QK1
.B956
1907

Kew. ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1907.



LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
By DARLING & SON, Ltd., 34-40, Bacon Street, E.

And to be purchased, either directly or through any Bookseller, from
WYMAN and SONS, Ltd., Fetter Lane, E.C; or
OLIVER & BOYD, Tweeddale Court, Edinburgh; or
E. PONSONBY, 116, Grafton Street, Dublin.

1907.

Price Five Shillings.

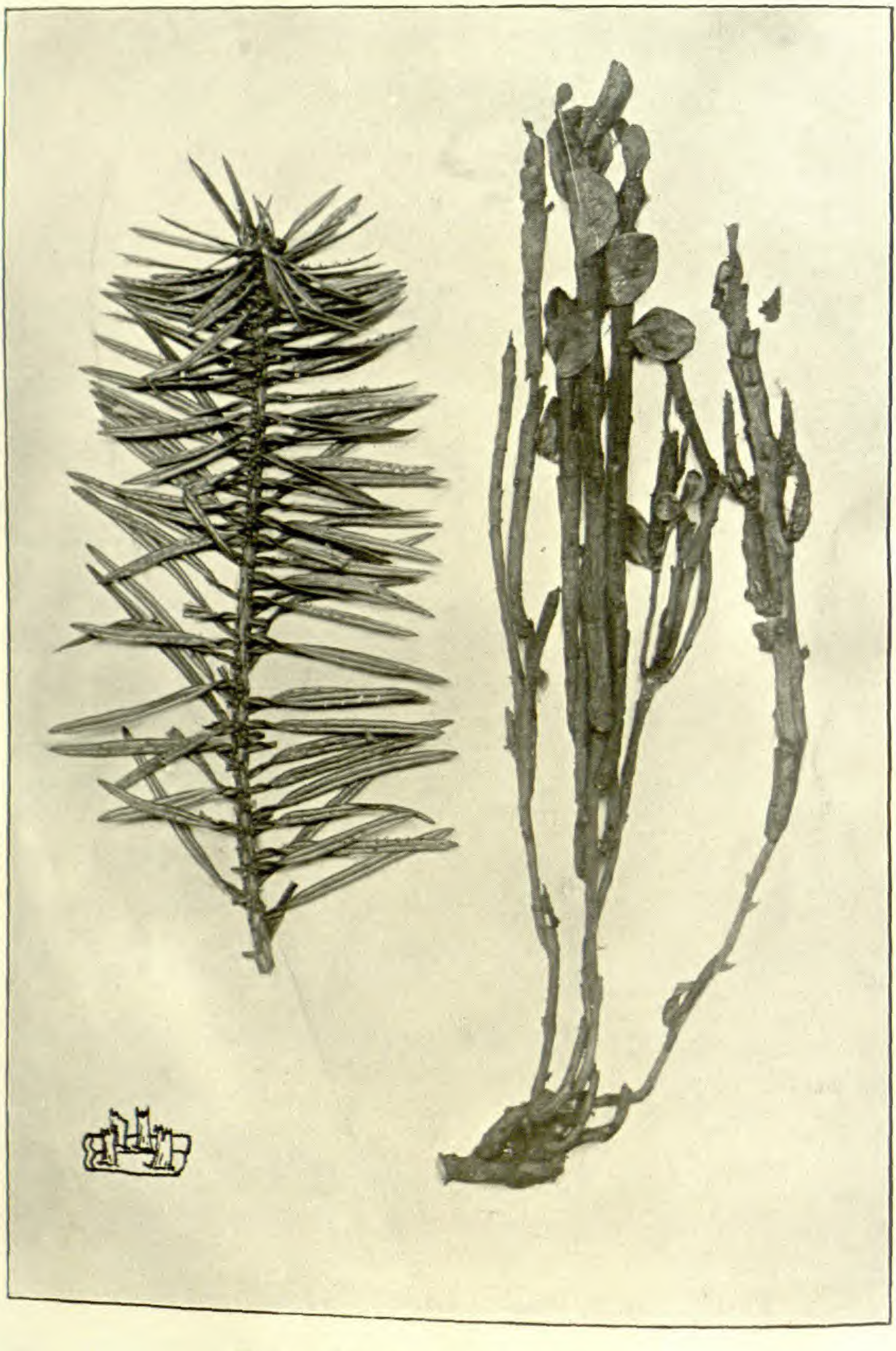
CONTENTS.

No.	Article.	Subject.	Page.
1	I.	Plant Diseases.—VII. "Cluster-cup" Disease of Conifers (with plate)	1
"	II.	The Chinese species of *Eriocaulon*	3
"	III.	Ramie in Tirhut (*Boehmeria nivea*) ...	4
"	IV.	T'ang-shên (*Codonopsis Tangshen*) (with plate)	9
"	V.	The Synonymy and Distribution of the Species of *Tricuspidaria*	10
"	VI.	Reductions of the Wallichian Herbarium.—I. *Bignoniaceae*; Pedalineae	16
"	VII.	Miscellaneous Notes	18
2	VIII.	Marine Algae from the Chatham Islands ...	37
"	IX.	The Western Catalpa (*Catalpa cordifolia*)...	43
"	X.	Diagnoses Africanae: XIX.	45
"	XI.	Sassafras in China (*Sassafras Tzumu*) ...	55
"	XII.	Decades Kewenses: XLIII.	56
"	XIII.	Economic Notes: Liverpool	61
"	XIV.	Miscellaneous Notes	65
3	XV.	Ginseng in Corea (*Aralia quinquefolia*, var. *Ginseng*)	73
"	XVI.	Plants from Labrador...	76
"	XVII.	Distillation of Camphor (*Cinnamomum Camphora*)	88
"	XVIII.	*Chlamydites:* a new Genus of Compositae	90
"	XIX.	Alpine Notes from Sikkim (with plate) ...	92
"	XX.	Reductions of the Wallichian Herbarium.—II. Gesneraceae	94
"	XXI.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: II. ...	97
"	XXII.	Miscellaneous Notes	100
4	XXIII.	Gutta Percha Trees of the Malay Peninsula	109
"	XXIV.	Fungi Exotici: VI.	121
"	XXV.	A Revision of *Dubouzetia*	125
"	XXVI.	New Orchids.—Decade 30	128
"	XXVII.	Miscellaneous Notes	132
5	XXVIII.	N'hangellite and Coorongite...	145
"	XXIX.	Report on a Sample of N'hangellite from Inhambane, Portuguese East Africa ...	151
"	XXX.	American Rubber Plants	153
"	XXXI.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: III. (with plate)	156
"	XXXII.	African Tree Rubber	187
"	XXXIII.	Mud-binding Grasses (*Spartina stricta* and allied forms)...	190
"	XXXIV.	Miscellaneous Notes	197
6	XXXV.	The Grasses of British Somaliland	203
"	XXXVI.	The Flowering of Cultivated Bamboos ...	228
"	XXXVII.	Accession of Tropical African Plants from *1899–1906*	233
"	XXXVIII.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: IV. (with plate)	238
"	XXXIX.	A New Chinese Rhododendron	244
"	XL.	Miscellaneous Notes	246

No.	Article.	Subject.	Page.
7	XLI.	The Linnean Bicentenary	251
,,	XLII.	New or Little-known Marine Algae from the East (with plate)	260
,,	XLIII.	Reductions of the Wallichian Herbarium.—III. Cyperaceae	264
,,	XLIV.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: V. ...	282
,,	XLV.	Mgoa Rubber in British East Africa (*Mascarenhasia elastica*)...	283
,,	XLVI.	Guayule Rubber (*Parthenium argentatum*)	285
,,	XLVII.	A New Rubber Tree: Palo Amarillo (*Euphorbia fulva*)	294
,,	XLVIII	Miscellaneous Notes	296
8	XLIX.	Plant Diseases.—VIII. Degeneration in Potatoes (with plate)	307
,,	L.	The Cricket Bat Willow (with plates) ...	311
,,	LI.	Decades Kewenses: XLIV.	316
,,	LII.	The Genus *Pergularia*	323
,,	LIII.	Miscellaneous Notes	325
9	LIV.	Some Notes on a Journey from Walfish Bay to Windhuk (with map and plates) ...	339
;	LV.	Diagnoses Africanae: XX.	360
,,	LVI.	Additions to the Florula Marmarica ...	365
,,	LVII.	Miscellaneous Notes	369
10	LVIII.	The Gums Ammoniac of Morocco and the Cyrenaica	375
,,	LIX.	Visit to Newport and South Wales	388
,,	LX.	Zapupe Fibre Plant	396
,,	LXI.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew: VI. (with plate)	401
,,	LXII.	Miscellaneous Notes (with figs.)	403
Appendix I.	—	List of seeds of hardy herbaceous plants and of trees and shrubs	1
,, II.	—	Catalogue of the Library. Additions received during 1906...	25
,, III.	—	New garden plants of the year 1906 ...	55
,, IV.	—	Botanical Departments at home and in India and the Colonies	81
,, V.	—	List of Kew Publications, 1896–1906 ...	95

Errata.

Page 141, lines 2 and 26 from bottom, for *Meconopsisis* read *Meconopsis*.
Page 200, line 22 from top, *for* April *read* May.
Page 360, line 15 from top, *for* XIX. *read* XX.



CLUSTER-CUP DISEASE OF CONIFERS.

To face p. 1.

In the first place it is evident that both descriptions contain characters of at least two very different plants. Cav. Diss., t. 158, fig. A, is *apparently* a bad figure of the species figured by Hooker and Arnott in 1833 under the same name, *Crinodendron Patagua*, and redescribed by Miquel in 1852 under the name *Tricuspidaria lanceolata*. Hooker and Arnott have been followed by Kuntze (1891) in their identification of fig. A.

C. Gay, on the other hand, followed by K. Schumann (1890) and Reiche (1896), identified Cavanilles's figure with *Tricuspidaria dependens*, Ruiz et Pav., and gave to *Crinodendron Patagua* Hook. et Arn., the new name *Crinodendron Hookerianum*. Unfortunately, Gay did not state on what grounds he based his reversal of Hooker and Arnott's identification; whether, in fact, he had seen type specimens of Molina or Cavanilles, or not.

Comparison of fig. A, and of the descriptions given by Molina and Cavanilles, with *T. dependens* and *T. lanceolata*, yields the following points in favour of the identity of *Crinodendron Patagua*, Molina, with *T. lanceolata* :—1, leaves lanceolate, acute; 2, flowers and flower-buds more nearly the shape and size of those in *T. lanceolata*; 3, petals shown as apparently entire [in *T. lanceolata* the petals are much less obviously trifid than in *T. dependens*].

The only point in favour of *C. Patagua*, Molina, being conspecific with *T. dependens*, Ruiz et Pav., is the native name, viz., *Patagua**, which is the same in both.

Both Molina and Cavanilles describe the stamens of *Crinodendron Patagua* as 10 in number, and monadelphous, and this part of their descriptions together with the great diameter of the trunk (7 ft.) point to a tree of another family having been confused with *T. lanceolata* by Molina. Fig. B of Cavanilles shows the 10 monadelphous stamens, and is, therefore, also to be excluded. Figs. C, D, E may conceivably have been drawn from a fruit of *Tricuspidaria*, but if so the reproduction is wretchedly inaccurate.

In conclusion, it may be well to give our reasons for adopting the name *Tricuspidaria* instead of *Crinodendron*, and the combination *T. lanceolata* in preference to any of its synonyms.

1. The genus *Crinodendron*, Molina, was based (in 1782) on a *mixture* of at least two species, belonging to different families.

2. It remained of doubtful position until re-described in 1833 and referred to the *Elaeocarpeae* by Hooker and Arnott. In the meantime it was placed among *Plantae incertae sedis* in Juss. Gen. Pl. (1789), p. 431; retained in *Monadelphia Decandria*, in Gmel. Syst. (1791), p. 1026, and Spreng. Syst. vol. iii. (1826), p. 78; transferred to *Linozosteae*, in Spreng. Anleitung, p. 889 (1818); to *Euphorbiaceae*, in Agardh Aphor., p. 195 (1823); and doubtfully placed in *Samydeae*, in Reichb. Consp. (1828), p. 177.

Tricuspidaria, on the other hand, was accurately described and figured in 1794, and placed in *Dodecandria Monogynia*; more

---

* According to Gay, Fl. Chil., vol. ii., p. 393, the name *Patagua* is also applied (in Valdivia) to *Eugenia planipes*, Hook. et Arn.

fully figured in 1802; placed in *Tiliaceae* by St. Hilaire in 1805 (Expos., vol. ii., p. 94, ex Pfeiffer); and transferred to *Elaeocarpeae* in 1824 (DC. Prodr., vol. i., p. 520).

3. The species *Crinodendron Patagua*, Molina, cannot now be identified with *certainty*.

The specific name *lanceolata* is the earliest (in the species under consideration) about which there is *no ambiguity*. The adoption of the specific name *Patagua* would imply the identity of the doubtful *C. Patagua*, Mol., with *T. lanceolata*, Miq., and this cannot be proved; it is also undesirable on account of the pre-existing *T. Patagua*, Miers, now reduced to *T. dependens*, Ruiz et Pav. The adoption of the name *Hookeriana* is also open to objection, since it implies that Gay was right in identifying *C. Patagua*, Mol., with *T. dependens*, Ruiz et Pav. The two remaining specific names available are *lanceolata* and *hexapetala*; the former is the earlier and is more diagnostic.

VI.—REDUCTIONS OF THE WALLICHIAN HERBARIUM.—I. BIGNONIACEAE; PEDALINEAE.

C. B. Clarke.

The Wallichian Herbarium was the Herbarium belonging to the Honourable East India Company. Its contents were distributed under the Company's orders in 1828 and subsequent years by Dr. N. Wallich, F.R.S., with the assistance of various other botanists. The type set was presented by the Company to the Linnean Society of London, at whose premises it is now preserved. At various times the late Mr. C. B. Clarke and others have had occasion to critically examine portions of this type set, and Mr. Clarke has left in manuscript the reductions resulting from his examination of the specimens.

These reductions are likely to be of practical utility to those in charge of the various distributed sets of the Herbarium, and in order that they be more readily available it is proposed to publish them in the *Kew Bulletin*.

Bignoniaceae.

487. *Incarvillea Emodi*, Wall. (1 sheet), left-hand example = Amphicome arguta, Lindl.; right-hand examples = Amphicome Emodi, Lindl.

6498. *Bignonia undulata*, Roxb. (2 sheets) = Tecoma undulata, G. Don.

6499. *Bignonia suaveolens*, Roxb. (8 sheets) = Stereospermum suaveolens, DC.

6500. *Bignonia fimbriata*, Wall. (1 sheet) = Stereospermum fimbriatum, DC.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1.] [1907.

I.—PLANT DISEASES.—VII. "CLUSTER-CUP" DISEASE OF CONIFERS.

(*Calyptospora Goeppertiana*, Jul. Kühn.)

(With Plate.)

G. MASSEE.

The term "cluster-cup" is used popularly in this country to designate the Aecidium-form of fruit of many of the "rusts" or Uredines. It appears in the shape of tiny white cups with frilled edges, filled with yellow spores, growing in dense clusters on the living leaves of many of our wild and cultivated plants. The fungus causing this disease is one of those parasites which, when opportunity offers, grows on two different kinds of host-plant during different periods of its development. The resting-spore stage grows on *Vaccinium*, and the "cluster-cup" stage on various conifers.

It has been proved, however, that when conifers are not forthcoming, the "cluster-cup" or Aecidium-stage can be left out of the cycle of development of the fungus, which continues to reproduce itself entirely on its *Vaccinium* host. On the other hand when *Vaccinium* and conifers grow together, the fungus certainly passes from the former to the latter, and often proves very destructive to young trees and nursery stock, causing defoliation early in the season. It may be mentioned that in some other "rusts" or Uredines, to which group the present fungus belongs, the Aecidium- or "cluster-cup" stage may drop out without in any way interfering with the continuation of the species. This frequently happens in the case of a rust of wheat—*Puccinia graminis*, DC. In many other rusts the "cluster-cup" stage has been permanently left out of the cycle of development.

1375 Wt 72 1/07 D & S 29 26873

In Europe the resting-spore condition of this fungus has only been met with on the Cowberry—*Vaccinium Vitis-Idaea*, L. In addition to this host it also occurs on *V. Myrtillus*, L., and *V. Chandleri*, Jepson, in the United States. It has been recorded as occurring on *Salix* in the United States, but an examination of the specimen in the Kew Herbarium on which this report was founded, shows that the plant is *Vaccinium Vitis-Idaea*, L.

The "cluster-cup" stage occurs spontaneously on the Silver fir—*Abies pectinata*, DC., and on *A. Nordmanniana*, Spach. Infection experiments have shown that the fungus will also develop on *Abies nobilis*, Lindl., *A. magnifica*, A. Murr., *A. concolor*, Lindl., *A. balsamea*, Mill., *A. Fraseri*, Lindl., *A. cephalonica*, Lond., *A. cilicica*, Ant. & Kotschy, *A. Pictita*, Forbes, *A. Pinsapo*, Boiss., and *A. Veitchii*, Lindl.

On the other hand *Tsuga canadensis*, Carr., and *T. Douglasii*, Carr., have resisted all attempts at infection.

The appearance presented by Cowberry plants when diseased is very striking. All the branches grow perfectly erect, the entire plant grows much taller than uninfected plants, and the leaves are much stunted. The fungus attacks the stem, which becomes much swollen and spongy in texture. The colour of the swollen stem is at first clear pink, gradually changing to brown and finally almost to black. The resting-spores or teleutospores of the fungus are produced in the epidermal cells of the swollen stem, and in the spring following the period of infection, germinate *in situ* and send delicate threads through the epidermis of the host-plant into the air. These threads bear very minute secondary spores, which are scattered by wind. Some of these spores alight on the stems of other Cowberry plants, and the same cycle of development is repeated. If young conifers happen to be growing near a diseased Cowberry plant, and the spores from the latter settle on the conifer leaves, the "cluster-cup" stage of the fungus develops and the spores it produces can infect neighbouring Cowberry plants, but cannot directly infect another conifer.

The Silver fir—*Abies pectinata*, DC., suffers most from the disease in this country, and also on the Continent; diseased specimens of *A. Nordmanniana*, Spach, have also been received from Wales.

In conifers the leaves only are attacked. About a month after infection two rows of white, cylindrical "cluster-cups," about half a line in length, appear on the under surface of the leaf; these "cluster-cups" or peridia are the fruit of the fungus and are filled with minute orange spores. Infection usually occurs in May, and by the middle or end of July diseased leaves have become yellow and soon fall. After the spores have been blown away, the silvery-white empty "cluster-cups" resemble the eggs or empty remains of some minute insect, for which they are frequently mistaken.

Preventive measures are alone of service in combating this disease. In selecting a site for a seed bed or nursery, it is important to ascertain that no diseased Cowberry plants are growing in the neighbourhood. Such can be readily detected when growing amongst healthy plants from the description given above.

The same rule applies when young conifers are planted in woods or other places where the Cowberry grows. If the diseased plants are not numerous, they may be removed and burned.

Description of Figures on Plate.

Left-hand figure : A branch of Silver fir bearing the minute "cluster-cups" on the leaves.

Right-hand figure: Cowberry plant showing the upright branches much thickened by the fungus present in the tissues.

Left-hand lower small figure : Portion of leaf of Silver fir bearing "cluster-cups" on its lower surface.—Mag. 5 times.

II.—THE CHINESE SPECIES OF ERIOCAULON.

C. H. Wright.

The following clavis to the Chinese species of *Eriocaulon* was drawn up as a result of the examination of the specimens employed in working out that genus for the "Index Florae Sinensis," the plan of which did not allow of its inclusion therein.

All the species, except *E. Henryanum*, occur only in the eastern half of the empire, and their number in each province is as follows :—Kwangtung, 11 ; Hongkong, 6 ; Chekiang, 5 ; Kiangsi, 2 ; Shantung, Formosa, Hupeh, Yunnan and Hainan, 1 each. Of these species, no less than 10 have been recorded from single provinces only, 3 from two, 3 from three and 1 from four. *E. Faberi*, *E. Henryanum* and *E. sinicum* are confined to China ; *E. Buergerianum*, *E. Miquelianum* and *E. nipponicum* extend to Japan only ; *E. australe* and *E. cinereum* to Australia only ; *E. alpestre*, *E. echinulatum*, *E. luzulaefolium*, *E. setaceum*, *E. Wallichianum* and *E. Wightianum* to British India only (3 southwards to Ceylon) ; *E. truncatum* to British India and Malaya ; *E. Sieboldianum* to British India, Malaya and Japan. The type of *E. cristatum* occurs in Northern India and Japan. No species is recorded in the enumeration of Tibetan plants in the Journal of the Linnean Society, vol. xxxv. Thirty-six of the well-ascertained Indian species do not occur in China. *E. officinale*, Koern., an imperfectly described plant, is only known as an ingredient of a Chinese medicine.

Caulis elongatus, foliis dense obtectus . . . . . 1. *E. setaceum*, Linn.

Caulis brevis, folia radicalia :—

Bracteae involucrantes floribus longiores :—

Flores dimeri . . . . . 2. *E. nipponicum*, Maxim.

Flores trimeri :—

Bracteae involucrantes acuminatae, rectae . . . . . 3. *E. Miquelianum*, Koern.

Bracteae involucrantes apice cuspide longa recurva instructae . . . . . 4. *E. echinulatum*, Mart.

Caulis brevis, folia radicalia—*cont.*
Bracteae involucrantes floribus non longioribus :—
Folia pilosa . . . . . 5. *E. australe*, R. Br.
Folia glabra :—
Bracteae involucrantes villosae . . . . . 6. *E. Wightianum*, Mart.
Bracteae involucrantes glabrae :—
Sepala ♂ dimera :—
Bracteae florales acutae . . 7. *E. sinicum*, Miq.
Bracteae florales obtusae . . . . . 8. *E. truncatum*, Ham.
Sepala ♂ trimera :—
Antherae nigrae :—
Sepala ♀ libera :—
Corolla ♂ tubulosa, glabra :—
Receptaculum pilosum . . . . . 9. *E. luzulaefolium*, Mart.
Receptaculum glabrum . . . . . 10. *E. Wallichianum*, Mart.
Corolla ♂ tubulosa intus pilosa . . . . . 11. *E. cristatum*, var. *brevicalyx*, Wright.
Corolla ♂ tubulosa apice ciliata . . . . . 12. *E. Henryanum*, Buhl.
Sepala ♀ connata :—
Bracteae involucrantes semiorbiculares . . . 13. *E. Buergerianum*, Koern.
Bracteae involucrantes ovatae :—
Folia 5 mm. lata . . . . . 14. *E. alpestre*, Hk. f. & Thoms.
Folia 2 mm. lata . . 15. *E. Faberi*, Buhl.
Antherae albae :—
Corolla ♂ ciliata . . . 16. *E. cinereum*, R. Br.
Corolla ♂ glabra . . . . . 17. *E. Sieboldianum*, Sieb. & Zucc.

III.—RAMIE IN TIRHUT.

(*Boehmeria nivea*, Hook. & Arn.)

In the *Agricultural Ledger*, 1898, No. 15, pp. 37–46, Sir G. Watt, in dealing with the cultivation of Rhea or Ramie in Bengal, indicated the extent to which it was then actually grown in that province. He remarked particularly the suitability of the plant to the north-eastern districts of Rungpur, Jalpaiguri and the Duars, and indicated the possibility of an extension of its cultivation westward to Tirhut, though at the same time he pointed out that how far this extension was really possible was for the future to show.

Considerable interest, therefore, attaches to the experience of an association formed in Calcutta in 1900 for the purpose of putting on the market Ramie fibre in a commercial form. This association,

the Bengal Rhea Syndicate, entered into an agreement with various planters in the district of Durbungah, in Tirhut, under which the growers were to put a definite area under Ramie, and provide Rhea stalks, the syndicate supplying the necessary machines to produce from these the commercial fibre. It has long been known that there is no serious difficulty attending the cultivation of Ramie, provided the soil is suitable and the climatic conditions are at all favourable. As has already been pointed out (*Kew Bulletin*, 1888, p. 298), the chief difficulty is as regards the decortication of the Ramie stalks. The experience in Tirhut is therefore of further interest as throwing light on such practical advances as may have been made in this direction.

That the plant could be successfully grown in Tirhut on an experimental scale was already known; various planters in Tirhut had demonstrated this in plots containing plants raised from roots supplied from the Royal Botanic Garden at Calcutta, and to a smaller extent from the Botanic Garden at Saharanpur. But what Sir G. Watt had in view, and what it was desirable to test was whether, if the difficulties attending decortication were overcome, the cultivation of the plant in Tirhut was likely to prove remunerative commercially. The original contracts entered into by the syndicate in question were nine in number; the area involved amounted to 3,700 acres. Actually, however, owing to difficulties connected with soil and rainfall, operations had to be restricted to seven concerns with an aggregate area of 3,100 acres, and of the suitable available land the amount actually under Ramie, in February, 1906, was 1,950 acres. The results of these operations, which have now extended over several years, are calculated to throw some light on both questions.

