, Herbarium Vivae Icones (1530) to that of C. Bauhin's Pinax (1623) many new species had been described by botanists in various parts of Europe, such as Tabernaemontanus and Camerarius in Germany, Dodoens, de l'Ecluse and de l'Obel in the Netherlands, d'Alechamps in France, Turner in England, Mattioli, Colonna and Prospero Alpino in Italy, and Monardes in Spain. Each of these used whatever names pleased him, so that botanical nomenclature became gradually more and more confused. This is well illustrated by the synonymy of the species now known as *Plantago media*. Various authors from Brunfels onwards had given it at least seven different names, including *P. major*, *latifolia*, *media*, *major incana*, *minor incana*.

Order was brought into systematic botany and nomenclature by Caspar Bauhin, who in 1623 published his Pinax Theatri Botanici. This was the first nomenclator, or list of all known plants with their synonyms. It was in a way the forerunner of the *Index Kewensis*. It was a bibliography and a concordance of previous work on Systematic Botany, and even at the present day it is very useful in identifying the species figured or described by the sixteenth century herbalists from Brunfels onwards, since Linné generally cites the names adopted by Bauhin.

Bauhin had projected a much larger work with descriptions and figures, but only a sample of this was published under the title Prodrum Theatri Botanici (1620). Bauhin gave the name "*Plantago latifolia incana*" to what is now called *P. media*. Like many of his names of species this was plurinomial, and partook more of the nature of a diagnostic phrase than of a name. As time went on and many more species of some genera became known, these diagnostic

phrases became very cumbersome, remaining in vogue up to the time of Linné.

Another outstanding botanist, who lived later in this century, was John Ray (1628-1705). His chief work was the *Historia Plantarum* (1686-1704), which included full descriptions of all the plants known at that time. The number of standard books included in his list of abbreviated citations was well over a hundred, which gives some indication of the progress that had been made since the appearance of C. Bauhin's *Pinax*. Some of his important contributions to taxonomy and morphology may be mentioned in passing. He was the first to distinguish Monocotyledons and Dicotyledons, and perceived that some seeds had endosperm and that others had none. Undoubtedly Ray's system was the most natural one up to the time of Linné.

Another great systematist of the late seventeenth century was Tournefort (1656-1708). He has been regarded as the founder of genera in the plant kingdom. But it has already been shown that he cannot properly be given that distinction. The first systematic enumeration of genera is that in Caspar Bauhin's *Pinax*. There is a great difference between the work of Bauhin and that of Tournefort. Bauhin only gave names to genera, without descriptions, but distinguished the species by diagnostic phrases. Tournefort on the other hand provided his genera with names, descriptions and figures. Tournefort's chief work "*Institutiones Rei Herbariae*" (1700), has great method in it, every class being divided into sections, these into genera and these again into species. Most of Tournefort's generic names are uninominal but some are binominal such as *Ruta Muraria*, *Caryophyllus aromaticus* and *Auricula Ursi*. The two former might be mistaken for species of the very different genera *Ruta* and *Caryophyllus*, which he also recognises. Tournefort's theories do not appear as advanced as Ray's and his system was certainly more artificial.

As already indicated, Nomenclature at this time had become extremely cumbersome, as it was quite usual for species to be known by long sentences. Linné in 1753 replaced each of these diagnostic phrases by a binary name and this reform was found to be so convenient that it met with almost immediate acceptance. Carl Linné (1707-1778), a Swede, was born at Rashult where his father was a pastor. It is usual to say that a new era in the history of botany begins with him, but it is far better, following Sachs, to regard him as the last link of a chain of botanists such as Ray, Tournefort, etc., since his views are in the main the same as theirs. Linné systematised what had gone before him, and this placed him in a unique position. He recognised the functions of the stamens, and pistils, and introduced a new scheme of classification, known as the "Sexual System of Linnaeus," based on their number, relative position, etc. This was at least a convenient classification albeit an artificial one. He introduced various terms still in use such as monoecious and dioecious.

We are indebted to Linné for three great services.

1. His introduction of a consistent binary nomenclature for species, each species bearing only two names, the first being the generic and the second the specific.

2. The introduction of his Sexual System which for the first time supplied a thoroughly workable and convenient scheme for the arrangement of genera.

3. The publication of the "*Species Plantarum*," ed. 1 (1753), in which he repeated Caspar Bauhin's feat of one hundred and thirty years earlier of restoring order to Systematic Botany.

Linné thus cleared the ground for systematic botany, and it is therefore essential that our present system of Nomenclature should date from the year 1753, the year in which he published the first edition of the "*Species Plantarum*." Inspection of this work shows to what a large extent (as regards European plants) it was based on Bauhin's *Pinax*. Under the accepted binominal Linné gave only the more important synonyms. Thus when he referred to Bauhin's *Pinax* he considered it unnecessary to quote also the older works of Brunfels, Fuchs, Mattioli and others which Bauhin had already cited.

Linné was well aware of the artificial nature of his Sexual System, and had even published a fragmentary sketch of a Natural System, but the introduction of our present "Natural System" dates from the year 1789, when A. L. de Jussieu published his celebrated "*Genera Plantarum*" in which many of our modern "Natural Families" are defined, though sometimes under different names.

After the time of Linné Systematic Botany made great progress. Nomenclature and Classification were far more stabilised, and the way was prepared for the numerous taxonomic systems that were to follow. The names of natural plant families recognised by Linné were mainly descriptive such as *Coniferae*, *Umbellatae* and *Asperifoliae*. Jussieu, on the other hand, employed many plurals of generic names such as *Junci* and *Polemonia*, thus emphasising the fact that his families were aggregates around a typical genus. As this plural form was misleading, De Candolle introduced a variety of distinctive endings for family names including *-aceae*, *-ineae*, *-arieae*, *-ideae*. Lindley adopted the uniform termination *-aceae* for family names, and this is now accepted with the exception of eight well known names conserved under the International Rules e.g. *Labiatae*, *Compositae*.

In the year 1821 Steudel's "*Nomenclator Botanicus*" appeared. It consisted of a list of the names of all flowering plants then known with their synonyms. A second edition appeared in the year 1840. It was an extremely useful work of reference and, as will be seen later, was of great service in the preparation of the *Index Kewensis*. Another important work which was commenced in 1818 and continued up to 1873 was De Candolle's *Prodromus*; an enumeration with descriptions of all the known Dicotyledons based on a definitely natural system.

Various other systems were put forward during the nineteenth century, amongst them that of Bentham and Hooker's *Genera Plantarum*, a system that is still standard and still very largely followed. The first volume appeared in 1862 and the last in 1883.

From the year 1840 to 1880 or thereabouts very many new plants were described and there was no complete index of them, so it was quite possible for the same plant to be named and described more than once. To give a single example: Linden & Planchon in 1863 printed descriptions of eleven species from Colombia and Venezuela, not realising that in 1854 and 1858 these very same species had been described under other names in a Russian botanical periodical by Turczaninow.

Thus it came about that in 1881 Sir William Thiselton-Dyer after a Committee Meeting at the Linnean Society first broached the subject of the *Index Kewensis*. He stated that Charles Darwin had received so much help from Steudel's *Nomenclator*, then forty years old, that he was prepared to devote a sum of money annually for several years if a suitable person could be found to compile a list of the vast number of names that had been published since its issue. The task was entrusted to Dr. B. Daydon Jackson, who had established his reputation as a bibliographer by the publication of his "Guide to the Literature of Botany". At his suggestion the scope of the work was enlarged to include all the names of genera and species of flowering plants published from the time of Linné down to the end of the year 1885, with references to their places of publication. To quote his own words "I emphasized the desirability of giving references to all the names pointing out that a work on Steudel's plan, based solely on synonymy, would in no long time become out of date, whilst an enumeration of genera and species, with their place of publication during one hundred and fifty years, would be of permanent value." Dr. Jackson and his assistants carried out the work in the Kew Herbarium, where the continuation of the *Index* is still in progress. Quinquennial supplements are published by the Clarendon Press, and the latest, Supplement VI, appeared in 1926. One of the chief sources from which the original *Index* was compiled was the interleaved copy of Steudel's *Nomenclator* which had been kept more or less up to date at Kew. Other sources of help were Richter's *Codex Linnaeanus* for the Linnean names. De Candolle's *Prodromus* and *Monographiae*, Kunth's *Enumeratio*, Walper's *Repertorium* and *Annales*, and various floras of large areas, such as Bentham's *Flora Australiensis*, Hooker's *Flora of British India*, Martius' *Flora Brasiliensis* and Boissier's *Flora Orientalis*. By experiment Dr. Jackson found that up to 1850 practically all names were accounted for in the main works consulted. From that year onwards up to the end of 1885 the new names were extracted from the original works themselves. The indication of the geographical distribution of the species was revised by Sir Joseph Hooker.

The *Index* was a monumental work and took about ten years to compile and revise. The publication was undertaken by the Clarendon Press. It appeared in four fascicles making two thick volumes (1893-95). The first supplement covering the period 1886-1895 was prepared by Messrs. Th. Durand and B. Daydon Jackson and published in Brussels. Succeeding supplements, one every five years, are prepared at Kew. It is estimated that about four hundred periodicals are searched for new names for each supplement in addition to all the independent works published during the particular five years. There are usually over thirty thousand new names in each supplement.

The scope of the original *Index* is rather different from that of the present supplements. In the main work, generic reductions were made in accordance with Bentham & Hooker's *Genera Plantarum*, and reductions of species on the authority of various standard floras and monographs. Such reductions, however, only represent the views of the particular author or authors. It should also be borne in mind that the reduction of one species to another in the *Index Kewensis* did not necessarily imply that the two were regarded as being exactly the same. As varieties were not indexed any species which was treated as a variety of another was reduced to it in the *Index* in precisely the same way as if the two had been strictly identical. In the first, second and third supplements (1886-1905) generic reductions were made in accordance with the *Genera Plantarum*. When the fourth supplement was in preparation, however, it was realised that the chief value of the Supplements was as an *Index* not as a *Nomenclator*, and from the fourth supplement onwards all new names were printed in the same type, no reductions being made. The use of the sign = might have led to misconception, so it was replaced by a colon.

When the original *Index* was compiled, the year 1735 (or 1737) was generally accepted as the starting point for the nomenclature of genera, and 1753 for that of species. But in 1905 at the International conference held at Vienna, the year 1753 was fixed as the starting point for both genera and species.

In looking through the names in the *Index Kewensis* and considering the reductions made therein, it was very obvious that the same plant was frequently known by several names, and it was not an easy matter to find out the correct name, since different botanists held opposing views. To meet these needs the International Rules of Botanical Nomenclature were evolved with the result that there is now far greater uniformity.

These rules were drawn up at the International Botanical Congress in 1905 at Vienna. A few additions and modifications were introduced in 1910 at the Brussels Congress. This is the last formal International Congress that has taken place. One was due in London in 1915 but was postponed owing to the War. Since then two Conferences have been held, the one in London in 1924—an

Imperial Conference—and an International Congress of Plant Sciences at Ithaca in 1926, neither of which assumed legislative functions. The next International Botanical Congress is to be held at Cambridge in 1930 and, being the true successor to the Brussels Congress of 1910, it will have power to enact legislation.

The Rules at present consist of sixty Articles and forty-six Recommendations. Perhaps the most important Rules are those which deal with publication, priority and stability of names.

No name is recognised as valid unless it is published with a description or a reference to a former description under another name.

Of two competing names for the same group the one which was first published is the one to be accepted.

When a species is transferred from one genus to another the original specific name is retained unless it duplicates a valid name.

In order to avoid disturbing changes in the nomenclature of well known genera by the strict application of the Rules, a list was drawn up of well known generic names which are to be retained as exceptions, e.g. *Capsella*, *Luzula* and *Taraxacum*.

Since the Brussels Congress it has been discovered that several important generic names, such as, *Combretum* and *Nuphar* will have to be superseded on account of earlier names. It is hoped, however, that these and others will be added to the list of conserved names at the coming International Congress in 1930.

The following is a list of works dealing with the subject of this paper.

- THEOPHRASTUS,—Enquiry into Plants, ed. Hort (London and New York, 1916).
 DIOSCORIDES,—Materia Medica, ed. Sprengel (Leipsig 1820-30).
 BRUNFELS, O.—Herbarium Vivae Icones (1530).
 FUCHS, L.—Historia Stirpium (1542).
 CORDUS, VALERIUS,—Historia Stirpium (1561).
 BAUHIN, C.—Pinax Theatri Botanici (1623).
 RAY, J.—Historia Plantarum (1686-1704).
 TOURNEFORT, J. P. DE —“Institutiones Rei Herbariae” (1700).
 LINNÉ, C. VON —Species Plantarum, ed. 1 (1753); Genera Plantarum, ed. 5 (1754).
 JUSSIEU, A. L. DE —Genera Plantarum (1789).
 STEUDEL, E. G.—Nomenclator Botanicus (1821; ed. 2, 1840-41).
 CANDOLLE, A. P. DE —Prodromus Systematis Naturalis (1824-73).
 BENTHAM, G. & HOOKER, J. D.—Genera Plantarum (1862-83).
 JACKSON, B. D.—Index Kewensis (1893-95).
 INDEX KEWENSIS, Supplement 1 (prepared at Brussels 1901-1906).
 “ ” Supplements 2-6 (prepared at Kew under the auspices of the Director, 1904-1926).
 BRIQUET, J.—International Rules of Botanical Nomenclature, ed. 2 (Jena, 1912).
 SPRENGEL, K.—Geschichte der Botanik (1817-18).
 MEYER, E. H. F.—Geschichte der Botanik (1854-57).

SACHS, F. G. J. VON —History of Botany (1530-1860), English Edition (1890).

GREENE, E. L.—Landmarks of Botanical History (1909).

ARBER, A.—Herbals, their Origin and Evolution (1912).

HARVEY-GIBSON, R. J.—Outlines of the History of Botany (1919).

SPRAGUE, T. A.—The Nomenclature of Plant Families (Journ. Bot. 1922, pp. 69-73).

SMITH, H. H.—Ethnobotany of the Menomini Indians (Bull. Publ. Mus. Milwaukee, 1923).

JACKSON, B. D.—History of the Compilation of the Index Kewensis (Journ. Roy. Hort. Soc., Lond. xlix. pp. 224-229 : 1924).

XLVIII.—AFRICAN ORCHIDS, I. V. S. SUMMERHAYES.

Eulophia chilangensis sp. nov.; affinis *E. massokoensis* Schltr., a qua sepalis petalisque latioribus obtusioribusque et labelli lobo intermedio nudo differt.

Herba terrestris, erecta, 35-40 cm. alta. *Rhizoma* nondum notum. *Folia* (sub anthesi nondum omnino evoluta) linearia, acuta, rigida, 4-6 cm. longa. *Scapus* erectus, substrictus, vaginulis perpaucis lanceolatis praeditus, teres, glaber. *Racemus* laxe 13-15-florus, usque ad 23 cm. longus; bracteae lineari-lanceolatae, acuminatae, ovario pedicelloque vix duplo breviores. *Sepala* late linearia, obtusa vel subacuta, lateralia leviter falcata, 9-9.5 mm. longa, 1.5-2 mm. lata. *Petala* oblique oblonga, acuta vel apiculata, 7-8 mm. longa, 2-2.5 mm. lata. *Labellum* obpanduratum, 8 mm. longum, medio 4 mm. latum, nervis primariis 3 incrassatis e basi usque infra apicem decurrentibus, nervis secundariis basi incrassatis; calcar gracile, flexuosum, apice subdilatatum. *Columna* subteres, glabra, 3 mm. longa.

NORTHERN RHODESIA. Chilanga, 20 miles N. of Kafue River, on loam, 900 m., Oct. 1909, *F. A. Rogers* 8522.

Eulophia anisotepala sp. nov.; species *E. brevipetalae* Rolfe proxima, petalis oblongis, labelli disco 3-nervato recedit.

Herba perennis, terrestris. *Folia* sub anthesi vix evoluta, anguste linearia, ad 8 cm. longa, acutissima. *Scapus* erectus, subflexuosus, gracilis, glaber, 60 cm. altus, vaginulis paucis lanceolatis acutis instructus. *Racemus* secundus, sublaxe 16-florus, erectus, 24 cm. longus; bracteae lanceolatae, acuminatae, ovario pedicelloque multo breviores. *Flores* patentes, glabri. *Sepala* subspathulato-linearia, lateralia oblique acuta, 8-10 mm. longa. *Petala* oblique oblonga, obtusa, 5-5.5 mm. longa. *Labellum* ambitu oblongum, supra medium trilobatum, 5.5 mm. longum, medio 3 mm. latum, nervis primariis 3 incrassatis in lobo intermedio dense breviter barbatis; lobus intermedius obovatus, 2 mm. longus, vix 2 mm. latus; lobi laterales perbreves, rotundati vel obtusissimi;

calcar basi gracile, apice recurvum ampliatur, 3-4 mm. longum. *Columna* 3 mm. longa, glabra, pede brevi.

NORTHERN RHODESIA. Mumbwa, Mrs. Macaulay 968.

Eulophia Macaulayi sp. nov.; affinis *E. encyclioidi* Schltr., sed sepalis distincte spathulato-linearibus, labelli lobo intermedio brevior, carinis tuberculato-appendiculatis satis distinguenda.

Herba perennis, terrestris, gracilis, 27-33 cm. alta. *Folia* 3, fasciculata, anguste linearia, acuta, sub anthesi ad 10 cm. longa. *Scapus* erectus, vaginulis paucis lanceolatis praeditus, subflexuosus, teres, glaber. *Racemus* laxe 7-9-florus, 12-15 cm. longus; bracteae lineari-lanceolatae, acuminatae, ovario multo breviores. *Flores* erecto-patentes, post anthesin nutantes, pedicellis cum ovario 10-11 mm. longis. *Sepala* spathulato-linearia, acuta, leviter falcata, 12-15 mm. longa, superne 1.5-2 mm. lata. *Petala* oblonga vel lanceolato-oblonga, obtusa, 8-11 mm. longa, 2-3 mm. lata. *Labellum* supra medium trilobatum, 11-12 mm. longum, explanatum inter apices loborum 6 mm. latum, lineis 3 incrassatis parallelis e basi labelli usque in basin lobi intermedii decurrentibus; lobus intermedius ellipticus vel obovato-ellipticus, margine crenulatus, 4-6 mm. longus, 3-4.5 mm. latus, carinis appendicibus tuberculatis congestis obtectis; lobi laterales oblique triangulares, subacuti, intermedio multo breviores; calcar cylindricum vel apicem versus paulum inflatum, leviter curvatum, 4-5 mm. longum. *Columna* 4-5 mm. longa, pede brevi.

NORTHERN RHODESIA. Mumbwa, Mrs. Macaulay 964 (type), 1033.

Eulophia mumbwaensis sp. nov.; affinis *E. sabulosae* Schltr., a qua labello angustiore, lobis lateralibus subacutis differt.

Herba perennis, rhizomate et foliis nondum notis. *Scapus* erectus, strictus, 34 cm. longus, vaginula singula arcte adpressa instructus, teres, glaber. *Racemus* laxe 6-florus, 12 cm. longus; bracteae lanceolatae, acuminatae, 5-8 mm. longae. *Flores* patentes, glabri, pedicellis cum ovario 7-14 mm. longis. *Sepalum* dorsale lineare, basi sensim attenuatum, apice acutum, 16 mm. longum; sepala lateralia linearia, acuta, 15-18 mm. longa, 1.5-2.5 mm. lata. *Petala* oblonga vel lanceolato-oblonga, obtusa, 8-10 mm. longa, 2-2.5 mm. lata. *Labellum* e medio trilobatum, totum 10-14 mm. longum; lobus intermedius anguste obovatus, mucronatus, 6-8 mm. longus, 3-4 mm. latus; lobi laterales subacuti, intermedio multo breviores; carinae 3, inferne nuda, in disco medio dense breviterque barbatae; calcar cylindricum, subrectum, 3 mm. longum. *Columna* glabra, leviter falcata, 5 mm. longa, pede distincto.

NORTHERN RHODESIA. Mumbwa, Mrs. Macaulay 859.

Eulophia acutilabra sp. nov.; affinis *E. venulosae* Rehb. f., a qua floribus minoribus, labelli lobis lateralibus magis evolutis, calcari longiore et angustiore differt.

Herba terrestris. *Folia* sub anthesi vix evoluta, circiter 3 cm. longa, anguste linearia. *Scapus* erectus, strictus, gracilis, circiter

20 cm. altus, vaginulis paucis praeditus. *Racemus* laxe 4-florus, 6-7 cm. longus; bracteae lineari-lanceolatae, acuminatae, ovario multo breviores. *Flores* patentes, glabri, pedicellis cum ovario 8-10 mm. longis. *Sepala* anguste linearia, acuminata, 9-11 mm. longa. *Petala* oblongo-linearia, acuminata, 8-9 mm. longa, 2-2.5 mm. lata, sepalis duplo latiora. *Labellum* infra medium trilobatum, 9-10 mm. longum, inter apices loborum lateralium 5 mm. latum; lobi laterales breves, obtusi vel rotundati; lobus intermedius obovatus, valde cuspidatus, 5-6 mm. longus, margine inferne minute crenulatus; labellum lineis 3 elevatis antice tuberculato-cristatis e basi usque infra apicem decurrentibus; calcar cylindricum, gracile, subfalcatum recurvatum, 3 mm. longum. *Columna* pro rata brevis, glabra, 3 mm. longa, pede perbrevis.

BELGIAN CONGO. Katanga, Comite Specials farm, 1350-1440 m., Nov. 27th, 1923, C. W. Von Hirschberg 138.

"Flowers white shaded with pinkish mauve, sepals green with reddish markings. Rare, only two specimens found."

Eulophidium zanzibaricum sp. nov.; ab *E. Ledienii* De Wild. panicula ramosa, labello majore, calcari apice vix dilatato, ab *E. warneckeano* Kraenzl. inflorescentia multiflora, lamellis basi labelli longitudinalibus nec oblique transversis, lobo intermedio labelli margine integro, ab omnibus aliis speciebus foliis satis longioribus, floribus majoribus distinguenda.

Rhizoma repens, radicibus carnosiss. *Pseudobulbi* breves, cylindrici, 1-1.5 cm. longi, unifoliati, basi cataphyllis paucis lanceolatis acuminatis usque ad 4 cm. longis cincti. *Folia* petiolata, lanceolata vel lineari-lanceolata, apice acuta, basi complicata, cuneata, 7-45 cm. longa, 2-3.5 cm. lata, subcoriacea, utrinque glabra. *Scapus* erectus, folia aequans vel superans, 25-46 cm. longus, inferne vaginis 1-3 remotis adpressis lanceolatis acuminatis 2-3.5 cm. longis instructus. *Panicula* basi pauciramosa, saepius multiflora, 8-35 cm. longa; rhachis teres, glabra. *Bracteae* lanceolatae vel lineari-subulatae, 1-12 mm. longae; cataphylla ramos subtendentia bracteis majora, 1.1-2.5 cm. longa. *Pedicelli* graciles, 1-1.5 cm. longi. *Sepalum* dorsale oblongo-lanceolatum, apiculatum, 8-10.5 mm. longum, 3-4 mm. latum; sepala lateralia oblique vel falcatum oblanceolata, apiculata, 8-10 mm. longa, 3-4.5 mm. lata. *Petala* oblongo-elliptica, acuta vel apiculata, 7.5-9 mm. longa, 3-4.5 mm. lata. *Labellum* ambitu quadratum, trilobum; lobi laterales rotundati, 2-3 mm. longi; lobus intermedius profunde bifidus, 6.5-8 mm. latus, lobulis plus minusve divergentibus oblique obovatis vel subquadratis 4 mm. longis; totum labellum 8-10.5 mm. longum, 8-11.5 mm. latum, basi lamellis 2 brevibus longitudinalibus compressis instructum; calcar cylindricum, rectum, obtusum, 3-4 mm. longum. *Columna* 2.5 mm. longa, leviter incurva, in pedem 1-2 mm. longum producta. *Ovarium* gracillimum.

ZANZIBAR. 1908, J. T. Last.

Polystachya Dalzielii sp. nov.; affinis *P. Pobeguini* Rolfe, sed labello non geniculato brevissime unguiculato, floribus minoribus differt.

Planta epiphytica, radicibus copiosis carnosis. *Caules* breves, basi incrassati ita ut pseudobulbosi videantur, paucifoliati. *Folia* e basi vaginanti lineari-lanceolata vel lineari-oblonga, obtusa, 11–12 cm. longa, 12–15 mm. lata. *Scapi* 5–8 cm. alti, racemosi, 4–8-flori, apice subnutantes, basi vaginis 5–6 scariosis acutis vestiti, sparse pubescentes; bracteae minutae, latissime ovatae, apiculatae, circiter 1 mm. longae; pedicelli cum ovario 5–7 mm. longi. *Flores* pallide roseo-purpurei. *Sepalum* dorsale oblongum, 3–5 mm. longum, apice inaequaliter trilobum, lobis lateralibus fere obsoletis, lobo intermedio late ovato dorso cornu minuto praedito. *Sepala* lateralialia latissime triangulo-ovata, apice emarginata, dorso cuspidata, 6–7 mm. longa. *Petala* cuneato-obovata, apice fere bilobulata, 4 mm. longa. *Labellum* brevissime unguiculatum, ungue callo appanato dentiformi instructo, ambitu elliptico-oblongum, antice margine undulatum, 5 mm. longum, disci pulvinaribus duobus oblongis. *Columna* brevis, lata, 1 mm. longa.

FRENCH GUINEA. Dalaba, Futa Jallon, fl. March, *J. M. Dalziel* (A. V. Armour Expedition 1926–7) 8433.

Aerangis collum-cygni sp. nov.; inter omnibus speciebus calcari valde incurvo satis distinguenda.

Epiphytica; caules usque ad 3 cm. longi, radicibus teretibus 2.5–3 mm. diametro. *Folia* disticha, oblanceolata, recta vel leviter falcata, basi conduplicata, apice inaequaliter acutiuscule biloba, 7–11 cm. longa, supra medium 1.9–2.4 cm. lata, carnosae, utrinque praesertim versus basin nigro-punctata, costa supra leviter impressa. *Racemus* unus quem solum vide adscendens, 12 cm. longus; rhachis teres, 1.8 mm. diametro, nigro-punctata. *Flores* 5, 1.7–2.0 cm. distantes, albi, 2.5–3 cm. diametro; pedicelli graciles, 2.3–2.6 cm. longi. *Sepala* oblonga-lanceolata, acuta, 1.2–1.4 cm. longa, 4–5 mm. lata, valde reflexa. *Petala* sepalis similia sed paulo minora, 1.1 cm. longa, 3 mm. lata, reflexa. *Labellum* lanceolatum, convexum, acutum, 1–1.2 cm. longum, de calcari reflexum; calcar pro generi crassum, circinate incurvum, 3–4.5 cm. longum, apice angustatum. *Columna* 6–7 mm. longa, 2.2–2.3 mm. diametro. *Stipes* polliniorum singulus, gracillimus.

UGANDA. Coll. *C. H. Lankester* and flowered at the Royal Botanic Gardens, Kew, in September, 1926.

Deroemera pentadactyla sp. nov.; affinis *D. unifoliae* Rchb. f., sed petalis quinquelobis, calcari ovario aequali facile distinguenda.

Herba terrestris. *Folia* desunt. *Scapus* erectus, usque ad 30 cm. altus, sub anthesi aphyllus, teres, basi retrorse pilosus, superne glaber, cataphyllis parvis lanceolatis acuminatis distantibus 4–5.5 mm. longis praeditus. *Racemus* secundus, densus, 2.5–7.5 cm. longus, 12–30-florus. *Bracteae* ovato-lanceolatae, acuminatae,

3–4 mm. longae. *Flores* albi. *Sepala* ovata, acuta, concava, dorsale 4 mm. longum, lateralialia 2.5–3 mm. longa. *Petala* cuneata, superne valde quinqueloba vel rarius quadriloba, plus minusve obliqua, 5–6 mm. longa, 2.5–3 mm. lata. *Labellum* petalis simile sed latius, quinquelobum, 4 mm. longum, 3.5–4 mm. latum; calcar plus minusve curvatum, ovarium aequans vel paulo longius, 7–8 mm. longum. *Columna* 2.5 mm. longa.

KENYA COLONY. Eastern Aberdares, grasslands, 2820 m., *H. M. Gardner* 1340 (type); Mau Plateau, 2850 m., *E. Battiscombe* 915.

This genus, for a reason not given, has by recent authors, beginning with Rendle and Schlechter in 1895, been spelt *Deroemera*. It was named originally by Reichenbach after J. J. Roemer and was spelt as given above.

Disa (§ *Calostachys*) **aequiloba** sp. nov.; affinis *D. Welwitschii* Rchb. f., a qua spicis laxioribus, floribus minoribus, petali segmentis aequalibus differt.

Herba perennis, erecta, 25–38 cm. alta. *Folia* basilaria nondum nota. *Caulis* strictus, vaginis 7–9 arcte et alte amplexantibus acuminatis maculatis obtectus. *Racemus* subdensus, multiflorus, 6–9 cm. longus; bracteae lanceolatae, acuminatae, flores superantes vel vix aequantes. *Flores* erecto-patentes, glabri. *Sepalum* dorsale orbiculari-obovatum, sessile, valde concavum, circiter 4.5 mm. longum, circiter 3 mm. latum, calcari pendulo cylindrico obtusiusculo 4.5 mm. longo; sepala lateralialia patentia, oblonga vel oblongo-elliptica, obtusa, 5 mm. longa. *Petala* subflabellata vel late cuneata, biloba, 4.5 mm. longa, lobis aequilongis; lobus anterior quam posterior latior, 2 mm. latus, sinum versus dentatus; lobus posterior apice margine anteriore apiculatus, 1–1.5 mm. latus. *Labellum* lineare, acutum, 5 mm. longum. *Anthera* erecta, 2.7 mm. longa, rostello humili. *Ovarium* cylindricum, glabrum, 1.1 cm. longum.

BELGIAN CONGO. Katanga, in moist places, January, *C. W. Von Hirschberg* 177.

“Flower magenta spotted with darker shades, stem red, bracts and leaves spotted.”

XLIX.—THE IDENTITY OF TALAUMA VILLARIANA. J. E. DANDY.

The name *Talauma Villariana* first appeared in 1884 in a paper by Rolfe on the flora of the Philippine Islands¹. Its publication consisted of a brief diagnosis in English pointing out the chief points of difference from *T. mutabilis* Bl., accompanied by a reference to *T. mutabilis* F.-Vill. (non Bl.) as a synonym. The latter plant, enumerated by F.-Villar² and figured by Naves³ as *T. mutabilis* Bl., represents a species which is closely allied to, but distinct from, the

¹ Journ. Linn. Soc., Bot. 21:307 (1884). ² Blanco Fl. Filip., Ed. 3, Nov. App. 3 (1880). ³ Blanco l.c.: t. 148.

true *T. mutabilis* (*T. Candollei* Bl.), and which is now known from almost all the Philippine Islands and also from Northern Borneo. Accepting Rolfe's synonymy as correct, Merrill¹ regarded this species as *T. Villariana*, under which name it is now known. Rolfe, however, was incorrect in giving *T. mutabilis* F.-Vill. as a synonym of *T. Villariana*, as the following evidence shows.

Although Rolfe did not accompany the publication of his *T. Villariana* by the citation of any specimens, the plant upon which it was actually based was a specimen (Vidal 5) in the Kew Herbarium, which he himself wrote up as the type of *T. Villariana*. This specimen, which corresponds exactly with his diagnosis, is now found to consist of flowering material of *T. angatensis* (Blanco) F.-Vill.; the flower is typical of that species and is quite different in its very numerous pubescent carpels from that of *T. mutabilis* F.-Vill.; the leaves, though smaller than the average for *T. angatensis*, which is very variable in leaf-size, also agree with the latter species and not with *T. mutabilis* F.-Vill. It was probably the small size of its leaves that caused Rolfe to identify the Kew specimen with *T. mutabilis* F.-Vill. instead of with *T. angatensis*. It is clear, however, that *T. Villariana* was founded upon a specimen of *T. angatensis*², and the name *T. Villariana* must therefore be regarded as a synonym of *T. angatensis*. It is significant that the type-specimen of *T. Villariana* was collected by Vidal at Angat, in Bulacan Province, Luzon, the type-locality for *T. angatensis*.

The species usually known as *T. Villariana*, i.e. *T. mutabilis* F.-Vill., is a very variable plant and embraces *T. gitingensis* Elmer³ and *T. borneensis* Merr. *T. borneensis* has larger leaves than most specimens of the so-called *T. Villariana*, but is indistinguishable from the bigger-leaved examples of the latter. *T. gitingensis* dates from 1912, and *T. borneensis* was described in 1922, so that the former should be regarded as the correct name for the species, whose synonymy is as follows:—

***Talauma gitingensis* Elmer** Leaflet. Philipp. Bot. 4: 1479 (1912).

Talauma mutabilis F.-Vill. in Blanco Fl. Filip., Ed. 3, Nov. App. 3 (1880).—Naves in Blanco l.c.: t. 148 (1877-83).—non Bl.

Talauma Villariana Merr. in Bur. Gov. Lab. (Philipp.) Publ. 35: 7 (1906); in Philipp. Journ. Sci. 1, Suppl. 52 (1906); l.c., Bot. 5: 348 (1910); Enum. Philipp. Pl. 2: 152 (1923).—non Rolfe.

Talauma borneensis Merr. in Journ. Straits Br. R. As. Soc. 85: 173 (1922).

¹ Bur. Gov. Lab. (Philipp.) Publ. 35: 7 (1906). ² Merrill (l.c.: 8) stated that *T. Villariana* was based upon Naves' plate and Vidal's numbers 942 and 1099, and did not mention Vidal's n. 5. All three specimens, however, represent *T. angatensis*. ³ Merrill reduced *T. gitingensis* to *T. Villariana* in his Enum. Philipp. Pl. 2: 152 (1923).

L.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. J. F. V. PHILLIPS, B.Sc., Botanist, Game Preservation, Tanganyika Territory; Mr. T. D. RUTTER, B.Sc., Agricultural Officer, Zanzibar; Mr. R. G. BENTALL, B.A. (Agric.), Assistant Agricultural Officer, Kenya; Mr. D. H. BROWN, Superintendent, Agricultural Department, Nigeria.

MR. CHARLES MORRIS WOODFORD, C.M.G., whose death took place at Steyning, Sussex, on October the 4th, was associated with the Southern Pacific for 44 years. He went out in 1871 as collector for the Rothschild Museum at Tring and afterwards spent ten years in exploring Melanesia. He first corresponded with Kew in 1890, when he stated that he had sent some orchid plants from the Solomon Islands to England. In the same year he sent a fan palm (*Licuala* sp.) to Kew. From 1883 he held various Government appointments in Fiji, Samoa, etc., and in 1897 was appointed by Sir John B. Thurston (another Kew correspondent) as first Resident Commissioner in the British Solomon Islands Protectorate, where he introduced the cultivation of coffee, and held this post until 1915. In the *Kew Bulletin*, 1897, p. 416, it is erroneously stated that this post was held by Mr. G. R. Swayne. Between 1907 and 1913 he sent herbarium specimens to Kew. His name is commemorated in *Livistona Woodfordii* Ridl. in Gard. Chron. 1898, xxiii. 177. C.H.W.

BENJAMIN DAYDON JACKSON.—The death of Dr. Jackson was briefly recorded in the last number of the Bulletin. While passing across Buckingham Gate on October 1st, he was knocked down by a motor-car and was removed to Westminster Hospital. After some days he rallied to such an extent as to give hopes of a speedy recovery, but a relapse took place and he passed away on October 12th. The funeral service at Golder's Green Crematorium took place on October 17th in the presence of a large gathering of botanists and others.

Dr. Jackson was born in London on April 3rd, 1846, and after being educated at private schools entered upon a commercial career in the City, which, however, did not last long. In 1865, while staying in Sussex during recovery from an illness, his attention was directed to botany, to which (especially its bibliography) the greater part of his after life was devoted. In January, 1868, he was elected a Fellow of the Linnean Society, and in 1880 became its botanical Secretary, a post to which he was annually re-elected until 1902. During this period he took great pains in editing the Society's botanical publications and compiled an index to the first twenty volumes of the Society's Journal (Botany), and the botanical portion of its Proceedings up to June, 1886. Although up to 1902 Dr.

Jackson was working almost daily in the Kew Herbarium, he found time to make himself thoroughly acquainted with the Linnean collections at Burlington House, which culminated in his compiling an "Index to the Linnean Herbarium," which was published with the Proceedings of the Society for 1911-1912. In 1902 Dr. Jackson was appointed to the newly created salaried post of General Secretary to the Society and held it until May, 1926. His retirement after forty-six years' official connection with the Society was marked by the presentation of his portrait (which now hangs in the Society's Rooms) by Fellows and others, and by his appointment as Honorary Curator of the Linnean collections.

Perhaps the time of his life which gave him the greatest pleasure was when, in May, 1907, he visited Sweden as one of the delegates from the Linnean Society of London to take part in the celebrations in connection with the bicentenary of the birth of Linnaeus, which are described in the Proceedings for 1906-1907, pp. 59-60. On this occasion he was made by the King of Sweden a Knight of the Polar Star, by the University of Upsala an honorary Doctor of Philosophy and Master of Arts, and by the Swedish Linnean Society an honorary Fellow.

After his appointment as General Secretary, his visits to Kew were almost restricted to Saturday afternoons, when he arranged and indexed the vast mass of correspondence which had accumulated over many years and has now been bound and deposited in the Library. During the present year he has again visited Kew in connection with the preparation of a new edition of his "Glossary of Botanic Terms," the last occasion being on July 6th.