These results have been made generally available by the publication in the *Journal d'Agriculture Tropicale* for June 30, 1906, of the French text of an account of the operations, which is there stated to have been supplied on February 10, 1906, to the Director of Agriculture, Bengal, by Mr. J. Karpelés, the managing director of the Bengal Rhea Syndicate. The original agreement entered into by the syndicate with the planters in Durbungah stipulated that the growers were to produce the Ramie stalks, while the syndicate were to supply the machines for preparing the commercial fibre. The fact that the firm in Calcutta to which the syndicate's managing director belongs acted as agents in India for the machine especially devised by Mr. Faure for dealing with Ramie, adds further to the interest of the account.

In the *Queensland Agricultural Journal* for November, 1906, p. 247, is given a translation of the report referred to, which is here reprinted. Its value is considerable owing to the fairness with which the results obtained and the difficulties encountered by the Bengal Rhea Syndicate have been stated. But, as pointed out in the *Queensland Agricultural Journal*, it possesses another interest—it gives for the first time, so far at least as India is concerned, an account of operations on a scale sufficiently extensive to justify the formation of reliable estimates for a plantation :—

"At the outset there was considerable difficulty in procuring the necessary quantity of plants to establish the plantations. Some small lots of stocks (rooted plants) were certainly obtained from

various localities, notably from Assam, and from sundry Indian botanical gardens, but these supplies were insufficient in quantity, and often of bad quality; it therefore became necessary to establish on each farm a nursery for the multiplication of rhizomes.

"The plantations suffered much from the attacks of white ants, which rapidly destroyed the young roots, and especially the cuttings. The planting of cuttings, however, during the rainy season obviated to some extent this inconvenience, but still the best method of reproduction is the division of the rooted plants. Portions of the rhizomes may be taken from one- to two-year-old plants without injuring them.

"It was evident from the commencement that successful plantations could only be established on light, porous soils; saltpetre and alkali soils are not conducive to the successful production of Ramie. On well-cultivated lands, where noxious weeds had been carefully eradicated, every root produced annually 15 to 30 stalks, about 5 feet in length, whilst in a field left as an experiment without cultivation produced only from two to five stems per plant; the plot in the same field, called the 'control plot,' which had been weeded and cleaned, gave 10 to 15 stems. It will thus be seen that a Ramie field must be well cultivated, in spite of the increased expense, the field having to be cleaned by hand labour to avoid damage to the roots and young shoots.

"In the three-year-old well-cultivated fields, no sign of soil exhaustion has yet been observed, although the upper part of the root has a tendency to become woody, to the detriment of the development of new stems. To overcome this, it is intended to remove the lignified portion every year, in order to rejuvenate the plants. Experience alone will decide if this is a good idea.

"Ramie is a very exhausting crop, and, therefore, the question of manure must be carefully studied, for unmanured plants yield a very poor crop. Good results were obtained by the use of indigo refuse. It is said that the refuse of Ramie itself, such as the leaves, bark, and wood, constitutes a perfect manure, sufficient to restore to the soil the constituents taken out of it by the crop. But, up to the present, no experiments in this direction have been possible, as nowhere has the decortication of the stems been carried on in a systematic manner. However, at Dalsing Serai, a manure consisting of decomposed Ramie refuse was applied to the experimental plots with excellent results. It has not yet been determined what quantity of such manure is needed. At Dalsing Serai and Mooktapore, where respectively 60 and 40 acres are in full bearing, there is a sufficiency of fermented material which will be utilised for manure. The leaves, separated from the stems when the latter are cut, are left on the ground, and these form a good mulch for the roots, at the same time supplying a manure.

"Ramie requires a good deal of moisture to properly develop, but water must not be allowed to remain too long on the ground, as the rotting of the roots would probably be thus caused. This was the unfortunate experience on plantations established on the low, flat country, where, last September (1905), many hundreds of acres were destroyed in consequence of the heavy rains. Ramie requires at least 45 inches of rain per annum. Two plantations had to be abandoned in a district where the annual rainfall did

not exceed 35 inches. Consequently, cultivation was only carried on on seven plantations, representing an aggregate area of 3,100 acres, of which 1,950 acres were planted up to February, 1906. The remaining 1,150 acres will, we are told, be planted during the next rainy season.

"It is very important to cut the stems at the proper time. If they are cut too soon, they yield a very fine fibre, but in small quantity ; if cut too late, the decortication becomes more difficult, and the fibre is brittle. The best time to cut is when the base of the stem is of a brownish tint for a height of about 10 inches. The stems must be worked up immediately they are cut. The decortication is much more readily performed if carried out within twelve hours of the cutting. When they have been allowed to dry decortication is more difficult, and the fibre is inferior. If circumstances render it necessary to defer decortication, the stems, having the leaves removed, are made into little bundles of thirty or forty, and preserved in water, where they will remain unchanged for forty-eight hours.

"Fibre containing 30 per cent. of gum does not easily dry in the climate of Bengal. The syndicate has, therefore, been obliged to have special drying apparatus constructed in Paris, and installed on each plantation. The fibre on leaving the decorticating machine passes first through a centrifugal drier, made by Dehaitre, which removes 70 per cent. of the water it holds. It is then hung up in a large closed-in straining-room, supplied with a current of warm air set in motion by a fan.

"The fibre, when ready, must be at once baled, for it readily absorbs a quantity of fresh moisture from the air, which would soon produce fermentation and mouldiness. At Dalsing Serai a hand press is used.

"A 20-h.p. engine is sufficient to drive all the machines required for 500 acres. As the fibre has to be washed as it passes through the decorticators, a good and sufficient water supply is indispensable.

"The fibre must not be twisted, as this imparts to it a permanent undulation which depreciates it from the spinner's point of view.

"Many samples of Ramie fibre produced by the syndicate were sent to Europe to several spinners. They were considered quite equal in quality to China grass, and very shortly orders were received totalling 1,500 tons. Some 20 tons of better quality fibre, more carefully prepared than hitherto, have been lately exported from the syndicate's estates.

"From a forecast of the next year's crop (1906) the syndicate should be in a position to deliver at least 200 tons of fibre from the 1,950 acres already under cultivation. This is said to be a very moderate estimate, since the normal production from this area will be, it is estimated, 800 tons when in full maturity.

"It is the intention of the syndicate, in the near future, to de-gum the fibre as well as decorticate the stems, in order to save the freight charges on 30 per cent. of gummy substance contained in it. But, as every spinner of Ramie has his own particular method of de-gumming, all of them require the fibre to be delivered to them without its having been subjected to any

chemical treatment. It is hoped, however, that flax spinners will some day take up Ramie as well, and will accept the fibre de-gummed on the plantation."

In connection with this account of the operations of the Bengal Rhea Syndicate, the *Queensland Agricultural Journal* publishes certain critical remarks on the prospects of successful cultivation of Ramie in Queensland. But Queensland is not the only colony where there are considerable areas with climatic conditions approximating to those that are known to prevail in Tirhut, and the questions raised in the *Journal* deserve consideration by those who contemplate the extensive cultivation of Ramie elsewhere. These remarks are therefore reproduced below.

"From the above account of the operations of the Bengal syndicate, we can form some idea of the initial difficulties to be encountered in entering upon Ramie cultivation. After six years' work the company has 1,950 acres under cultivation, from which they have obtained 20 tons of fibre, and, possibly 200 tons will be the result of the 1906 crop. Two hundred and twenty tons is not a large return from such an area. The expenditure on over 3,000 acres must have been very considerable during six years. With cheap and abundant and reliable labour, the necessary humid climate, and abundant water supply, and cheap water carriage, one would have expected far greater results. Ribbons are worth £14 per ton in the English market. Clean, de-gummed fibre is worth £50 per ton. Clean, undegummed fibre from the plantation is worth about £24 per ton in London. At this latter price, 220 tons would be worth £5,280, or a return of £880 per annum spread over the six years since commencement. Decorticating machines, motive power, expenses of management, labour, freights, &c., have all to be deducted.

"Mr. J. Macdonald (of Macdonald, Boyle & Co., London) estimated the cost of 900 acres of Ramie under cultivation from planting to extraction of the fibre at £6,477 17*s.*, and the machinery at £6,775.

"At the end of the first year the product might be estimated at 450 tons of clean fibre, ready for the manufacturer. This, at $4\frac{1}{2}d.$ per lb., amounts to £18,900. Deducting the cost of production as above, also £900 for freight, and £260 for brokerage and incidentals, a working profit remains of £11,262 3*s.*

"This estimate, so extremely sanguine, was based on a three and a half to four years old Ramie plantation. Yet Mr. Macdonald begins operations six months after planting! An obvious discrepancy. Practical men would be better pleased to see a well-considered moderate statement work out a possible profit of £5 per acre than to be met with £12 profit per acre the first year, and well nigh £50 in the second, from a cultivation which, so far as we know, no one has yet tried, except the Bengal syndicate above described, on a scale sufficiently large to justify reliable estimates for a plantation, at any rate in the Eastern world.

"Queensland planters would not be likely to drop sugar, cotton, pineapples, &c., for a return of £880 per annum from 1,950 acres, and from which return heavy expenses have to be deducted."



Codonopsis Tangshen, Oliv.

IV.—T'ANG-SHÊN.

(*Codonopsis Tangshen*, Oliv.)

(With Plate.)

E. H. WILSON.

The source of the bulk of the drug *T'ang-shên*, an important Chinese drug, accredited with tonic and aphrodisiac properties and largely used as a substitute for the valuable and costly Ginseng, is the species described by Professor Oliver as *Codonopsis Tangshen* in *Hooker's Icones Plantarum*, t. 1966. A copy of the figure there given, for which Kew is indebted to the kindness of the Bentham Trustees, accompanies this note. The species has since been figured, from a living example, in the *Botanical Magazine*, t. 8090.

The part used is the thickened root, which varies from the thickness of a lead pencil to nearly an inch in diameter. When broken these roots emit a milky sticky juice, and the whole of the root when bruised has a curious and not very pleasant odour.

Codonopsis Tangshen is common in the margins of thickets above 4,000 feet in Hupeh, Szechuan, and apparently also in Shensi. These wild plants are searched for by medicine-gatherers, the roots dug up, dried in the sun or artificially, tied up in various ways and imported to all parts of China. Hankow is the principal port of export for this drug and on an average some 8,500 piculs (about 500 tons) are exported annually.

The drug has many trade names, according to its source and the manner in which it is packed. Thus, T'ang-shên from—

Szechuan is distinguished as Ch'uan-t'ang;
Hupeh (Fang district) is distinguished as Fang-t'ang;
Shense (Fang district) is distinguished as Hsi-t'ang.

Fêng-p'i (Fêng-p'i t'ang, Hung-t'ang) is the name applied when the drug is fastened into bundles with red cord. Hsiang-t'ang is the drug selected and packed in boxes. Pao-t'ang is the name applied when the drug is packed in bales. The different grades are valued at from taels 3.00 to taels 15.00 per picul.

An inferior kind is furnished by *Codonopsis lanceolata*, Benth. and Hook. fil., which grows associated with *C. Tangshen*.

From the province of Shansi is exported a different kind of T'ang-shên distinguished as Lu-t'ang (meaning T'ang-shên from the Lu-an prefecture in Shansi). This Lu-t'ang is probably furnished by *Campanumoea pilosula*, Franch., a plant first discovered by Pére David in the neighbourhood of Peking.

It is probable that other species of *Campanumoea* and *Codonopsis* yield a kind of T'ang-shên in different parts of China.

The Chinese drug Ming-t'ang-shên is supposed to possess similar properties to the true T'ang-shên, and is exported in fairly large quantities from the province of Anhwei, through the port of Wuhu, and in small quantities from the Kiangsu province by way of Chiukiang. The source of this drug is not actually known, but there is reason to believe it to be the product of *Adenophora polymorpha*, Ledeb.

V.—THE SYNONYMY AND DISTRIBUTION OF THE SPECIES OF TRICUSPIDARIA.

T. A. Sprague.

Introduction.

The genus *Tricuspidaria* belongs to the family *Elaeocarpaceae*, and is endemic in Chili; the area inhabited by it is almost that of Drude's "Chilian Wood Region" (Atlas der Pflanzenverbreitung, No. vii., Region 28), except that *Tricuspidaria* apparently does not extend farther south than the island of Chiloe. If we follow Ball (in Journ. Linn. Soc. Bot., vol. xxii., p. 140), however, in taking the parallel of 44° S. as the boundary between the "Chilian Wood Region" and the "Antarctic Wood Region" (Drude, l.c., Region 29), then the area occupied by *Tricuspidaria* practically coincides with the former region. In connection with their distribution it is interesting to note that both species of *Tricuspidaria* have the capsule provided with a drip-tip, *see* Neger in Engl. Bot. Jahrb., vol. xxiii., p. 378.

The closest relationship of *Tricuspidaria* is undoubtedly with *Dubouzetia*, Panch., which is endemic in New Caledonia. *Dubouzetia* was founded on *D. campanulata*, Panch., and was originally distinguished from *Tricuspidaria* by the following characters:—petals entire; stamens more numerous (about 35); fruit septicidal (Brongn. et Gris, in Bull. Soc. Bot. France, vol. viii. [1861], p. 199). The number of cells of the ovary and capsule was given in the generic description as 5, and that of the ovules in each cell as 10–12. Two years later, however, Brongniart and Gris described two new species, *D. elegans* and *D. parviflora*, which had about 25 stamens, a 3–4- or 3–5-celled ovary and capsule, and 6 ovules in each cell, approaching more nearly to *Tricuspidaria* in these respects (l.c., vol. x., p. 476). In 1868 Brongniart and Gris published a further paper in which (Nouv. Arch., Mus. Par., vol. iv., p. 34, t. 13) they gave a fuller description and an excellent figure of *D. campanulata*, from which it appears that the capsule of that species is *simultaneously* septicidal and imperfectly loculicidal. [The capsule of *D. elegans*, on the other hand, is *loculicidal* with only a very faint indication of a septicidal split or none at all, so that the distinction drawn between *Dubouzetia* and *Tricuspidaria*, as regards the dehiscence of the fruit, now breaks down. *See Vieillard*, No. 50, in the Kew Herbarium.]

Bocquillon had already stated in his "Mémoire sur le groupe des Tiliacées" (Adansonia, vol. vii., p. 55, Sept. 1866) that the only difference between *Tricuspidaria* and *Dubouzetia* lay in the dehiscence of the fruit; and Baillon in 1873 (Hist. Pl., vol. iv., p. 198) united the two genera, adopting the generic name *Crinodendron*, which is an earlier name for *Tricuspidaria*.*

In 1885, Szyszylowicz published his monograph of the Tiliaceae, in which he kept *Dubouzetia* and *Tricuspidaria* separate, partly on the ground of the different dehiscence of the capsule in the two genera (Engl. Bot. Jahrb., vol. vi., pp. 452–3). Other

* The reasons for the adoption of *Tricuspidaria* in preference to *Crinodendron* are given at p. 15.

diagnostic generic characters given by Szyszylowicz are that the 5 carpels (when all present) are opposite the sepals in *Tricuspidaria* and opposite the petals in *Dubouzetia* (l.c., p. 448); and that the seeds of *Tricuspidaria* have a wing-like strophiole, those of *Dubouzetia* a spiral strophiole (l.c., p. 450). Lack of material has prevented the verification of the two additional characters just mentioned. Szyszylowicz also used the union or non-union of the sepals to distinguish the two genera. He seems to have overlooked Brongniart and Gris's second paper (Bull. Soc. Bot. France, vol. x.. p. 476), as he states in the generic description of *Dubouzetia* that the ovary is 5-celled (Engl. Bot. Jahrb., vol. vi., p. 453).

Schumann in 1890 practically followed Szyszylowicz (Engl. und Prantl, Pflanzenfam., vol. iii., pars vi., p. 6), as did also Dalle Torre and Harms in 1901 (Gen. Siphonog., p. 304); the latter attribute only one species to *Dubouzetia*.

It may be useful to give the more certain external characters which separate *Tricuspidaria* and *Dubouzetia*, although it appears doubtful whether they are of generic value.

Tricuspidaria.—Sepals more or less united; petals trifid; stamens 15–20.

Dubouzetia.—Sepals free; petals entire; stamens 25–35.

The following account of the anatomy of *Tricuspidaria* and *Dubouzetia* has been furnished by Mr. L. A. Boodle, F.L.S. Owing to pressure of work, only one species of each genus could be examined.

"A comparison of the anatomical structure of *Tricuspidaria lanceolata*, Miq., with that of *Dubouzetia campanulata*, Panch, shows a rather close agreement in the more important characters, as well as in a certain number of minor details.

"The two species agree in the following features. In the leaf: the hairs are uni-cellular, and of similar form; large crystals of oxalate of lime are present in enlarged cells of the palisade-tissue; some of the smaller veins are accompanied by sclerenchyma, and are connected with the upper and lower epidermis by sclerenchymatous or slightly thickened cells; in the midrib there is a somewhat broken ring of fibro-vascular tissue, having practically the same form and structure in the two cases. In the stem: the cork cells are tabular; sclerotic cells are present in the inner part of the primary cortex; there is a ring composed of fibres and sclerotic cells in the pericycle; the phloem includes bast-fibres (few), and vertical rows of cells containing crystals; the wood-fibres have simple pits; the medullary rays of the wood are one cell in breadth; the vessels have simple perforations, and sometimes form radial rows; the portions of the vessel-wall in contact with medullary ray-tissue bear large simple pits; the cells of the pith are lignified and of different sizes, and some of them contain crystals.

"In describing the points of difference between the two species, "T." will stand for *Tricuspidaria lanceolata*, "D." for *Dubouzetia campanulata*. Walls of upper epidermis undulated (T.); straight (D.). Spongy parenchyma denser, and with less chloro-

phyll in T. In the lower epidermis each cell bears a papilla (T.); only a few slight papillae present (D.). Stomata in the plane of the epidermis (T.); stomata raised (D.). The structure of the upper part of the petiole is not very different in the two species, but there is a considerable difference in the basal region. In the stem the pitted vessels of the wood have spiral thickenings (T.); no spiral thickening (D.).

"All the points of difference enumerated above are comparatively unimportant, and are such as are often found within the limits of a single genus. Hence the investigation of the anatomy confirms the close relationship of *Tricuspidaria* and *Dubouzetia*, while leaving undecided the question as to whether the two genera should be united or kept separate."

Whether we regard *Tricuspidaria* and *Dubouzetia* as congeneric or as two closely allied genera, their distribution is equally interesting, for it is evident that they form a well-defined group with a distribution of the kind termed by Engler "old-oceanic" (Versuch einer Entwicklungsgeschichte der Pflanzenwelt, vol. ii. pp. 262, 329, 346). A list of genera and groups of allied genera, with a somewhat similar distribution, is given by Engler in the course of his remarks on the Flora of New Zealand (l.c., pp. 95–103). In what follows, the name *Tricuspidaria* is here used in the narrow sense, as including only the Chilian species.

The Species of Tricuspidaria.

Although only two species of *Tricuspidaria* are known, their synonymy has become somewhat involved, and it is therefore thought desirable to give it in full. The two species may be distinguished as follows:—

1. *T. lanceolata*, Miq. Folia lanceolata vel oblongo-lanceolata, apice acuta. Calyx jam in alabastro fere ad basin 2–4-partitus, extra pubescens. Corolla rubra. Ovarium tomentosum.
2. *T. dependens*, Ruiz et Pav. Folia obovata, elliptica vel ovata, apice rotundata vel obtusa. Calyx in alabastro cupularis, extra minutissime puberulus. Corolla alba. Ovarium minute puberulum.

1. **Tricuspidaria lanceolata**, Miq., in Linnaea, vol. xxv. (1852), p. 650; W. Wats. in Gard. Chron. Ser. III. vol. xxxviii. (1905), p. 306, excl. syn. *T. Patagua*, Miers.

? *Crinodendron Patagua*, Molina, Saggio Chili (1782), p. 179, *ex parte*; Hist. Chil. ed. angl. vol. i. pp. 146, 290, *ex parte*; Cav. Diss., pp. 268, 300, *ex parte*, t. 158, fig. A.

Crinodendron Patagua, Hook. et Arn. in Hook. Bot. Misc. vol. iii. (1833), p. 156, t. 100; Kuntze, Rev. Gen. (1891), p. 82.

Crinodendron Hookerianum, C. Gay, Fl. Chil. vol. i. (1845), p. 341; Miers in Ann. & Mag. Nat. Hist. Ser. IV. vol. ii. (1868), p. 53; Contrib. Bot. vol. ii. p. 189, t. 83A; F. Philippi, Cat. Pl. Vasc. Chil. p. 31; F. W. Neger in Verh. deutsch. wiss. Ver. Santiago, vol. iii. (1895), pp. 149–153; Reiche, Fl. Chile, vol. i.

p. 266 (1896); Jeogr. Bot. Rio Manso, pp. 125–154 (Ann. Univ. Chile, 1898); The Garden, vol. xviii. p. 542, t. 260 (Nov. 27, 1880).

Tricuspidaria hexapetala, Turcz. in Bull. Soc. Nat. Mosc. vol. xxxvi. (1863), pars i. p. 576; Nichols. Dict. Gard. vol. iv. p. 87, fig. 99.

Tricuspidaria dependens, Hook. f., Bot. Mag. t. 7160 (excl. synon. nonnull.); J. H. Veitch, Hortus Veitchii, pp. 58, 293; non Ruiz et Pav.

Tricuspidaria Hookeriana, R. O. Cunningham, Nat. Hist. Strait Magell. (1871), pp. 342, 433.

A small evergreen tree, attaining a height of 3–5 m.* Confined to the provinces of Valdivia and Llanquihue, and the island of Chiloe, where it is found in moist, wooded, low-lying situations. The range of the species is approximately from 39° to 43° S. lat. It is known by the following native names :—*Chequehue*, *Chaqueihua*, and *Polisones*.

According to F. W. Neger (l.c.), a gall named *Erineum Crinodendri* is produced by *Phytoptus* on the leaves of *T. lanceolata*; and nearly every specimen of *T. lanceolata* in the Kew Herbarium has what appears to be the gall in question on the under surface of its leaves.

VALDIVIA. *Philippi*: near Corral, *Bridges*, 613; between Corral and San Carlos, *Lechler*, 269.

LLANQUIHUE. Region of the Rio Manso, in woods of the littoral zone (ex Reiche, teste Just. Bot. Jahresb. vol. xxvi. pars i. p. 566).

CHILOE. *Lobb*; *Reed*; *King*: *Cuming*, 22; Gulf of Ancud, Oscuro Cove, *Cunningham*.

2. **Tricuspidaria dependens**, Ruiz et Pav. Prodr. (1794), p. 64, t. 36; Syst. p. 112; Fl. Peruv. et Chil. vol. iv. t. 403; DC. Prodr. vol. i. p. 520; A. Cruckshanks, in Hook. Bot. Misc. vol. ii. (1831), p. 172; Hook. et Arn. in Hook. Bot. Misc. vol. iii. (1833), p. 155; C. Gay, Fl. Chil. vol. i. p. 338; Miers in Ann. & Mag. Nat. Hist. Ser. IV. vol. ii. (1868), p. 50; Contrib. Bot. vol. ii. p. 186; F. Philippi, Cat. Pl. Vasc. Chil. p. 31; N. L. Britton in Bull. Torr. Bot. Club, vol. xvi. (1889), p. 157; Neger in Engl. Bot. Jahrb. vol. xxiii. p. 378 (1896); Introd. Fl. Concepcion, p. 40 (Ann. Univ. Chile, 1897); W. Wats. in Gard. Chron. Ser. III. vol. xxxviii. (1905), p. 306; Sprague in Bot. Mag. t. 8115.

Tricuspis dependens, Pers. Syn. vol. ii. (1807), p. 9.

Tricuspidaria Patagua, Miers, in Ann. & Mag. Nat. Hist. Ser. IV. vol. ii. (1868), p. 51, excl. syn. *Crinodendron Patagua*, Mol.; Contrib. Bot. vol. ii., p. 187, t. 82.

Crinodendron Patagua, K. Schum. in Engl. und Prantl., Pflanzenfam. vol. iii., pars. vi., p. 6, t. 1, fig. C–E (1890); Reiche, Fl. Chile, vol. i., p. 266; non Molina nec Cav.

---

* The ‘ height of 30 ft.,” given in Gard. Chron. Oct. 1905, p. 306, for *T. lanceolata*, Miq., is copied from Miers's description of *T. Patagua*, Miers, and refers properly to *T. dependens*, Ruiz et Pav.

Crinodendron dependens, Kuntze, Rev. Gen. (1891), p. 82.

An evergreen tree, attaining a height of 6–8 m. Confined to the central provinces of Chili, where it is found on the banks of streams and in other moist situations. It ascends to 1200 m. in the Cordilleras. A specimen in the Benthamian herbarium is marked "Aconcagua Ld. Colchester, 1832," which is the most northern locality recorded; and, according to Reiche, the species is found as far south as Lebu; so that its range is approximately from 32° to 38° S. lat.

According to C. Gay, the wood is very white, and is much used for carpentry and even for cabinet-making, and the bark is employed in tanning; Gay also states that silkworms eat the leaves of *T. dependens* with relish, but that the Mulberry should always be cultivated in preference for that purpose. The native name is *Patagua*.

Nearly every specimen of *T. dependens* in the Kew Herbarium has fairly numerous subglobose galls on the under surface of its leaves, of very different appearance to the *Erineum Crinodendri* found on *T. lanceolata*. Each kind of gall appears to occur on only one species of *Tricuspidaria*, and the galls are of such frequent occurrence that they might almost be taken as additional specific characters separating *T. dependens* and *T. lanceolata*.

ACONCAGUA (dedit *Lord Colchester*, 1832).

VALPARAISO. *Cuming*, 85; *Philippi*; *King*; *Rusby*, 1025 (ex Britton).

SANTIAGO. Near La Dormida, in the Quebrada de Alvarado, *Gillies*.

O'HIGGINS. Aculeo, *Reed*.

CONCEPCION. *Dombey* (ex Miers); in the neighbourhood of the town of Concepcion (ex Neger).

ARAUCO. Lebu (ex Reiche).

CHILI (without precise locality). *Cruckshanks*, 114; *Bridges*, 159.

There is also a specimen of *T. dependens* in the Hookerian herbarium, marked "Bolivia, Mr. Pentland," but the locality given is more than doubtful.

For suggestions as to the most satisfactory treatment of both species under cultivation in this country, reference may be made to the article on the genus by Watson, published in the *Gardeners' Chronicle* in 1905, cited above, This article possesses the further interest of giving the most satisfactory account of their synonymy which has hitherto appeared.

DISCUSSION OF THE SYNONYMY.

It now remains to consider the identity of *Crinodendron Patagua*, Molina, Saggio Chili (1782), p. 179; Hist. Chil. ed. angl., vol. i., pp. 146, 290; Cav. Diss., pp. 268, 300, t. 158, fig. A—E. Cavanilles states that the figure and description of *C. Patagua* were communicated to him by Molina, so that Cavanilles's description and that of Molina may be considered together.

Page missing
from book
at time
of scanning.

botanicus

Page missing
from book
at time
of scanning.

botanicus

6501. *Bignonia chelonoides*, Roxb. (7 sheets), A (two), B, C, D, E = STEREOSPERMUM CHELONOIDES, DC. 6501 F = *Stereospermum chelonoides*, DC.? ; *Oroxylum indicum*, Vent. ?

6502. *Bignonia adenophylla*, Wall. (4 sheets), A, A β, B = HETEROPHRAGMA ADENOPHYLLUM, Seem. 6502 a γ, Leaf and bud = HETEROPHRAGMA ADENOPHYLLUM, Seem. ; capsule = STEREOSPERMUM SUAVEOLENS, DC.

6503. *Bignonia multijuga*, Wall. (2 sheets) = PAJANELIA RHEEDII, DC.

6504. *Bignonia macrostachya*, Wall. (1 sheet) = ? The example consists of flowers only. According to G. Don, Gen. Syst. iv. 221, the leaves are 1-pinnate, with 9 stipelled leaflets.

6505. *Bignonia laeta*, Wall. (2 sheets), A = STEREOSPERMUM SERRULATUM, Kurz ; B (leaves only) = ? (perhaps not Bignoniaceous).

6506. *Bignonia glauca*, Wall. (1 sheet) = ? Example consists of leaves only ; perhaps not Bignoniaceous.

6507. *Bignonia quadrilocularis*, Ham. (1 sheet) = HETEROPHRAGMA ROXBURGHII, DC. ? The example consists of one leaf only.

6508. *Bignonia grandiflora*, Thunb. (1 sheet) = TECOMA GRANDIFLORA, Loisel.

6509. *Bignonia Porteriana*, Wall. (1 sheet) = STEREOSPERMUM GLANDULOSUM, Miq.

6510. *Bignonia Ghorta*, Ham. (1 sheet) = STEREOSPERMUM ? GHORTA, C. B. Clarke.

6511. *Bignonia xylocarpa*, Roxb. (4 sheets) = STEREOSPERMUM XYLOCARPUM, Wight.

6512. *Bignonia amoena*, Wall. (1 sheet) = STEREOSPERMUM HYPOSTICTUM, Miq.

6513. *Bignonia suberosa*, Roxb. (4 sheets) = MILLINGTONIA HORTENSIS, Linn. f.

6514. *Bignonia indica*, Linn. (4 sheets), A, D = OROXYLUM INDICUM, Vent. ; B (at least the flowers) = PAJANELIA RHEEDII, DC. ; C = ? C is a leaf only, neither *Oroxylum* nor *Pajanelia*.

6515. *Spathodea crispa*, Wall. (2 sheets), A = DOLICHANDRONE CRISPA, Seem. ? ; B = DOLICHANDRONE CRISPA, Seem. The example A is from the Calcutta Botanic Garden, and has the corymbs and mature leaves hairy.

6516. *Spathodea Rheedii*, Spreng. (1 sheet) = DOLICHANDRONE RHEEDII, Seem.

6517. *Spathodea falcata*, Wall. (2 sheets) = DOLICHANDRONE FALCATA, Seem.

6518. *Spathodea stipulata*, Wall. (4 sheets), A, part C, D = DOLICHANDRONE STIPULATA, Benth.; B, part C = STEREOSPERMUM? WALLICHII, C. B. Clarke. (D. Don has noted on 6518 B, in his own hand, *Spathodea Wallichii*, D. Don; and Seemann has made a note on the same sheet, but has made no suggestion as to the genus.)

PEDALINEAE.

6408. *Sesamum indicum*, Linn. (7 sheets), is good.

6409. *Sesamum prostratum*, Retz. (2 sheets), is good.

6410. *Pedalium Murex*, Linn. (1 sheet), is good.

VII.—MISCELLANEOUS NOTES.

Visitors during 1906.—The number of persons who visited the Royal Botanic Gardens during the year 1906 was 2,339,492. This establishes a record, the previous highest number in any one year having been 1,839,966 in 1890. The number for 1905 was 1,824,319. The average for the ten years 1896–1905 was 1,376,244. The total number on Sundays was 867,148, and on week-days 1,472,344. The maximum number on any one day was 113,131, on August 6, also a record number for a single day; the smallest number on any one day was 204, on February 17.

The detailed monthly returns are given below :—

January	27,736
February	33,407
March	66,613
April	267,629
May	159,071
June	513,095
July	372,398
August	425,117
September	277,917
October	137,201
November	34,042
December	25,266

MR. T. W. BROWN, formerly a member of the gardening staff of the Royal Botanic Gardens, Kew, and for some time Assistant Curator of the Botanic Station, Aburi, Gold Coast (*K.B.*, 1899, 50, 221), has been appointed Secretary of the newly formed Horticultural Society at Ghizeh near Cairo.

ANGELA GEORGINA, Baroness BURDETT-COUTTS.—The death of Lady Burdett-Coutts, on 29th December, 1906, leaves no part of the community and few institutions of public utility unaffected.

Kew, in common with many another establishment, mourns the loss of one whose interest in its objects and work took the practical form of timely gifts.

In 1862 Lady Burdett-Coutts presented to Kew the large collection of British seaweeds formed by the late Mrs. Griffiths of Torquay, as it stood at that date. During her lifetime this lady was one of the leading authorities on seaweeds in England. She corresponded extensively with and contributed largely to the herbaria of Sir W. Hooker, Dr. Harvey, Mr. W. Borrer and other contemporary algologists. But besides her presentations to fellow-workers Mrs. Griffiths disposed during her life-time of one collection of Algae to the British Museum, and presented another to the Torquay Museum. On Mrs. Griffiths' death, which occurred in 1857, a complete set of her collection of seaweeds was acquired for the Linnean Society, in whose possession it now is. The general collection from which this set had been taken was purchased by Lady Burdett-Coutts and given by her to Kew. The collection was kept apart till 1891 when it was decided to incorporate as much of it as was desirable in the general collection, which already contained the extensive set of specimens given by Mrs. Griffiths during her life-time to Sir William Hooker. Very many of these earlier specimens were removed from the general collection and replaced by better specimens from the special collection, all of which, with the exception of such specimens as had been presented to her by other collectors, have the localities and names entered in Mrs. Griffiths' own handwriting. The extent and value of Lady Burdett-Coutts' gift may best be gathered from the fact that when Mrs. Griffiths' collection was incorporated in the general herbarium, six sets of duplicates were made up at Kew and presented to six other botanical establishments.

In 1880 Kew was indebted to Lady Burdett-Coutts for another and still more important gift. In that year she purchased and presented to Kew the herbarium of the late Dr. W. P. Schimper, Professor of Botany in the University of Strassburg, author, in conjunction with Bruch and Gümbal, of the *Bryologia Europaea*, a work in six quarto volumes, with 640 plates, giving a critical account of the mosses of Europe. In recording this gift the *Kew Report* (in 1880, p. 63), says :—" Dr. Schimper's herbarium, upon which " the *Bryologia* was in the main founded, contains a profusion of " specimens of *Musci* collected with unrivalled judgment and " preserved and ticketed with scrupulous care. It further contains " the muscological collections of Bruch and other of the older " botanists, who published on the group, together with a mis- " cellany of interesting plants (especially *Hepaticae*) from various " sources."

In addition, it may be added, the herbarium contains the types corresponding to Schimper's monograph of the genus *Sphagnum*, and a number of manuscript descriptions and exquisite drawings of a large number of species of mosses not included in the *Bryologia*.

Plants suitable for the Warmer Parts of the United Kingdom.—Enquiries are frequently made at Kew by those interested in horticulture as to the hardiness of particular species, the merits of which have been casually brought to their notice. To meet the needs and extend the knowledge of correspondents, it seems therefore advisable to draw up a compact list of such plants as are known to be too tender to survive permanently out-of-doors in the British Islands except in the milder localities, such as Cornwall, South Wales, Western Ireland, and the West of Scotland. The list, which is given below, makes no pretence at being exhaustive. The species it includes are, however, all known to be in cultivation out-of-doors at present in one or other of the localities indicated; the hardiness of all of them, under the climatic conditions that have prevailed during the winter and spring months of recent years, has thus been tested. It does not follow that all of these species will prove permanently hardy in any of the localities, or that any of them will, even under normal conditions, thrive equally well in all of the localities mentioned. But, subject to the limitations which those who find occasion to consult it are competent to apply, the list may prove useful to those who are engaged in forming out-of-doors collections in the milder parts of the kingdom.

Abelia floribunda, *Decne*, Mexico.
" uniflora, *R. Br.*, China and Japan.
Abutilon megapotamicum, *St. Hil.*, Brazil.
" vitifolium, *Presl*, Chili.
Acacia armata, *R. Br.*, Australia.
" Baileyana, *F. Muell.*, Australia.
" cultriformis, *A. Cunn.*, Australia.
" dealbata, *Link*, Australia.
" decurrens, *Willd.*, Australia.
" hastulata, *Sm.*, Australia.
" juniperina, *Willd.*, Australia.
" longifolia, *Willd.*, Australia.
" platyptera, *Lindl.*, Australia.
Acradenia Frankliniae, *Kipp.*, Tasmania.
Actinidia callosa, *Lindl.*, Temperate Asia.
Anopterus glandulosus, *Labill.*, Tasmania.
Aristotelia Macqui, *L'Hérit.*, Chili.
" racemosa, *Hook. f.*, New Zealand.
Azara Gilliesii, *Hook. & Arn.*, Chili.
Bauhinia yunnanensis, *Franch.*, China.
Begonia Evansiana, *Andr.*, China, &c.
" Hemsleyana, *Hook. f.*, Yunnan.
Berberidopsis corallina, *Hook. f.*, Chili.
Berberis Fortunei, *Lindl.*, China.
" Fremonti, *Torr.*, South-west United States.
Boronia elatior, *Bartl.*, Australia.
Brachyglottis repanda, *Forst.*, New Zealand.
Buddleia asiatica, *Lour.*, Malaya, &c.
" Colvilei, *Hook. f.*, Himalaya.
Caesalpinia sepiaria, *Roxb.*, Tropical Asia.
Calceolaria alba, *Ruiz & Pav.*, Chili.
" amplexicaulis, *H. B. & K.*, Ecuador.
" violacea, *Cav.*, Chili.
Callistemon lanceolatus, *DC.*, Australia.
" phoeniceus, *Lindl.*, Australia.
" salignus, *DC.*, Australia.
Camellia reticulata, *Lindl.*, China.
" theifera, *Griff.*, China.
Carpentaria californica, *Torr.*, California.
Caryopteris Mastacanthus, *Schau.*, China.
Cassia corymbosa, *Lam.*, Tropical America.
" laevigata, *Willd.*, Tropics.
" marylandica, *L.*, East United States.
Cavendishia acuminata, *Benth.*, Mexico.
Ceanothus divaricatus, *Nutt.*, California.
" integerrimus, *Hook. & Arn.*, California.
" papillosus, *Torr. & Gray*, California.
" rigidus, *Nutt.*, California.
" thyrsiflorus, *Eschsch.*, California.
" Veitchianus, *Hook.*, California.
Cereus viridiflorus, *Engelm.*, Texas.
Cheiranthus kewensis, Garden origin.
" mutabilis, *L'Hérit.*, Canaries.
Clematis indivisa, *Willd.*, New Zealand.
Clerodendron foetidum, *Bunge*, China.
Clianthus puniceus, *Banks & Sol.*, New Zealand.
Convolvulus cneorum, *L.*, South Europe.

Coriaria terminalis, *Hemsl.*, China.
Corokia Cotoneaster, *Raoul*, New Zealand.
Coronilla glauca, *L.*, South Europe.
„ valentina, *L.*, South-west Europe.
Correa, various species.
Corylopsis pauciflora, *Sieb. & Zucc.*, Japan.
Cotoneaster augustifolia, *Franch.*, Yunnan.
Crossosoma californicum, *Nutt.*, California.
Cyrilla racemiflora, *L.*, South United States.
Cytisus fragrans, *Lam.*, Canaries.
„ proliferus, *L.*, Teneriffe.
Davidia involucrata, *Baill.*, Western China.
Desfontainia spinosa, *Ruiz & Pav.*, Peru.
Deutzia corymbosa, *R. Br.*, Himalaya.
„ discolor, *Hemsl.*, China.
„ gracilis, *Sieb. & Zucc.*, Japan.
„ scabra, *Sieb. & Zucc.*, China and Japan.
Dianthus arboreus, *L.*, Greece.
Diervilla Middendorfiana, *Carr.*, Siberia, &c.
Drimys aromatica, *F. Muell.*, Australia.
„ Winteri, *Forst.*, South America.
Eccremocarpus scaber, *Ruiz & Pav.*, Chili.
Echium callithrysum, *Webb*, Canaries.
„ Wildpretti, *Hook. f.*, Canaries.
Edgeworthia chrysantha, *Lindl.*, Himalaya.
Ehretia acuminata, *R. Br.*, Tropical Asia.
Elaeocarpus cyaneus, *Sims*, Australia.
Embothrium coccineum, *Forst.*, Chili.
Enkianthus campanulatus, *Nichols.*, Japan.
„ japonicus, *Hook. f.*, Japan.
„ quinqueflorus, *Lour.*, China.
Erica arborea, *L.*, Mediterranean and Caucasus.
„ australis, *L.*, Portugal, &c.
„ lusitanica, *Rudolph*, Spain and Portugal.
„ Veitchii, Garden origin.
Erythrina Crista-galli, *L.*, Brazil.
Escallonia floribunda, *H. B. & K.*, Colombia, &c.
„ macrantha, *Hook. & Arn.*, Chiloe.
„ montevidensis, *DC.*, Montevideo, &c.
„ Philippiana, *Masters*, Valdivia.
Eucalyptus, various species.
Eucryphia cordifolia, *Cav.*, Chili.
„ pinnatifolia, *Gay*, Chili.
Fabiana imbricata, *Ruiz & Pav.*, Peru.
Feijoa Sellowiana, *Berg.*, Brazil.
Fendlera rupicola, *A. Gray*, South-west United States.
Fothergilla Gardeni, *Murr.*, South-east United States.
Francoa ramosa, *D. Don*, Chili.
„ sonchifolia, *Cav.*, Chili.
Fremontia californica, *Torr.*, California.
Fuchsia excorticata, *L.*, New Zealand.
Gerbera Jamesoni, *Bolus*, South Africa.
Gordonia anomala, *Spreng.*, China.
„ Lasianthus, *L.*, South United States.
Grevillea alpina, *Lindl.*, Australia.
„ Hilliana, *F. Muell.*, Australia.
„ juniperina, *R. Br.*, Australia.
„ rosmarinifolia, *A. Cunn.*, Australia.
Halesia corymbosa, *Nichols.*, Japan.
Hardenbergia Comptoniana, *Benth.*, Australia.
Helichrysum antennarium, *F. Muell.*, Australia.
„ rosmarinifolium, *Less.*, Tasmania.
Hibiscus Moscheutos, *L.*, South United States.
Hoheria populnea, *A. Cunn.*, New Zealand.
Hydrangea hortensis, *Sm.*, varieties, China and Japan.
„ involucrata, *Sieb. & Zucc.*, Japan.
„ paniculata, *Sieb. & Zucc.*, Japan.
Hypericum chinense, *L.*, China and Japan.
„ empetrifolium, *Willd.*, Greece, &c.
„ Hookerianum, *Wight & Arn.*, Himalaya.
„ patulum, *Thunb.*, India, China, &c.
Illicium anisatum, *L.*, Japan.
„ floridanum, *Ellis*, South United States.
„ religiosum, *Sieb. & Zucc.*, Japan.
Incarvillea Delavayi, *Bur. & Franch.*, China.
Isoplexis canariensis, *Steud.*, Canaries.
Itea ilicifolia, *Olirer*, China.
Jasminum grandiflorum, *L.*, Malaya.
„ primulinum, *Hemsl.*, Yunnan.
Kitaibelia vitifolia, *Willd.*, South Europe.
Lathyrus pubescens, *Hook. & Arn.*, South America.
„ splendens, *Kellogg*, California.
Lavatera maritima, *Gouan*, var. bicolor.
Leonotis Leonurus, *R. Br.*, South Africa.
Leptospermum flavescens, *Sm.*, Australia.
„ laevigatum, *F. Muell.*, Australia.
„ scoparium, *Forst.*, Australia and New Zealand.
Linum arboreum, *L.*, Greece, &c.

Lonicera etrusca, *Santi*, var. superba, *C. H. Wright*, Mediterranean region.
„ Hildebrandiana, *Hemsl.*, Burma.
„ sempervirens, *L.*, North America.
Loropetalum chinense, *Oliv.*, China and India.
Magnolia Campbellii, *Hook. f. & Thoms.*, Eastern Himalaya.
„ compressa, *Maxim.*, Japan.
„ stellata, *Maxim.*, Japan.
„ Watsoni, *Hook. f.*, Japan.
Mandevilla suaveolens, *Lindl.*, Argentina.
Myrtus bullata, *Sol.*, New Zealand.
„ communis, *L.*, South Europe.
„ Luma, *Barn.*, Chili.
„ Ugni, *Mol.*, Chili.
Nandina domestica, *Thunb.*, China and Japan.
Neviusia alabamensis, *A. Gray*, Alabama.
Nerium Oleander, *L.*, varieties, Orient.
Nicotiana glauca, *R. Grah.*, Argentina.
Notospartium Carmichaeliae, *Hook. f.* New Zealand.
Olearia, all species.
Passiflora coerulea, *L.*, Brazil.
Paulownia imperialis, *Sieb. & Zucc.*, Japan.
Philadelphus mexicanus, *Schl.*, Mexico.
Phlomis fruticosa, *L.*, South Europe, &c.
Photinia serrulata, *Lindl.*, Japan, and China.
Pieris formosa, *D. Don*, India and China.
Piptanthus nepalensis, *Sweet*, Temperate Himalaya.
Pittosporum, various species.
Plagianthus Lyallii, *Hook. f.*, New Zealand.
Plumbago capensis, *Thunb.*, South Africa.
Polygala myrtifolia, *L.*, South Africa.
Prunus ilicifolia, *Walp.*, North-west America.
Psoralea pinnata, *L.*, South Africa.
Punica Granatum, *L.*, South Europe.
Ranunculus cortusaefolius, *Willd.*, Canaries.
Raphiolepis japonica, *Sieb. & Zucc.*, Japan.
Rhaphithamnus cyanocarpus, *Miers*, Chili.
Rhododendron, various species.
Romneya Coulteri, *Harv.*, California.
Rosa Banksiae, *Ait.*, China.
„ bracteata, *Wendl.*, China.
„ laevigata, *Michx*, China.
Salvia dichroa, *Lam.*, Mediterranean region.
„ Grahami, *Benth.*, Mexico.
Schizophragma hydrangioides, *Sieb. & Zucc.*, Japan.
Senecio compactus, *T. Kirk*, New Zealand.
„ laxifolius, *Buch.*, New Zealand.
„ rotundifolius, *Hook. f.*, New Zealand.
Solanum aviculare, *Forst.*, Australia and New Zealand.
„ crispum, *Ruiz & Pav.*, Chili.
„ jasminoides, *Paxt.*, Brazil.
Sollya heterophylla, *Lindl.*, Australia.
Sophora secundiflora, *Lag.*, Mexico.
„ tetraptera, *Mill.*, New Zealand.
„ viciifolia, *Hance*, China.
Stuartia pentagyna, *L'Hérit.*, South United States.
„ Pseudo-camellia, *Maxim.*, Japan.
Styrax japonicum, *Sieb. & Zucc.*, Japan.
„ Obassia, *Sieb. & Zucc.*, Japan.
Trachelospermum jasminoides, *Lem.*, China.
Tricuspidaria dependens, *Ruiz & Pav.*, Peru.
Trochodendron aralioides, *Sieb. & Zucc.*, Japan.
Viburnum Carlesii, *Hemsl.*, Corea.
„ odoratissimum, *Ker-Gawl.*, China.
„ rhytidophyllum, *Hemsl.*, Central China.

Podocarpus milanjiana, *Rendle*, var. **arborescens**, *Pritz.*—A quantity of fresh seeds of this conifer received at Kew from the Botanic Garden at Entebbe, Uganda, have been distributed to numerous botanic gardens and arboreta in this country and elsewhere where the tree is likely to succeed. The following particulars regarding *Podocarpus milanjiana*, from Mr. M. T. Dawe's Report on a botanical mission through the forest districts of Buddu and the Western and Nile Provinces of the Uganda Protectorate, 1906, are of interest:—"About a mile south of Dumu village, near the Mugawe stream, occurs a coniferous tree, which, for specific purposes, affords one of the most valuable timbers of

Uganda. It is *Podocarpus milanjiana*, var. *arborescens*. . . . It occurs practically on the Lake shore, a point of considerable importance respecting transport, and is distributed more or less throughout the forests down to the Kagera River, and is said by the Baseba to extend beyond the Anglo-German boundary. The tree does not exceed about 40 feet in height, but serviceable timber can be cut from it. Its insect-resisting qualities are well known to the natives. Instances have come to my notice where the poles have been taken inland a distance of nearly 15 miles for building purposes. A chief, whose father had died and left a house built six years ago, is said to have rebuilt it with the same poles that were as sound as ever, and this is unusual where white ants occur. The young poles are very largely used for building purposes, and the result is that forests in thickly populated districts, like Sango and Kanabulemu, do not contain many large trees. This *Podocarpus* is known to the natives at Dumu as 'Mukeke,' at Kanabulemu and Sango as 'Musenene,' and to the Baseba as 'Muyunjui.' It grows usually in swampy forests, and could only be obtained in quantity during the dry seasons."

Mr. Dawe found the type sparsely distributed above 8,000 feet on Ruwenzori Mountain, where it forms a tree 40 to 70 feet high; the variety *arborescens* he found in Buddu, at an altitude of 3,900 feet.

W. W.

Sudan Gum.—In the *Kew Bulletin* for 1906, No. 4, p. 109, in an article dealing with "Persian Gum" a passage was quoted from the *Pharmaceutical Journal*, March 29th, 1890, p. 793. The writer of the passage in question, citing as his authority Professor E. Sickenberger, stated that quantities of Persian gum "are sent "from Bushire, either to a small port on the west coast of the "Red Sea or to Jedda, in order that it may be substituted for "Kordofan gum. It is thence conveyed to Assouan and packed "in old Kordofan packages and sold as genuine gum. Owing to "its pale color and the absence of any suspicion that the gum "from Assouan could be other than good Gum Arabic, a consider-"able amount has been sold."