Even allowing for the fact that Dr. Jackson's life was a long one and that he appears to have been favoured by excellent health, a survey of the enormous amount of work that he accomplished must convince one that he worked very rapidly and methodically and could have allowed himself but little leisure. In his achievements as a maker of botanical bibliographies, biographies and indexes he has no equal. Had he done nothing more for botany than the very large share he took in the compilation of the "Index Kewensis," botanists would have ample cause to regard him as one of their greatest benefactors. But he produced in addition to this colossal work several books and a multitude of papers which involved many a long and tedious research such as could have been successfully prosecuted only by one possessing an intimate knowledge of botanical history and bibliography and well acquainted with foreign languages. In another place we may hope to have a complete list of his many contributions to botanical literature.

Dr. Jackson has himself placed on record the main facts concerning the history of the "Index Kewensis" in articles communicated to the Journal of Botany, 1887, pp. 66 and 150, the Gardeners' Chronicle, 1909, xlv. p. 406, and the Journal of the Royal Horticultural Society, 1924, xlix. pp. 224-229.

In the interval between 1895, when the publication of the "Index Kewensis" was completed, and 1902, when he was appointed General Secretary of the Linnean Society, Jackson undertook the preparation of a "Catalogue of the Library of the Royal Botanic Gardens, Kew," published in 1899. Previously he compiled a "List of Kew Publications," which appeared in the *Kew Bulletin*, 1897, pp. 1-84 and 238-240. The "List of Collectors whose Plants are in the Herbarium" (*K.B.* 1901, pp. 1-80) is also Jackson's work. The first edition of his "Glossary of Botanic Terms" was issued in 1900; a second appeared in 1905 and a third in 1916. A new edition was in preparation at the time of Dr. Jackson's fatal accident.

He acted as Secretary to the Departmental Committee on Botanical Work and Collections at the British Museum and at Kew, which was appointed in 1900 and issued its Report in 1901, and was referee for all of the 14 annual volumes of the botanical section of the "International Catalogue of Scientific Literature," published during the period 1902 to 1919.

Though deploring the loss of one who was remarkable in many ways and really distinguished in his own particular fields, we must realise how excellent it was that life for Benjamin Daydon Jackson was so prolonged, for his many days were spent in an untiring effort to be useful not only to those of his own time but also to those of generations to come.

Hooker's Icones Plantarum.—The Bentham Trustees have now issued the first part of volume ii of the Fifth Series or Vol. xxxii of the entire work. This contains twenty-five plates with their accompanying descriptions. They include three species of *Struthiola* (Thymelaeaceae) from South Africa and eight species of *Commiphora* (Burseraceae) from Arabia and British Somaliland. All these are new species, seven of which have been described by Mr. T. A. Sprague from material collected by Drake-Brockman in Somaliland and one from an Arabian specimen collected by Bent. There are two representatives of the family Acanthaceae from Trinidad, one of which is *Isothea alba*, the only species of the genus.

A new *Astragalus* from Gallipoli represents the Leguminosae. Five representatives of the Gramineae are figured, *Pleiadelphia* Stapf and *Lasiorrhachis* Stapf being new genera. The former comes from the Portuguese Congo and the latter is a native of Madagascar. Of the other grasses two come from Madagascar, *Viguierella madagascariensis* A. Camus et Stapf, and *Lecomtella madagascariensis* A. Camus, and the fifth is *Leptosaccharum filiforme* A. Camus, a unique species from Brazil and Paraguay. A new species of Iridaceae, *Zygotritonia crocea* Stapf, from Northern Nigeria, is also figured and a description given of another new species, *Z. praecox*, from the same region.

Other plants figured include *Pseudoscolopia polyantha* Gilg, Flacourtiaceae, from South Africa, *Veronica rigida* Turrill, *Viola*

delphinantha Boiss. and *Epimedium pubigerum* Morren et Decaisne from Greek Macedonia and Bulgaria. A figure of *Boottia muricata* C. H. Wright, Hydrocharitaceae, from Ngamiland, South Africa, completes the series of plants illustrated in this part.

Principles of Soil Microbiology*. Professor Selman A. Waksman, whose joint book on Enzymes has been recently noticed (*K.B.* No. 3, 1927, p. 142), has produced a companion volume dealing with Soil Microbiology. Like the previous work, it is a compilation, and aims at bringing together all the scattered information on the subject. Professor Waksman's own work on the micro-organisms of the soil has placed him in a position well fitted to produce a compilation of critical value. He has, however, increased its value by submitting certain sections to specialists in the respective branches, whose helpful criticism is acknowledged in the preface.

The work is divided into four parts, namely:—

- A. Occurrence and Differentiation of Organisms in the soil—serving as a general introduction.
- B. Isolation, Identification, and Cultivation of soil micro-organisms. Under this head are discussed in turn bacteria and their activities (8 chapters), soil algae, soil actinomycetes, soil protozoa, and the non-protozoan fauna of the soil.
- C. Chemical Activities of Micro-organisms.
- D. Soil microbiological processes and Soil fertility.

The two latter sections occupy more than one half of the book, and aim at giving a connected view of the processes taking place in the soil, and their relation to plant growth. A concluding chapter summarises the history of the science, and indicates directions in which further investigation is required.

The usefulness of the work is enhanced by the addition of a list of books of reference, copious bibliographical foot-notes, and a fairly full index.

The ground covered by Prof. Waksman is somewhat similar to that included in the joint Rothamsted Monograph "The Micro-organisms of the Soil," but gives much greater detail. For the general reader who is not specially interested in soil science, but merely wants to keep abreast of recent agricultural developments, the Rothamsted volumes are still the most readable source of information. The present volume, in the words of the preface, is to be "looked upon more as an introduction to further research rather than as an ordinary text-book, as of help to those working in the allied sciences, who are desirous of obtaining some information concerning the soil population and its activities." Its price is unfortunately high, but there is no doubt that it will be widely used, both by the specialist and the general worker in sciences connected with agriculture.

E.M.W.

*Principles of Soil Microbiology, by Selman A. Waksman. Baillière, Tindall & Cox, 8, Henrietta Street, Covent Garden, London, W.C. 2, 1927; pp. xxviii and 897, 19 plates, 77 figures in text, price 45s.

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix I, 1927. ROYAL BOTANIC GARDENS, KEW.

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1926.

Official Visits.

During the year the Director, as the official representative of H.M. Government, attended the Fourth International Congress on Colonial and Tropical Agriculture, which was held in Paris in March.

The Director also attended the International Congress of Plant Sciences held at Ithaca, New York State, U.S.A., from August 16th to the 23rd. On the conclusion of the Congress he visited the Missouri Botanical Garden, St. Louis, and the University of California, Berkeley, where he had been invited to deliver three lectures. The only previous visit of a Director of Kew to the Missouri Botanical Garden was that paid by Sir Joseph Hooker to Henry Shaw in 1877.

11 Thanks to the kindness of the Dean of the College of Agriculture at the University of California and to the Professors in the various Botanical Departments he was able to visit the Yosemite region, the transplant stations and experiments which are being conducted by Dr. H. M. Hall under the auspices of the Carnegie Institution, the Redwood forests at Scotia and Eureka, north of San Francisco, as well as the Golden Gate Park, San Francisco, and Leland Stanford University, where it is hoped to develop a Botanic Garden worthy of this interesting region. On his way to Berkeley the city of Los Angeles was visited, and a lecture was delivered by invitation on the value and functions of a Botanic Garden, in connection with a scheme in project there for the formation of a Pacific Botanic Garden in the Mandeville Canyon, a scheme which it is learnt has now materialised.

He then proceeded to Seattle and ascended Mt. Rainier to the limits of vegetation and journeyed thence to Victoria, where he was the guest of the Lieut.-Governor and was invited to deliver a lecture on the importance of Botanic Gardens and on the urgent need of reserving a large and beautiful woodland area for the preservation of the magnificent native vegetation. He was also able to impress on the Mayor and leading authorities in Victoria the benefit that should result in the formation of the proposed botanic garden in their Park to illustrate the native flora.

A visit was paid to the University of British Columbia at Vancouver, where the Director lectured to a large audience. Here

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he was pleased to find a small and very interesting botanic garden in course of development.

Both in Victoria and Vancouver and also at Banff he was greatly impressed by the keen interest displayed in the rich flora of British Columbia and Western Canada and by the foundations which exist for the compilation of a Flora of this wonderful region.

A brief visit was paid to the University of Toronto, under the guidance of Professor Thomson, and here again the absence of a botanic garden was felt to be a matter demanding the attention of the Canadian authorities.

The Director was given the opportunity of laying this important matter before the President of the University, and it is much to be hoped that a garden worthy of the Dominion may before long be established in this very suitable central position.

From Toronto the Director journeyed to Washington, D.C., to visit the U.S. Department of Agriculture and the herbarium of the Smithsonian Institution, and he was enabled, through the great kindness of Dr. Taylor, Dr. Marlitt, Dr. Fairchild, and other officials of the Department, to study fully the quarantine regulations and all the arrangements concerned with plant introductions and the details of the special plant introduction glass houses.

The lecture which had to be given at Washington was, he felt, but a small return for all the kindness and courtesy he received at the hands of the officials of the Department and of the Smithsonian Institution.

He then travelled to New York to deliver the lecture which he had been invited to give by the Director-in-Chief of the New York Botanical Garden, and he had the honour of being introduced to his audience by the Director-in-Chief himself. During his stay he paid visits to the Boyce Thompson Institute at Yonkers, and to the Brooklyn Botanical Garden, where he was duly impressed by the educational uses to which this interesting Garden is being put.

At New York after his lecture he was entertained at dinner by Dr. N. L. Britton and some 43 other botanists, representing Columbia University, the Boyce Thompson Institute, Brooklyn Botanical Garden, Yale University, Cornell University, Princeton University, Rutgers University, Pennsylvania State College, the Bureau of Plant Industry and The New York Botanical Garden, were present. Dr. Britton read the following address of welcome.

"We gladly welcome the occasion of a visit by the Director of the Royal Botanic Gardens at Kew, as opportunity to express to him our cordial appreciation of the great contributions to knowledge which have characterised that wonderful institution throughout its history. These have aided and stimulated botanical investigation in all lands, and nowhere more than in these United States, portions of which Dr. Hill has been traversing during the past few weeks. He and his distinguished predecessors have had the guidance and direction of the activities of Kew over a period of 86 years, the institution dating as a public botanical

garden from about the year 1840, its site, however, occupied by royal gardens for a century preceding.

"My first visit to Kew was in 1880, in the course of a trip to Europe soon after graduation; this was during the administration of Sir Joseph Hooker. My first studies there were in 1888, on which occasion I spent much time in determining Bolivian specimens collected by Dr. Rusby; Sir William Thiselton-Dyer was Director at that time. It was on this visit that the inspiration for the establishment of a botanical garden in New York was obtained by Mrs. Britton, which bore fruit a few years subsequently through a committee of the Torrey Botanical Club. We were at Kew again in 1891, for supplementary inspiration, and for study of the Paraguay collection made by Dr. Morong. I was at Kew for a week after the Paris Botanical Congress in 1900; again in 1902, soon after our first West Indian explorations had been accomplished; again in 1905, after the Vienna Botanical Congress. In the summer of 1911 we were there for the study of Cuban and other West Indian plants; Sir David Prain had then been appointed Director. Our most recent visit to Kew was in 1920, especially for the study of Cacti, and of some of the large collections from northern South America, then commencing to be obtained; the institution was still under the directorship of Sir David Prain, but Doctor Arthur W. Hill was Assistant Director, since promoted.

"We have known all through these years that at any time we might be privileged to be at Kew we would be taken into the family and made to feel essentially like members of the staff; our visits have been profitable and delightful. May I express to Dr. Hill our profound conviction that under his administration the laurels of his great institution will become more and more luxuriant."

Prof. J. M. Coulter, Dr. H. H. Rusby, Prof. R. A. Harper, Dr. G. Stuart Gager and Dr. H. Crocker made equally kind speeches expressing their admiration of Kew and their indebtedness to the Institution, and the Director did his best to return suitable thanks for all the kind things which had been said, which he fully realised were intended to apply to all the officials at Kew whom he, at the moment, represented.

The final visit in the United States was to Boston, and there the Director spent one day at the Gray Herbarium and another all too short day at the Arnold Arboretum with Professor C. S. Sargent; and at both institutions, thanks to Prof. B. L. Robinson and his staff and to the Director and other officials at the Arboretum, he was enabled to derive the fullest possible profit and interest during his stay.

He finally travelled to Montreal to visit McGill University, where he delivered a lecture at the invitation of the Professor of Physics, and also visited the Botanical Department, under the guidance of Professor Lloyd, and the interesting private garden of Mr. Cleveland Morgan.

From Montreal he travelled home in the C.P.R. S.S. "Melita," and reached Kew on October 14th.

Mr. W. Taylor, Assistant Curator, Tropical Department, in September visited the chief gardens of the French and Italian Riviera, including those of H.H. The Prince of Monaco and Mr. Cecil Hanbury at La Mortola.

Mr. A. Osborn, Assistant Curator, Arboretum Department, during July visited the Royal Botanic Garden, Edinburgh, and the new Bayley Balfour Memorial Garden at Ben More.

The Gardens.

The number of visitors to the Gardens in 1926 was 1,162,547. This was a decrease of 509,293 on the figures for the preceding year. Although the charge of one penny for admission, which was removed in 1924, was reimposed as from the 1st January, 1926, the attendance for the first four months exceeded by over 21,000 that for the corresponding period of 1925 when admission fees were charged on Students' Days only. The decline was greatest in May and June, when travelling facilities were restricted owing to industrial troubles. It is during these months that the largest number of visitors normally attend the Gardens. In June, 1925, 332,458 visitors were recorded against 144,174 during June, 1926. In May also unusually inclement weather was experienced, and this also adversely affected the attendance of visitors.

PLANT HOUSES.—The Conservatory (No. 4) and Nepenthes House have been repainted, and the woodwork of the Victoria House (No. 10) has needed extensive repair owing to decay. Through defects in glazing the roof of the Temperate House has for some years past leaked badly, the drip causing damage and unsightliness to the plants in the beds beneath. A commencement was made during the summer at the south end in its thorough overhauling. The corrugated brick pavement has been completed in the Aroid House (No. 1), the Cape House (No. 7), and the Water Lily House (No. 15), and it has also been laid down in the cool Fernery House (No. 3).

NEW RHODODENDRON HOUSE.—Owing to considerable delay in completing this house (see *K.B.* 1926, App. I., p. 1), the stocking of it with plants had to be deferred until last autumn. The greater proportion of the plants used have been raised and grown at Kew, but several correspondents have contributed valuable species, notably Mr. J. C. Williams and Mr. Lionel de Rothschild. To the former especially Kew is indebted for a large number of fine specimens sent from his magnificent collection at Caerhays. As stated in the previous issue, it is intended to use this house for the more tender Chinese species. The soil with which the beds have been filled is "top-spit" taken from the Queen's Cottage

Grounds at Kew. This we find is a much better medium for cultivating rhododendrons under glass than a peaty soil, which, through lack of aeration and constant watering, is very apt to turn close and sour in a few years' time. The Kew soil, although lacking richness, is free from lime and keeps sweet for a much longer time.

ROSE GARDEN.—The garden varieties of roses in the new arrangement of beds west of the Palm House were very difficult to keep clean and free from aphides in the early part of the season, and their first crop of flowers was somewhat affected thereby. In August, however, the second growths provided a very fine display, and attracted the interest of a great number of visitors. We have to thank several trade establishments for their interest in this garden, and for the presentation of new varieties to be planted there, especially Messrs. Dobbie, Messrs. Beckwith, Messrs. Barbier, of Orleans and Mr. Easlea.

COLLECTIONS OF ROSACEAE AND SAXIFRAGACEAE.—The re-arrangement of these collections in the Arboretum, adverted to in the last Review (p. 5), has been continued during the autumn and winter. The shrubs belonging to the *Saxifragaceae*—the chief genera being *Philadelphus*, *Deutzia* and *Ribes*—are now established west of the Holly Walk. The collection of wild species of *Rosa* is opposite to them on the eastern side. Interest in the wild types of roses has been growing in recent years, and students will be able to inspect them with more comfort in their new quarters. Here most of them will be grown as isolated plants or in isolated groups of three, so that their examination will not entail such risks to clothing as it did when they were crowded in the border which has so long been their home. Owing to the dominant place the garden types of rose occupy in horticulture, the beauty of these wild types is apt to be overlooked and disparaging comparisons made. Judged on their own merits, many of them are singularly attractive, and although their season of flowering is short compared with that of the Tea Rose and Hybrid Perpetual sections, many of them have a beauty in fruit to which the latter can lay no claim. It is anticipated that the collection at Kew, with the greater space now provided for their individual development, will be able to display their attractions much more effectively.

The movement of large collections of shrubs like these involves very much labour, as the borders occupied by the roses have had to be filled with *Spiraeas* and the place of these again filled with *Cotoneasters*.

RIVERSIDE AVENUE.—The view of the docks and railway across the Thames at Brentford was always a distressing eyesore from the Gardens during the winter as long as the belt of vegetation forming the screen between the Riverside Avenue and the ha-ha was of a deciduous nature. During the years 1912 and 1913 a large number of elms and other hungry trees were felled and their place taken by large evergreens. These have grown very well indeed, and besides adding greatly to the interest of this part of the garden now constitute

an admirable screen effective throughout the year. Owing to the extension by the Great Western Railway of their works on the Middlesex side of the river right up to the Sion House property, it has become necessary to carry on the screen of evergreen vegetation still farther. This necessitated the felling of several elm trees and planting in their place a number of large specimens assembled from various parts of the Gardens. As long as the Sion House property remains in its present condition it is not likely that any further plantings of this kind will be necessary.

DECAYED TREES.—As has been the case every year since the great drought of 1921, a number of beech trees have either died or become so decrepit that their removal became necessary. No tree of great botanical or historical interest has been lost, although a large limb was wrenched from the fine Maidenhair tree (*Ginkgo biloba*), near No. 2 Fernery, by a fierce gust of wind during the summer. The picturesque old horse chestnut close to the Isleworth Gate entrance to the Queen's Cottage Grounds has died after being in failing health for some years. A large common elm, too, growing on the western slope of the Rhododendron Dell was taken down as no longer safe.

SERVICE ROAD.—This road starts at the depot near Kew Palace, and after passing through the Stable Yard, extends to the Queen's Gate on the Kew Road. It has always been difficult to keep in good repair owing to its narrowness, to the weight of the fuel vans, etc., that pass along it, and to the fact that in places it is heavily shaded by trees which keep the surface damp and soft. H.M. Office of Works have undertaken the re-making of it by laying down a foundation of road metal solidified by a steam roller and surfacing this with tarmac. That portion extending from the Kew Palace Depot to the Stable Yard has now been finished, and it is hoped that the remainder will be treated similarly in 1927.

ITEMS OF SPECIAL INTEREST.—Special exhibitions were arranged throughout the year in House 14c, which was set aside in 1926 for Objects of Special Interest. In addition to the subjects mentioned in the last Review the following were shown:—the development of the modern varieties of *Schizanthus*; the history of *Primula kewensis*; a collection of oranges, lemons and gourds from the garden of Mr. Cecil Hanbury at La Mortola; new and rare plants in flower.