This passage has attracted the attention of the Central Economic Board of the Sudan Government, who have instructed their Secretary to explain that the statement in the *Pharmaceutical Journal* is based on a misapprehension as to an incident which occurred fifteen years ago. The letter of explanation, which is reproduced below, shows that a large consignment of Persian gum was, at least on one occasion, purchased by a dealer at Assouan under the belief that he was buying Sudan gum; thus far, therefore, the statement in the *Pharmaceutical Journal*, based on Professor Sickenberger's authority, is accurate. But from the explanation it would appear that, whatever the extent to which the practice described by Professor Sickenberger may formerly have prevailed, that practice no longer exists.

CENTRAL ECONOMIC BOARD; SUDAN GOVERNMENT

Khartoum, December 9, 1906.

SUDAN GUM.

I have the honour to inform you that the attention of the Central Economic Board has been drawn to the Article xix. "Persian Gum" in *Kew Bulletin* No. 4 of 1906, in which it is stated that Persian gum is substituted for Gum Arabic at Assouan and is fraudulently exported as gum from the Sudan. I am directed to request that you would kindly have a contradiction of this statement published as enquiries show that no such practice exists and that the above mentioned paragraph is based on a misapprehension of the true facts of the case. If the statement is allowed to pass without comment it is calculated to depreciate the value of Sudan gum.

Probably Professor Sickenberger, who is quoted as the authority in this instance, has been misinformed of an incident which occurred some fifteen years ago. At that time the Sudan had not been reconquered. Consequently supplies of gum were small and fetched very high prices. At about that date a Cairo merchant purchased in Assouan a large consignment of what he believed to be Sudan gum. It was in fact Persian gum which had probably been introduced into Assouan in the manner mentioned by Professor Sickenberger. The matter formed the subject of legal proceedings in Cairo in which the person who supplied me with this information acted as expert witness.

Sudan gum is now so cheap that substitution of the nature described would not be worth the expense.

Additions to the Herbarium during 1906.—Besides the Churchill Herbarium, the gift of which was recorded in *Kew Bulletin* for 1906, p. 387, over 22,000 sheets were presented by about one hundred and forty persons and institutions, while over 5,700 sheets were purchased. The principal collections are enumerated below. Except where otherwise stated or implied, the collections purchased are named, and those presented are unnamed or only partially named.

VARIOUS PARTS OF THE WORLD.—*Presented*:—named Characeae and marine Algae, by the New York Botanical Garden; Seymour and Earle, Economic Fungi, Suppl. C., Nos. 101–150, by Mr. G. P. Clinton; named Crassulaceae, by the United States National Museum; named Orchids, by the Department of Agriculture, Buitenzorg; Herbarium of the late Arthur Bennett, by the late Mr. C. B. Clarke.

Purchased:—Kneucker, "Gramineae Exsiccatae," lief. xix–xx.

ANTARCTIC REGIONS. *Presented*:—Gough Island, named, by the Scottish National Antarctic Expedition.

EUROPE.—*Presented*:—"Kryptogamae Exsiccatae," Cent. xii.-xiii., by the Imperial Natural History Museum, Vienna; British Florideae, fasc. ii., by Mr. A. D. Cotton; Geheeb, named German Mosses, by Mr. E. S. Salmon; named British Mosses, by Miss A.

Clarke ; rare British plants by Mr. C. E. Salmon ; a small herbarium of European plants collected by the late G. Bentham, by Sir J. D. Hooker, G.C.S.I., C.B.

Purchased :—Adamović, Thrace and Macedonia ; Fiori, Béguinot and Pampanini, "Flora Italica Exsiccata," Cent. iii.–v. ; Sydow, "Mycotheca germanica," fasc. i.–ix. ; Dahlstedt, Scandinavian Hieracia, Cent. xviii.-xix. ; Enander, "Salices Scandinaviae Exsiccatae," fasc. ii.

NORTH AFRICA. *Presented* :—Egypt, by Mr. W. L. Balls.
Purchased :—Chevallier, Algerian Sahara.

NORTHERN ASIA. *Presented* :—Named Tibetan plants, by the Royal Botanic Garden, Calcutta ; Wakefield, Corean Algae, by Mr. A. D. Cotton ; Ssüzew, named Ussuri Mosses, by Mr. V. F. Brotherus.

INDIA AND MALAY PENINSULA. *Presented* :—Named plants from various parts, by the Royal Botanic Garden, Calcutta ; India, named, by Sir D. Brandis, K.C.I.E. ; rare Bombay plants, by Dr. T. Cooke, C.I.E. ; Burmese Dalbergia and Strobilanthes, by Mr. J. H. Lace ; Andaman Islands, by Mr. C. G. Rogers ; Malay Peninsula, by the Botanic Gardens, Singapore ; Impatiens, by Mr. I. H. Burkill.

MALAY ARCHIPELAGO AND INDO-CHINA. *Presented* :—Philippine Islands, by the Bureau of Science, Manila ; Philippine Islands, by Mr. A. Loher ; Philippine Islands, by Mr. A. D. E. Elmer ; Williams, Philippine Islands, named, by the New York Botanical Garden ; Philippine Acoridium, by Mr. Oakes Ames ; Borneo and Christmas Island, by the Botanic Gardens, Singapore ; Malay Archipelago, named Orchids, by the Rijks-Herbarium, Leiden.

Purchased.—Hosseus, Siam, partially named ; Elmer, Mount Mariveles, Luzon.

AUSTRALASIA. *Presented*.—New South Wales, named, by the Botanic Gardens, Sydney ; Hillier, Central South Australia, by Miss Hillier ; named New Zealand Olearias, by Mr. T. F. Cheeseman ; Maltby, Marine Algae of the Chatham Islands, by Mr. A. D. Cotton.

Purchased.—Koch, Western Australia.

TROPICAL AFRICA. *Presented* :—Farmar, West Tropical Africa, named, by the Viscount Mountmorres ; Sierra Leone, by Mr. C. W. Smythe ; Lagos, by Mr. E. W. Foster ; Dalziel, Northern Nigeria, by the Imperial Institute ; Southern Nigeria, by Mr. H. N. Thompson ; Southern Nigeria, by Mr. A. H. Unwin ; Southern Nigeria, by Mr. J. C. Leslie ; Benguella, by Dr. F. C. Wellmann ; Sennar and Kordofan, named, by Mr. A. F. Broun ; Drake Brockman, Somaliland, by the Imperial Institute ; Somaliland, by Mrs. Lort-Phillips ; Uganda, by Mr. M. T. Dawe ; Uganda, by Mr. E. Brown ; British East Africa, by Mr. A. Linton ; British East Africa, by Mr. H. Powell ; Grenfell, British East Africa, by Mr. J. S. Gamble, C.I.E. ; Adamson and Buchanan, British Central Africa, named, by the Royal Botanic Garden, Edinburgh ; Allen and Sykes, Rhodesia, by Mr. C. E. F. Allen ; Victoria Falls, by the Rev. Dr. F. C. Kolbe.

MASCARENE ISLANDS. *Presented*: Seychelles and Aldabra Islands, by Mr. R. Dupont.

SOUTH AFRICA. *Presented*:—Named specimens from various parts, by Dr. H. Bolus; named specimens from various parts by Mr. E. E. Galpin; Schlechter, named, by Dr. H. Schinz; Port Elizabeth and Uitenhage, by Miss E. West; Stapelieae, by Mr. N. S. Pillans; Dieterlen, Basutoland Grasses, by Professor C. Flahault; Transvaal, by the Transvaal Museum; Grenfell, Transvaal, by Mr. J. S. Gamble, C.I.E.

Purchased:—Schlechter, Delagoa Bay, etc.

NORTH AMERICA. *Presented*:—Canada, named, by the Geological Survey of Canada; Labrador, by Sir W. MacGregor, K.C.M.G., C.B.; Canada and the United States, named, by the Gray Herbarium, Harvard University; Western North America, named, by the University of Pennsylvania; Abrams, Southern California, named, by the New York Botanical Garden; named Fungi of the United States, by Mr. J. C. Arthur.

Purchased:—Shaw, Selkirk Range, British Columbia; Heller, California; Purpus, Lower California.

CENTRAL AMERICA. *Presented*:—Named specimens, by Capt. J. Donnell Smith; Seler, Mexico and Guatemala, named, by the Botanic Garden, Berlin; Mexico, named, by the United States National Museum.

WEST INDIES. *Presented*:—Jamaica and Bahamas, named, by the New York Botanical Garden; Jamaican Ferns, by Miss A. J. Smith; Cuba, named, by Mr. C. F. Baker; named Mosses, by Mr. E. S. Salmon.

TROPICAL SOUTH AMERICA. *Presented*:—Johnston, Margarita Island, named, by the Gray Herbarium, Harvard University; British Guiana Fungi, by the Botanic Garden, Georgetown; Brownea, by the Natural History Museum, Paris.

Purchased:—Fiebrig, Bolivia; Dusén, Brazil; Ule, Brazilian Fungi.

TEMPERATE SOUTH AMERICA. *Presented*:—Argentine Republic, by Mr. A. Thays.

Purchased:—Dusén, Patagonia.

The principal feature of the year's accessions was the very large number of Philippine plants presented, amounting in all to over 10,000 sheets, or nearly half the total donations. Of these the Bureau of Science, Manila, contributed over 6,500 sheets, and Mr. A. Loher a collection which is estimated at about 3,000 sheets.

Other large collections received were:—a set of Abrams, Southern California plants, containing nearly 1,000 sheets, presented by the New York Botanical Garden; and several sets of Western North American plants, collected by Krautter, Farr and others, containing about 700 sheets in all, and presented by the University of Pennsylvania.

As has been usual in recent years, numerous Tropical African collections were received, none of them, however, of any great size. Among those of special interest might be mentioned Dr. J. M. Dalziel's collection from Northern Nigeria, and that formed by Dr. F. C. Wellman in Benguella.

A noteworthy addition to the European collections at Kew is the set of 900 plants of Thrace and Macedonia, acquired by purchase from the collector, Dr. L. Adamović.

Presentations to the Library during 1906.—The Library is indebted to the Bentham Trustees for the following additions :—*Boudier*, *Icones mycologicae*, of which two series, each consisting of a hundred beautiful coloured plates, and a part of a third, have been issued. The complete work will consist of six series of plates and a thin volume of text. *Sweert*, *Florilegium amplissimum et selectissimum*, 1631, in which all the figures have been coloured, often, it would appear, inaccurately ; on plate 10 of the second part there is a figure of a Monkshood, under the name of *Lycoctonon coeruleum*, the flowers of which are coloured bright red, but in the 1620 edition, which is also at Kew, the flowers of this plant are coloured blue. Bound with the *Florilegium* were 69 plates very similar to those of Sweert's work in execution, entirely without text or clue to their origin. They form, however, a complete set of plates of the *Theatrum Florae* (*Pritzel*, *Thes. Lit. Bot.* ed. 2, n. 10,855), but whether of Mathonière's edition of 1622 or of Firens's edition of 1633 cannot be determined, as they are the same in both editions. The work was issued without text. *Triggs*, *The Art of Garden Design in Italy*, and the continuation of about 20 periodical publications were also presented by the Bentham Trustees.

Professor Hans Schinz has continued to present the numerous publications of the Botanical Museum of the University of Zurich, including *Thellung*, *Die Gattung Lepidium*, and seven dissertations. From Sir W. T. Thiselton-Dyer, K.C.M.G., a further selection of pamphlets from his own library were received, as well as Sir Kenelme Digby's curious work containing the discourses *Of the Powder of Sympathy and of the Vegetation of Plants*, 1669 ; and the *Report of His Majesty's Commissioners for the International Exhibition at Saint Louis, 1904*. The Director of the Botanic Garden, Upsala, Professor F. R. Kjellman, presented a copy of the *Botaniska Studier*, a series of memoirs written and dedicated to him by his students. From the same source were received :—*Rosander*, *Studier öfver Bladmossornas Organisation*, and *Witte*, *Till de Sevenska Alfvarväxternas Ekologi*. A number of papers, elaborated at the Botanical Museum, Hamburg, have been contributed by the Director of that establishment. Sir J. D. Hooker, G.C.S.I., has presented the continuation of several periodicals and serials as in former years. From Mr. George Nicholson the following have been received : *Loddiges*, *Orchidaceae in the collection of Conrad Loddiges and Sons* [1844] ; *H. Mann*, *Catalogue of the Phaenogamous Plants of the United States*, ed. 2 ; *H. Maurer*, *Das Beerenobst*, ed. 2 ; *C. A. Strail*, *Essai de Classification et descriptions des Menthes qu' on rencontre en Belgique* and two other

small works. To Professor J. Matsumura, who has made frequent visits to the Herbarium during the year, the Library is indebted for a copy of the voluminous work on the Flora of Formosa by himself and Mr. B. Hayata; also *M. Miyoshi, Atlas of Japanese Vegetation*, sets i.–vi.; and *M. Miyoshi and T. Makino, Pocket Atlas of Alpine Plants of Japan*, vol. i. Professor Matsumura has also enabled us to complete vol. xi. of the Japanese *Botanical Magazine* of which three numbers were wanting. *F. B. Archer, The Gambia Colony and Protectorate*, was received from His Excellency the Governor of the Gambia; the elaborate reports on the results of the Belgian Antarctic Expedition, from Monsieur G. Lecointe; *T. F. Cheeseman, Manual of the New Zealand Flora*, and the late Mr. C. B. Clarke's annotated copy of his reprint of Carey's edition of *Roxburgh's Flora Indica*, from Miss Aletta Clarke; *S. T. Dunn, Alien Flora of Britain*, from Mr. G. Massee; two catalogues of collections in the Koloniaal Museum, Haarlem, from the Director, Dr. Greshoff; *C. G. Ehrenberg, Sylvae mycologicae berolinenses*, 1818, a scarce work, from Mr. C. G. Lloyd; *G. F. Scott Elliot, A First Course in Practical Botany*, from the publishers, Messrs. Blackie and Sons, Limited; *Sir J. Floyer*, ΦΑΡΜΑΚΟ-ΒΑΣΑΝΟΣ, *or the Touchstone of Medicines*, vol. i., 1687, from Dr. F. Clarke, of Dumfries, through the kind offices of Sir George Watt, C.I.E.; *K. Goebel, Ueber die Biologie der Epiphyten*, and *Ueber die Rhizophoren-Vegetation*, from the Director; *W. Hutchinson, Handbook of Grasses*, from Mr. E. H. Wilson; two pathological papers by Professor Istvanffi, from Dr. M. T. Masters; *B. Daydon Jackson, George Bentham* (English Men of Science), from the publishers, Messrs. J. M. Dent and Co.; *P. E. O. W. Knuth, Handbook of Flower Pollination, translated by J. R. Ainsworth Davis*, vol. i., from the Delegates of the Press, Oxford; *P. Krylow, Flora Altaya, &c.*, i.–iii., from the Director; *A. A. Pulle, An enumeration of the Vascular Plants known from Surinam*, from Dr. F. A. F. C. Went; *Reports on the finance, administration and condition of the Sudan*, 1904 *and* 1905, from Mr. A. F. Broun; *J. H. Veitch, Hortus Veitchii*, special edition, from Messrs. James Veitch and Sons; *North American Flora*, vol. ii., pt. 1, and *Venezuela, Geographical Sketch, Natural Resources, &c.*, from Dr. N. L. Britton; *Le Bambou*, a new periodical devoted to the Bamboo, from Monsieur J. Houzeau de Lehaie; *Annual Report of the Imperial Department of Agriculture* (*India*), 1904–5, from the Superintendent of Government Printing, Calcutta; *Memoirs of the Department of Agriculture, Botanical Series*, and *The Agricultural Journal of India*, from the Inspector-General of Agriculture in India; *Quarterly Journal of the Institute of Commercial Research in the Tropics*, from the Director, Viscount Mountmorres; *Bulletins of the Department of Agriculture, Natal*, from Mr. Claude Fuller; *Der Pflanzer: Ratgeber für tropische Landwirtschaft*, from the Editor; *La Tribune Horticole*, also from the Editor; and *Reports of the British Association for the Advancement of Science*, 1899 to 1905, from the Council. The following works have been presented by their respective authors. *G. E. Anastasia, Le varietà tipiche della Nicotiana Tabacum, L.*; *J. G. Baker, North Yorkshire: Studies of its Botany, &c.*, ed. 2; *F. C. E. Börgesen, The Alga-Vegetation of the Faeröese coasts*; *Conte G. Borromeo,*

Catalogo delle Piante dei Giardini d'Acclimazione delle Isole Borromee; *Sir D. Brandis, Indian Trees*; *M. T. Dawe, Report on a botanical mission through the forest districts of Budda and the western and Nile provinces of Uganda*; *E. A. Finet and F. Gagnepain, Contributions à la flore de l'Asie orientale*; *J. d'Ascensão Guimarães, Monographia das Orobanchaceas portuguezas*; *H. B. Guppy, Observations of a Naturalist in the Pacific*, ii., *Plant dispersal*; *M. Hardy, Esquisse de la géographie et de la végétation des Highlands d'Ecosse*; *S. Jávorka, Species Hungaricae generis Onosma*; *Sir H. H. Johnston, Liberia*; *C. G. Lloyd, The Tylostomeae*; *J. H. Maiden, Wattles and Wattle-barks*, ed. 3; *J. S. Medvedeff, Trees and Shrubs of the Caucasus* (in Russian); *C. A. Menezes, Madeira Ferns, translated by H. Gilbert*; *F. Niedenzu, De genere Hiraea*; *J. Palacky, Catalogus plantarum madagascariensium*; *D. Prain, Noviciae indicae*; *F. Sander and Sons, Orchid Hybrids*; *Sir R. Strachey, Catalogue of the Plants of Kumaon . . . revised and supplemented by J. F. Duthie.* In addition to the above, publications have been received in exchange as in previous years, and a great number of pamphlets have been presented by their respective authors.

Botanical Magazine for December.—The plants figured are: *Aechmea gigas*, E. Morren, *Pontederia cordata*, Linn., var. *lancifolia*, Morong, *Vanda Watsoni*, Rolfe, *Coreopsis Grantii*, Oliv., and *Rhododendron Fordii*, Hemsl. The *Aechmea* is probably a native of Brazil. The Kew plant, which flowered for the first time in March last, was purchased from the widow of the late Prof. E. Morren of Liége. The peduncle bears a number of large crimson bracts, armed on the margin with very numerous sharp teeth, and is terminated by a dense inflorescence of white and pale green flowers. The *Pontederia* flowers annually in the Water Lily House at Kew, where it has been cultivated for many years. It is a native of Temperate America. *Vanda Watsoni* is an attractive species from the interior of Annam, whence it was introduced to cultivation by Messrs. Sander and Sons, of St. Albans, at whose request it was named in compliment to Mr. W. Watson, of Kew. The plate was prepared from material supplied by Messrs. Sander, and from a living plant in the Kew collection previously received from them. It belongs to the small group, characterised by having narrow or acute leaves and racemes of moderate-sized flowers, in which *V. Kimballiana*, Reichb. f., and *V. Amesiana*, Reichb. f., are included. *Coreopsis Grantii*, a species from Eastern Tropical Africa, has elegant deeply cut leaves and rather large bright yellow flower-heads, which are produced in the winter months. The Kew plants were raised from seed received in 1905 from Mr. M. T. Dawe, Director of the Scientific and Forestry Department, Entebbe, Uganda. It requires the protection of a greenhouse in the winter. The *Rhododendron* is a native of Lantao Island, which lies a little to the west of Hong Kong. The plant figured was raised from seed received in 1894 from Mr. C. Ford, I.S.O., F.L.S., who was then Superintendent of the Hong Kong Botanic Garden. The volume of the Magazine just completed is dedicated to H. N. Ridley, Esq., M.A., F.L.S.,

Director of the Botanic Gardens, Singapore, "who, with untiring generosity, has surpassed all recent contributors in enriching the Kew collections with rare and novel plants."

Hooker's Icones Plantarum.—The first part of the twenty-ninth volume of this work containing plates 2801 to 2825, appeared in December. It contains illustrations of five proposed new genera, namely, *Indokingia* and *Geopanax*, Hemsl. (Araliaceae), both from Seychelles; *Neoschimpera*, Hemsl. (Rubiaceae), also from Seychelles; *Sinowilsonia*, Hemsl. (Hamamelidaceae), from China, and *Elaeophorbia*, Stapf, which differs from *Euphorbia* in having a drupaceous fruit, from Western Tropical Africa. Three plates are devoted to the genus *Corylopsis*, and seven species are recorded from China, six of which are new. The Indian specimens of this genus, hitherto regarded as belonging to one species, are here referred to three species. In addition to these there are three or four distinct species in Japan. *Sinowilsonia* is very similar to *Corylopsis* in foliage, but the flowers are unisexual and probably dioicous, though only the females are known. The interesting genus *Clematoclethra*, Planch., is figured and three new species described. *Durandea*, Planch., hitherto very imperfectly known, is fully described by Dr. Stapf, who enumerates 13 species, six of which are new; the rest had been referred to *Penicillanthemum*, Vieill., *Hugonia*, L. and *Ancistrocladus*, Wall. Amongst other noteworthy subjects are *Eryngium pilularioides*, Hemsl. & Rose, *Wielandia elegans*, Baill., *Nepenthes Macfarlanei*, Hemsl., and *Stevia Rebaudiana*, Hemsl.

W. B. H.

Indian Trees.—More than a generation has elapsed since Sir Dietrich Brandis brought out the "Forest Flora of North-West and Central India," begun by Lindsay Stuart, which has in the meantime proved a highly welcome aid to working botanists in India, and the time was ripe for a fresh publication giving the results of subsequent research and information. In "Indian Trees" he has set himself the double task of bringing up to date the matter dealt with in the "Forest Flora," and at the same time adding to it all that might prove interesting to foresters as regards the classification of trees, shrubs, and woody plants throughout the limits of the British Indian Empire, the vastness of which few, perhaps, are better qualified to appreciate than himself. Over 4,400 species are dealt with in the present work, whereas in the "Flore Forestière de la France" of Matthieu, as is pointed out in the Introduction to this new Indian Forest Flora, less than one-tenth of that number has been handled.

Obviously no individual forester could acquaint himself with more than a proportion of these Indian forest products, and the key to the situation lies without question in the gradual drawing up of local Forest Manuals dealing with the known forest products of restricted areas, framed upon professional lines, for working purposes. Sir Dietrich Brandis is disposed to think that the time

when these can be expected may as yet be distant, but the path is being cleared, at all events, by the Government of India through the series of local Indian Floras which, in pursuance of Sir Joseph Hooker's suggestions, are in course of preparation. Mr. Duthie's "Flora of the Upper Gangetic Plain" has reached Campanulaceae, and the "Flora of Bombay," by Dr. T. Cooke, is well nigh completed. At page ix. of the Introduction reasons are given for including many species which from a purely forest point of view might perhaps have been omitted, but in point of fact no apology for this is needed, because it is largely to forest officers that we must look for additions to our knowledge of the living flora in the less known parts of the Empire, more especially in S. India, Burma, and on the North-Western Frontier. Theirs are the most frequent opportunities, and the use already made of these promises well for the future.

No Indian botanist could fail to remember what is due to such workers as Richard Thompson, Beddome, Gamble, Lace, Talbot, Manson, and many younger workers, to say nothing of the distinguished author of this work himself as a systematist and an indefatigable collector. Of work done for Indian botany, in and out of India, by other branches of the public service it is needless here to speak; we may be assured that worthy successors to Buchanan, Wight and Roxburgh, Jones and Colebrooke, Munro, Thomas Thomson, Strachey, C. B. Clarke, Collett, and others who are still with us will never be wanting; but if "Indian Trees," as it ought to, inspires and keeps alive a love of science in coming generations of the Indian Forest Service it will have fulfilled a most important public duty. If a criticism may be offered as regards the systematic aspect of the work, the author seems to have felt more diffidence in approaching points of nomenclature than his reputation and experience as a botanist altogether warranted.

It is true, as is stated at page xi. of the Introduction, that "the change of a name always causes inconvenience, loss of time, and often creates confusion," if the change at least is made needlessly or in contravention of accepted principles; but in many cases, it should be added, practical confusion and economic loss have arisen from the perpetuation of a wrongly cited name, more particularly if, as too often happens, the name wrongly given or quoted conveys or suggests misleading inferences.

In such a case as the supercession of *Mitrogyna* for *Stephegyne*, both of Korthals, some amount of inconvenience must arise temporarily, but for this the author of the names must be held answerable, and not principles, which cannot be infringed without leading to results that are nowhere more to be deprecated than in the domain of applied science in the interests of forestry directly. To take another case quoted in the same passage, it is most undesirable to depart from the usage by which a well-known form of Northern India is described as "Zizyphus Nummularia," if this can be avoided, and unless examples of Lamarck's "Z. rotundifolia" be accessible in Paris, we may feel some hesitation in identifying Wight and Arnott's plant with Lamarck's. But there is a prior question which, if rules of nomenclatnre are to have any force at all, must be first answered, namely, why the

name was ever changed from that of *Z. microphylla*, which, as Wight and Arnott candidly admit, had been duly given it by Roxburgh?

The great merits of the illustrious botanists who deliberately set aside the only valid and, as it happens, perfectly appropriate name in breach of a plain fundamental canon, cannot be accepted as a ground for throwing over an essential principle.