Considerable interest has been aroused recently in the plants yielding Chaulmoogra Oil (*K.B.* 1926, p. 17). Through the courtesy of correspondents in India and the East, several consignments of seeds have been received at Kew, and about 120 seedlings of species of *Hydnocarpus* have now been raised. These will be distributed to various botanic stations in the Empire during the coming summer.

The most interesting plant that flowered at Kew during the year was *Amorphophallus Titanum*, which opened its enormous spathe on August 4th. An illustrated article giving rates of growth and other particulars appeared in the *Kew Bulletin* 1926, p. 374.

Another plant of unusual interest that flowered during 1926 was a hybrid between *Amaryllis belladonna* and *Criminum Moorei*. This plant was raised by Mr. F. Howard, California, and presented by him to Kew through Mr. T. Hay, Superintendent of Hyde Park, in November, 1924. Mr. Howard has recently been awarded the Cory Cup for this hybrid under the name of *Crindonna Memoria-Corsii* as the best new hardy plant of 1926. Plants from a similar cross were raised in Europe previously (see *Gardeners' Chronicle*, January 15th, 1921, p. 32). The plant at Kew is grown in a narrow border at the foot of a south wall.

HIS MAJESTY THE KING presented from the Frogmore Gardens several fine palms, which have been suitably labelled and planted in the Temperate House and the Palm House, also some Crotons, and plants of *Cupressus lusitanica* var. *Benthamii*.

In March, and shortly before his death, the late Mr. J. A. Kenrick, of Edgbaston, presented to Kew 850 bulbs (his entire collection) of *Hippeastrums*, a class of plants he had cultivated for many years and of which he had raised many varieties. So large an accretion to the number of plants we already possessed compelled us, from considerations of space, to overhaul the whole stock and eliminate a number of duplicate forms. These were distributed to Sydney Botanic Gardens, H.H. The Begum of Bhopal, Trinidad Botanic Garden, the National Botanic Garden at Kirstenbosch, S.A., and the Department of Agriculture, Pretoria.

Vanda Lowii.—A very fine specimen of this Orchid, probably the finest in Britain, was presented to Kew in September by Mr. W. H. B. Fletcher, Aldwick Manor, Bognor. It measures ten feet in length, and being fetched in a light motor van, arrived in perfect condition, with nearly a score of its long pendent flower racemes still attached and uninjured. It is planted in the warm section of the Orchid House.

Nothofagus obliqua.—Considerable interest has been aroused in this Chilean beech as represented at Kew among those interested in economic forestry. The oldest specimens are growing near the Stable Yard and in the collection of beeches near the Azaleas. They were raised from seed given to Kew in March, 1902, by the late Mr. H. J. Elwes which had been collected by him in Chile. The largest of these is now 68 feet high, its trunk 3 feet 3 inches in girth. Apart from poplars and willows there must be very few hardwood trees capable of so quick a growth in a climate like that of Kew, especially considering the poverty of the soil in which they are growing. Another point in their favour is that they usually form slender trees with only comparatively small side branches, thereby approaching the forester's ideal tree even in the open ground. Mr. Elwes describes the timber as "dense, reddish, not at all resembling that of the European beech and apparently suitable to take the place of lower grades of mahogany in the manufacture of furniture. It cracks, however, badly in drying, and will require very careful seasoning." On the whole it would

seem that this beech is worth a trial under forest conditions in this country. As Mr. Elwes delivered his seeds at Kew in the month of March, it would appear that they ripen naturally in February. Many seeds sent to this country have failed through being kept dry too long. The most important factor in their successful introduction is that the shortest possible period should elapse between gathering them in Chile and sowing them in this country.

By desire of the Right Hon. S. M. Bruce, Prime Minister of the Australian Commonwealth, a number of trees were despatched by the s.s. "Balranald" to the Sydney Botanic Garden a few days before Christmas. They consisted of 8 beeches, 8 oaks, 8 horse chestnuts, 6 alders, 6 elms, and 6 Cricket Bat willows, all of which had been raised at Kew. If they arrive in Australia in a suitable condition they are intended to be planted at Canberra by the Duke and Duchess of York and other notable personages on the occasion of the opening of the new Parliament Buildings there. The introduction of trees from this country to Australia has always been attended with difficulty owing to the opposition of the seasons and the passage through the tropics, but every step possible has been taken to ensure their safe arrival. They were packed in a ventilated box with their roots embedded in damp moss and arrangements were made with the officers of the "Balranald" to place them in cool storage. It is expected that during the voyage they will not be subjected to a temperature higher than 40 deg. Fahr. which should enable them to pass through the tropics without being excited into growth. Kew has had close and continuous relations with Australia since the days of Sir Joseph Banks and Captain Cook. Some of the earliest plant collectors from Kew went there, amongst them Peter Good, George Caley and Allan Cunningham, and Kew has always possessed a collection of Australian plants unequalled anywhere except in Australia itself.

PUBLICATIONS.—Eight further sets of picture postcards of plants in natural colours have been placed on sale during the year, at the Publication Kiosk near Museum III. The subjects are Hardy Trees and Shrubs (two sets), Stove and Greenhouse Plants (two sets), Rhododendrons, Roses, Orchids and Decorative Plants. Each set consists of six cards with a descriptive folder, and is priced at one shilling; individual cards may be purchased at 2d. each. A complete list of the postcards on sale may be obtained on application.

ADDITIONS TO GARDENS, 1926.—The number of separate consignments of living plants, seeds, etc., was 789, a decrease of 31 on those of 1925. The most important contributions were the following :—

Public Institutions:—

Aberdeen, Botanic Gardens.—Plants of *Didymocarpus bicolor*, *D. insula* and *D. tristis*.

Cambridge, Botanic Garden.—Plants of *Bomarea cantabrigiensis* and *Alstroemeria pulchella*.

Edinburgh, Royal Botanic Garden.—90 packets of seeds, and plants of *Primula heterochroma*, *Rhododendron* spp., etc.

Glasnevin, Botanic Garden.—Hardy plants and 65 packets of seeds.

Hyde Park (per Mr. T. Hay).—Bulbs of *Crinodonna Memoria-Corsii*, seeds including *Lathyrus magellanicus*, *Lilium* spp., *Fremontia mexicana*, etc., and miscellaneous greenhouse and herbaceous plants.

Windsor, The Royal Gardens.—Specimen Palms, *Cupressus lusitanica* var. *Benthamii* and small Crotons.

Adelaide, Botanic Gardens, Australia.—Seeds of *Eucalyptus* spp.

Arnold Arboretum, Jamaica Plain, Mass., U.S.A.—381 packets of seeds, grafts of *Quercus* spp., and plants including *Decodon verticillatum*, and *Viburnum* spp.

Bermuda (Paget East), Department of Agriculture.—Bulbs of *Lilium longiflorum* var. *Harrisii*.

Bucharest, Botanic Garden, Roumania.—41 packets of seeds.

Buitenzorg, Botanic Garden, Java.—118 packets of seeds and fern spores.

Calcutta, Royal Botanic Garden, India.—Seeds of *Hydnocarpus Wightiana*.

Chinese Eastern Railway Co.'s Experimental Station, Manchuria.—Seeds of Chinese plants.

Darjeeling, Lloyd Botanic Garden, India.—390 packets of seeds.

Dehra Dun, Forest Research Institute, India.—Miscellaneous seeds, including *Adina cordifolia* and *Bassia longifolia*.

Dunedin, Botanic Gardens, New Zealand.—69 packets of seeds and a collection of filmy ferns.

Gambia, Department of Agriculture.—Tubers of ground orchids, including *Lissochilus purpuratus*.

Hongkong, Botanic and Forestry Department.—Seeds, including *Lilium Brownii*.

Honolulu, Department of Agriculture and Forestry, Hawaii.—Seeds of *Argyroxiphium sandwicense*.

Kirstenbosch, National Botanic Garden, Cape Town, S.A.—51 packets of seeds and plants of *Pelargonium capitatum*, *Watsonia* spp. and *Lachenalia* spp.

Leningrad, Botanic Garden, Russia.—64 packets of seeds.

Missouri, Botanic Garden, U.S.A.—Plants of *Dionaea muscipula*, and seeds of *Nelumbium luteum*.

Morton Arboretum, Lisle, Illinois, U.S.A.—50 packets of seeds.

New York, Botanical Garden, U.S.A.—Stove plants and seeds of *Lilium* spp.

Palermo, Botanic Gardens, Italy.—117 packets of seeds.

Paris, Botanic Gardens, France.—Plants of *Kalanchoe* spp. etc.

Peradeniya, Royal Botanic Garden, Ceylon.—Collection of stove plants and seeds of *Areca concinna*, *Arenga Wightii*, etc.

Philadelphia Academy of Sciences, U.S.A.—Seeds, including many species of *Calceolaria*.
 Sapporo, Botanic Garden, Japan.—44 packets of seeds.
 Sierra Leone, Dept. of Lands and Forests, West Africa.—Seeds of *Dioncophyllum Darwei*.
 Singapore, Botanic Garden, Straits Settlements.—Collections of Stove plants including *Nepenthes* spp., *Aeschynanthus* spp., and seeds of *Nipa fruticans*, *Sagrus laevis*, etc.
 Sydney, Botanic Gardens, Australia.—Seeds of Australian plants including *Macrozamia mountperiensis*, *M. spiralis*, etc.
 Trinidad, Royal Botanic Garden.—Plants of *Anemopaegma grandiflora* and *A. carrerense*.
 Washington, U.S. Department of Agriculture.—Plants including *Cydonia oblonga*, *Castanea mollissima*, *Rhamnus globosa*, etc.

Private Donors:—

Mr. B. C. Aston, Wellington, New Zealand.—46 packets seeds of New Zealand plants.
 Rt. Hon. the Earl Bathurst, Cirencester.—Seeds and plants of *Picea purpurea*.
 Mr. W. E. Broadway, Port-of-Spain, Trinidad.—Collections of orchids and fern spores.
 Mr. N. E. Brown, Kew.—Seeds, plants and cuttings of South African succulents.
 Sir Charles Cave, Sidmouth.—Plants and seeds, including *Quercus lamellosa*.
 Dr. J. B. Christopherson, London.—Seeds of *Hydnocarpus venenata* and *H. anthelmintica*.
 Col. Stephenson Clarke, Cuckfield, Sussex.—Plants including *Rhododendron indicum*, and conifers.
 Dr. L. Cockayne, Wellington, New Zealand.—Seeds including *Clematis marata*.
 Mr. W. P. Cranfield, Enfield Chase, Middlesex.—A large and representative collection of hardy ferns, including *Aspidium angulare* vars., *Scolopendrium vulgare* vars., etc.
 Prof. L. A. Dode, Paris.—Seeds and grafts, including *Fagus multinervis*.
 Mr. S. A. Duruz, Wallington.—Bulbs and seeds of a variety of *Lilium bulbiferum*, and alpine collected in the Lower Engadine.
 Mr. Charles Eley, East Bergholt.—Plant of *Rhododendron Roylei* x *R. Maddenii*.
 Mr. W. P. Ellmore, Leicester.—55 varieties of Basket Willows.
 Major R. Emmett, Moreton Morrell.—Plants including *Daphne acutiloba*, *Berchemia lineata*, *Potentilla Beesii*, *Exochorda serratifolia*.
 Mr. W. H. B. Fletcher, Aldwick Manor, Bognor.—Specimen plant of *Vanda Lowii*.
 Mr. G. B. Foote, Elston, Puwakpitiya, Ceylon.—Plants of *Vanda Roxburghii*, *Vanda spathulata*, etc.

Hon. Vicary Gibbs, Aldenham House, Elstree.—Collections of hardy trees and shrubs.
 Prof. H. H. Greenish, Pharmaceutical Society of London.—Bulbs of *Urginea Burkei* and plants of *Artemisia Cina*.
 Mr. A. Grove, London.—Bulbs and seeds of *Lilium* spp.
 Miss M. S. Hall, Woking.—Plants of *Platynerium alaicorne*, and small collection of succulents.
 Mr. Cecil Hanbury, La Mortola, Ventimiglia, Italy.—68 packets of seeds, bulbs of *Iris tingitana*, etc.
 Marquis of Headfort, Kells, Co. Meath, Ireland.—Rhododendrons.
 Prof. A. Henry, Dublin.—Seeds and plants including *Glyptostrobus heterophyllus*, *Taxodium* spp., etc.
 Mr. T. E. Henwood, Reading.—Collection of varieties of *Polypodium vulgare*.
 Miss Agnes Hill, Groendoorn, S.W. Africa.—Collections of succulents including plants of *Mesembryanthemum concinnum*, *M. fulviceps*, etc.
 Mr. G. Lindley Hinde, Assam.—Collection of orchids including *Vanda* spp., *Dendrobium* spp., etc.
 Mr. F. N. Howes, Gold Coast.—Seeds including *Entada abyssinica*, *Pachyrhizus palmatilobus*, *Sarcocephalus esculentus*, etc.
 Capt. C. Ingram, Benenden, Kent.—Plants and seeds of *Prunus* spp. and Japanese alpine.
 Mrs. W. Jones, Hurlingham.—Plants of *Meconopsis Florindae* and *M. Wallichii* var. *alba*.
 Mr. J. A. Kenrick, Edgbaston.—A collection of 850 Hippeastrums in variety.
 Dr. A. F. G. Kerr, Bangkok, Siam.—Plants of *Dendrobium Friedrichsianum*, fern spores and seeds including *Hydnocarpus ilicifolia* and *H. anthelmintica*.
 Mr. C. C. Lacaita, Petworth.—Plants of twenty-two species of *Pulmonaria*.
 Mr. C. H. Lankester, Costa Rica.—Seeds and plants including *Oncidium ampliatus* var. *majus*, *Laelia rubescens*, etc.
 Sir William Lawrence, Bt., Dorking.—*Calceolaria pratensis* and greenhouse plants.
 Mr. C. J. Leyland, Beal, Northumberland.—Plants and cuttings of *Cupressus Leylandii*.
 Mr. G. W. E. Loder, Wakehurst Place, Ardingly.—Collection of Rhododendrons and conifers.
 Mr. H. Armytage Moore, Co. Down, Ireland.—Collection of Rhododendrons including *R. Wardii*, *R. Maddenii* and *R. Baileyi*.
 Mr. H. Musk, Wye, Kent.—Hardy British orchids.
 Mrs. N. D. Parry, Assam.—Seeds collected in the Lushai Hills including *Boea hygrometrica*.
 Sir John Ramsden, Bt., Gerrard's Cross.—Seedling Rhododendrons, corms of *Gladiolus Quartinianus*, etc.
 Mrs. Rey, Hyde Park, London, W.—30 packets of seeds collected in Abyssinia.

Mr. George H. Rock, Kingston, Jamaica.—Specimen plants of *Broughtonia sanguinea*.
 Mr. Lionel de Rothschild, London.—Seeds collected in South America, Rhododendrons and Chinese plants.
 The Hon. Mrs. Ryder, Brockenhurst.—Collection of seedling *Gladiolus* spp.
 Prof. C. E. Salmon, Reigate.—Plants including *Artemisia granatensis*, *Myosotis* sp. nov.
 Mr. T. Sharp, Westbury, Wilts.—Cape succulents and *Encephalartos transvenosus*.
 Major A. A. Dorien-Smith, Isles of Scilly.—Plants and cuttings including *Puya chilensis*.
 Mr. F. P. Smith, Southgate.—A collection of *Sempervivum* spp.
 Mr. Gilliat-Smith, North Persia.—50 packets of seeds.
 Mr. W. H. Stansfield, Southport.—Hardy ferns including *Asplenium fontanum* and *A. septentrionale*.
 Major F. C. Stern, Goring-by-Sea.—*Calceolaria Germainii* and seeds.
 Mr. T. P. Stokoe, Cape Town, South Africa.—Seeds of *Erica* spp.
 Mr. S. Tapscott, Kimberley, South Africa.—Seeds of *Stapelia* spp., and other succulents.
 Mr. C. A. Treadwell, Wellington, New Zealand.—Seeds including *Sophora tetraptera*, *S. Treadwellii* and *Arthropodium cirrhatum*.
 Mr. W. B. Turrill, Kew.—*Sempervivum* spp. and miscellaneous seeds collected in the Balkans.
 Sir Oscar Warburg, Epsom.—Plants and cuttings of *Cistus* spp. *Helianthemum* spp. and *Salix* spp.
 Mrs. Whittall, Haslemere.—Plants of *Nothofagus betuloides*.
 Mr. J. C. Williams, Caerhays Castle, Cornwall.—223 packets of seeds collected by Mr. G. Forrest. Plants of *Styrax Hookeri*, Rhododendrons, *Prunus serrula*, etc.
 Mr. A. Worsley, Isleworth.—Bulbs of *Brunsdonna Parkeri* var. *alba*.

Seeds and Plants received at Kew from America through agency of the Director, 1926.

Dr. A. W. Hill.—90 packets of seeds collected in U.S. and Canada, and seedlings of *Epigaea repens*.
 Arnold Arboretum.—Plants of *Juniperus formosana*, *J. squamata* var. *Wilsoni*, *J. virginiana* var. *Burkei*, *J. chinensis* var. *dentata*, *Taiwania cryptomerioides*, *Abies balsamea* var. *macrocarpa*, *Picea brevifolia* var. *argentea*.
 Dr. M. L. Fernald, Gray Herbarium, Cambridge, Mass.—48 packets of seeds collected in Newfoundland. 34 packets of seeds collected at Cape Cod.
 Missouri, Botanic Gardens, St. Louis.—Night-blooming Nymphaeas, seeds of *Helianthus hirsutus*, *H. angustifolius* and *Nelumbium luteum*.

Miss A. Eastwood, Golden Gate Park, San Francisco.—Seeds of *Galvesia (Pentstemon) speciosa*.
 New York, Botanical Garden.—Succulents, Stove plants and *Rhododendron Chapmani*.
 Smithsonian Institute, Washington.—Collection of succulents.
 Wyoming University.—Seeds of *Pentstemon* spp.
 Mr. W. G. Corbitt, Pacific Lumber Co., Scotia, California.—Seeds of *Rhamnus Purshiana* var. *tomentella*.
 Mrs. Rogers, Vancouver.—Seeds of *Thalictrum dipterocarpum*.
 Dr. F. T. M. Lean, State College, Kingston, R.I.—Corms of hybrid Gladioli.

DISTRIBUTION OF PLANTS AND SEEDS.—The usual distribution of surplus plants from the various collections was made, either as gifts to educational institutions or in exchange with botanic gardens, nurserymen, etc. The total number of packets of seeds distributed was 10,058:—hardy trees and shrubs, 3428, hardy herbaceous plants, 6630; a net increase of 2831 packets compared with the 1925 distribution. The most important seeds specially distributed were *Nipa fruticans*, *Khaya ivorensis*, *Sclerocarya Schweinfurthiana*, *Olearia insignis*, *Calceolaria Darwinii*, *Phormium tenax*, *Rosa Hugonis*, *Quercus macedonica*, *Thalictrum dipterocarpum* and *Rhamnus Purshiana* var. *tomentella*.

Wardian cases of plants were despatched to the Botanic Gardens of Dominica, Singapore and Sydney. Other Wardian cases were sent to the Departments of Agriculture at Bathurst (Gambia) and Trinidad, as well as to the Siamese Minister at Bangkok, Siam.

The recipients of plants, etc., from Kew included the following:—

Cambridge, Botanic Garden.—Plants including *Carludovica rotundifolia*, *Dionaea muscipula*, *Utricularia prehensilis*, etc.
 Edinburgh, Royal Botanic Garden.—Hardy trees and shrubs, greenhouse, stove and herbaceous plants.
 Glasnevin, Botanic Garden.—Plants of *Taxus baccata* var. *nana* and alpine.
 Singapore, Botanic Garden.—Plants of *Lecythis* spp.
 Mr. F. R. S. Balfour, Dawyck, Stobo.—Plants of *Magnolia Wilsonii*.
 Her Highness the Begum of Bhopal, India.—*Clivia miniata* and garden varieties of *Hippeastrum*.
 Revd. C. R. Curtis, Magdalen College, Oxford.—Collection of Nymphaeas.
 Lady Chaplin, South Africa.—Cuttings of *Populus* spp., bulbs of *Nerine* spp., and seeds of trees and shrubs.
 H.R.H. The Duke of Connaught, Bagshot Park.—*Populus trichocarpa*.
 Major R. Emmett, Moreton Morrell.—Plants of *Vitis megalo-phylla*, *Magnolia Wilsonii*, etc.

The Hon. Vicary Gibbs, Aldenham House, Elstree.—Trees, shrubs and herbaceous plants.
 Dame Alice Godman, Horsham.—Plants and seeds of hardy trees, shrubs and alpine.
 Mr. C. Hanbury, La Mortola, Ventimiglia, Italy.—Collection of succulents.
 Mr. S. H. C. Hawtrey, Como, Thika, Kenya.—Plants of *Acrocomia sclerocarpa*.
 Marquess of Headfort, Kells, Co. Meath, Ireland.—Hardy trees and shrubs, including *Nothofagus betuloides*, *Rhododendron strigillosum*, etc.
 Mr. G. Lindley Hinde, Assam.—A collection of orchids, including *Cypripedium* spp., *Cattleya* spp., *Oncidium* spp., etc.
 Capt. C. Ingram, Benenden.—Trees and shrubs.
 Mr. C. H. Lankester, Costa Rica.—Collection of orchids and stove plants.
 Sir William Lawrence, Bt., Dorking.—Greenhouse and decorative plants.
 Mr. H. Lawson, Bermerside, Halifax.—Collection of economic plants.
 Liverpool Corporation.—Grafts of 20 species of *Pyrus*.
 Mr. T. Ashton Lofthouse, Middlesbrough.—Herbaceous plants.
 Mr. F. W. Millard, East Grinstead.—Alpines.
 Major A. Pam, Broxbourne.—Hardy shrubs including *Pieris formosa*.
 Mr. G. A. Rock, Jamaica.—Orchids including *Cattleya gigas* and *Laelio-Cattleya* hybrids.
 Mr. Lionel de Rothschild, Exbury, Southampton.—Trees and shrubs including *Magnolia officinalis* and *Koeleria apiculata*.
 Lady Beatrix Stanley, Market Harborough.—Alpines.
 Sir Oscar Warburg, Epsom.—Trees and shrubs including *Rosa mirifica*, etc.
 Mr. J. C. Williams, Caerhays Castle.—Plants of *Rhododendron Kingianum*, *Magnolia salicifolia* and *Prunus triloba*.
 Mr. C. Woodward, Bewdley. Trees and shrubs.

EXPERIMENTAL PLANTATION IN RICHMOND PARK.—Among the several disadvantages Kew has to contend with in the cultivation of hardy plants is the one due to its low-lying situation. This renders the young growths of spring particularly subject to injury by late frosts in April and May, which, as is well known, are more frequent and more severe on low, flat levels than on adjacent elevated localities. It is, in consequence, practically impossible to grow out of doors at Kew certain trees and shrubs which, although subjected in their natural habitats to much greater winter cold than we ever experience here, are excited into early growth by what is to them unseasonable warmth. Last spring for instance the majority of the Chinese rhododendrons had their first growths entirely destroyed, thereby causing the formation of several weak

shoots in place of one strong one and making the development of flower buds during that season impossible.

Richmond Park is the nearest elevated ground to Kew and it appeared that it would be interesting and useful to compare the behaviour of plants grown there, more particularly as to hardiness, with those grown in the Gardens. Through the courtesy of H.M. Office of Works we have been permitted to use a plot of ground on one of the higher elevations. This as the crow flies is about two miles away from the Gardens. Its area is 100 feet by 30 feet, and it has been fenced round with wire netting to keep out rabbits and deer.

The following trees and shrubs were planted there on May 18th, 1926:—

Southern European.—*Coronilla valentina*, *Olea europaea* (Olive), *Cytisus filipes*, *Teucrium frutescens*.
 Asiatic.—*Cocculus laurifolius*, *Cinnamomum brevifolium*, *Piptanthus nepalensis*.
 South American.—*Myrtus Ugni*, *M. Luma*, *Crinodendron lanceolatum*, *C. dependens*, *Feijoa Sellowiana*, *Azara Gilliesii*, *Drimys Winteri*, *Calceolaria violacea*, *Eucryphia cordifolia*.
 New Zealand.—*Leptospermum scoparium*, *L. scoparium* var. *Nichollsii*, *Hoheria populnea*, *Sophora tetraptera*, *Veronica Hulkeana*, *Griselinia lucida*, *Pittosporum Ralphii*, *Myrtus bullata*, *Acradenia Frankliniae*, *Olearia nitida*, *O. Gunniana*, *O. erubescens*, *O. furfuracea*, *Corokia virgata*.
 Chinese.—*Rhododendron aemulorum*, *R. basilicum*, *R. fictolacteum*, *R. megacalyx*, *R. penninivium*, *R. crassum* series, *R. zeylanicum*, *Buddleia Farreri*.

With the valued assistance of the Meteorological Office and of H.M. Office of Works, we have been enabled to place some meteorological instruments in the Park near the plantation. The records from these instruments will, it is hoped, provide an interesting comparison with our own meteorological records at Kew, and with those of Kew Observatory. The Superintendent of the Observatory, Mr. F. J. W. Whipple, is very kindly supervising the instruments in the Park and assisting us in the comparison of the data obtained. So far as can be gathered from the short time during which the instruments have been in use, the daily maxima in the Park are in general slightly lower than at Kew, while the minima tend to be slightly higher. As regards humidity, the record of the hygrograph in the Park agrees very closely with that of the instrument at the Observatory, and no differences worthy of note have yet been observed.

NATIONAL PINETUM AT BEDGEBURY.—Owing to delay in preparatory work due to wet weather and shortage of labour, planting operations, postponed from the autumn of 1925, could not be undertaken until February, 1926. About 1,200 young trees were ready for planting and five workmen were sent from Kew

to do this. Unfortunately almost the whole of February was wet, and planting consequently had to be done under unsatisfactory conditions. The drains through years of neglect had ceased to function, and it was necessary to open many of them in order that the water from the ground to be planted might drain away. Even then, in some of the worst positions, mounds had to be made on which to plant the trees. However, most of the genera were dealt with, though some species of *Cupressus* had to be planted in temporary quarters, and most of the *Taxaceae* had to be left for another year owing to the position selected for them not having been prepared. Planting was a laborious operation, for the impassable condition of the roads made it necessary to unload the young trees at points varying from 200 yards to nearly half a mile from the points where they were to be planted, and they had to be carried there by hand.

Following a cold spring, when young shoots of early growing trees were crippled, there was a favourable growing season, and most of the young trees, even those planted in very wet places, became well established and made satisfactory growth. A few trees died and some were damaged by rabbits and pine weevils. The rabbits were got under control after the first fortnight, but weevils caused considerable damage to young pine trees during early summer and again in August and September. Some 7,000 weevils were trapped and it will be necessary to maintain a close watch over the trees again in 1927.

Two men and a boy have been employed in the Pinetum during the greater part of the year. There has been a good deal of work in keeping down weeds, suckers from Chestnut and Birch stools, bracken and rushes; for some weeks one person's time was almost fully occupied in trapping weevils. The opportunity of dry weather in summer was taken to clean out many of the drains and ditches, and this has resulted in the ground being much drier during the present winter than it was last year. The odds and ends of timber left on the ground after felling have mostly been cleared away and a number of wooden bridges have been laid across streams to connect important areas and facilitate work.

Permanent labels were placed upon some 300 trees planted during March, 1925, and it is hoped to replace the wooden labels on later planted trees by enamelled ones before long. A little planting was carried out in November, mostly the replacement of trees that had died, and further planting, chiefly of the Yew family, is contemplated during the coming spring.

From the general appearance of the trees planted in March, 1925, we confidently look forward to the Pinetum becoming a great success, for they have grown well and look very healthy. Some two or three had to be transplanted and the roots were found to be in excellent condition. The foundation of the Pinetum may now be considered as surely laid.

RAINFALL RECORDED AT THE ROYAL BOTANIC GARDENS, KEW, DURING 1926.

Inches.			Inches.		
January	...	2.47	July	...	2.06
February	...	2.47	August	...	0.99
March	...	0.16	September	...	1.30
April	...	2.94	October	...	2.08
May	...	1.99	November	...	5.11
June	...	3.03	December	...	0.36
Total 24.96 inches.					

The Museums.

The retirement of Mr. John Masters Hillier after forty-seven years' service in the Museums, during the last twenty-five of which he was Keeper, took place on March 31st last, Mr. W. Dallimore succeeding to the position (*K.B.* 1926, p. 220). The change of Keepers necessitated some reorganisation of the Department and amongst changes already effected is that of the transference of Museum Headquarters from Museum I. to Museum IV. The want of more office accommodation in Museum I. had long been felt, but as more office space could only be acquired by correspondingly diminishing the area available for collections, it was decided to move the headquarters office to Museum IV. where three rooms on the first floor were available. This brings Museum Headquarters within easy reach of the Director's Office and effects an appreciable saving of time in intercommunication. The change, however, will not inconvenience visitors requiring information in Museum I., for an Assistant will still be stationed in the old office. As the officers responsible for fire control were dissatisfied with the use of open fires in Museum IV. the opportunity was taken of substituting radiators for open fires in the rooms that are now being used for the Museum Offices.

The drainage system and sanitary arrangements in Museum I. were very much out of date, and H.M. Office of Works have consequently thoroughly overhauled the system and fitted modern sanitary conveniences. The office in Museum I. has been fitted with electric light.

Temporary assistance to the Museum staff was provided for several months after the retirement of the late Keeper, until in November Mr. F. N. Howes, M.Sc., F.L.S., lately Economic Botanist of the Agricultural Department of the Gold Coast, was appointed to the vacant Assistantship in the Museums. This appointment will considerably strengthen the Department, for there will now be two Assistants with practical experience in the cultivation of tropical crops.

ROUTINE WORK.—Answers to correspondents have entailed replies to some 463 letters on miscellaneous economic subjects coming from all parts of the Empire, in addition to numerous reports.

A good deal of relabelling has been necessary amongst the collections, and there has been the usual indexing of information from periodicals. A considerable number of visitors have called at the Museums for special information, and 15 visitors have carried out private work for periods varying from a few days to several months.

SPECIAL WORK.—A large number of specimens received at the close of the 1924-25 British Empire Exhibition have been incorporated in the collections. This entailed a good deal of work owing to the already congested state of the buildings. The difficulty of finding space for new exhibits in Museum III. was very pronounced. In this building space had to be found for fine collections of Canadian and Malayan timbers, in addition to an important collection of Japanese and Formosan woods that had been in store. In order to keep abreast with modern requirements and to display Empire woods to the best advantage, it is necessary to set up exhibits in commercial sizes. To exhibit large sections of timbers or planks in a satisfactory manner requires a good deal of space, and to obtain this certain inferior specimens had to be removed and a good deal of rearrangement undertaken. In addition it was necessary to remove a large number of historical prints and plans of 'Old Kew' from this Museum to Kew Palace (*K.B.* 1926, p. 369). There are still, however, many useful commercial timbers that cannot be displayed owing to lack of space.

The collections in Museum II. have been overhauled, some specimens have been discarded and others reduced in size in order to relieve congestion and make room for new and more up-to-date exhibits. The necessary rearrangements in both Museums II. and III. are practically completed and new Guides to the collections are in course of preparation.

The practice followed during recent years of making occasional special exhibits of important subjects has been continued. These have included exhibits of kitchen, dairy, and sports requisites from home-grown woods; Quinine, from the plantation to the finished drug, and models of hardy fruits with examples of the diseases common to fruit trees. Such exhibits have been found to be very popular with visitors.

Special investigations are in progress concerning important questions upon various economic plants, more particularly Cacao and Camphor. The efficacy tests of various insecticides on wood infested with wood-boring beetles commenced in 1922 were continued, and conclusions arrived at in 1925 as to the inefficacy of certain preparations were verified. Experiments have proved that the best time for the application of insecticides is in April. Unfortunately, in research of this character, definite results are only possible after a very lengthy experimental period, and the time available at Kew for such work is very limited. Part of this work has been carried out at the instance of H.M. Office of Works, and the results so far obtained have been appreciated by that Department.

EDUCATIONAL VISITS.—Meetings of Scientific Societies have been attended and visits paid to centres of trade and imports that have a bearing upon the work of the establishment. In this connection an Assistant attended the Annual Meeting of the Museums Association at Bournemouth, and the Keeper attended and read a paper at the Annual Meeting of the British Association at Oxford. Visits have also been paid to the sale rooms and various other places for the inspection of the economic products derived from plants. The Port of London Authority have very kindly given facilities for periodic visits to the London Docks and Warehouses under their control, in order that methods of packing and the condition of products on arrival may be studied and new imports noted.

PRESENTATION TO MUSEUMS.—The following are the principal donations received during 1926 :—

Lady Harris, Hyde Park.—Herbarium specimens and Wood of three Brazilian trees.

Messrs. Bowyer & Bartleet, Fenchurch Street, London.—Sample of Morocco Roses.

Mr. I. H. Burkill, Kew.—Chinese Drugs and a collection of photographs of the Botanic Gardens, Singapore.

Prof. A. Henry, Dublin.—Wood of *Glyptostrobus pensilis*.

Mr. W. C. Edwards, London.—Sections taken from piles found 18 feet below the surface of the ground in Arthur Street West, London, which are said to have been driven by the Romans.

Mr. E. C. Horton, Westerham.—Planks of home-grown Timber.

Dr. C. C. Forsaith, Imperial Forestry Institute, Oxford.—Micro-photographs of Woods.

Department of Agriculture, Tanganyika.—Miscellaneous Agricultural Products.

Mrs. Bushnan, Kew.—Gum and Wood of *Agathis australis*, received from New Zealand.

Messrs. Cadbury, Bournville.—Cocoa and Cocoa Products in various stages of manufacture.

Department of Agriculture, Gambia.—Varieties of Ground-nut.

Sir W. T. Thiselton-Dyer, Witcombe.—Pictures showing *Phragmites*? on the shores of Lake Nyasa, and flowers at 8000 feet in the Cameroons; Map of Central Europe showing Hyrcinian Forest; Photograph of *Dyera costulata*.

Mr. Seacombe, Ealing.—Model of circular staircase.

Mr. C. F. Speh, New Orleans.—Photographs illustrating the Resin industry in the Southern United States, together with a specimen tapped log of *Pinus palustris*.

Messrs. Thomas Hill-Jones, Bow Common Lane, London.—Samples of Charcoal.

Mr. H. G. King, Peckham.—Twisted branch of Cedar.

Rev. A. C. Hutchinson, Japan.—Calcined Oranges picked up at the foot of the volcano, Sakurajima in South Japan after the great eruption in January, 1914.

Dr. Stapf, Kew.—Sample of *Ephedra distachya* from the Ukraine.

of time has been devoted to the re-arranging of genera and writing up according to monographs. The chief genera which have been so dealt with are:—*Centaurea*, *Linaria*, *Cerastium*, *Holosteum* and *Daphne*.

Amongst important collections which have been named mention may be made of the late Dr. Forsyth-Major's Corsican Herbarium; Mr. B. Gilliat-Smith's North Persian plants, and plants collected by Sir Ronald Lindsay in Asia Minor. The Balkan Peninsula collections have been enriched by a good set of Javorka's and Kümmerle's Albanian plants; a set of rare Bulgarian plants presented by the Department of Botany, Sofia University, and a further contribution by Dr. K. Maly, from Bosnia and Herzegovina. As a result of another visit by Mr. and Mrs. W. B. Turrill to South-East Europe over 600 sheets of dried plants and 200 packets of fruits and seeds from Bulgaria and Thrace were added to the Herbarium. The Rev. E. Ellman again invited Mr. N. Y. Sandwith to accompany him on a month's collecting journey, and areas in South-Central and South-Eastern Spain were worked and some thousand specimens were collected. Contributions of British plants, especially grasses, have been made by various members of the Staff and by several British botanists. Most of the above material has been mounted and a portion has already been laid in.

Mr. E. M. Marsden-Jones presented a fine series of experimental material of *Geum rivale* × *urbanum* hybrids and other *Geum* crosses, each representing several generations. The preservation of such pedigree materials in the Herbarium is of great value in affording a permanent record of genetical research and in elucidating publications. He also presented an extensive series of experimental material of *Centaurea* and *Silene*.

Research and Publications.—The following papers dealing with European and Oriental Floras have been published:—"On the Flora of the Nearer East" (*K.B.* 1926, p. 100, and p. 375), "Revision of Sibthorp's plants at Kew" (*K.B.* 1926, p. 120), "A new *Anthemis* from Bulgaria" (*Gard. Chron.*, Vol. 80, 1926, p. 120). Work on the Phytogeography of the Balkan Peninsula was continued.

ASIA.—Routine.—In the Indian Section a very large amount of laying in has been accomplished. The whole of the Duthie Herbarium has now been incorporated and also additional material purchased from the Rev. A. Saulière and the Rev. L. Anglade. An additional 200 sheets of the Rottler collection received from King's College, London (*K.B.* 1926, p. 221), have also been mounted and incorporated. From the Gamble Herbarium, referred to in detail last year (*K.B.* 1926, p. 12), the whole of the grasses, including Mr. Gamble's unique collection of Bamboos, has been extracted and laid in, and the preparation of a few other families for incorporation has been commenced. A considerable number of plants, including many type specimens received from Siam and named by Prof. W. G. Craib, has been placed in the cabinets.

Many small collections from various localities sent to be named have passed through the hands of the Assistant for India, the most important being those received from Mr. R. N. Parker, Imperial Forest Botanist, Dehra Dun, Mr. C. E. Parkinson, Forest Botanist, Burma, and from Mrs. A. D. Parry, from the Lushai Hills of Assam, a tract hitherto almost unexplored botanically. The material received from Mr. Parkinson is especially interesting and important in coming from the little-known province of Tenasserim in Southern Burma and contains many new species. The same botanist also sent a separate collection of 60 specimens of *Flacourtiaceae*. These are of value in connection with investigations into the treatment of leprosy by the use of *Chaulmoogra* oil obtained from the seeds (*K.B.* 1926, p. 17). The specimens proved to belong to four separate species, and an account of the whole collection is in preparation.