What the plant of the "Encyclopaedia" may have been possibly remains to be seen; that from Wight's country, which is certainly the familiar "Nummularia" of Northern India, is unquestionably *Z. microphylla*, Roxburgh, as the excellent drawing in the Calcutta Herbarium, of which a duplicate exists at Kew, would prove most conclusively were it neeessary to support the description given in the "Flora Indica." In his criticism of the treatment by Mez of the forms grouped in the "Flora of British India" under *Maesa indica*, Sir Dietrich Brandis very justly points out that the results arrived at by a monographer working on often imperfect herbarium material may very likely be at some time modified by other workers with more extended knowledge; but in the meantime something must be done, and the best course, unless we are prepared to give reasons and amend his scheme, is ordinarily, perhaps, to follow the monographer, who has made a family or group his special study. The arrangement of the families, with a few explained departures, follows that of De Candolle as carried out in the "Genera Plantarum" of Bentham and Hooker, an arrangement which brings "Indian Trees" into working correspondence with the "Flora of British India" and the leading English and Indian Herbaria. Synonyms are, naturally, sparingly cited, but reference is given to a published figure where it exists, and a number of inset illustrations, drawn from specimens, add to the utility of the book.

In conclusion, his many friends will join in congratulating the author on the successful conclusion of his eight years' labour, and the issue of a work which should prove of great assistance not only to foresters, but to other civil officers, and also, in spite of the disclaimer in the Introduction, to all interested in the Floras of the different Provinces and Dependencies of India.

J. R. D.

The Orchids of the North-Western Himalaya.—The second part of the ninth volume of the *Annals of the Royal Botanic Garden, Calcutta*, the Preface to which is dated February, 1904, is wholly devoted to descriptions and figures of the orchids of the North-Western Himalaya, by J. F. Duthie, B.A., late Director, Botanical Department, Northern India, and now Assistant for India in the Kew Herbarium. The area comprised under the above designation lies between 28° 45′ and 36° N. lat. and 71° 30′ to 80° 40′ E. long., and extends from Kumaon on the east to the frontier territories of Gilgit, Chitral, and Hazara on the west.

This is a valuable and interesting contribution to orchidology, and Mr. Duthie is to be congratulated on having had the services of

so competent an artist as Mr. H. Hormusji Deboo, whose work is indeed excellent, and one is glad to see his name commemorated in *Eulophia Hormusjii*, Duthie. A similar compliment is paid to Inayat Khan, an enthusiastic and very successful native collector, in *Listera Inayati*, Duthie.

Incidentally it may be mentioned that the orchid flora of India, Northern India more especially, has now been almost fully illustrated in the *Annals*. Part i. of vol. v. contained "A Century of Indian Orchids," by Sir Joseph Hooker, and vol. viii. is wholly devoted to "the Orchids of the Sikkim Himalaya," with 448 plates, by Sir George King and Mr. R. Pantling.

The following particulars of the North-Western Orchids are mostly taken from the author's "Introduction." Up to the present time 173 species of orchids have been collected within the limits described above. Of these, 114 are terrestrial and 59 are epiphytal, and 24 are peculiar to the region, or at least, they have not hitherto been found outside of its limits. Several of the last category are described for the first time. One collector of specimens, Mr. Philip Mackinnon, F.L.S., contributed no fewer than nine previously undescribed species, discovered by him and his native collectors in the neighbourhood of Mussoorie. There are 58 plates, representing as many species, and only such species as are not figured in the volume on the Sikkim orchids. No fewer than 105 of the western species extend to Sikkim, and 35 to China. A noteworthy fact in this connection is the wider distribution of species of orchids than was formerly supposed, as shown by recent investigations. Twelve of the species are found in Ceylon. *Pholidota imbricata* and *Spiranthes australis* extend to Australia, and *Epipactis gigantea* and *Goodyera repens* re-appear in North America, whilst 10 British species also occur in North-West India, namely, *Listera ovata*, *Corallorhiza innata*, *Goodyera repens*, *Spiranthes autumnalis*, *Epipogum aphyllum*, *Epipactis latifolia*, *Cephalanthera ensifolia*, *Orchis latifolia*, *Herminium Monorchis*, and *Habenaria viridis*. Forty-five genera are represented; none of these are endemic. The most numerously represented are :—*Habenaria*, 31 species; *Dendrobium*, 15; *Liparis* and *Eulophia*, 9; *Cymbidium* and *Herminium*, 7; and *Coelogyne* and *Goodyera*, 6 species. On the other hand, 18 of the genera are represented by one species each.

The genus *Cymbidium* divides naturally into leafy and leafless species, which are, however, very uniform in floral structure. *C. macrorhizon*, Lindl., is a remarkable representative of the latter group. It was originally described from Kashmir specimens, but it is now known to inhabit the mountains eastward to Assam, Khasia, and Naga. The flowers are not easily distinguished from those of the leafy *C. lancifolium*, Hook. It has been described as a root-parasite, but there is no evidence of this in the specimens at Kew. Indeed, the fleshy, branched, hairy rhizomes suggest that it is of saprophytic nature.

Cymbidium Mackinnoni flowers in mid-winter near Mussoorie at an elevation of 5,000 feet, within the region of heavy snowfall. An allied species, *C. cyperifolium*, is found in similar situations, but always under the shelter of trees, where it comes into flower

in March and April, though it is recorded as flowering in Sikkim in November. Some of the normally terrestrial species are more frequently found on the trunks of trees than in the ground; among them *Habenaria latilabris* and *H. Elisabethae*, and *Herminium Mackinnoni* has never been found growing in the ground.

W. B. H.

The Ceylon Rubber Exhibition, 1906.—The following brief account of this exhibition has been received from Dr. J. C. Willis, Director of the Royal Botanic Gardens, Peradeniya, in his capacity as Chairman for publication of the results of the exhibition. Dr. Willis reports that a detailed handbook of the exhibition will shortly be published :—

An extremely successful Exhibition of Rubber has lately been held (September 13th–27th) in the Royal Botanic Gardens at Peradeniya, Ceylon, and marks a distinct stage in the progress of this great new industry, an industry which owes it inception and progress entirely to the forethought and aid of scientific men at the various Botanic Gardens of Kew, Ceylon, and Singapore.

Extensive buildings were erected in the Kandyan (or Sinhalese mountaineer) style of architecture, and were well filled with exhibits of raw rubber in its different forms from the plantations of Ceylon, the Malay Peninsula, and India, tools for the tapping and collecting of latex, manufactured rubber and rubber goods, and other things, besides exhibits of raw rubbers from all corners of the globe. Two large sheds were also filled with machinery for the treatment of the latex, and there were interesting side shows as well.

We do not propose to go into details as to the exhibits, but to give some of the chief facts connected with the industry, and some of the chief lessons learnt at the exhibition.

Ten years ago there was practically no rubber in cultivation of the 'Para' kind (*Hevea brasiliensis*), the kind that is now almost exclusively attended to. Seed was then all but impossible to obtain, and though a small "boom" in this product took place in Ceylon in 1898–9, the supply of seed was too small to allow it to go far. Only since 1902 has there been plentiful seed and the industry has expanded very rapidly till now in Ceylon there are about 110,000 acres, in Malaya about 60,000, and in other countries probably 40,000, say 200,000 acres in all, to say nothing of perhaps 100,000 acres (of *Castilloa elastica*) in Mexico.

The primitive methods of tapping the trees in V's with a hammer and chisel have now gone out, and the favourite methods are to cut spirals or herring bones on the trees, and pare the edges of the cuts at intervals of from 2 to 10 days, thus getting the advantage of the wound-response discovered by the writer in 1897 and worked out in detail by Mr. Parkin in Ceylon in 1898–9. The second tapping of a given area gives more latex than the first, and the amount often continues to increase for some time.

For paring the cuts there were many knives exhibited, and gold medals went to the Bowman-Northway and Miller knives, both of which are simple, keep sharp, and pare thin shavings without any dragging of the cut edges. It is very important that the shavings should be thin, as the bark should be made to last about four years before it is all cut away, in order to allow the renewed bark time to ripen fully.

The yields obtained on some estates have been phenomenal, but it is probable that in many of these cases the bark has been too rapidly cut away, and that a period of waiting for the renewed bark to ripen will ensue. It is not as yet safe to count on more than a pound a year a tree, if so much, but even this means 150–200 lbs. an acre, an amount sufficient at present prices to yield an enormous profit.

Hitherto the Ceylon rubber has mostly appeared upon the market in the form of "biscuits"—flat pancakes about 10 inches in diameter. The Malayan has mostly been in "sheets" about 2 feet long. But both these forms seem destined to disappear in favour of block—rubber prepared by blocking the sheets, biscuits, or other form under high pressure. Some samples of block were shown by Lanadron Estate, Johore, and similar samples have lately been getting the highest prices on the market.

The Ceylon and Malayan rubber has been obtaining higher prices per pound than any of the "wild" rubbers, even "fine Para," the standard of the market, but pound for pound of pure rubber is really getting lower prices, for the Para rubber contains about 20 per cent. of moisture. Why this should be so is one of the greatest problems before the investigation at the present moment.

Anyone comparing a sample of fine Para with one of any plantation rubber—Ceylon, Malayan, or Mexican—can see at once that the former is more springy, returning more readily to its original shape when stretched. The higher price really obtained for this rubber may therefore probably be explained on this consideration.

Now is it because the trees are young that the rubber is weaker, or because the rubber is not smoke-cured? Is it because the rubber is in biscuit or sheet instead of in blocks? Is it that it is too much dried (Para rubber contains 20 per cent. of moisture)? Is it that it is too pure and too much washed? Or is it that it is not coagulated in the best way? All these, singly or in combination, are possible explanations, and there may be others.

There is no doubt that older trees give stronger rubber, but that of even the oldest trees in Ceylon—30 years old—is not equal to South American rubber. Smoke-curing (without coagulation at the same time) seems to strengthen the rubber, and block rubber, besides its saving in cost of freight, and exposure of less surface to oxidation, seems actually stronger than sheets or biscuits. The great dryness of the plantation rubber may also have something to do with it, and experiments are now being tried by the Peradeniya institution in the preparation of block from wet biscuits.

To anyone looking forward a little, one of the most interesting exhibits in the show was the vulcanised and coloured rubber exhibited by Mr. M. K. Bamber, Government Chemist in Ceylon. Mr. Bamber acts, not on the coagulated and macerated rubber, but directly on the latex with the necessary reagents, and then coagulates, giving a perfect intermixture.

The coagulated rubber can then be worked up into whatever is required in the ordinary way, and finally heated, when it vulcanises. One of the most promising of his exhibits was the mixture of fibre and rubber. The fibre, cleaned, is soaked in sulphurised rubber milk, coagulated and then dried, and finally subjected to hydraulic pressure and vulcanised, the result being blocks suitable for pavement, &c. By this method rubber can also be turned out of any colour desired, and the colour will not wash or crack off—a great advantage for children's toys. One of the most noteworthy features of the Exhibition was a series of daily lectures on the various parts of the rubber industry—cultivation, tapping, shipment to London, vulcanisation, catch-crops, pests, &c., &c., and these lectures, with the reports of the judges, description of the machinery, and other things, are now being put together into a book, which will form a standard treatise,* to be in the hands of everyone interested in rubber.

Seeds from Crops of Wild Ducks.—A quantity of seeds taken from the crops of three species of Wild Duck have been submitted for identification by Mrs. C. J. Cornish, from Steyne, Bembridge, Isle of Wight. The ducks were shot on Brading Harbour Marshes. "With the exception of a few minute shell-fish," writes Mrs. Cornish, "the contents of the crops consisted entirely of seeds similar to those sent." The seeds in question were found to be those of *Zostera marina*, L. The few shells present, on being sorted out, proved to belong to *Paludestrina stagnalis*, a species of brackish water, with those of *Rissoa*, also inhabiting brackish water, and of *Nassa*, inhabiting truly marine localities. The two genera last mentioned are very critical, and it is possible that more than one species of each genus may be represented in the collection. In a subsequent note on the subject, Mrs. Cornish has been so good as to add the information that *Zostera marina* does not grow in the marshes where the birds were actually shot. They are fresh water or brackish marshes. The plant, however, Mrs. Cornish states, "grows freely in the Harbour, outside the Embankment." The three species of Wild Duck from which the seeds were taken were Pochard, Widgeon, and Common Mallard. The crops of Teal killed at the same time were quite empty.

---

* The Ceylon Rubber Exhibition Handbook, by J. C. Willis, M. K. Bamber, and E. B. Denham. To be obtained from Dulau & Co., 37, Soho Square, or Messrs. Wyman & Sons, Limited, Fetter Lane, London, for 7*s*. 6*d*., net.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1907.

VIII.—MARINE ALGAE FROM THE CHATHAM ISLANDS.

A. D. COTTON.

The distribution of marine algae is a subject which has of late received some attention from botanists, but owing to insufficient data our knowledge is, up to the present, rather imperfect. The record of accurate determinations from any little known region may therefore be of value as providing a basis for further study.

Amongst the algae recently received at the Herbarium is an interesting collection from the Chatham Islands forwarded by Miss H. E. Maltby. These islands appear to possess a luxuriant marine vegetation. Miss Maltby notes the profusion of weeds on the shore; and Mr. R. M. Laing, who for many years has worked at the New Zealand marine flora, observes in a letter: "There are many novelties to be obtained here; in fact I have seen a good many undescribed species from the locality, which seems to be rich in marine algae."

The literature of the Chatham Islands algae is scanty. Agardh published two short lists, and Reinbold includes the Islands in his "Ergebnisse einer Reise nach dem Pacific. Meeresalgen." Laing also has obtained some records.

When the general character of the specimens received is considered, their marked difference from those of the Northern hemisphere is at once apparent. As in the case of Phanerogams, when one looks over any of the lists of algae from the Southern hemisphere one cannot fail to be struck with the fact that if we exclude a few cosmopolitan forms none of the species given occur in Europe or N. America. New Zealand appears more strikingly diverse in this respect even than Australia; and it is to the flora of this country that the Chatham Islands algal flora bears most resemblance.

1375 Wt 72 2/07 D & S 29 27247

Subjoined is a list of those algae in Miss Maltby's collection which it has been possible satisfactorily to determine :—

Chlorophyceae.

Enteromorpha acanthophora, *Kütz.*, Spec. Alg., p. 479 ; De Toni Syll. Alg. vol. i., p. 135.

Lyall's Otago specimens determined by Harvey as *E. clathrata* var. *ramulosa*, Harv., have been frequently quoted as *E. acanthophora*, Kütz. This is not correct. An examination of Lyall's specimens in the Kew Herbarium shows that the plant is in reality what it was originally named, or as it is known to-day *E. ramulosa*, Hook.

Distribution. New Zealand.

Caulerpa Brownii, *Endl.*, Gen. Pl. Suppl. vol. iii., p. 16 ; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 260. *C. furcifolia*, Harv. in Hook. l. c. p. 260. Concerning this species Weber van Bosse (Mon. p. 307) remarks :—"J'ai été frappée de voir que, parmi les échantillons de la Nouvelle Zélande, il y en avait tant, chez lesquels le nombre de ramules avait diminué. J'ai observé également un amoindrissement du nombre de ramules chez des échantillons du *C. hypnoides* venant de la même localité, et je me suis demandée si ceci pouvait être à cause des courants d' eau froide qui, venant du Pôle, se mêlent à l' Océan Pacifique et en abaissent la température."

The Chatham Islands specimens do not show the above-mentioned peculiarity. The depth below the surface of the water is also a factor of importance in the solution of such problems, and the recent work of Svedelius (Ecol. and Syst. Studies of the Ceylon Species of *Caulerpa*, Ceylon Marine Biological Reports No 4, 1906) tends to show that in the case of *C. clavifera* diminished light causes distinct elongation of the axis.

Distribution. S. Australia, Tasmania, New Zealand.

Phoeophyceae.

Carpophyllum Phyllanthus, *Hook. et Harv.* in Lond. Journ. Bot. vol. iv., p. 525 ; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 212 ; Laing Revised List, in Trans. New Zeal. Inst. vol. xxxii., 1899, p. 68, with figures.

Distribution. New Zealand.

Carpophyllum plumosum, *J. Ag.*, De Alg. Nov. Zel. p. 11. *Sargassum plumosum*, A. Rich. ; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 212 ; Laing Revised List, in Trans. New Zeal. Inst., vol. xxxii., 1899, p. 68, with figures.

Distribution. New Zealand.

Cystophora retroflexa, *J. Ag.*, Sp. Alg. vol. i., p. 242 ; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 214.

Distribution. Australia, Tasmania, New Zealand.

Hormosira Banksii, *Decne.* in Ann. Sci. Nat. sér. ii. vol. xvii., p. 331 ; De Toni Syll. Alg. vol. iii., p. 187.

Distribution. Australia, Tasmania, New Zealand.

Xiphophora chondrophylla, *De Toni*, Syll. Alg., vol. iii., p. 213; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 215.

DISTRIBUTION. Australia, New Zealand.

Zonaria Turneri, *J. Ag.*, Chat. öar. alg., p. 438. *Z. interrupta*, Harv. Phyc. Austral. tab. 190.

DISTRIBUTION. Australia, Tasmania, New Zealand.

Scytothamnus australis, *Hook. et Harv.* in Lond. Journ. Bot. vol. iv., p. 531; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 219.

DISTRIBUTION. New Zealand, Cape Horn, S. Australia ?

Stypocaulon funiculare, *Kütz.*, Sp. p. 467; Reinke Vergl. Anat. Morph. Sphacelar. p. 22, t. 8. *Sphacelaria funicularis*, Mont.; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 221.

S. paniculatum, Kütz., was frequently confused by older writers with the present species. Reinke, l. c., has fully gone into the question and has pointed out the inaccuracies in previous descriptions. *S. paniculatum* may be distinguished from *S. funiculare* by the characteristic fertile frond with sori consisting of a multicellular placenta, and numerous sessile unilocular sporangia.

DISTRIBUTION. Australia, New Zealand, Cape Horn.

FLORIDEAE.

Gigartina angulata, *J. Ag.*, Epicr. p. 197. *G. stiriata*, Ag.; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 252, non aliorum. *Iridaea stiriata*, Hook. et Harv. in Lond. Journ. Bot. vol. iv., p. 547.

G. stiriata, Ag. in Harvey Gibson's New Zealand List has been pointed out by Laing to be *G. angulata*. Thus the former plant is still only known from the Cape; it is distinct from *G. angulata* as explained by J. Agardh, Epicr. p. 197.

DISTRIBUTION. New Zealand.

Stenogramme interrupta, *Mont.* in Duchartre Rev. Bot. 1846, p. 483; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 249.

This interesting alga, though not general in its distribution, has been reported from various quarters of the world. It is locally abundant, but sporadic, and appears to be most frequent in certain localities of New Zealand. It is, however, also known from Australia, Florida, California and Japan. In Europe it is very rare, but has been collected on the coast of Devon, in the North of France, and in Spain.

The Chatham Islands specimens, of which both cystocarpic and tetrasporic plants were received, are somewhat more robust than those of Europe.

DISTRIBUTION. Vide supra.

Callophyllis Hombroniana, *Kütz.*; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 251.

DISTRIBUTION. New Zealand.

Callocolax neglectus, *Schmitz* ex Batters in Ann. Bot. vol. ix., 1895, p. 316.

On *Callophyllis Hombroniana*, Kütz.

New Zealand specimens were recorded by Laing (Trans. New Zeal. Inst. vol. xxxvii., 1904, p. 282.)

DISTRIBUTION. On *C. laciniata*, Kütz. British Isles.
On *C. Hombroniana*, Kütz. New Zealand.

Rhodophyllis chathamensis, *Cotton*, sp. nov.

A *R. membranacea*, Harv. tetrasporangiis in sorum collectis distincta.

Species submembranacea, mediocris magnitudinis, flabellatim vel irregulariter ramosa; *frons* duobus distinctis cellularum stratis contexta, cellulis interioribus majoribus per duas series frondis plano parallelas dispositis, cellulis corticalibus minutis aspectu rosulato-areolato a superficie desunt; *rami* 5 mm. lati, subdichotomi vel flabellati, margine integro, segmentis terminalibus augustioribus obtusis; *venae* nullae; *cystocarpia* incognita; *tetrasporangia* secus mediam paginam incrassatam fere in soro disposita, 40 × 20 μ. Color brunneo-ruber.

In form this species often resembles *R. membranacea*, Harv. It differs from it however both in the structure of the frond and the position of the tetraspores. The cortex is distinct, and is composed of a uniform layer of minute cells, which entirely covers the inner tissue. A true rosulato-areolate arrangement is not present, though the outline of the larger cells beneath is very obvious. *R. membranacea*, Harv., differs in the punctate thallus, and incomplete cortex. In the arrangement of the tetraspores the present species approaches the Australian *R. Brookeana*, J. Ag., to which it is perhaps most nearly allied; it differs from it in the structure of the frond.

Rhodophyllis membranacea, *Harv.* in Hook. Fl. Nov. Zel., vol. ii. p. 247, t. 117. *Halymenia membranacea*, Hook. et Harv. in Lond. Journ. Bot. vol. iii., 1844, p. 448; non *R. membranacea* Harv., Alg. Austral. exsicc. No. 372, 373.

Originally described by Harvey from Tasmania in 1844, and 11 years later figured by him in Fl. New Zeal. Recently this alga has been almost completely lost sight of. For the present it will suffice to say that an examination of the original specimen in Herb. Kew shows the references quoted above to be correct. It is hoped to publish a full account of the New Zealand species of *Rhodophyllis* shortly.

DISTRIBUTION. S. Australia, Tasmania, New Zealand.

Sarcodia Montagneana, *J. Ag.*, Spec. vol. ii., p. 623; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 242. *Rhodymenia Montagneana*, Harv. Ner. Austral. tab. 48.

DISTRIBUTION. New Zealand.

Apophlaea Lyallii, *Harv.* in Hook. Fl. Nov. Zel., vol. ii., p. 244, tab. 116 a.

DISTRIBUTION. New Zealand.

Champia Novae-Zelandiae, *Harv.* in Hook. Fl. Nov. Zel., vol. ii., p. 235; cf. Laing. in Trans. New Zeal. Inst. vol. xxxiv., 1901, p. 338.

DISTRIBUTION. New Zealand.

Chylocladia umbellata, *Harv.* in Hook. Fl. Nov. Zel., vol. ii., p. 253, tab. 119 c.; De Toni Syll. Alg. vol. iv., p. 577.

DISTRIBUTION. New Zealand.

Plocamium abnorme, *Hook. et Harv.* in Lond. Journ. Bot. vol. iv., p. 543; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 246.

DISTRIBUTION. New Zealand.

Plocamium brachiocarpum, *Kütz.*, Sp. p. 885; De Toni Syll. Alg. vol. iv., p. 592.

DISTRIBUTION. New Zealand.

Nitophyllum palmatum, *Harv.* in Hook. Fl. Nov. Zel., vol. ii., p. 240, (var. excl.); De Toni Syll. Alg. vol. iv., p. 659.

DISTRIBUTION. New Zealand.

Laurencia obtusa, *Lam.*, Ess., p. 42; De Toni Syll. Alg. vol. iv., p. 791. The specimens though differing slightly from those of Europe are not sufficiently dissimilar to justify their being regarded as a distinct species.

DISTRIBUTION. In almost all tropical and temperate seas.

Laurencia botryoides, *Gaill.*, Résumé p. 15; Harv. Phyc. Austral. tab. 182.

L. thyrsifera, J. Ag., which approaches this species very closely, differs in having opposite branches. Transitional forms are not wanting, and it is doubtful if the two plants are distinct.

DISTRIBUTION. S. Australia.

Laurencia heteroclada, *Harv.* in Trans. Irish Acad. vol. xxii. p. 544; Phyc. Austral. tab. 148.

DISTRIBUTION. S. and W. Australia, New Zealand.

Laurencia gracilis, *Harv.*, Ner. Austral. p. 84. *L. filiformis*, Hook. et Harv. in Lond. Journ. Bot. vol. vii., p. 444, (non alibi).

DISTRIBUTION. New Zealand.

Cladhymenia oblongifolia, *Hook. et Harv.* in Lond. Journ. Bot. vol. iv., p. 540; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 235, tab. 113.

DISTRIBUTION. New Zealand.

Polysiphonia Lyallii, *Hook. et Harv.* in Hook. Fl. Antarct. vol i., p. 182, tab. 74; Harv. Ner. Austral. p. 41.

DISTBIBUTION. New Zealand.

Polysiphonia aterrima, *Hook. et Harv.* in Lond. Journ. Bot. vol. iv., p. 536; Harv. Ner. Austral. p. 52, non J. Ag.

DISTRIBUTION. New Zealand.

Euzoniella ovalifolia, *Falkenb.*, Die Rhodomelaceen p. 367. *Polyzonia ovalifolia*, Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 226, tab. 112 b.

On *Cheilosporium Wardii*, De Toni.

DISTRIBUTION. New Zealand.