In the Chinese section considerable progress has been made with the mounting of the accumulation in the Store. A certain number of specimens has been laid in, but a large residuum of nearly 8000 specimens has, owing to the shortage of cabinet space, been temporarily sorted and arranged in family sequence. These include collections made by Farrer, Forrest, Handel-Mazzetti and Schindler as well as the Japanese and Korean specimens mentioned below. Considerable time has also been devoted to the re-arrangement and writing up of several important Chinese genera.

With regard to naming, the remainder of Père Licent's Northern China collection has been dealt with, also E. H. Wilson's collections made in Japan and Korea on behalf of the Arnold Arboretum, and several small collections such as Taquet's Korean plants and Sir Aurel Stein's recent specimens from Chinese Khotan.

In the Malayan division a number of consignments of Siamese plants continue to come to hand from Dr. A. F. G. Kerr, and, with the exception of special groups, are referred to Prof. W. G. Craib for determination. Some 200 grasses and 150 ferns were named at Kew. A valuable series of Pierre's specimens from Cochin China were received as duplicates from Paris, including examples of his new species and genera not hitherto represented at Kew, together with reproductions of drawings and dissections. These are being sorted as quickly as opportunity allows, the grasses already having been extracted, mounted and laid in.

A considerable amount of work was accomplished in splitting up and arranging the Malayan material according to the new subdivisions recently adopted in the Herbarium. Progress has also been made in the Stores. The sorting into families of the two principal collections awaiting attention, namely those of E. D. Merrill and A. D. E. Elmer, has been completed, and the specimens, though still mostly unmounted, are more readily accessible for study.

Research and Publications.—The lamented death of Mr. J. S. Gamble left the preparation of the Flora of the Presidency of

Madras unfinished, the 7th part being the last to be published. The Government of Madras has agreed to the Flora being completed by the Assistant for India in the Herbarium at Kew, and the work of elaboration, beginning with the family *Urticaceae*, was commenced during the year.

Connected with the Indo-Malayan region the following papers appeared:—"The Flora of the Mentawi Islands," by H. N. Ridley (*K.B.* 1926, p. 57), including 55 new species and 1 new genus; "Additions to the Flora of Malaya," by H. N. Ridley (*K.B.* 1926, p. 469), including 23 new species; "Contributions to the Flora of Siam" by W. G. Craib, *Additamentum xviii* (*K.B.* 1926, p. 154), *Additamentum xix* (*K.B.* 1926, p. 337), the two comprising a total of 72 new species; "Contributions to the Flora of Burma," by the Assistant for India (*K.B.* 1926, p. 446), with 20 new species.

In the Chinese section the principal work has been the enumeration and preparation for publication of the collection made by Captain F. Kingdon Ward in 1924 in the Eastern Himalayas and Southern Tibet. The work on the revision of Chinese species of *Gentiana* has been continued and is approaching completion.

AFRICA.—*Routine*.—The Store work has proceeded satisfactorily, some 10,000 sheets having been mounted, 6000 laid in, and 2000 named. Temporary sortings into families have also been made, especially in the case of Gossweiler's Angolan collection, the main set of which is at the British Museum, where it is being worked out. As regards current work, with few exceptions all new collections received from Africa during the year have been determined and identifications supplied, the South African material being named in conjunction with the Assistant for South Africa. Some 620 critical *Compositae* were dealt with, about half of which had been sent for naming by the Chief of the Division of Botany at Pretoria. As was the case last year, the bulk of the material received for naming during 1926 was from East Africa.

In addition opportunity has been taken to re-arrange several large genera to facilitate reference, such as *Tephrosia*, *Rubiaceae* tribe *Vanguerieae*, *Psychotria*, and *Acacia*.

Work was also continued on the re-arrangement of African orchids, and the genus *Polystachya* was written up and arranged according to Kränzlin's monograph. The determination of a large collection of orchids made in Katanga, Belgian Congo, received from Pretoria, was begun, but owing to the extremely critical nature of the material many types had to be borrowed from continental herbaria and progress has been unavoidably slow. It is evident that the collection contains many novelties. Considerable attention was also paid to Grasses as regards the writing up of sheets and covers. Over 1000 sheets of South African and Tropical African grasses were named and some 2000 sheets were laid in.

Research and Publications.—As was the case last year the chief

work has been the preparation by Mr. J. Hutchinson and Dr. J. M. Dalziel, Assistant for West Africa, of "The Flora of West Tropical Africa," the first part of which is now in the press. In this connection the large and difficult families *Tiliaceae*, *Sterculiaceae*, *Malvaceae* and *Euphorbiaceae* have been worked out, and also the *Caesalpiniaceae*. The *Mimosaceae* are now in hand, and with the completion of the *Papilionaceae* the bulk of the more troublesome families will have been dealt with, the majority of the other families being included in the later and more up-to-date volumes of the Flora of Tropical Africa. Drawings for the flora have been prepared up to the end of the *Metachlamydeae*.

The following papers appeared during the year: "A Revision of *Englerastrum*," by Mr. A. H. G. Alston, now Systematic Botanist at Peradeniya, Ceylon (*K.B.* 1926, p. 295), and the following papers by various members of the staff, "Notes on *Kissenia* and the Geographical Distribution of the *Loasaceae*" (*K.B.* 1926, p. 174), "*Harpagocarpus*: A New Genus from Uganda" (*K.B.* 1926, p. 363), "African Leather Dyes" (*K.B.* 1926, p. 225), and a further note on "The Genus *Englerastrum*" (*K.B.* 1926, p. 479).

The Assistant for South Africa commenced a revision of the genus *Crotalaria* as represented in South Africa, Nyasaland, Portuguese East Africa, Rhodesia, and South-West Africa, and a paper by her on the African *Toddalieceae* was prepared and published (*K.B.* 1926, p. 389).

With regard to grasses, definite progress was made with the last part of the Flora of Tropical Africa. A small booklet entitled "East African Pasture Plants," prepared at Kew, was published, and is on sale by the Crown Agents for the Colonies (*K.B.* 1926, p. 256). The publication of a new series of articles entitled "Notes on African Grasses" was initiated, and during the year the following contributions appeared:—No. I, Descriptions of new species (*K.B.* 1926, p. 246); No. II, *Bromuntola* gen. nov. (*K.B.* 1926, p. 366); No. III, New species of *Melinis* (*K.B.* 1926, p. 440).

Two papers were published on Orchids, one on "New Polystachyas" communicated by Dr. F. Kränzlin and based entirely on Kew material (*K.B.* 1926, p. 288), and the other, "Angraecoid Orchids", arising out of the difficulty experienced in naming the African material of *Sarcantheae* at Kew, was prepared by Major K. W. Braid (*K.B.* 1926, p. 323).

AMERICA.—*Routine*.—Special attention was paid to South America, various collections from British Guiana, Colombia, Ecuador, Uruguay and Argentina having been named, in addition to others from Mexico and Trinidad. Among the more interesting was Mr. H. F. Comber's collection from the Neuquen Territory, Argentina, which is remarkable for the very fine condition of the specimens, and forms a notable addition to our material from that part of the Andes. A large amount of South American material from the Store, chiefly from French Guiana and the Amazons, has been passed through all stages and incorporated in the

Herbarium. Numerous genera, chiefly belonging to the *Araceae* and the families of *Bicarpeolatae*, have been written up and arranged in accordance with recent monographs and revisions. The Carey Herbarium of North American plants, which, on account of the larger size of the herbarium sheet, is kept apart from the general collections, has been re-arranged so as to render it more readily available for consultation.

Research and Publications.—Among the investigations undertaken was a revision of the genus *Doliocarpus*, written in collaboration with Mr. R. O. Williams, Assistant Botanist, Dept. of Agriculture, Trinidad, with whom also numerous new species of *Rubiaceae* were described in preparation for a Flora of Trinidad which is being prepared by the Trinidad botanists.

The appearance of accounts of Humboldt and Bonpland's Itineraries in Colombia, Ecuador and Peru (*K.B.* 1926, p. 23, p. 181) rounds off our knowledge of these authors' travels in Tropical America, and makes it possible to identify the type-localities of species described by them. The publication by the Mexican Society of Natural History and the Mexican Government, during the period 1887-1897, of Sessé and Mociño's "*Plantae Novae Hispaniae*" and "*Flora Mexicana*," which were written about a century previously, led to difficulties of various kinds, as it was doubtful in numerous cases whether particular species were regarded as new by Sessé and Mociño, and many of the localities cited could not be found. These difficulties have been largely removed by an intensive study of "*Sessé and Mociño's Plantae Novae Hispaniae and Flora Mexicana*" (*K.B.* 1926, p. 417).

Other papers published with reference to American plants included "*Taxonomic and Genetic notes on some species of Nemophila*" by Messrs. R. J. Chittenden and W. B. Turrill (*K.B.* 1926, p. 1) and a "*Revision of the genus Calycolpus*" by Mr. L. A. M. Riley (*K.B.* 1926, p. 145).

AUSTRALASIA.—*Routine.*—The work on the already determined material in the Store has been continued with the result that with the exception of a very large collection of New Caledonian plants received recently from Paris, the whole of the named material has been incorporated in the Herbarium or has been sorted and is awaiting incorporation when cabinet space is available. Together with current collections about 4000 specimens have been dealt with in this way. Work has also commenced on the writing up and putting in order of Australian material of several large families some of which do not appear to have been dealt with since the "*Flora Australiensis*" was compiled. These include *Proteaceae*, *Myrtaceae*, *Epacridaceae*, *Stylidiaceae* and *Goodeniaceae*, whilst a start has also been made with *Leguminosae* and *Compositae*.

There has been a material increase in the number of queries received from the State herbaria in Australia and the correspondence which has resulted therefrom has been somewhat heavy, inasmuch as it has involved the borrowing of types from continental herbaria.

Portions of types and co-types of various new species have also been presented from Australia to Kew, and are very valuable additions. This increased correspondence with the State herbaria is a welcome sign of closer co-operation.

A valuable set of species, forms, and hybrids of New Zealand *Celmisias* was received from Dr. Cockayne. It is of special interest as it is copiously annotated by Dr. Cockayne, Mr. T. Kirk, and the late Mr. T. F. Cheesman.

Research and Publications.—The revision of the Australian species of *Frankenia* has been continued, and the examination of much material and several type specimens received on loan from various sources has been practically completed, and the paper is now in the course of preparation.

In response to a query from Professor A. J. Ewart, an investigation is being conducted into the identity and nomenclature of 77 species of Australian *Myrtaceae* described by Turczaninov in 1852, and omitted by Bentham from the "*Flora Australiensis*."

At Mr. W. Greenwood's suggestion, a paper dealing with the grasses of Fiji, giving a synopsis and key, has been prepared for publication in the Kew Bulletin.

The following papers were published: "*The Taxonomic position of Hoheria Lyallii*" (*K.B.* 1926, p. 214), "*A New Solanum from Western Australia*" (*K.B.* 1926, p. 116). Mr. L. A. M. Riley also contributed a short paper entitled "*Notes on the Flora of Rapa*" (*K.B.* 1926, p. 51).

FERNS, MOSSES AND HEPATICAE.—Considerable progress has been made in re-arranging the ferns according to Dr. C. Christensen's "*Index Filicum*" and about one-fifth has been sorted into the sequence of that work, while many others have been written up as a necessary preliminary to such re-arrangement. Various collections have been incorporated in the herbarium, including that of the late Mr. J. S. Gamble, amounting to 2822 sheets, which, although chiefly Indian, included European and South African specimens. Certain collections of which duplicates had been distributed under provisional names have been more exactly identified and the determinations distributed; these include J. Cavalerie's Chinese, W. Hancock's Hawaiian, Sumatran and Ceylonese and Ed. André's Colombian specimens. Many of the ferns from the large collections made in Siam by Dr. A. F. G. Kerr have been worked out and it is hoped that the rest may be dealt with shortly. Other collections which have been named include: G. Forrest, China; L. Gibbs, Corea; Dr. G. Bryce, New Guinea; Dr. Dunlap, Cameroons; J. Gonzalez Ortega, Sinaloa; and E. Langlasse, Mexico.

Of Mosses and Hepatics, various sets have been incorporated in the Herbarium and some of the newer genera written up and separated out. Naming has proceeded as far as time permitted. An interesting collection of about 460 British Mosses made by the late Rev. W. E. Thompson has been presented by his niece, Miss

M. G. Noyle. Many of these are from Norfolk and are of historic interest, in that they formed the basis of the lists published by Mr. H. N. Dixon in the Transactions of the Norfolk Naturalists' Society, vol. vii. (1903).

ALGAE AND LICHENS.—A large collection of Marine Algae made by Col. H. H. Johnston in the Orkneys was examined and named. Amongst other contributions presented and worked out may be mentioned a set of critical Gigartinas from New Zealand, sent by Mr. R. M. Laing of Christchurch, and a miscellaneous collection from Ceylon forwarded by Mr. A. H. G. Alston. One of the most interesting was a small collection from Spitsbergen collected during the British Arctic Expedition of 1925 by Mr. J. W. S. Marr, and brought to Kew by Prof. W. G. Craib. Mr. J. Groves has kindly identified many *Charophyta*, and the whole group has been rearranged in geographical order.

With regard to Lichens, Miss D. Powell was especially employed for a short time to continue the arrangement of saxicolous species according to Zahlbruckner's monograph. Kew is greatly indebted to Mr. R. Paulson for his voluntary assistance in naming, on the occasions of his weekly visits, certain difficult and critical species which were received for determination during the course of the year. A small collection of Lichens, collected on the British Arctic Expedition mentioned above, was also dealt with by him, and a selection of specimens of both algae and lichens have been incorporated in the Herbarium.

FUNGI.—*Routine*.—In addition to general correspondence an increasing amount of time is occupied in giving expert assistance to other workers, in particular on such matters as the examination of type material, the naming of critical species and questions of nomenclature.

The principal collections dealt with included a set of Australian Clavarias from Dr. J. B. Cleland, a large collection of Cameroons fungi made by Dr. Dunlap and presented by Messrs. Elders and Fyffes, and several tropical collections on behalf of the late Dr. C. G. Lloyd. Numerous additions to the Herbarium have been made, including a set of miscellaneous fungi collected by Miss Wakefield during the International Congress at Ithaca, and various new or critical British fungi obtained during forays.

Research and Publications.—Work was continued on the life history of *Rhizoctonia Crocorum* and a paper on the subject was presented at the International Congress at Ithaca. The investigation of the life-history of *Cercosporella Antirrhini* was completed and the results published (Trans. Brit. Myc. Soc. xi. 1926.)

The taxonomic investigation on the genus *Vermicularia* and its allies was continued, several new forms having been obtained which are being grown in pure culture. A paper entitled "Fungi from Kenya Colony," being a complete list of the fungi known from that Colony, was published (K.B. 1926, p. 305). A new edition of the Ministry of Agriculture's "Handbook of Edible

and Poisonous Fungi" was prepared, several new plates being provided.

An enquiry was conducted with regard to a very severe outbreak of *Melampsora larici-populina* which occurred in a collection of poplars in Herefordshire, and a comparison made with outbreaks elsewhere.

STOREHOUSE.—Four botanists and eight preparers were employed as before for the four continents from which most material still awaits attention. For the fifth continent, Australasia, no special Assistant has been allotted but help was provided whenever possible by Temporary Technical Assistants or in other ways. It is satisfactory to record that in spite of being considerably hampered by cabinet alterations, very satisfactory work has been carried out in connection with all five continents and that for the two most important items, namely mounting and laying in, the figures returned exceed those of last year. Some details of the work will be found under the geographical headings above, whilst the figures for mounting, etc., are included in the table in the next paragraph.

SUMMARY OF ROUTINE.—The following table summarises the routine work, apart from naming, accomplished by the regular staff and by the special Store staff during 1926, the lower Cryptogams being excluded:—

Mounted	87,400
Incorporated in the Herbarium ...	47,792
Duplicates distributed	3,496
Specimens received on loan	2,942
Specimens sent out on loan	1,604

SEEDS AND CARPOLOGICAL COLLECTIONS.—Nearly 600 boxes of seeds have been added to the Seed Collection. These include 465 specimens presented by Mr. C. E. Hubbard, which consist chiefly of seeds from Northern India and of rare garden plants cultivated in this country. Some 30 boxes of fruits have been added to the Carpological Collection, and 285 specimens of Monocotyledonous fruits have been transferred from the Museums, but their incorporation has been postponed until further accommodation becomes available.

NOMENCLATURE.—Mr. T. A. Sprague attended the International Congress of Plant Sciences at Ithaca as an official delegate on questions of nomenclature.

In order to expedite the solution of the problems brought before the Congress a considerable amount of preliminary work was carried out at Kew, and the following papers were published:—"Alphabetical List of Nomina Rejicienda (Phanerogamae)" included in the second edition of the International Rules (K.B. 1926, p. 128). This supplements the "Alphabetical List of Nomina Conservanda" which appeared in 1921, and by the aid of these two lists it is possible to ascertain at a glance whether a given generic name is or is not conserved or rejected. The

absence of any provision for the application of conserved names in the event of generic segregation was remedied by the preparation of a paper on "Standard-species of Nomina Conservanda." In this paper a standard-species—usually the type-species, but sometimes a substitute-species—has been suggested for each of the conserved names, reasons for the selection being supplied in all cases.

In the opinion of competent authorities disagreement in the application of generic names (other than conserved names) is likely to be responsible for greater divergence in nomenclature than any other cause, and the adoption of standard-species for the more important generic names is therefore of immediate practical importance. The general question of what Rules would be suitable as a guide to the selection of standard-species was accordingly discussed in a paper on "Standard-species" (*K.B.* 1926, p. 96).

Among the proposals and papers on Nomenclature brought before the Congress were:—the Resolutions on Nomenclature passed by the Imperial Botanical Conference, London, 1924 (presented by Dr. A. B. Rendle); the Resolutions of the Committee on Australian Botanical Nomenclature (*Journ. Bot.* 1925, p. 210; *K.B.* 1925, p. 343); the paper on "Standard-species of Nomina Conservanda," mentioned above; and a paper on "Principles and Problems of Plant-Nomenclature."

The Ithaca Congress afforded excellent opportunities for the exchange of views on nomenclature as well as on other subjects, and for ascertaining the general trend of botanical opinion. A large majority of the delegates seemed to be in favour of more complete agreement as to the Rules of Nomenclature, and a representative Committee was appointed to consider proposals for amending the International Rules and to make recommendations to the next International Congress to be held in England in 1930 (*vide Science*, n.s. lxiv. p. 290, Sept. 24, 1926).

A schedule comprising thirty-one suggested new Nomina Conservanda, with the reasons for their conservation, has been prepared at Kew and has been sent to each member of the new International Committee and to others, thus affording an opportunity for raising objections, amendments and additions before the schedule is formally presented for the consideration of the Committee. It is hoped that in this way it may be possible to bring forward a list which will meet with general approval.

INDEX KEWENSIS.—In April, 1926, the VIth Supplement of the Index Kewensis covering the period 1916–1920 was published. This volume contains about 32,000 references to new names, many of which were published during the years 1914–1915, but owing to the war were not available for insertion in Supplement V.

During the past year considerable progress has been made in the preparation of Supplement VII, quinquennium 1921–25. Over 13,000 entries have been added to the Card Catalogue. Certain periodicals, not received at Kew, have had to be examined

at the British Museum (Natural History), South Kensington, and the number of new names extracted from these journals was over a thousand. In addition to these, several old works or parts of old works not searched hitherto for the compilation of the Index were examined and many additional names have been recorded. Amongst these may be mentioned:—Pierre, *Flore Forestière de la Cochinchine* (1879–1907) K. Koch, *Hortus Dendrologicus* (1853) and Sessé and Mocino's *Plantae Novae Hispaniae and Flora Mexicana*. The two former were the subjects of notes under "Additions to the Index Kewensis" (*K.B.* 1926, pp. 30–32; 211–214), and from these three about a thousand names were extracted. Up to the present the total number of references prepared for Supplement VII. amounts to about 22,000. All the reference cards are in duplicate, one set being required for the Press, whilst the other forms the basis of a permanent Card Catalogue at Kew into which later Supplements will successively be incorporated.

EXPERIMENTAL GROUND.—The importance of the experimental plot is increasingly evident. Over two hundred species have been grown and studied during the past year, and about 300 sheets have been prepared and laid in the Herbarium, in addition to a large number of duplicate sheets kept for purposes of exchange.

In the genus *Veronica* considerable attention was paid to the *spicata* group, and the following species were studied in detail in all stages from seedling to fruit; *V. spicata* L., *V. orchidea* Crantz and *V. euxina* Turill. Many constant characters were found which had not been recorded from a study of herbarium specimens. *Veronica thracica* was also grown from two wild sources and its interesting life-history ascertained. In connection with the breeding work on *Silene angustifolia* and allied species (which is being carried out in conjunction with Mr. E. M. Marsden-Jones at Potterne), various collections of *Silene* were grown and studied. Cultures of species of *Verbascum* were continued, as were also the investigations on numerous variations exhibited by *Epilobium angustifolium*.

Investigations on the method of hibernation in certain rust-fungi were also commenced.

As a result of the meeting of the Genetical Society held at Kew in June the distribution of "pure" material of known origin, for breeding and cytological research, was arranged with several specialists and with institutions engaged in genetical work.

VISITORS.—About 4820 visits have been made to the Herbarium during the year. Amongst those who have paid frequent visits or made a prolonged stay were:—Mr. E. G. Baker, British Museum (African *Leguminosae*); Mr. Frank Barker, Agricultural Department, Nyasaland Protectorate (*Sorghum*); Miss A. M. Bottomley, Division of Botany, Pretoria (Mycology); Prof. F. O. Bower (Ferns); Mr. N. E. Brown (South African plants); Mr. I. H. Burkill (Malay Peninsula plants); Miss M. E. J. Chandler (Fossil seeds and fruits); Mr. H. F. Comber (Plants of Argentine Andes); Prof. R. H. Comp-

ton, National Botanic Garden, Cape Town (South African and New Guinea plants); Mr. B. O. Coventry, Indian Forest Service (Cashmir plants); Prof. W. G. Craib, University of Aberdeen (Siamese plants); Mr. E. D. Darlington, John Innes Horticultural Institution, Merton (*Prunus* spp.); Dr. J. Burtt Davy, Imperial Forestry Institute, Oxford (Flora of the Transvaal); Mr. H. N. Dixon, Northampton (Mosses); Mr. A. W. Exell, British Museum (miscellaneous); Mr. H. C. Fourcade, South Africa (South African plants); Mr. J. Fraser (Garden plants); Miss E. T. Geddes, University of Aberdeen (Siamese plants); Mr. B. Gilliat-Smith, Tabriz, Persia (Persian plants); Mr. R. D'O. Good, British Museum (miscellaneous); Mr. P. J. Greenway, Imperial Forestry Institute, Oxford (Transvaal plants); Mr. W. B. Grove, Birmingham (Fungi); Dr. Alfred Gunderson, Botanic Garden, Brooklyn, New York (*Frankeniaceae*, Nomenclature); Mr. L. Hall, Messrs. Cross and Bevan's Laboratories (Plant Chemistry); Mr. M. R. Henderson, Singapore Botanic Gardens (Malay plants); Prof. A. Henry, University College, Dublin (Forestry); Dr. D. Hooper, late of Indian Museum, Calcutta (Chinese drugs); Mr. F. R. Irvine, Achimota College, Accra, Gold Coast (Gold Coast plants); Mr. A. Bruce Jackson (Garden Shrubs); Dr. Ivan C. Jagger, Experimental Station, Chula Vista, California (Pathology); Prof. W. L. Jepson, University of California, Berkeley (Flora of California); Miss Mia C. Karsten, Terborg, Gelderland, Holland (Succulents); Prof. G. Koidzumi, Botanical Institute, Imperial University, Kyoto, Japan (Flora of Japan); Prof. Y. Kudo, Hokkaido Imperial University, Sapporo, Japan (Flora of Formosa); Prof. John M. Macfarlane, Philadelphia (*Nepenthes*, etc.); Mr. E. M. Marsden-Jones, Potterne (Genetics); Mr. T. H. Marshall, Dar-es-Salaam (Tanganyika plants); Mr. E. W. Mason, Imperial Bureau of Mycology (Fungi); Mr. R. E. Massey, Department of Agriculture, Khartoum (Grasses); Prof. B. Miyazawa, Miyazaki Agricultural College, Miyazaki, Japan (Genetics); Mr. Spencer Moore, British Museum (various); Prof. C. E. Moss, University of Witwatersrand, Johannesburg (South African *Chenopodiaceae* and *Thymelaeaceae*); Mr. S. K. Mukerji, Lucknow University, United Provinces, India (Flora of Kashmir); Mr. C. Norman (Tropical African *Umbelliferae*); Dr. Alice M. Ottley, Wellesley College, Wellesley, Mass. (*Hosackia*); Mr. R. N. Parker, Dehra Dun (*Dipterocarpaceae*); Mr. R. Paulson, Pinner (Lichens); Dr. R. Lloyd Praeger, Dublin (*Sempervivum*); Mrs. Clement Reid, Milford-on-Sea (Fossil seeds and fruits); Mr. H. N. Ridley, Kew (Plants of Borneo and Sumatra, Distribution of Seeds); Dr. and Mrs. A. J. Riker, University of Wisconsin, Madison, U.S.A. (Bacterial Diseases); Mr. L. A. M. Riley (Plants of "St. George" Expedition); Dr. Geo. H. Rodman (Insectivorous plants); Mr. J. Roffey (*Hieracium*); Mr. C. E. Salmon, Reigate (British plants); Mr. J. R. Shabetai, Ministry of Agriculture, Giza, Cairo (Flora of Egypt); Mr. N. Douglas Simpson, The Cotton Research Board, Giza, Cairo (Egyptian plants); Miss Lilian Snelling (Botanical

Magazine); Dr. O. Stapf (Botanical Magazine, Pritzel's Index Iconum); Capt. F. Kingdon Ward (Flora of Tibet); Mr. R. O. Williams, Royal Botanic Gardens, Trinidad (Flora of Trinidad); Dr. and Mrs. T. G. Yuncker, de Pauw University, Greencastle, Indiana (*Cuscuta*).

As in previous years, Dr. O. Stapf and the staff working under him on the Botanical Magazine and on the new edition of Pritzel's Index Iconum were accommodated on the top floor of the Library. Thanks are due to Dr. Stapf for assistance in various directions, especially in connection with the naming of species of *Ephedra* and of *Gramineae*.

Mrs. Clement Reid and Miss M. E. J. Chandler have made several stays at Kew comparing Oligocene and Eocene fruits and seeds with recent material, especially in connection with their work on the Bembridge beds and the flora of London clay (Catalogue of Cainozoic Plants Vol. i. The Bembridge Flora, British Museum, Natural History).

In the Indo-Malayan field Mr. R. N. Parker, Imperial Forest Botanist of Dehra Dun, stayed at Kew for a month during his leave working out some difficulties connected with *Dipterocarpaceae*. Mr. H. N. Ridley continued work with Malayan plants and contributed two important papers to the Bulletin (see Research, p. 24). He also studied material in connection with his forthcoming work on seed-distribution. Mr. I. H. Burkill was engaged in compiling his "Dictionary of Economic Products of the Malay Peninsula," in which he was assisted by Dr. D. Hooper, late Curator of the Indian Museum, Calcutta. Kew is indebted both to Mr. Ridley and Mr. Burkill for help on various questions concerning Malayan plants.

In addition to naming Kew material sent to Aberdeen throughout the year, Prof. W. G. Craib spent a large part of his summer vacation at the Herbarium working out doubtful points in various Siamese plants. Miss E. T. Geddes, of Aberdeen University, who was awarded a Kilgour Scholarship in Natural Science for two years, decided to spend a year at Kew and commenced work in September on the Siamese flora *Rosaceae* to *Rubiaceae*.

Amongst the Japanese visitors of the year lengthy stays were made by Prof. Y. Kudo (recently appointed Professor of Botany in the Botanical Institute of Taipeh University, Formosa), who studied particularly Formosan botany, and by Prof. Koidzumi, an authority on the flora of Japan, who was chiefly interested in examining the old type specimens of Japanese species.

Mr. B. Gilliat-Smith spent much time at Kew working out an interesting collection of about 500 plants made by him in the neighbourhood of Tabriz in Northern Persia and which he had generously presented to Kew.

Africa was represented by Prof. R. H. Compton and Prof. C. E. Moss, who were at work chiefly with South African *Compositae* and *Chenopodiaceae* respectively, also by Mr. H. C. Fourcade, who, was occupied with the determination of various critical South African plants.

- by Messrs. Elders and Fyffes; Belgian Congo (coll. Mr. F. C. M. Vermoesen and others), by the Jardin Botanique de l'État, Brussels, and (coll. Mr. C. W. von Hirschberg), by the Division of Botany, Pretoria; Uganda (coll. Mr. R. Fyffe), by the Forestry Department, Uganda, and (coll. Mr. T. D. Maitland), by the Department of Agriculture; Kenya Colony, by the Forestry Department, and (coll. J. McDonald), by the Agricultural Department. Tanganyika Territory (coll. Mr. A. E. Haarer), by the Department of Agriculture and Messrs. R. L. Davies, B. D. Burt and F. M. Rogers.
- MASCARENE ISLANDS.—*Presented*: Mauritius, by Mr. R. E. Vaughan.
- SOUTH AFRICA.—*Presented*: Cape Province, *Compositae* and *Cyperaceae*, by Mr. H. G. Fourcade; *Gramineae* and *Cyperaceae*, by Prof. C. E. Moss; Transvaal, by Dr. J. Burt Davy and the Division of Botany, Pretoria; Natal, by Messrs. Bayer and McClean.
- NORTH AMERICA.—*Presented*: Nova Scotia and Georgia, *Hepaticae*, by Miss M. S. Brown; Rhode Island (coll. Mr. A. Vocari), by Prof. R. Pampanini; *Fungi*, by Mr. J. S. Boyce; various, by Prof. L. H. Pammel; 9th Century of North American plants, by the United States Department of Agriculture.
- CENTRAL AMERICA.—*Presented*: Mexico, by Senhor J. Gonzalez Ortega, and (coll. Dr. J. Rose) by the United States National Museum; Costa Rica, by Mr. C. H. Lankester.
- WEST INDIES.—*Presented*: Trinidad (coll. Mr. W. E. Broadway) by the New York Botanical Gardens; (coll. Mr. R. O. Williams) by the Trinidad Department of Agriculture.
Purchased: Mr. W. E. Broadway, Trinidad.
- EAST TROPICAL SOUTH AMERICA.—*Presented*: Brazil (coll. Dr. P. Dusén) by the Rijksmuseum, Stockholm; British Guiana, by the Department of Science and Agriculture; Paraguay, by Mr. C. Osten and Mr. G. Herter.
- WEST TROPICAL SOUTH AMERICA.—*Presented*: Colombia, by the Jardin Botanique de l'État, Brussels.
Purchased: Botanic Garden, Berlin, Bolivia (coll. Mr. José Steinbach).
- TEMPERATE SOUTH AMERICA.—*Presented*: Argentine, by Mrs. J. Raynes: Argentine Andes (coll. Mr. H. F. Comber) by the Royal Botanic Garden, Edinburgh; Uruguay, by Dr. F. Felippone.
- GENERAL.—*Purchased*: Drs. G. Polacci and A. Nannizzi, I Miceti Patogeni, fasc. 5, nos. 41–50.
The original drawings for the late Mrs. E. Vallentin's book on the Falkland Islands have been presented by Messrs. Lovell Reeve and Co.

The Library.

Under this heading are included references to the more important additions to the library received as presentations.

From the Bentham Trustees:—B. Carrichter, *Kräuterbuch . . . darinn begriffen under welchem Zeichen Zodiaci auch in welchem Gradu ein jedes Kraut stehe*, &c., Strassburg, 1601; G. Du Val, *Phytologia, sive philosophia plantarum*, Paris, 1647; F. de Portenschlag-Ledermayer, *Enumeratio plantarum in Dalmatia lectarum*, Vienna, 1824 (13 proof plates, mostly by Rochel, mounted in a folio volume, with MS. notes, also by Rochel, and some printed matter); *Hortus Sanitatis*: Facsimile of Peter Schoeffer's edition, Mainz, 1485, with appendix: *Die Kräuterbücher des XV. und XVI. Jahrhunderts*, by W. L. Schreiber; R. T. Gunther, *Early Science in Oxford*, vol. iii., *The biological sciences*, Oxford, 1925; and A. P. de Candolle, *Plantarum succulentarum historia*, Paris, 1837 [1799–1832]. Some remarks concerning the last named work will be found at the end of the section relating to the library.

A volume of more than ordinary interest and value has been received as a presentation from Captain E. G. Spencer-Churchill, M.C., by whom the work, which was printed by the Oxford University Press in 1925, has been "dedicated and presented to the President and members of the Roxburghe Club." This is entitled *The Herbal of Apuleius Barbarus; from the early twelfth-century manuscript formerly in the Abbey of Bury St. Edmunds* (MS. Bodley 130). Described by Robert T. Gunther. This ancient MS., which is believed to be the earliest Herbal written and illustrated in England, dating from about A.D. 1100, has been reproduced in facsimile by photography. Dr. Gunther has supplied a detailed history of the manuscript and four appendices (I, "The Herbs described in MS. Bodley 130, with Notes"; II, "The Herbarium of Apuleius"; III, "The Book of Extracts from Dioscorides"; IV, "The Medicina Animalium of Sextus Placitus") and an index. Further particulars of this most interesting volume were published in *Nature* of May 1, 1926, p. 617.

Sir Campbell Rhodes, C.B.E., has presented a copy of Mrs. Henry Perrin's handsome work, *British Flowering Plants*. This consists of four quarto volumes, published in 1914, containing 300 full-page coloured plates, reproduced from drawings by Mrs. Perrin, and text by the late Professor Boulger. The edition was limited to 1000 copies. The drawings possess very considerable artistic merit, and Professor Boulger's descriptions and remarks, written in popular language, are excellent, but the work, though so large, is far from being a complete account of British Flowering Plants, as only 290 species are included. A good review of it was published in the *Journal of Botany*, 1914, pp. 134–136.

Four large folio volumes lettered "Prize Oaks of England," containing in all 50 fine photographs of remarkable old oaks, have been presented by the Council of the Royal Photographic Society of Great Britain through the kind offices of Dr. G. H. Rodman.

From Sir William Thiselton-Dyer:—*C. Darwin, *The foundations of the "Origin of Species"*: two essays written in 1842 and 1844; edited by F. Darwin, 1909; H. De Vries, *Plant-breeding*, 1907; *C. R. L. Fletcher, *Edmond Warre*, 1922; O. Heer, *The primaeval world of Switzerland*, 1876, 2 vols.; S. W. Johnson, *How crops feed*, 1870; *E. B. Poulton, *Charles Darwin and the theory of natural selection*, 1896; G. de Saporta, *Origine paléontologique des arbres cultivés ou utilisés par l'homme*, 1888; *Sir R. Strachey, *Catalogue of the plants of Kumaon* . . . revised by J. F. Duthie, 1906; A. R. Wallace, *The world of life*, 1910; and *R. Woodward, *Hortus Arleyensis*, 1907. Autograph letters are inserted in the volumes indicated by asterisks.

From Lieut.-Col. Sir David Prain:—The year's issues, in continuation, of a number of periodicals, including the *Berichte der Deutschen Botanischen Gesellschaft*, *Bulletin de la Société Botanique de France*, *Proceedings of the American Philosophical Society*; also the *Year-Book of Pharmacy* . . . and *Transactions of the British Pharmaceutical Conference*, 1925, and *The Forests of India*, by E. P. Stebbing, vol. iii.

From Dr. Otto Stapf: *Taschenflora des Alpen-Wanderers*, by L. and C. Schroeter, 1889, and *Coloured vade-mecum to the Alpine flora*, ed. 16 and 17 (in one), by the same authors; also several pamphlets and a typed index to Dr. Handel-Mazzetti's *Plantae novae sinenses*.

The late Mr. J. S. Gamble's working copy of Munro's *Monograph of the Bambusaceae*, 1868, with many additions of printed and manuscript notes, indexes, and a few autograph letters, and his copy of Ruprecht's *Bambuseae*, 1839, have been presented by Mrs. Gamble.

From the Trustees of the British Museum:—*Flora of Jamaica*, by W. Fawcett and A. B. Rendle, vol. v; *Catalogue of the Cainozoic plants in the Department of Geology*, vol. i, *The Bembridge flora*, by Mrs. E. M. Reid and Miss M. E. J. Chandler; *Monograph of the British Lichens*, by Miss A. Lorrain Smith, pt. II, ed. 2.

The Secretary of State for Foreign Affairs has presented through the Ministry of Agriculture and Fisheries a copy of the *Carte phytogéographique de l'Algérie et de la Tunisie*, with text by Dr. R. Maire, published during the year by the Government General of Algeria (Direction of Agriculture, etc.).

Two copies of Mr. J. S. Gamble's *Flora of the Presidency of Madras*, part 7, which was published shortly after his death on Oct. 16, 1925, have been received from the Secretary of State for India.

The publications of the Botanic Garden ('s Lands Plantentuin), Buitenzorg, received in 1926, include the *Annales du Jardin Botanique de Buitenzorg*, vol. xxxv, pte 2, and vol. xxxvi; *The Zooecidia of the Netherlands East Indies*, by Mrs. J. Docters van Leeuwen-Reijnvaan and Dr. W. M. Docters van Leeuwen; and the 8th part of *Mikrographie des Holzes der auf Java vorkommenden Baumarten*, by Dr. H. H. Janssonius. The Department of Agri-

culture in the Netherlands East Indies has continued to send the *Mededeelingen* of its various sections.