Metamorphe Colensoi, *Falkenb.* in Engl. & Prantl Nat. Pflanzenf. p. 445. *Polysiphonia Colensoi*, Harv. in Hook. Fl. Nov. Zel., vol. ii., tab. 112 c. (parum characteristica).

On *Cystophora retroflexa*, Ag.

DISTRIBUTION. New Zealand.

Dipterosiphonia dendritica, *Falkenb.*, Die Rhodomelaceen p. 324. *Polysiphonia dendritica*, C. Ag., non Hook. et Harv.

On *Cheilosporium Wardii*, De Toni.

DISTRIBUTION. Australia, New Zealand, Brazil.

Lenormandia Chauvinii, *Harv.* in J. Ag. Spec. vol. iv., p. 1104; Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 222 (excl. var. *angustifolia*).

DISTRIBUTION. Australia, New Zealand.

Bostrychia mixta, *Hook. et Harv.* in Lond. Journ. Bot. vol. iv. p. 270 et p. 539; Harv. Ner. Austral. p. 70; Phyc. Austral. tab. 176 a. Hook. Fl. Nov. Zel., vol. ii., p. 225.

DISTRIBUTION. Australia, New Zealand, S. Africa.

Griffithsia Sonderiana, *J. Ag.*, Epicr. p. 62; Laing, in Trans. New Zeal. Inst. vol. xxxvii., 1904, p. 389. *Callithamnion Griffithsiae*, Harv. Alg. Austral. Exsicc. No. 535. *Griffithsia setacea*, Harv. quoad spec. ex Austral. et Nov. Zel. *Monospora? griffithsioides*, De Toni Syll. Alg. vol. iv., p. 1302.

DISTRIBUTION. S. Australia, Tasmania, New Zealand.

Ceramium apiculatum, *J. Ag.*, De Alg. Nov. Zel. p. 14. *C. cancellatum*, Harv. in Hook. Fl. Nov. Zel., vol. ii., p. 256 (non alibi).

DISTRIBUTION. New Zealand.

Lithothamnion cystocarpideum, *Fosl.*, Alg. Notiser, vol. ii. p. 7. (Kgl. Nor. Vid. Selsk. Skr. 1906 No. 2.) sp. nov.

As the original description of this species is published in the Norwegian language a Latin translation is given below.

L. conchato, Setch. et Fosl. affine a quo conceptaculis sporangiorum recedit.

Frons suborbiculata, paulum convexa aut concava, 0·4–1 cm. diam., 0·2–0·5 mm. crassa, plusminusve undulata, saepe irregulariter incisa. *Conceptacula sporangiorum* convexa aut hemispherica, 300–500 μ diam., centro valde depressa, tegmine canalibus 12–20 intersecto, *sporangia* zonatim 4 divisa, 160–240 $\times$ 50–80 μ; *conceptacula cystocarpiorum* subconica, 300–600 μ diam.

HAB. in frondibus Cheilosporii.

This species was sent to Mr. Foslie the well-known authority on *Lithothamnia*. He has described it as new, and has furnished the following notes.

"In habit and also partly in structure this species is most nearly "related to *L. conchatum*, Setch. and Fosl. from the Pacific coast "of North America. The conceptacles of sporangia however "approach those of *L. haptericolum*, from New Zealand, and "*L. nitidum*, Fosl. from Japan. If only a cursory examination be "made, the conceptacles of sporangia may easily be confounded "with those of the cystocarps."

Lithothamnion Patena, *Heydr.*, Lith. Mus. Paris, 1901, p. 542. *Melobesia Patena*, Harv. Ner. Austral. p. 111, tab. 40.

Foslie though previously regarding this plant as a form of *L. lichenoides*, Heydr. states in a letter that he now considers it "a separate species as remarked in 'Antarctic and Sub-Antarctic Corallinae' now in the press."

DISTRIBUTION. New Zealand.

Cheilosporium Wardii, *De Toni*, Syll. Alg. vol. iv., p. 1828. *Amphiroa Wardii*, Harv., Ner. Austral. p. 99, tab. 38.

DISTRIBUTION. Australia.

Corallina armata, *Harv.*, Ner. Austral. p. 103, tab. 40, fig. 1–7.

DISTRIBUTION. New Zealand.

Corallina Cuvieri, *Lamour.*, Pol. flex. p. 286; Harv. Ner. Austral. p. 106. *Jania granifera*, Decne. *J. subulata*, Sow.

DISTRIBUTION. S. Australia, New Zealand.

IX.—THE WESTERN CATALPA.

(*Catalpa cordifolia*, Jaume [*C. speciosa*, Warder.])

W. J. BEAN.

A number of enquiries have recently been addressed to Kew as to the likelihood of this tree proving of value in the British Isles for the production of timber. Some of these enquiries probably had their origin in statements that have appeared in the daily press describing the wonderfully durable qualities of the timber of this tree. But one correspondent says: "I was told by the chief "engineer of 3,000 miles of railroad in the Southern States of "U.S.A. that the railway companies were now planting large areas "to supply them with sleepers, and that he had known this timber "to stand 30 years in situations where 'White Oak' rotted in 6 "or 7 years."

The wood of *Catalpa cordifolia* undoubtedly possesses a remarkable quality of resisting decay in moist places or in contact with the soil. Numerous instances of this are recorded by American authorities. In Sargent's *Silva of North America*, vol. vi., p. 90, the following statement occurs: "The trunks of the "Catalpa trees killed by the sinking and subsequent submersion of "a large tract of land near New Madrid, Missouri, which followed "the earthquake of August, 1811, were standing and perfectly sound

"67 years later, although all their companions in the forest had "disappeared long before. Undecayed fence-posts believed to "have been continuously in the ground for more than half a century "demonstrate, too, the remarkable duration of the wood of this "Catalpa." Mr. B. Landreth, president of the Pennsylvania Forestry Association, stated in 1888 that he had in his possession a piece of gate-post which had stood in place 100 years and was still in a perfect state of preservation (*Garden and Forest*, 1888, p. 500).

Catalpa cordifolia inhabits moist fertile situations in the States of Illinois, Indiana, Kentucky, Tennessee, Missouri and Arkansas. Under forest conditions it grows 100 feet, occasionally 120 feet, high, but in open situations where the branches have room for lateral development, it attains to only half those heights. The finest trunks are 4½ feet in diameter. The blade of the leaf is ovate with a long, tapering apex and frequently more than one foot long by 6 to 8 inches broad; the petiole is about half the length of the blade. It is a very handsome tree in regard to both its foliage and its flowers, the latter being 2½ inches across with a white, campanulate corolla blotched with yellow and spotted with purple. The oldest specimens in Kew were raised in 1880 from seed sent by Professor Sargent, and they have flowered annually for several years past.

The species may easily be confounded with *Catalpa bignoniaefolia*, a well-known ornamental tree that has been cultivated in English gardens since early in the eighteenth century. Besides differing, however, from *C. cordifolia* in its slower growth and smaller stature, it can also be distinguished by its shorter, less tapering leaves, its fewer-flowered panicles, its smaller, more profusely spotted flowers, and the thinner walls of the fruit. It is of little value as a timber tree compared with *C. cordifolia* and if large plantings of the latter were contemplated, care should be taken to obtain the seed true.

The wood of *C. cordifolia* is light in weight and colour, and although coarse-grained and neither hard nor strong, it takes a fine polish and can be used for furniture and cabinet work. Millions of trees have been planted by railway companies and others in the United States, especially in the west. It is highly valued there for making railway sleepers on account of its great durability when in contact with the earth. In this respect it is superior to 'White Oak,' but the wood does not afford so firm and sound a grip for the bolts holding down the rail to the sleeper as the 'White Oak' does. It is also very useful for gate-posts, fencing, telegraph poles, &c.

And now the question arises as to whether this tree is likely to be of any value for forest planting in the British Isles. We may say at once that the replies made by Kew to enquirers on this matter have been to the effect that it is very improbable that this Catalpa can be grown for profit in this country, and to dissuade them from devoting land and capital to its cultivation on any other than an experimental scale. It is certainly quite hardy in the South of England; at Kew it has withstood the winters of the last 25 years quite uninjured. But it does not grow fast. The trees at Kew, however, do not give a fair idea of its capabilities

under forest conditions. They have been transplanted several times, are situated quite in the open, and the soil is not good. The localities in the British Isles where it would be most likely to succeed are the south and west of England and perhaps the north of Ireland. Although a mild climate is no doubt favourable to its quick growth, it is not that alone that will make its cultivation a success. It has experienced 32° Fahr. of frost at Kew without injury and is perfectly hardy in the severe New England climate. Abundant sunshine with a moist fertile soil are more important desiderata, and where those are available more profitable crops than this Catalpa can be secured. Certainly it will not be a success—as some enquirers had been led to hope—on barren uplands and places where ordinary crops could not be grown.

X.—DIAGNOSES AFRICANAE: XIX.

881. **Hibiscus Allenii**, *Sprague et Hutchinson* [Malvaceae—Hibisceae]; ab affini *H. micrantho*, Linn. f., foliis profunde trilobatis et seminibus pubescentibus tantum nec villosis recedit.

Herba erecta, 30–50 cm. alta, simplex vel ramis lateralibus rectis angulo acuto divergentibus munita, caulibus et petiolis et pedunculis pilis stellatis flavescentibus patule hirsutis. *Caulis* teres, basi 1·5–3 mm. diametro, internodiis 3–6 cm. longis. *Stipulae* filiformes, 3–5 mm. longae, pilis simplicibus hirsutae. *Folia* saltem 3-lobata, irregulariter serrata, lobis oblongis vel oblongo-lanceolatis 2–5·5 cm. longis 0·8–2 cm. latis rarius (in foliis basalibus ramorum) elliptico-oblongis 1–2 cm. longis 0·8–1·2 cm. latis, superiora et media profunde 3-lobata, inferiora minus profunde 3–5-lobata, lobo intermedio interdum utrinque lobulo circa medium orto munito, lamina utrinque strigosa supra pilis simplicibus subtus pilis 3–4-radiatis, venis utrinque subtus magis prominulis; petioli 1–2·3 cm. longi. *Flores* in axillis solitarii, pedunculis 2·5–3 cm. longis circ. 5 mm. infra apicem articulatis sub fructu usque ad 4 cm. longis. *Bracteolae* 8, rarius 9, lineares, obtusae, 2·5–3·75 mm. longae, circ. 0·5 mm. latae, extra et marginibus pilis biradiatis et simplicibus hirsutae. *Calyx* apice extra et margine pilis simplicibus ceterum extra pilis 2-radiatis hirsutus, intus glaber; tubus 2 mm. longus; lobi lanceolati, subacuti, 5–6·5 mm. longi, 1·75–2·5 mm. lati. *Petala* carminea, oblique elliptica, rotundata, 12 mm. longa, 6–6·5 mm. lata, basi 2 mm. tubo staminеo adnata, intus glabra, extra parte eorum in alabastro visa stellato-pilosa. *Stamina* 25; columna tota 11–12 mm. longa, staminum verticillos tres gerens, ultra verticillum superiorem 2 mm. producta, dentibus 5 triangularibus vix 0·5 mm. longis; verticillus inferior 1 mm. supra petala insertus, e staminibus 5 compositus, filamentellis simplicibus 1·5–2 mm. longis; verticilli medius et superior e staminibus 10 compositi, filamentellis e basi bifurcatis quam iis verticilli inferioris brevioribus; verticillus medius 3·5–4·5 mm. supra inferiorem, superior 2·5 mm. supra verticillum medium situs. *Ovarium* globosum, 2·5 mm. diametro, minute dense appresse albo-pubescens, loculis 3–4 ovulatis; styli glabri pars

communis 8–8·5 mm. longa, ramis circ. 5 mm. longis e tubo tubo stamineo 4 mm. exsertis, stigmatibus capitatis dense penicillatis. *Capsula* circ. 8 mm. diametro, puberula. *Semina* minute appresse pubescentia.

RHODESIA. Near Victoria Falls, in the damp vlei, *Allen*, 103, 113.

Evidently allied to *H. Dinteri*, Hochr., which differs, however (from the description), in the following points :—" lamina usque ad basin tripartita : pedunculis ca. medio articulatis ; involucri bracteae ca. 6, subulatae."

882. **Hibiscus Hildebrandtii**, *Sprague et Hutchinson* [Malvaceae—Hibisceae] ; habitus fere *H. crassinervii*, Hochst., a quo indumento bracteolarum et calycis, calycis lobis latioribus plurinerviis, columna staminea diversa abhorret.

Suffrutex erectus, strictus, ramulis sub angulo acuto divergentibus, ramis stipulis petiolis et laminis infra aspere stellato-tomentellis, pilis pluriradiatis. *Rami* teretes, 1·5–2·5 mm. diametro, internodiis 1·5–3·5 cm. longis. *Stipulae* subulatae, 4–5 mm. longae. *Folia* ovato-elliptica vel late elliptica, apice rotundata, 1·5–3·7 cm. longa, 1–3·2 cm. lata, margine denticulata, basi 5–7 nervia, utrinque pilis stellatis aspera, supra pubescentia, subtus tomentella, venis supra inconspicuis subtus prominentibus ; petioli 3–12 mm. longi. *Flores* in axillis solitarii, pedunculis 2–3 cm. longis 5–8 mm. infra apicem articulatis. *Bracteolae* 8, rarius 7 vel 9, subulatae, 3·5–6·5 mm. longae, basi 1–1·25 mm. latae, extra pilis stellatis antrorsis intus et margine pilis simplicibus indutae. *Calyx* extra pilis 2–5-radiatis antrorsis aspere tomentellus, radiis sub angulo parvo divergentibus ; tubus 2–2·5 mm. longus, intus glaber ; lobi lanceolati vel ovati et acuminati, 5–8 mm. longi, 3–3·5 mm. lati, subacuti, 5–7-nervii, intus superne sparsiuscule appresse pubescentes. *Petala* rosea vel coccinea (*Hildebrandt*), anguste obovata, 1·5–2 cm. longa, circ. 7 mm. lata, basi 3 mm. tubo stamineo adnata, intus glabra, extra parte eorum in alabastro visa stellato-pilosa. *Stamina* in forma typica 50 ; columna tota circ. 1·7 cm. longa, staminum verticillos quinque gerens, ultra verticillum supremum circ. 2 mm. producta, lobis 5 oblongis vel oblongo-lanceolatis 1–1·5 mm. longis obtusiusculis ; verticilli omnes e staminibus 10 compositi, filamentellis bifurcatis ; verticillus infimus circ. 6 mm. supra petala insertus ; inferiores 2–2·5 mm., superiores 1–1·5 mm. distantes. *Ovarium* globosum vel subglobosum, circ. 3 mm. diametro, minute dense appresse albo-pubescens, loculis 4–6-ovulatis ; styli glabri pars communis 1·4 cm. longa, ramis 4–5 mm. longis exsertis. stigmatibus capitatis dense penicillatis circ. 0·75 mm. diametro. *Capsula* ellipsoidea, 1 cm. longa, puberula. *Semina* rufo-villosa, villis circ. 5 mm. longis. *Embryo* 2·5-3 mm. longus.

SOMALILAND. Adda Gallah, *James and Thrupp* ; without precise locality, *Lort-Phillips*.

BRITISH EAST AFRICA. Mombasa, *Hildebrandt*, 1926 ; *Scott Elliot*, 6121 ; *Wakefield*. Pemba River, *Kässner*, 350. Ribe, *Wakefield*. Makini, 120 m. alt., *Kässner*, 426. North of Mombasa, on a journey to Lamu and Witu, *Whyte*. Duruma District ; Tkhamtei, *Hildebrandt*, 2327.

German East Africa. Umba Valley, *C. S. Smith*; Tanga, *Heinsen*, 140.

The description of the staminal tube was taken from a fully developed flower (*Hildebrandt*, 1926), and represents the normal condition. Occasionally a few (3 in two instances) additional *solitary* stamens are found below the lowest normal whorl; or the latter may be absent and the stamens are thus reduced to four whorls (*Scott Elliot*, 6121.)

The two lowest whorls may consist of solitary stamens instead of pairs (*Lort-Phillips*); or they may be represented by a single solitary stamen (*James and Thrupp*), the number of stamens being thus reduced to 31.

883. **Hibiscus shirensis**, *Sprague et Hutchinson* [Malvaceae — Hibisceae]; ab. *H. gossypino*, Thunb., quocum confusus, indumento, floribus minoribus, styli ramis glabris facillime distinguitur.

Frutex erectus, 1–2 m. altus, caule terete inferne circ. 4 mm. diametro pilis pluriradiatis magnis brunneis sparse, et aliis parvis albidis dense, aspere pubescente, superne tomentello subcorymbose ramoso, ramulis sub angulo acuto ortis ascendentibus, internodiis 2·5–10 cm. longis. *Stipulae* filiformes, 5–8 mm. longae. *Folia* caulis ambitu deltoideo-ovata, leviter trilobata, apice acuta, basi subcordata, 6–8 cm. longa, 4–6 cm. lata, crenata, basi sub-7-nervia, supra breviter stellato-pubescentia, subtus stellato-tomentella, venis supra inconspicuis subtus prominentibus; folia ramulorum ovata, 2–3·5 cm. longa, 1·5–3 cm. lata, subacute crenata, majora eorum interdum leviter trilobata; petioli 3–6 cm. longi, stellato-pubescentes, juniores tomentelli. *Inflorescentia* laxe paniculata, ramulis circ. 3-floris, inferioribus solitariis 10–15 cm. longis, superioribus ex eadem axilla ac pedunculo unifloro jam fructifero ortis. *Pedunculi* florum solitarium tandem 2·5–5·8 cm. longi, 4–13 mm. infra apicem articulati. *Bracteolae* 7, rarius 6 vel 8, linearilanceolatae, subacutae, 4–6 mm. longae, 1–1·25 mm. latae, utrinque pilis albidis 2-pauci-radiatis antrorsis tomentellae, extra pilis paucis majoribus brunneis 2-radiatis inferne adjectis. *Calyx* extra pilis albidis stellato-tomentellus et aliis majoribus brunneis 2–4 radiatis hirsutus; tubus 1·5–1·75 mm. longus; lobi lanceolati, acuti vel subacuti, 7–9 mm. longi, 2–3 mm. lati, intus superne breviter appresse albo-pubescens vel tomentellus, superne 3-nervius, inferne 5-nervius. *Petala* carminea, obovato-oblonga, 1·5–2 cm. longa, 8–12 mm. lata, basi 2–2·5 mm. tubo stamineo adnata. *Stamina* 50–80, plerumque geminata, uno alterove hinc inde solitario, inferiora paullo supra petala inserta, filamentellis 3–4 mm. longis; columna tota circ. 1 cm. longa, ultra filamentella suprema 1–1·5 mm. producta, dentibus oblongis vel subtriangularibus circ. 0·5 mm. longis. *Ovarium* globosum, 3 mm. diametro, minute albo-pubescens, loculis 6–8-ovulatis; styli glabri pars communis 5–6·5 mm. longa, ramis 4–6 mm. longis, stigmatibus capitatis dense penicillatis. *Capsula* circ. 1 cm. longa, sparse puberula. *Semina* dense villosa, villis circ. 5 mm. longis. — *Hibiscus gossypinus*, Mast. in Oliv. Fl. Trop. Afr. vol. i. p. 205, *partim*, non Thunb.

Nyasaland. Manganja Hills; entrance of Bangwe Pass, 900 m., *Meller*. Shire Highlands, *Buchanan*, 94; banks of Likangala River, *Buchanan*, 385. Zomba, *Purves*, 140.

The partial filaments are crowded on the staminal column and their arrangement is in consequence difficult to determine, but it is probably spiral.

The corolla of *Hibiscus gossypinus*, Thunb., appears to be *white*, at all events in the Tropical African specimens : see the labels of *Meller*, Manganja Hills, and *Johnston*, 93, Kilimanjaro, both in the Kew Herbarium ; also the note by Grant in Trans. Linn. Soc., vol. xxix., p. 37, referring to *Grant*, 162.

The pink-flowered " variety " of *H. gossypinus*, described on the same page, is a distinct species, closely allied to *H. Hildebrandtii ;* and Masters' description in Fl. Trop. Afr., vol. i., p. 205, of the corolla of *H. gossypinus* as pink is due to confusion with *H. shirensis* and other species.

None of the South African specimens of *H. gossypinus* have any indication of the colour of the flowers on the labels, but Harvey in Harv. and Sond. Fl. cap., vol. i., p. 175 describes the flowers as yellow. The colour is probably taken from the description of *H. fuscus*, Garcke, which Harvey reduces to *H. gossypinus*.

Hochreutiner's reduction of *H. gossypinus* to *H. ferrugineus*, Cav., in Ann. Conserv. et Jard. Bot. Genève, 1900, p. 84, is inadmissible. The style-branches are shown as much exserted and glabrous in Cavanilles's figure (Diss. t. 60, f. 1), characters quite inconsistent with *H. gossypinus*.

The specimen of *Scott Elliot*, 2670, Madagascar, at Kew, on the other hand, agrees well with Cavanilles's figure, so that there can be little doubt that *H. ferrugineus* is a well-defined species endemic in Madagascar.—T. A. S.

884. **Cienfuegosia heteroclada**, *Sprague* [Malvaceae—Hibisceae] ; ab omnibus speciebus hactenus descriptis cymis e rhizomate ortis differt.

Suffrutex rhizomate ascendente vel suberecto lignoso apice incrassato caules foliatos et cymas aphyllas gerente. *Caules* 2 coëtanei vel 1, 7–22 cm. longi, ± anfractuosi, pentagoni, angulis costatis, pallidi, glandulis nigro-purpureis punctati, ceterum glabri. *Stipulae* lineari-subulatae vel subulatae, 4–8 mm. longae, valde unicostatae, glanduloso-punctatae. *Folia* simplicia ; laminae obovatae vel anguste obovatae, aliae integrae, aliae apice tridentatae, unica bidentata, dentibus terminali et laterali, apice vel dentibus acute breviter acuminatae vel apiculatae, basi cuneatae, 9–13 cm. longae, 4–6·5 cm. latae, 5-veniae, tenuiter coriaceae, glanduloso-punctatae, ceterum glabrae, utrinque manifeste crebre reticulatae, venis primariis supra prominulis subtus prominentibus ; petioli 2–6 mm. longi, supra late excavati. *Cymae* plures e basi caulis vel ex apice rhizomatis ortae, 3–7-florae ; rhachis 1–2 cm. longa, costata, pallida, purpureo-tincta, ut bracteae pedicelli bracteolae calycesque glanduloso-punctata ; bracteae subulatae ; pedicelli 1–3 cm. longi. *Bracteolae* 3, ± inaequales, ovatae usque lanceolatae, apice plerumque tricuspidatae vel trifidae rarius integrae, acuminatae, 3·5 mm. longae, 2–3·5 mm. latae. *Calyx* campanulatus, 1·2–1·7 cm. longus, usque ad medium irregulariter 5-fidus ; lobi ovati vel lanceolati, acuminati, 3-nerves vel aliqui eorum 4–5-nerves. *Petala* 3–3·5 cm. longa, purpurea,

basi 2–4 mm. tubo stamineo adnata et extra pubescentia, marginibus inferioribus ciliolatis. *Tubus stamineus* 1–1·5 cm. longus, usque ad apicem antheriferus. *Ovarium* 3–4-loculare; stylus circ. 2·5 mm. longus. *Capsula* 3-locularis; valvae obovatae, circ. 1·8 cm. longae, 8–9 mm. latae, rigidae, spongiosae, extra dense glanduloso-punctatae. *Semina* pilis rectis circ. 1 cm. longis dense sericeo-villosa. *Embryo* ellipsoideus, 5–6 mm. longus.

NORTHERN NIGERIA. Kontagora, in the bush after burning, *Dalziel*, 122.

Cienfuegosia was published by Cavanilles in 1787, and the name was altered to *Fugosia* by A. L. de Jussieu two years later. For those who prefer to use the latter name, the species may be known as *F. heteroclada*, Sprague.

885. **Lamprothamnus Fosteri**, *Hutchinson* [Rubiaceae - Alberteae]; affinis *L. zanguebarico*, Hiern, sed foliis acuminatis, petiolis longioribus et corollae tubo breviore differt.

Frutex ramis glabris teretibus, internodiis circiter 3 cm. longis. *Folia* glabra, coriacea, oblonga vel oblongo-elliptica, 13–18 cm. longa, 4–5 cm. lata, interdum basi attenuata, apice obtuse acuminata, marginibus integris; venae laterales utrinque 4–6, supra leviter impressae, subtus prominentes; petiolus circiter 1·5 cm. longus; stipulae deciduae, triangulares, acutae. *Cymae* axillares, multiflorae, quam folia multo breviores; pedunculus 1·5–2 cm. longus; bracteae et bracteolae parvae. *Calycis tubus* 3 mm. diametro, 2 mm. longus, intra glaber, extra breviter pubescens; limbus breviter quinqueundulatus. *Corollae tubus* 2 mm longus, 3 mm. diametro, fauce villosus; lobi 5, oblongi, 8 mm. longi, 3 mm. lati, apice obtusi vel subacuti. *Stamina* exserta; antherae 8 mm. longae, 1·5 mm. latae; filamenta 1 mm. longa. *Ovarium* 5-loculare, loculis uniovulatis; stylus clavatus (rarius bifidus), 1·5 cm. longus, glaber. *Fructus* globosus, minute pubescens.