Under the title of *Flora Salvadoreña* the Ministry of Public Instruction of the Republic of Salvador published during 1926 two volumes containing 200 photographs of plants of the republic, with text including short descriptive remarks and the botanical and common names. A few of the photographs are coloured. A copy of this work has been presented by Señor Rodolfo Duke, of San Salvador.

Among the numerous new scientific periodicals which have come into existence during the last few years is *Preslia*, which is published by the Czechoslovak Botanical Society of Prague, from which fascicles 2 and 3 have been received. It contains short papers relating to Czechoslovak botany, in Czech, with summaries in French or English, lists of Czechoslovak botanical literature and biographical notes.

From the Editor of *Nature*:—R. A. Davis, *Citrus growing in South Africa*; J. Halsham, *Every man's book of garden flowers*, and *Every man his own gardener*; A. Handel Hamer, *Wild flowers of the Cape; a floral year*, illustrated; H. Waddington, *Planting directory of Southern India*.

Books received from their publishers, all of which have been briefly reviewed in the *Kew Bulletin*. From the Clarendon Press, Oxford:—H. S. Blunt, *Gum arabic, with special reference to its production in the Sudan*; Sir F. Keeble, *Life of plants: Index kewensis*, Suppl. vi (10 copies). From Country Life:—M. C. Allwood, *Carnations for every garden and greenhouse*; W. J. Bean, *Ornamental trees for amateurs*; R. V. G. Woolley, *Herbaceous borders for amateurs*. From Messrs. Dulau:—W. Dallimore, *The pruning of trees and shrubs*. From Messrs. Longmans:—J. Burt Davy, *A manual of the flowering plants and ferns of the Transvaal*, etc., pt. 1. From Messrs. Macmillan:—H. H. Hume, *The cultivation of citrus fruits*; J. Hutchinson, *The families of flowering plants*, I, *Dicotyledons*; and *Key to the families of the Dicotyledons*, from the preceding; W. H. Johnson, *Cotton and its production*. From Messrs. Lovell Reeve:—A. W. Darnell, *Winter blossoms from the outdoor garden*.

Most of the publications mentioned in this paragraph are independent works, with a few reprints from journals, which have been presented by their authors unless otherwise stated:—W. G. Attwood and others, *Marine structures: their deterioration and preservation*, 1924 (Report of the National Research Council), (from the National Research Council, Washington); E. Autran and Th. Durand, *Hortus Boissierianus*, 1896 (from Mr. Maurice Barbey de Budé); E. G. Baker, *The Leguminosae of Tropical Africa*, pt. 1; E. Battiscombe, *A descriptive catalogue of some of the common trees and woody plants of Kenya Colony* (from the Government of Kenya Colony); F. Börgesen, *Marine Algae from the Canary Islands*, pt. II; H. P. Brown, *An elementary manual of Indian wood technology*, 1925 (from the Government of India Central Publication Branch, Calcutta); M. E. J. Chandler, *The upper eocene flora of Hordle*,

Hants, pt. I, 1925; R. Chodat, *Scenedesmus: étude de génétique, de systématique expérimentale et d'hydrobiologie*; Miller Christy and Hansford Worth, *The ancient dwarfed oak woods of Dartmoor*, 1922 (from Mr. T. A. Sprague); W. G. Craib, *Florae Siamensis enumeratio*, vol. i, pt. 2 (from the Siam Society, Bangkok); W. Dallimore and others, *The selection and cultivation of hardy trees and shrubs for the public and private gardens at Bournemouth* (from Sir Daniel Morris); J. Burtt Davy, *Manual of the flowering plants and ferns of the Transvaal with Swaziland, South Africa*, pt. 1, and *Handbook of Conifers grown in the Arboretum, Bagley Wood, Oxford*; E. De Wildeman, *Plantae Bequaertianae*, 2 pts., 1924-25, and *Les forêts congolaises et leurs principales essences économiques; East African grasses* (with text by C. E. Hubbard) 4 copies (from the Crown Agents for the Colonies); Federated Malay States, *Proceedings of the Forest Conference*, 1926 (from Mr. Fraser Story); B. Fedtschenko, *Flora Aziatskoi Rossii*, pts. 4-II, 13-15, 1914-20; C. E. C. Fischer, *Descriptive list of the forest flora of East-Central Madras*, 1923; G. Forrest, *Some plants, shrubs, and trees found . . . in 1925* (from Mr. J. C. Williams); G. W. Grabham and R. P. Black, *Report of the mission to Lake Tana*, 1920-21, 1925; U. P. Hedrick and others, *The small fruits of New York*, 1925; Mrs. H. Resvoll Holmsen, *Exploration du nord-ouest du Spitzberg entreprise . . . par la mission Isachsen: observations botaniques*, 1913; C. Hummel, *Report on the forests of British Honduras*, 1925 (from the Conservator of Forests, British Honduras); *Illustrations of Japanese fungi*, tt. 17-20, with text and index, [1925?] (from the Forest Experiment Station, Meguro, Tokyo); W. L. Jepson, *Flora of California*, pts. 6 and 7, 1922; R. Kanehira, *Anatomical characters and identification of the important woods of the Japanese Empire*; A. W. Knapp, *Cocoa and chocolate: their history*, etc., 1920, and 5 pamphlets; V. L. Komarov, *Introduction à l'étude de la flore de l'Iakoutie*; C. E. Lane-Poole, *The forest resources of the territories of Papua and New Guinea*, and *Report on the forests of Norfolk Island* (from the Government of the Commonwealth of Australia, Home and Territories Department); J. I. Liro, *Tärkeimmät tuhosienet* [Parasitic fungi], 1917 (from Dr. E. J. Butler), and *Die Ustilagineen Finnlands*, I, 1924 (from Mr. A. D. Cotton); D. T. MacDougal, *The hydrostatic system of trees* (from the Carnegie Institution of Washington); J. H. Maiden, *Critical revision of the genus Eucalyptus*, pts. 65 and 66, 1925-26 (from Director, Botanic Gardens, Sydney); Alice Martineau, *The herbaceous garden*, 1923; K. Miyabe, *Festschrift*, 1911 (from Prof. K. Miyabe); K. Miyabe and Y. Kudo, *Icons of the essential forest trees of Hokkaido*, fasc. 11-14, 1925-26 (from the Government of Hokkaido, Japan); S. Murbeck, *Contributions à la connaissance de la flore du Maroc*, I-II, 1922-23, and *Monographie der Gattung Celsia*, 1925; F. Niedenzu, *Arbeiten aus dem botanischen Institut der staatl. Akademie in Braunsberg*, VIII (containing papers on *Malpighiaceae*); *North American Flora*, vol. 7, pt. 11 (from Dr. N. L. Britton); W. Nylander and A. Hue, *Addenda nova ad lichenographiam europaeam*, 1886-88 (from Miss

E. M. Wakefield); C. W. Peck, *Australian legends*, 1925 (from Dr. F. A. Rodway); C. C. Robertson, *The trees of extra-tropical Australia . . . from the point of view of their cultivation in South Africa* (from the Forest Department, Pretoria); R. A. Rye, *The libraries of London*, ed. 2, 1910; C. Skottsberg, *Juan Fernandez and Hawaii: a phytogeographical discussion*, 1925; H. H. Smith, *Ethnobotany of the Menomini Indians*, 1923, etc. (from Mr. T. A. Sprague); *Statistical atlas of the Bombay Presidency*, ed. 3, 1925 (from the Director of Agriculture, Bombay Presidency); F. Stephani, *Species Hepaticarum*, vol. vi, pp. 177-765, 1921-25 (from Prof. R. Chodat); A. G. Tansley and T. F. Chipp, *Aims and methods in the study of vegetation* (from the British Empire Vegetation Committee); N. I. Vavilov, *Studies in the origin of cultivated plants*; P. Vuillemin, *Les anomalies végétales: leur cause biologique*; W. Webb, *Garden first in land development*, ed. 2, 1920 (from Mr. J. H. Holland); F. A. F. C. Went, *Untersuchungen über Podostemaceen*, II-III, 1912 and 1926; O. F. Wuyts, *Le Dahlia: son histoire, sa culture*, etc. When the year of publication is not given it is 1926.

Periodical and serial publications received during the year include the following, which have been presented by their editors, or by the societies or institutions issuing them, unless otherwise stated:—*Acta Horti Botanici Universitatis Latviensis*, no. 2; *Acta Horti Gothoburgensis*, ii; *Acta Instituti et Horti Botanici Tartuensis*, vol. i, fasc. 1; *Annals of the Bolus Herbarium*, vol. iv, pt. 2; Bernice P. Bishop Museum, Honolulu, *Bulletins* 19, 25, 28, and *Special Publication* 10; Boyce Thompson Institute for Plant Research, Yonkers, New York, *Contributions*, vol. i, nos. 1-3, and *Professional Papers*, nos. 1-2; British Association for the Advancement of Science, *Report*, 1925 (from Miss E. M. Wakefield); *Bulletin du Jardin Botanique de Kieff*, nos. 2-3; *Bulletin of the Rubber Growers' Association*, vol. viii; Canada, National Research Council, *Reports*, nos. 17-18; Cheshunt, Experimental and Research Station, Turner's Hill, *Reports* 5-11; *Contributions du Laboratoire de Botanique de l'Université de Montreal*, nos. 4-5; East Malling Research Station, *Annual Report*, 1924; *Empire Cotton Growing Review*, vol. iii; Indian Tea Association, *Quarterly Journal*, 1925, pt. 4, 1926, pts. 1-3; *Folia Cryptogamica*, Szeged, Hungary, vol. i, no. 3; *Journal of the Arnold Arboretum*, vol. vii, nos. 1-3; *Journal of the Federated Malay States Museums*, vol. xiii, pts. 1-3; *Journal of the Gold Coast Agricultural and Commercial Society*, vol. iv, no. 3, vol. v, no. 1; *Journal and Proceedings of the Royal Society of New South Wales*, vol. lix; Liverpool University, *Publications of the Hartley Botanical Laboratories*, nos. 1-2; Lyon, Société Linneenne, *Annales*, 1925, and *Bulletin*, 1926 (from Dr. A. W. Hill); Marlborough College Natural History Society, *Report*, 1925; *Mémoires publiés par la Société Portugaise des Sciences Naturelles*, sér. zool., no. 2, sér. biol., no. 4; *Nederlandsch Kruidkundig Archief*, 1925; Nigeria, Geological Survey, *Bulletins* nos. 8-9 (from the Crown Agents for the Colonies); *Orchid Review*, vol. xxxiv; *Oxford Forestry*

Memoirs, nos. 4-6; *Proceedings of the Imperial Academy of Japan*, vol. ii, nos. 1-8; *Proceedings of the Pan-Pacific Science Congress, Australia*, 1923, 2 vols. (from the Council for Scientific and Industrial Research, Melbourne); *Recueil des Travaux Botaniques Néerlandais*, vol. xxii, livr. 1-4, vol. xxiii, livr. 1-2; *Rhododendron Society Notes*, vol. i-ii; Rothamsted Experimental Station Library, *Catalogue of the printed books on agriculture published between 1471 and 1840, with notes on the authors*; Royal Agricultural Society of England, *Agricultural research in 1925*; Royal Horticultural Society, *Journal*, vol. li, pt. 2, and *List of awards to decorative plants, fruits and vegetables*, 1911-14; *Sarawak Museum Journal*, vol. iii, pts. 1-2; Tohoku Imperial University, Sendai, Japan, *Science Reports*, ser. 2, vol. vii, no. 4, vol. ix, no. 1, vol. x, no. 2; ser. 4, vol. i, nos. 3-4; *Transactions and Proceedings of the New Zealand Institute*, vol. lvi; *Transactions of the Royal Society of South Africa*, vol. xiii, pts. 2-4, vol. xiv, pt. 1; *Travaux du Laboratoire de Matière Médicale de la Faculté de Pharmacie de Paris*, tome xvi (from Prof. E. Perrot); *Tropical Woods*, nos. 5-8 and contents and index to nos. 1-8; Watson Botanical Exchange Club, *Annual Report*, 1925-26 (from Mr. H. S. Thompson); *The Wellcome Bureau of Scientific Research and Museum of Medical Science*, 1926 (an illustrated account of the buildings and exhibits, with a list of scientific papers prepared in the Wellcome Physiological Research Laboratories); *Welsh Journal of Agriculture*, vol. ii (from Prof. R. G. Stapledon); Yale University School of Forestry, *Bulletins*, nos. 15-18.

Numerous papers, usually reprints from journals or other publications, forming additions to the large collection of tracts in the library, have been received from their authors or in a few cases from other sources. The principal contributors of these have been:—Mr. W. R. G. Atkins, Prof. E. B. Babcock, Botanical Department of Purdue University, Botanical Department of the University of Melbourne, Prof. V. F. Brotherus, Dr. P. Bugnon, Miss A. Camus, Mr. H. Chermeson, Major T. F. Chipp, Dr. H. A. Gleason, Dr. A. W. Hill, Prof. C. C. Hosseus, Prof. E. C. Jeffrey, John Innes Horticultural Institution, Dr. J. M. Macfarlane, Mr. F. Pellegrin, Mr. T. Petch, Polish Society of Naturalists, Mr. Paul Popenoe, Dr. A. B. Rendle, Prof. A. K. Schindler, Prof. Hans Schinz, Mr. T. A. Sprague, Mr. I. Thériot, Prof. J. C. Th. Uphof, Dr. Th. Valetton, Mr. C. T. White, and Prof. R. H. Yapp.

Societies, academies, and other institutions, from which publications have been received, and which have not already been mentioned, include the following:—Royal Swedish Academy of Sciences, Stockholm; Royal University, Upsala; Danish Botanical Society; Botanical Garden, Copenhagen; Botanical Garden, Utrecht; Botanical Garden, Leningrad; Muséum National d'Histoire Naturelle, Paris; Botanical Museum, University of Zurich; Institute of Botany, University of Geneva; Botanical Society of Geneva; Faculty of Science, Masaryk University, Brno; Agricultural Research Institute, Pusa; Indian Tea Association, Calcutta; Department of Agriculture, Peradeniya; Bureaux of

Science, Agriculture and Forestry, Philippine Islands; Departments of Agriculture of Queensland, New South Wales, and Victoria; Ministry of Agriculture, Egypt; Union of South Africa Department of Agriculture; Botanical Survey of South Africa; United States Department of Agriculture; Smithsonian Institution, Washington; Gray Herbarium of Harvard University; Brooklyn Botanical Garden; Cornell University Agricultural Experiment Station; Missouri Botanical Garden; Field Museum, Chicago; California Academy of Sciences; University of California; and Dirección de Estudios Biológicos, Mexico.

The copy of Candolle's *Plantarum succulentarum historia*, which has been presented by the Bentham Trustees, is a fine example of the large paper issue, in a remarkably clean condition and uncut. It is believed that it contains all the plates and text published; thus, apparently, it is one of the very few copies of which this could be said. The work was issued on small as well as on large paper, and copies of both sizes are known to vary considerably in the number of plates and in the amount of text they contain. As it has been stated that no text to certain plates was ever published it is thought to be desirable to give some particulars of the copy recently acquired, from which it will be seen that the text, which is so often deficient in copies of the work, and has accordingly been regarded as non-existent, was actually issued.

The imprint on the title-page of each of the two volumes is the same and reads: "A Paris chez Garnery, Libraire. MDCCCXXXVII." There is a second title-page in vol. i the imprint of which has "Chez A. J. Dugour et Durand, Libraires," and the year "An VII." The same preface is used for both volumes, but at the foot of that in vol. ii occur the words "Paris, 15 Ventôse An VIII" [= March 5, 1800]. There are 187 plates, all of them accompanied by descriptive text. The arrangement of text and plates in this copy is alphabetical, but there are a few exceptions; thus, the two species of *Mesembryanthemum* issued in the final part (livraison 31) are placed at the end of the other species of the genus, and not in alphabetical order. At the end of the second volume is a "Table des espèces contenues dans les trente premières livraisons de l'Histoire des plantes grasses." We know that 31 livraisons were issued. The plates, all with text, contained in the 31st livraison are: t. 172, *Stapelia grandiflora*; t. 173, *Talinum patens*; t. 174, *Kalanchoe crenata*; t. 175, *Reaumuria vermiculata*; t. 176, *Mesembryanthemum lacerum*; and t. 177, *M. crassifolium*. All these are included in the copy now at Kew.

The work terminated, it would appear, with the plate and text of *Mesembryanthemum crassifolium* (t. 177). That there should be 187 plates in a complete copy is explained by there being two or more plates of certain species for which the same number is employed. Thus, there are four plates illustrating varieties of *Cactus Opuntia* the text of which is numbered 138 and 138*.

The cause of the incompleteness of so many copies of this work

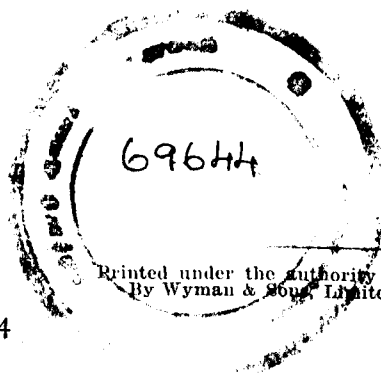
is no doubt due to an interruption in its publication, which occurred after the issue of livraison 28, and this can be traced to a dispute between A. P. de Candolle and the publisher of it, Garnery. Candolle had made some arrangement with Garnery for the publication by him of a work on parasitic fungi by R. A. Hedwig. Notwithstanding this arrangement Garnery, as stated by Candolle (*Memoires*, p. 143) "s'en dégoûta au bout de quelque temps. Ne voulant pas paraître négligent aux yeux d'Hedwig, j'engageai Garnery à lui écrire pour lui expliquer ses motifs. Il le promit et ne le fit pas. Je me fâchai et lui déclarai que je ne lui donnerais plus de texte des *Plantes grasses* jusqu'à ce qu'il eût écrit: il se piqua, et quoiqu'il eût alors huit à dix livraisons gravées il ne voulut pas écrire; je tins bon, et cet incident a déterminé la cessation de la publication des *Plantes grasses*. Dès lors Garnery fit banqueroute. Je n'entendis plus parler de lui jusqu'en 1829, qu'il vint me proposer de reprendre l'entreprise. J'avais alors d'autres idées; je cédai l'affaire à Guillemin, brave jeune homme dont je parlerai dans la suite, mais l'ouvrage ne fut pas repris."

As already shown the work was resumed and text to livraisons 29 to 31 was eventually published, that to 29 and 30 in 1832 (see Lasègue in *Ann. Sci. Nat.* 2e sér., xvii, p. 295). Lasègue does not mention the text of livraison 31. It was very probably published also in 1832. The text of 3 of the plates in these livraisons was written by Candolle and that of the other 15 by Guillemin.

For many years there has been at Kew a copy of the small paper issue. This contains 192 plates, being all those in the large paper issue and 5 additional ones, which are placed at the end of the work and are apparently proofs of plates that were never published. These 5 plates are: *Stapelia punctata*, *Sesuvium revolutum*, *Agave vivipara*, *Mesembryanthemum apetalum* (a tracing of a drawing which is the same as that on t. 88 and there intended for *M. nodiflorum*), and *Crassula scabra brevifolia*. In this copy there is no text after that to plate 159.

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