LAGOS. *Foster*, 4.

886. **Geigeria Wellmanii**, *Hutchinson* [Compositae-Inuloideae]; affinis *G. Hoffmannianae*, Hiern, sed foliis decurrentibus differt.

Herba ascendens, basi lignosa, caulibus glabris laminis decurrentibus bialatis, alis glanduloso-punctatis; internodia 0·5–1 cm. longa. *Folia* alterna, sessilia, oblongo-oblanceolata, 1·5–2·5 cm. longa, 4–8 mm. lata, apice breviter apiculata, integra, tenuiter coriacea, glabra, utrinque glanduloso-punctata, venis utrinque prominulis. *Capitula* sessilia terminalia et ramulos laterales breves terminantia. *Involucri bracteae* 6–8, lanceolatae, 7–8 mm. longae, 1–1·5 mm. latae, ciliatae, ceterum glabrae. *Flores disci* pauci; corollae tubus 2 mm. longus; lobi lineari-lanceolati, 6 mm. longi, 1 mm. lati, supra medium extra sparse pilosi. *Antherae* apiculatae, 3 mm. longae, apiculis 1 mm. longis acutis. *Stylus* breviter pilosus, ramis brevissimis acutis. *Achaenia* teretia, 1·5 mm. longa, dense pilosa. *Pappi segmenta* elliptica vel oblonga, 1·5 mm. longa, 1 mm. lata, acuta. *Receptaculi paleae* filiformes, glabrae.

ANGOLA. Bailundo District, Benguella, *Wellman*.

Mo. Bot. Garden
1908

887. **Hypericophyllum multicaule**, *Hutchinson* [Compositae-Helenioideae]; quoad capitula ad *H. congoense*, quoad habitum ad *H. compositarum* accedens, ab ambabus speciebus pappi setis usque ad apicem ciliatis recedit.

Herba rigida, multicaulis, circiter 25 cm. alta. *Rhizoma* horizontale, crassum. *Caules* erecti, puberuli, graciles, sulcati, basi foliis squamiformibus deltoideis densiuscule obtecti, internodiis 6–10 cm. longis. *Folia* sessilia, ovato-oblonga, obtusa vel rotundata, glabra, firma, 5–6 cm. longa, 1·5–2 cm. lata, venis utrinque subtus magis prominulis, marginibus leviter recurvis. *Capitula* in caulibus solitaria vel in cymas 3-floras disposita, terminalia vel ramos axillares terminantia, circiter 2 cm. longa et 1 cm. diametro; pedunculus usque ad 12 cm. longus, apicem versus incrassatus. *Involucri bracteae* 2-seriatae, oblongo-lanceolatae, acutae, glabrae. *Receptaculum* planum, nudum. *Flores* 12–15; tubus circa medium leviter constrictus, 1 cm. longus, lobis oblongis subacutis 3·5 mm. longis. *Antherae* apiculatae, 4 mm. longae, filamentis 4 mm. longis. *Styli rami* 3 mm. longi, minute glandulosi, truncati. *Achaenia* pubescentia, 8 mm. longa. *Pappi setae* 1·3 cm. longae, usque ad apicem ciliatae.

NORTHERN NIGERIA. Kontagora, *Dalziel*, 52.

888. **Othonna decurrens**, *Hutchinson* [Compositae-Senecionideae]; affinis *O. distichae*, N. E. Brown, sed foliis orbicularibus, capitulis majoribus differt.

Caules vel rami simplices, glabri, striati, foliis decurrentibus anguste bialatis, internodiis 7–8 cm. longis. *Folia* disticha, suberecta, sessilia, orbicularia, basi decurrentia, 7 cm. longa, 8 cm. lata, glabra, palmatim 8-venia, venis utrinque prominulis, iis partis decurrentis patulis. *Capitula* solitaria, axillaria vel terminalia, subsessilia, campanulata, circ. 2·8 cm. diametro. *Involucri bracteae* circ. 10, oblongae, leviter acuminatae, utrinque glabrae, 1·5–2 cm. longae, 0·5 cm. latae, marginibus membranaceis connatis. *Flores disci* 20–30; corollae tubus 1·3 cm. longus; lobi fere obsoleti. *Antherae* 1·5 mm. longae. *Stylus* glaber, 1·2 cm. longus, apicem versus incrassatus. *Achaenia* 1 cm. longa, 2·5 mm. lata, pilosa.

ANGOLA. Bailundo District, Benguella, *Wellman*.

889. **Berkheya** (§**Stobaea**) **macrocephala**, *J. M. Wood* [Compositae-Arctotideae]; affinis *B. latifoliae*, Wood et Evans, sed capitulis majoribus solitariis, haud racemoso-paniculatis et involucro distincta.

Herba perennis, rhizomate lignoso duro, 20–30 cm. alta. *Caulis* molliter hirsutus, lana tenuissima araneosus. *Folia basalia* oblonga, basi longe attenuata, in petiolum abeuntia, profunde pinnatifida segmentis utrinque 10–15 imbricatis basin versus cito decrescentibus rotundatis irregulariter lobulatis in margine spinosis spinis 1–3 mm. longis, petiolo incluso 35–45 cm. longa, 7–12 cm. lata, primum lana parca subaraneosa, deinde lana detrita, utrinque parce molliter hirsuta; petiolus interrupte lobato-alatus, lobis superne in lobos laminae abeuntibus inferne minutis eadem structura quam laminae. *Folia caulina* pauca (6–7), anguste oblonga vel oblongo-lanceolata, amplexicaulia, infima pinnatifida, summa vix lobata segmentis vel

lobis haud imbricatis in margine spinosis, a 12 (infima) ad 2·5 (summa) cm. longa, 5–1·2 cm. lata. *Capitula* in caulibus solitaria, basi extus lanato-araneosa, 10–12 cm. diam.; involucri bracteae lineares vel lanceolato-lineares, ad 5 cm. longae, ad 6 mm. latae, apice pungentes, ad margines spinulosae, rigidae, prominenter venosae; receptaculum paleis numerosissimis lineari-oblanceolatis spinuloso-serratis densissime onustum. *Flores* lutei, numerosi; *radii* involucri bracteas paulo superantes, ligula apice acute 4-dentata; *disci* profunde 5-lobati, lobis linearibus acutis. *Achaenia* sericea; pappus biseriatim paleaceus, paleis oblongis obtusis acutisve laceratis serrulatis vel subintegris.

NATAL. Hillside near Richmond in open ground, 600–900 m., Oct. 1906, *J. M. Wood*, 10,031.

890. **Landolphia Monteiroi**, *Dyer MS. ex Stapf* [Apocynaceae]; affinis *L. pachyphyllae*, Stapf, foliis minoribus, nervis paucioribus magis obliquis, corolla maiore distincta.

Frutex vagans, scandens ope cymarum cirrhiformium, novellis rufo-pubescentibus mox glabratis, ramis adultis lenticellis brunneis conspersis. *Folia* oblonga vel lanceolato-oblonga, obtusa vel subacuta, basi obtusa, 4–6 cm. longa, 1·8–2·5 cm. lata, coriacea, costa supra canaliculata subtus prominente, nervis lateralibus utrinque 8–10 subobliquis tenuibus, reticulatione tenui; petiolus 5–6 mm. longus. *Panicula* pedunculo 2·5–5 cm. longo suffulta, parce ramosa ramis cymas densas gerentibus. *Flores* subsessiles. *Calyx* ad 3 mm. longus, extus rufo- vel ferrugineo-tomentosus; sepala ovato-oblonga subacuta. *Corolla* alba, suaveolens; alabastrum ad 3·5 mm. longum; tubus 12–14 mm. longus, supra calycem ipsum paulo inflatus, tenuiter pubescens; lobi lineari-oblongi, ad 2·5 mm. longi, ad margines tenuiter ciliati. *Stamina* 3 mm. supra corollae basin inserta. *Ovarium* tenuissime albido-sericeo-tomentosum; ovula circiter 30 cum unaquaque placenta, 6-seriata. *Fructus* luteus, magnitudine parvi Pomi aurantiaci.—*Ancylobotrys Petersiana* var. *Forbesiana*, Pierre-Bull. Soc. Linn. Paris, 1898, p. 91 (name only, in parte).

PORTUGUESE EAST AFRICA. Delagoa Bay, *Monteiro*, 37.

Pierre also quotes (l.c.) a specimen collected by Forbes in the same locality, under *Ancylobotrys Petersiana* var. *Forbesiana*. This, however, is typical *Landolphia Petersiana*, Dyer.

891. **Wrightia natalensis**, *Stapf* [Apocynaceae]; nulli generis speciei arcte affinis, habitu *W. tinctoriae* accedens, sed floribus luteis et coronae forma distincta.

Frutex ramis novellis rufo-pubescentibus mox glabratis tandem cortice tenui cinereo obtectis. *Folia* lanceolata, subacuta, basi cuneata, ad 7·5 cm. longa, ad 1·8 c.m. lata (potius immatura), subtus ima basi rufo-pubescentia, ceterum glabra, nervis lateralibus circiter 9; petiolus tenuis, 4–8 mm. longus. *Panicula* brevis, subcorymbosa, 2·5 cm. vix diametro excedens, rufo-pubescens, bracteis lineari-oblongis vel linearibus 3–4 mm. longis; pedicelli ad 8 mm. longi. *Calyx* basi pubescens, superne subglaber, 5–6 mm. longus; sepala oblonga, obtusa, intus squamis solitariis munita, margine membranaceo. *Corolla* flava, extra dense minute papillosa; tubus 4 mm. longus; lobi oblongi,

subobtusi, 8 mm. longi, basi squama emarginata facie appendicibus 2 filiformibus brevibus instructa muniti, squamis ad medium in coronam brevem connatis. *Antherae* 4 mm. longae, tenuiter acuminatae, dorso glabrae. *Folliculi* ignoti.

NATAL. Near the Umzinyati Falls, 240 m., *Haygarth in Herb. J. M. Wood*, 7861.

This species is described under *Wrightia* because the general facies of the plant is more of that genus than of *Pleioceras*; but it is quite possible that it will turn out to belong to the latter when the fruit comes to be known.

892. **Strophanthus Gerrardii**, *Stapf* [Apocynaceae]; affinis *S. Petersiano*, Klotzsch, sed foliis angustioribus, sepalis potius subulatis, forma corollae diversa.

Frutex glaber ramis gracilibus castaneis, lenticellis albidis crebris. *Folia* anguste ovata vel ovato-lanceolata, acuta vel subacuminata, basi rotundata vel subacuta, 3–6 cm. longa, 1·8–2·5 cm. lata, papyracea, nervis secondariis utrinque circiter 5 uti venis tenuissimis vel obscuris; petiolus 4 mm. longus. *Cymae* in ramis abbreviatis terminales, ad florem solitarium redactae, cum foliis coëtaneae; pedunculus gracilis, 4–12 mm. longus, vel vix ullus; bracteae mox deciduae; pedicelli graciles, ad 12 mm. longi. *Calyx* 8–10 mm. longus; sepala subulata basi latiore. *Corolla* extus glabra, intus pubescens; tubi pars infrastaminalis 3 lin. longa, suprastaminalis tubuloso-campanulata, 9 mm. longa, ad 8 mm. lata (exsiccata); lobi e basi ovata vel lanceolata in caudas lineares attenuati, toti 3·6 mm. longi; faucis squamae lineari-subulatae, 2–3 mm. longae. *Antherae* acumine tenui acuto.

NATAL. Without precise locality, *Gerrard*, 1795.

893. **Oncinotis natalensis**, *Stapf* [Apocynaceae]; affinis *O. gracili*, *Stapf.*, sed tomento minuto, foliis basi magis acutis brevius petiolatis, nervis valde obliquis paucioribus, racemis brevioribus differt.

Frutex scandens, ramulis teretibus, novellis minute denseque fulvo-tomentosis, mox glabrescentibus, demum fuscis vel brunneis, lenticellis albidis. *Folia* obovato-oblonga vel oblanceolata, abrupte acuminata, basi acuta, 7·5–9 cm. longa, 2·5–4 cm. lata, firme membranacea, fulvo- vel rufo-tomentella in gemmis novellis, cito glabra, nervis secondariis utrinque 3–4 valde obliquis; petiolus 4–5 mm. longus. *Flores* in racemis vel paniculis numerosis axillaribus minute fulvo-tomentellis 2·5 cm. longis breviter pedunculatis; bracteae ovato-lanceolatae, parvae, mox deciduae; pedicelli brevissimi. *Calyx* 2 mm. longus, minute fulvo-tomentellus; sepala ovata, subacuta. *Corolla* olivaceo-virescens, extra minute tomentella (tubus quidem), gracilis, in alabastro subsubulata; tubus fere 3 mm. longus; lobi lineares, 3 mm. longi. *Folliculi* cylindrici, divaricati, 15–17 cm. longi, 6 mm. diametro, minute ochraceo-tomentelli, deinde glabrescentes; semina oblongo-linearia, 12–14 mm. longa, coma 3·5 c.m. longa.

NATAL. Inanda, in woods, *J. M. Wood*, 1009, 6159.

894. **Adenium oleifolium**, *Stapf* [Apocynaceae]; *A. somalensi*, Balf. f., simile, sed foliis latioribus obtusis molliter pubescentibus, corollae tubo intus supra stamina furfuraceo-papilloso differt.

Frutex omnibus partibus molliter pubescens vel subtomentosus. *Folia* linearia vel oblongo-linearia, obtusa, basi magis minusve attenuata, sessilia vel subsessilia, 7·5–10 cm. longa, 8–12 mm. lata, crassiuscula, glauca, nervis secondariis plane obscuris. *Cymae* terminales, pauciflorae, subsessiles, albo-tomentosae; bracteae lineares, 6 mm. longae; pedicelli perbreves. *Calyx* 6–7 mm. longus, albo-tomentosus; sepala lanceolata, subacuta. *Corolla* rosea, extus pubescens; pars tubi infrastaminalis 8–9 mm. longa, infra stamina lineis 5 dense tomentosis notata, basi glabra; pars suprastaminalis late infundibiliformi-campanulata, intus furfuraceo-pilosa, 16 mm. longa; squamae faucium sacculum obtriangularem formantes; lobi late ovati, cuspidato-acuminati, 12–14 mm. longi. *Antherae* 6 mm. longae, caudis laxe pilosis exsertis 12 mm. longis.

South Africa. Transvaal, without precise locality, *Podd*; Bechuanaland, Bakwena Country, near the Suriname River, 1050 m., *Holub*.

895. **Adenium swazicum**, *Stapf* [Apocynaceae]; *A. Boehmiano* affine, sed foliis multo angustioribus glabrescentibus, foliorum nervis obscuris obliquis distinctum.

Frutex caule ramisque (novellis exceptis) glabris, exsiccatis albicantibus. *Folia* obovato-cuneata, apice rotundata, sensim in basin cuneiformem attenuata, 7·5–10 cm. longa, 1·8–3 cm. lata, subcoriacea, juvenilia molliter albo-tomentosa, deinde magis minusve glabrescentia, glauca, nervis secondariis obliquis obscuris 3–5 mm. distantibus; petiolus ad 8 mm. longus. *Cymae* terminales vel pseudo-axillares, cinereo-tomentosae; bracteae lanceolata, 5 mm. longae; pedicelli breves vel ad 10 mm. longae. *Calyx* 8 mm. longus; sepala lanceolata, acuminata, pubescentia. *Corolla* rosea, faucibus purpureis; pars tubi infrastaminalis 8 mm. longa, infra stamina lineis 5 dense tomentosis notata, basi glabra; pars suprastaminalis 2·5 cm. longa, late tubulosa, intus glabra, squamis faucium vix ullis; lobi rotundato-obovati, fere 2·5 cm. longi. *Antherae* 6 mm. longae, dorso pilosae, caudis 6–10 mm. longis obtusis.

South Africa. Swaziland, *Rathbone in Herb. Bolus*, 6208; *Saunders*; *J. M. Wood*, 3511.

896. **Ehretia trachyphylla**, *C. H. Wright* [Boraginaceae]; ab *E. Bakeri*, Britten, foliis subtus scabris recedit.

Arbor parva, ramis lenticillatis. *Folia* elliptica vel oblongo-elliptica, acuminata, basi obtusa, 17 cm. longa, 6–7 cm. lata, integra, supra glabra, subtus albo-scabra. *Cymae* laxe paniculatim dispositae, terminales, pubescentes. *Calyx* glaber, 3 mm. longus, fere ad basin in lobos 5 anguste lanceolatos divisus. *Corolla* alba, 5 mm. longa; lobi 5, spathulati, integri, 3 mm. longi. *Stamina* ad corollae medium affixa; filamenta glabra. *Ovarium* ovoideum; stylus subulatus, pilosus, 2-lobus. *Fructus* ellipticus, 5-costatus, 12 mm. longus, 7 mm. latus, pyrenis duabus bilocularibus fissus.

Gold Coast. Aburi, *W. H. Johnson*, 974.

897. **Falkia canescens**, *C. H. Wright* [Convolvulaceae-Dichondreae]; *F. dichondroidem*, Baker, simulans, floribus cymosim dispositis differt.

Caulis tenuis, teres, pilosus, apice canescens. *Folia* rotundato-cordata, 14 mm. diam., integra, primum subtus dense tomentosa, brevi tempore glabrescentia; petiolus 15 mm. longus, pilosus. *Cymae* axillares, pauciflorae. *Calyx* extus canescens; tubus brevis; lobi deltoideo-ovati, acuti, 5 mm. longi, 2 mm. lati. *Corolla* extus pilosa; tubus 4 mm. longus; lobi oblongi, obtusi, 1·5 mm. longi. *Stamina* quam corolla paullo breviora, inaequalia; antherae subglobosae. *Ovarii* lobi coma pilis albis ovario aequilongis coronati; styli filiformes, 3 mm. longi; stigmata capitata.

British East Africa. Nairobi, *H. Powell*, 10.

This has the general appearance of *F. dichondroides*, Baker, but differs from that and all other species of the genus in the flowers not being solitary in each leaf-axil. The hoary leaf- and flower-buds are very conspicuous.

898. **Clerodendron (Cyclonema) phlebodes**, *C. H. Wright* [Verbenaceae - Viticeae]; *C. sansibarensi*, Gürke, proximum, quod foliis utrinque glaberrimis corollaeque lobis lanceolatis recedit.

Frutex circa 1·8 m. altus. *Rami* dense pubescentes. *Folia* ternata, ovata, utrinque acuminata, serrata, utrinque pubescentia, subtus pallidiora, 20 cm. longa, 9 cm. lata; petiolus 3 cm. longus, dense pubescens. *Panicula* terminalis, pyramidalis, laxiflora; ramuli graciles, pubescentes; bracteolae subulatae, 1 mm. longae; pedicelli 2 mm. longi. *Calyx* breviter campanulatus, 3 mm. diam.; lobi breves, rotundati, ciliati. *Corolla* caerulea; tubus 6 mm. longus, 2 mm. diam., prope basin abrupte decurvatus; limbus 15 mm. diam.; lobi patentes vel subrecurvati, obovati, undulati, ciliati, venis conspicuis anastomosantibus instructi. *Stamina* corollae tubo fere duplo longiora; filamenta parte inferiore dense tomentosa. *Ovarium* subglobosum, glabrum; stylus demum 22 mm. longus.

Uganda Protectorate. Entebbe, *Mahon*.

899. **Ocimum (Hierocimum) odontopetalum**, *C. H. Wright* [Labiatae-Ocimoideae]; ex affinitate *O. Schweinfurthii*, Briq., a quo foliis oblanceolatis nervis subtus minus prominulis glandulis numerosissimis recedit.

Radix lignosa, crassa. *Caules* plures ex apice radicis erecti, virgati, simplices rarius ramosi, pubescentes. *Folia* oblanceolata, obtusa, 4–5 cm. longa, 0·75–1 cm. lata, remote serrata, supra sparse hirsuta impresseque glandulosa, subtus pallidiora ad nervos pubescentia, glandulis numerosissimis impressis instructa. *Spicae* terminales, congestae, 2–3 cm. longae; bracteae 1 mm. longae, triangulares, crassae. *Calyx* 5 mm. longus, pubescens; labium superius integrum, ovatum, 3-costatum; labium inferius transverse oblongum, breviter acuminatum, 2-mucronatum, nervis 4 centralibus apice conniventibus, ceteris radiantibus. *Corolla* 12 mm. longa, alba vel dilute rosea; tubus e calyce breviter exsertus; lobi elongati, denticulati. *Stamina* quam corolla duplo longiora; filamenta superiora prope basin geniculata denseque pilosa.

BRITISH EAST AFRICA. Nyasaland: Blantyre, *Scott*; Mount Mlanji, *Whyte*; Mlanji Plateau, *McClounie*; Uvera, *Miss E. Kenyon*; Nyika Plateau, *McClounie*, 30.

In the Flora of Tropical Africa, v. 342, these plants were included under *O. affine*, Hochst., which differs in having broader leaves and non-denticulate corolla-lobes.

900. **Dasystachys nervata**, *C.H. Wright* [Liliaceae-Asphodeleae]; *D. Grantii*, Benth., affinis, quae bracteis quam flores multo longioribus foliisque flaccidis recedit.

Rhizoma ignotum. *Folia* per anthesin 15 cm. longa, 1·5 cm. lata, oblonga, acuminata, rigida, apice cucullata, utrinque glaberrima, nervis primariis circa 17 prominentibus. *Scapus* 22 cm. longus, cylindricus, parte superiore minute puberulus; racemus 10 cm. longus, rhachide pedicellisque glabri; pedicelli 2 mm. longi. *Perianthii* segmenta oblonga, valde concava, obtusa, 3·5 mm. longa, 1·5 mm. lata, alba, extus ad apicem luteo-puberula, uninervia. *Stamina* perianthii segmentis paullo breviora; filamenta e basi lanceolata complanata subulata; antherae 1·5 mm. longae, 1 mm. latae, obtusae. *Ovarium* trilobum; lobis globosis; stylus ovario aequilongus, columnaris; stigma punctiforme; ovula in quoque loculo 4–6. *Capsula* 4 mm. diam.

RHODESIA. Between Broken Hill zinc mine and Bwana M'cuba copper mine, *C. E. F. Allen*, 338.

XI.—SASSAFRAS IN CHINA.

(*Sassafras Tzumu*, Hemsl.)

W. B. HEMSLEY.

A few days before Mr. Wilson left on his third journey to China, he brought me some specimens of a laurel, collected by himself in the Patung district of Hupeh, which he had identified with the North American *Sassafras officinale*, Nees, and also with my *Lindera Tzumu* (Journ. Linn. Soc., vol. xxvi. p. 392) and *Litsea laxiflora* (loc. cit. p. 383, t. 8). He was quite right as to the two last, which were described from imperfect materials; the former from a specimen bearing young fruit, and the latter from a specimen bearing flowers of one sex only and no leaves; both instances of imprudence in founding species on imperfect specimens. He was also right, I think, as to the Chinese tree being a species of *Sassafras*; but, although there is a striking similarity between the dried specimens from China and those of *S. officinale* from North America, an examination of the flowers has revealed differences that are almost of generic importance, as the genera of Lauraceae are limited. Both species have heteromorphic, deciduous leaves with the same kind and range of variation, and the inflorescences of both sexes, which appear before the leaves, present no obvious differences. The flowers of the North American species are, however, somewhat larger, and the floral diagram is quite different. I have not examined a large number of flowers, but

those examined agree with the descriptions and the excellent figures in Sargent's "Silva of North America," vol. vii. t. 304. Only a small number of flowers of the Chinese species were examined, but they were so far uniform in structure. The following is a comparison of the flowers of the two species :—

	S. officinale, Nees.	*S. Tzumu*, Hemsl.
Male flowers ...	glabrous within	hairy within.
Stamens ...	6+3 with the filaments biglandular at the base	6 + 3 with the filaments biglandular at the base.
Staminodes ...	none	3, alternating with the glandular stamens.
Pistillode ...	none	prominent.
Female flowers	glabrous within	hairy within.
Staminodes ...	3 + 3	6+3+3, similar to the stamens and staminodes in the ♂.

As it is intended to publish a figure and full description of *S. Tzumu* in *Hooker's Icones Plantarum*, the foregoing differential characters will be sufficient here.

As Sargent remarks, *Sassafras officinale* or *Sassafras Sassafras*, as he has called it, was probably one of the first North American trees to be introduced into Europe. Gerarde describes it in his "Herbal" (1597), and in Johnson's edition of the same work (1633), he states that his figure was made from a small tree growing in the garden of Mr. Wilmote at Bow, some few years previously. In 1838 Loudon (*Arboretum Britannicum*, vol. iii. p. 1303) recorded specimen trees at Kew and Syon House sixty feet high, and the latter as having a trunk three feet in diameter.

Sassafras Tzumu, Hemsl., is a valuable timber tree which, on the authority of Dr. A. Henry, sometimes attains very large dimensions. It is the *tzu-mu* or *huang-chin* of Central China, and appears to be abundant in the Province of Hupeh. Kew also possesses specimens from Ningpo, Chekiang (*Faber*), and from Kiukiang, Kiangsi (*Maries*).

XII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS XLIII.

421. **Aconitum Gammiei**, *Stapf* [Ranunculaceae]; affinis *A. leucantho*, Stapf, differt glabritie, foliis multo magis dissectis divisionibus linearibus brevius petiolatis, galea magis depressa et magis hiante, nectario haud calcarato, sed in dorso basin cucullae versus gibbosa.

Tubera ignota. *Caulis* ad 70 cm. altus, simplex vel superne parce ramosus, gracilis, flexuosus, teres, glaberrimus. *Folia* sparsa, 9–12, infima sub anthesi emarcida, remotiuscula, petiolata ; petioli graciles, intermedii ad 4 cm. longi, summi brevissimi ; lamina glabra, ambitu cordato-rotundata, sinu subangusto 1–2 cm. alto, a sinu ad apicem 3–4 cm. longa, 5–6 cm. lata, ad basin 3-partita, segmento intermedio ambitu rhomboideo-cuneato basi anguste attenuato 2–2·5 cm. lato 3–5-laciniato, laciniis 2–3 mm. latis linearibus parce lacinulatis acutis, segmentis lateralibus trapezoideis inaequaliter fere ad basin 2-partitis ceterum intermedio similibus ; folia summa minora et minus divisa. *Inflorescentiae* terminales, pauciflorae, racemosae vel subpaniculatae, laxae, glabrae ; bracteae inferiores foliis proximis similes sed segmentis lateralibus magis reductis, superiores parvae, laciniatae ; bracteolae foliaceae vel lineares, parvae ; pedicel ligraciles, demum ad 4 cm. longi. *Sepala* caerulea ; summum galeatum, galea glabra depressa circiter 17 mm. alta a basi ad apicem 17–20 mm. metiente 6–7 mm. lata acute rostrata late hiante, ungue sensim a basi dilatato ; sepala lateralia orbicularia, ad 15 mm. longa, margine ciliolata, ungue lato brevissimo ; inferiora oblonga, descendentia, 12–14 mm. longa. *Nectaria* hispidula, ungue superne prorsus curvato 12–18 mm. longo, cuculla subhorizontali 3–5 mm. longa apice obtusissima dorso inferne gibbosa, labio ad 5 mm. longo latiusculo subintegro. *Filamenta* ad 4 mm. longa, late alata ad medium, deinde subito contracta, parce pilosula. *Carpella* 5, arcte conniventia, ovoidea, glabra, exsiccando nigricantia. *Fructus* ignoti.

SIKKIM HIMALAYA. Chola Range, Chamanaka, 3750 m., *Gammie*, 1310.

422. **Dubouzetia caudiculata**, *Sprague* [Elaeocarpaceae] ; affinis *D. campanulatae*, Panch., a qua foliis caudiculatis supra mollibus subtus villosis recedit.

Ramuli exstantes lignosi, circiter 5 mm. diametro, villoso-tomentosi. *Folia* oblanceolato-oblonga vel obovato-oblonga, apice acute caudiculata, caudicula usque ad 5 mm. longa, basi rotundata, 9–15 cm. longa, 2–5 cm. lata, repando-dentata, supra mollia, minute puberula, vena media pubescente vel tomentosa, subtus praesertim venis villoso-tomentosa demum sparsius villosa ; venae supra leviter vel vix impressae, subtus prominentes ; petiolus 6–9 mm. longus, villoso-tomentosus. *Stipulae* filiformi-subulatae, 9-14 mm. longae, villosae, apice glabrae et leviter curvatae. *Flores* bini, rarius superposite bigemini. *Pedunculi* circiter 1 cm. longi, ut pedicelli sepalaque extra, dense villoso-tomentosi ; pedicelli 2·5–3·5 cm. longi ; bracteae plures, stipulis conformes, sed minores et plerumque ± connatae. *Sepala* attenuato-lanceolata, acuta, 2·7–2·8 cm. longa, 5–7 mm. lata, intus sericea. *Petala* oblonga, ad $\frac{1}{4}$ supra basin leviter constricta, apice obtusiuscula, 2·8–2·9 cm. longa, 8·5 mm. lata (*in alabastro*), quadrante infimo intus pubescente et medio incrassato. *Discus* 3 mm. altus. *Stamina* circiter 40 ; filamenta usque ad 1·5 cm. longa, fere omnino glabra ; antherae usque ad 1·2 cm. longae, dense acute papillatae. *Ovarium* fere orbiculare, 4–5 mm. diametro, dense villoso-tomentosum, 5-loculare, loculis 12–13-ovulatis ; stylus circiter 1·5 cm. longus.

NEW CALEDONIA. Poinlotch Mountain, near Gatope, *Vieillard*, 2354 ; Panloitche Mountains, *Caldwell*.

It should be noted that the description of the petals is from a half-opened bud. No fully expanded petals are present on either of the Kew specimens, but from portions of petals which have been preserved, it appears that they are nearly 1·5 cm. broad when fully developed.

"Poinlotch" and "Panloitche" are doubtless merely different spellings of the same mountain, which is presumably situated in the Pouanloit district, marked in Mager's Atlas Colonial. Gatope Bay is situated about 162° 20′ E., 21° S.

423. **Dubouzetia acuminata**, *Sprague* [Elaeocarpaceae]; affinis *D. campanulatae*, Panch., a qua sepalis acuminatis extra dense griseo-pubescentibus tantum (nec rufo-tomentosis) recedit.

Ramulus unicus exstans lignosus, densiuscule pubescens, basi circiter 3 mm. diametro. *Folia* oblongo-oblanceolata, apice rotundata, basi in petiolum augustata, 2–4·5 cm. longa, 0·9–1·8 cm. lata, integra, marginibus reflexis, supra nitidula, juventute puberula demum glabrescentia, vena media et lateralibus valde impressis, subtus cano-tomentella, vena media et lateralibus prominentibus, venulis prominulis; petiolus 6–8 mm. longus, densiuscule pubescens. *Flores* bini. *Pedunculi* 4–12 mm. longi, ut pedicelli dense pubescentes; pedicelli 2–2·5 cm. longi. *Sepala* lanceolata, acuminata, 2–2·2 cm. longa, 5–6 mm. lata, extra dense breviter appresse pubescentia, intus sericeo-pubescentia. *Petala* subspathulato-oblonga, apiculata, 3–3·3 cm. longa, 1·2 cm. lata, triente inferiore intus pubescente, ceterum glabriuscula. *Discus* circ. 3 mm. altus. *Stamina* circ. 30; filamenta usque ad 1·8 cm. longa, fere glabra; antherae circ. 8 mm. longae, dense acute papillatae. *Ovarium* ovoideo-globosum, circ. 5 mm. altum, valde 5-costatum, tomentellum, 5-loculare, loculis circ. 11-ovulatis intus angulis exterioribus parce pilosis; stylus vix 2 cm. longus, inferne dense pubescens, superne glabriusculus.

NEW CALEDONIA. Near Noumea, *Caldwell*.

424. **Dysoxylum pachyphyllum**, *Hemsl.* in Hook. Ic. Plant. t. 2827, ined. [Meliaceae]; *D. Fraserano* proximum sed foliis crassis coriaceis obovato-oblongis obtusissimis vel rotundatis differt.

Arbor 12–18 m. alta, fere undique glabra, ramis florigeris crassis *Folia* paripinnata, cum petiolo communi usque ad 40 cm. longa; foliola 8–12, breviter petiolulata, petiolulis incrassatis, 4–15 cm. longa. *Paniculae* augustae, pauciflorae (an semper?), foliis breviores. *Flores* 3–4 mm. diametro, bene evoluti non visi, tetrameri, puberuli. *Calycis* dentes deltoidei. *Petala* crassa. *Stamina* 8; antherae tubi staminei lobos paulo superantes. *Stigma* peltatum. *Capsula* subglobosa, 3–4 cm. longa, coriacea, obscure 3-loba, 3-sperma. *Semina* ovoidea, in arillo crasso cupuliformi usque ad medium immersa.—*D. Fraseranum*, F. Muell, Fragm. Phytogr. Austral., vol. ix., p. 61, quoad plantam ex insula Lord Howe Island; Hemsl. in Ann. Bot., vol. x., p. 234.

AUSTRALIA. Lord Howe Island, *C. Moore*, 24, 35.

425. **Dalbergia Lacei**, *Prain* [Leguminosae-Dalbergieae]; species e grege *Ovatarum*, juxta *D. ovatam* ipsam ponenda, differt tamen dentibus calycis omnibus obtusis, staminibus 10, foliolis tenuioribus subtusque pubescentibus.

Arbor, ramulis junioribus pallidis. *Folia* 22–25 cm. longa; foliola 7–9, ovata, basi late cuneata, apice longius acuminata, chartacea, subtus parcius pubescentia, supra glabra, 5·5–8 cm. longa, 4–4·5 cm. lata; rachis pallida, 15–18 cm. longa, pulvino parce puberulo excepto glabra; petioluli 4 mm. longi, pubescentes; stipulae parvulae, puberulae, caducae. *Flores* in paniculis terminalibus ad axillas foliorum summorum usque extensis 9–10 cm. longis 6–7 cm. latis dispositi; pedunculi 3 cm. longi, ramisque 1·5 cm. longis parce puberuli; pedicelli 4 mm. longi, pubescentes. *Calyx* campanulatus, glaber, basi bracteolis ovatis 2 glabris involutus, 5-dentatus, segmentis obtusis, summis subconnatis, imo reliqua parum excedente, omnibus quam tubo parum brevioribus. *Corolla* albida, petalis vexillo oblongo apice parum retuso basi cuneato excepto distincte unguiculatis; alae callosae latere superiore distincte hastatae, lobo ungui fere aequilongo. *Stamina* 10, monadelpha, vagina supra aperta, filamentis dimidio superiore liberis. *Ovarium* glabrum, longe stipitatum; stylus gracilis; stigma parvum; ovula 4. *Legumen* ignotum.

BURMA. Henzada; N. Myanaung Reserve, *Lace*, 2810.

The leaves pubescent beneath bring this tree near to the species described from somewhat incomplete material as *D. tonkinensis*, of which the fruits are known but not the flowers, and which is therefore only tentatively considered a member of the group *Ovatae*. *D. Lacei*, however, cannot be referred to *D. tonkinensis* owing to its inflorescences being terminal.

426. **Vitex smilacifolia**, *H. H. W. Pearson* [Verbenaceae-Viticeae]; species distinctissima foliis 1-foliolatis iis *Smilacis barbatae*, Wall., simillimis.

Rami subteretes, glabri, nodis incrassati, cicatricibus foliorum prominentibus, cortice cinereo vel fulvo. *Folia* 1-foliolata, opposita, glaberrima; petioli crassi, supra complanati, basi apiceque incrassati, 1–2 cm. longi; foliolum sessile, elliptico-oblongum, acuminatum vel caudato-acuminatum, subacutum, basi rotundatum, 12–20 cm. longum, 4–8 cm. latum, coriaceum, marginibus integris subrevolutis, supra nitens, nervis subparallelis utrinque 3–4 infra medium costae ortis ascendentibus ad apicem supra prominulis subtus prominentibus, venis ultimis reticulatis, supra ± obscuris. *Panicula* terminalis, ramosa, laxa, glaberrima, infra plus minus foliosa, 25–30 cm. longa, 20–23 cm. lata. *Flores* brevissime pedicellati, circ. 6 mm. longi, in cymas paucifloras, breviter pedunculatas, oppositas vel alternas, minute bracteatas distantes dispositi. *Calyx* campanulatus, breviter 5-dentatus, 1·5–2 mm. longus, ore 2 mm. diametro, utrinque sparsiuscule minute glandulosus, intus glaber, mox accrescens, dentibus ciliolatis. *Corollae tubus* cylindricus, supra medium dilatatus, 4–6 mm. longus, extus glandulis peltatis sessilibus vestitus, intus supra medium praecipue antice villosus; lobi utrinque minute glandulosi; anterior flabelliformis vel subrotundus, 2·5–3 mm. latus; laterales posteriorque minores. *Stamina* vix exserta, infra medium tubi inserta; filamenta basi dilatata, villosa. *Ovarium* globosum, dense minute glandulosum; stylus apice breviter bilobus, circ. 6 mm. longus. *Drupa* (? matura) obovoidea, e calyce accrescente paullo exserta, atra, glandulosa, 4 mm. longa, 3 mm. lata.

BORNEO. Sarawak, *Beccari*, 1097, 1137.

427. **Vitex sarawakana**, *H. H. W. Pearson* [Verbenaceae-Viticeae]; a ceteris specibus unifoliolatis foliis supra bullatis subtus pulchre reticulatis et panicula laxa facile distinguitur.

Rami tetragoni, glabri, nodis incrassatis, cortice cinereo in lamellas tenues soluto. *Folia* opposita, 1-foliolata, glaberrima; petioli 1–2 cm. longi, supra late sulcati, basi et apice incrassati; foliolum sessile, oblongum vel oblongo-lanceolatum, acuminatum, subacutum, basi rotundatum vel subcuneatum, 10–15 cm. longum, 2–6 cm. latum, bullatum, tenuiter coriaceum, marginibus integris subrevolutis, nervis primariis utrinque 6–10 supra prominulis subtus prominentibus curvato-ascendentibus, venulis subtus perclaris. *Panicula* terminalis vel axillaris, laxa, glabra vel minute puberula, nodis distantibus. *Flores* pedicellati, in cymas bracteatas pedunculatas 3-floras dispositi, 7–10 mm. longi. *Calyx* campanulatus, 2–2·5 mm. longus, breviter 5-dentatus, extus minute appresse pubescens; dentes circ. 0·5 mm. longi. *Corollae tubus* cylindricus, circ. 5 mm. longus, extus supra medium appresse pubescens, intus villosus; lobus anterior flabelliformis, 2 mm. longus, 2·5 mm. latus, extus pubescens, intus basi villosus; lobi laterales et posterior minores, breviter oblongi, obtusi, pubescentes. *Stamina* vix exserta, infra medium tubi inserta; filamenta villosa. *Ovarium* globosum, minute dense pubescens; stylus apice breviter acuteque bilobus, 7–8 mm. longus. *Drupa* obconica vel obovoidea, e calyce subaccrescente multo exserta, 1 cm. longa, 7 mm. lata, minute pubescens.

BORNEO. Sarawak, *Beccari*, 2280, 2506, 2851.

428. **Kaempferia (Soncorus) lutea**, *C. H. Wright* [Scitamineae-Zingibereae]; *K. Andersoni*, Baker, affinis, labello staminodiisque lateralibus non pilosis differt.

Acaulis. *Folia* 3–4, disticha, oblonga, apice basique attenuata, 22 cm. longa, 9 cm. lata, supra viridia, glabra, subtus pallidiora, pilosa; nervi laterales circa 8 mm. inter se distantes; petiolus 6 cm. longus, pilosus, alis 5 mm. latis marginatus. *Scapus* centralis, 8 cm. altus; bracteae circa 8, rotundatae, breviter mucronatae, 2 cm. latae, virides; bracteolae late ovatae, obtusae, 2·5 cm. longae, 1·3 cm. latae, translucentes. *Calyx* 1·6 cm. longus, 3 mm. diam., spathaceo-fissus. *Corolla* lutea; tubus cylindricus, circa 2 cm. longus; lobi oblongi, obtusi, 1·5 cm. longi, 6 mm. lati; labellum integrum, aurantiacum, late ovatum, truncatum, 2·5 cm. longum, 1·1 cm. latum; staminodia lateralia corollae lobis similia. *Filamentum* complanatum, 2 mm. longum, 1·5 mm. latum; antherae loculi elliptici, 5·5 mm. longi, inter se 1 mm. distantes; connectivum concavum, apice in cristam reflexam leviter 2-lobam productum *Ovarium* glabrum, basi 3-loculare, apice 1-loculare.

MALAY PENINSULA. Penang, *Ridley*.

Described from a plant which flowered at Kew in October, 1903, and again in October, 1906.

429. **Tillandsia (Anoplophytum) argentina**, *C. H. Wright* [Bromeliaceae-Tillandsieae] *T. dianthoideae*, Rossi, proxima, foliis non longe acuminatis, petalis roseis quam spathis multo longioribus recedit.

Caulis brevis. *Folia* conferta, e basi vaginante 1 cm. lata lanceolata, leviter falcata, obtusiuscula, carnosa, appresse lepidota, 10 cm. longa. *Scapi* quam folia paullo longiores, simpliciter spicati ; bracteae ovatae, acuminatae, roseo-tinctae, 1·5 cm. longae, 5 mm. latae, apice marginibusque membranaceis. *Sepala* late lanceolata, breviter mucronata, 1·5 cm. longa, 4 mm. lata, circa 11-nervia, rigida, marginibus membranaceis. *Petala* rosea, oblanceolata, obtusa, 3 cm. longa, prope apicem 4 mm. lata, tenuia. *Filamenta* 15 cm. longa, complanata, recta ; antherae lineares, 8 mm. longae, dorsifixae. *Ovarium* 8 mm. longum, oblongo-conicum ; stylus cylindricus, 1·2 cm. longus ; stigmata recurvata, 1·5 mm. longa, acuta ; ovula apice breviter caudata.

ARGENTINE REPUBLIC. *T. Stuckert.*

430. **Gymnogramme (Eugymnogramme) hirtipes,** *C. H. Wright* [Filices-Polypodiaceae] ; ex affinitate *G. flabellatae*, Hook., a qua pinnulis non cuneato-flabellatis differt.

Stipes gracilis, rigidus, ater, 16 cm. altus, hirsutus. *Frons* oblonga, acuminata, 16 cm. longa, 3 cm. lata, tripinnatifida, crassa, utrinque sparse hirsuta ; rhachis atra, dense hirsuta. *Pinnae* erecto-patentes ; pinnulae oblongae, 2–3 mm. longae, 1 mm. latae, saepe emarginatae ; nervi simplices. *Sori* 1·5 mm. longi.

COLOMBIA. *R. B. White.*

XIII.—ECONOMIC NOTES : LIVERPOOL.

J. M. HILLIER.

A visit is annually paid to Liverpool by the Keeper of the Museums at Kew for the purpose of making enquiries on the spot regarding various economic products which reach that port. The following notes, made during the latest of these visits, November, 1906, give additional information with reference to several products and industries that have from time to time been dealt with in the *Kew Bulletin.*

PALM OIL.—This substance is derived from the pericarp of the fruit of *Elaeis guineensis* and is a product distinct from the oil obtained from the palm kernel which is alluded to in another note.

In Liverpool commercial circles from 25 to 30 varieties of Palm Oil are recognised. They are classified as :—

i. Soft oils ; mostly from Bonny, Opobo, Calabar and Lagos :
ii. Mixed oils ; from the Gold Coast and the Niger :
iii. Hard oils ; from the Niger, Oil River District, Liberia, the Gold Coast and the Congo.

Of these oils that from Lagos is esteemed the best and purest and as a rule the most reliable. Generally speaking the price of Palm Oil is governed by the price of Tallow.

When shipments of Palm Oil are being dealt with a sample is taken from each cask ; the samples are lumped together in a pail and then analysed before selling. To test the contents of casks for leakage, which at times is very considerable, a long gouge is driven through the oil from the bunghole and allowance is made for any shortage. The oil is sold by the ton ; the maximum price for Best Lagos at present is about £33 10*s.* per ton.

The casks used in importing this oil are made of oak shipped from the United States. A completed cask, including labour and material, costs from 23 to 24 shillings ; much of the work is done as piece-work. As freight on casks is paid by space, when a cask is finished the staves are marked consecutively beginning at the bung-stave, with roman figures ; this done the cask is taken to pieces and the pieces packed with a minimum waste of space. The staves of 10 casks when packed occupy the space of one cask ; the bottoms and tops with the iron hoops are similarly packed in such a way as to economise space.

To clean old casks fires of shavings are lighted inside each. These fires burn furiously for a time ; when the oily lining has been completely burnt off, the cask is turned on its mouth so as to extinguish the fire. Very old casks have their use ; they may be cut down into smaller sizes ; old staves are also used for repairing defective casks. At the docks large quantities of Rushes (*Scirpus lacustris*), may be seen ; these are imported from Ireland and are shipped to the West Coast of Africa to be used in caulking the seams of casks, should there be any shrinkage, when the staves are put together. The staves shrink transversely, but not longitudinally, hence the tops and bottoms are always made full. The casks are readily opened by striking up the topmost hoop.

Palm Kernels and Oil.—Palm Kernels are imported in bags. Large quantities reach Liverpool but the bulk of the carrying trade is in German hands, the kernels being shipped to Hamburg. In transactions where Palm Kernels are being dealt with 5 per cent. rebate is allowed for debris. Where, however, any dispute arises during a transaction of the kind, samples are taken from the various bags ; the samples are mixed together and taken to a laboratory. From the mixed samples a few handfuls are taken ; these are carefully gone over, the rubbish picked out by hand and the percentage of the latter determined.

The African Oil Mills Company possess the chief mill in Liverpool, provided with up-to-date machinery for crushing these kernels ; the oil obtained is used for soap-making.

At the time this visit was paid it was noted that several vessels belonging to the Woerman Line, last spoken from Las Palmas, carried an aggregate of 4,450 tons of Kernels and 500 tons of Palm Oil destined for Hamburg. Palm kernels constituted the chief import into Germany from British West Africa in 1905, amounting to £1,918,000 in value, against £2,005,000 in 1904.

Cotton.—At the docks part of a cargo of 11,027 bales of New Orleans Cotton from Wilmington was seen in course of unshipment. The whole cargo was landed in 3½ days. The bales, weighing from

450 to 680 lbs. each, were taken from the hold of the vessel, landed, weighed, marked, and then either put on trollies to be carted away immediately or arranged on the floor of the dock shed.

FRUIT.—Barrels of Apples, each weighing about 1¼ cwt., were seen being landed from a Cunard Liner. The cargo included 27,000 such barrels, shipped from Boston, U.S.A. In a dock warehouse were large quantities of oranges and onions in casks, grapes in small barrels, and raisins and almonds in small boxes, imported from Spain. In addition were noted some carefully packed crates of "Jamaica Selected" oranges, each crate containing 200 to 270 fruits. These crates were held securely together by means of iron hooping.

MISCELLANEOUS PRODUCTS.—In the dock warehouses a great variety of miscellaneous products were to be seen. The following from West Africa were recognised :—Gum Copal, in casks, from the Oil River District ; Rubber, in casks, from Free Town, Sierra Leone ; large quantities of Maize from Lagos. Maize is a comparatively new import, dating practically from two or three years back ; the industry is one of increasing importance. The Maize is imported in sacks of 1¾ cwt. each ; on being landed it is usually put into the buyers' sacks, of 240 lbs. to the sack. In addition were seen Lagos Bass or Raffia, esteemed the best variety shipped from the West Coast, in bales of 2 cwt. 1 qr. 16 lbs. each ; Monrovian Bass or Piassaba, in loose packages ; Palm Kernels from Lagos, in bags of uniform weight, 1 cwt. 1 qr. each ; Elephant Berry Coffee from Liberia ; Ebony from the Gaboon ; Cotton seed, in sacks, from Lagos ; Ginger from Sierra Leone ; the inner bark of the Baobab, probably for paper-making, in bales held together by hoop-iron ; Gum Copal from Sierra Leone ; Baa seed (*Bassia* sp. ?) from Grand Bassam ; Palm Oil from Bathurst and from St. Paul de Loando, in casks of 15 cwts. each ; casks of Palm Oil scrapings from the holds of vessels ; Cocoa from the Gold Coast, in bags averaging 1 cwt. 1 qr. each ; Decorticated Ground Nuts, perhaps from the Niger ; such Ground Nuts are usually shipped to Oporto, Rotterdam or Hamburg. From the Niger were observed the following :—Gum Kino, in cases ; Gambia Pods, Unginned Cotton, Kola and Beni Seeds, in sacks ; also Shea Butter, in casks weighing 10 cwt. 1 qr. 1 lb. each. Beside these imports were to be seen large quantities of the Rushes (*Scirpus lacustris*) ready for export to the West Coast, to be used in caulking Palm Oil casks.

The following Eastern products were observed :—Rice meal, in sacks of 180 to 200 lbs. each, from Rangoon ; large quantities of Manila hemp (*Musa textilis*), in bales of 2½ cwt. each ; also the following, all shipped from Singapore :—Rattans, in two sizes ; Tanning extract, in packages of matting measuring 2½ ft. by 2 ft. by 8 ins. and weighing about 1 cwt. each ; Gambier, in packages like the preceding, each weighing from 1 to 2 cwt.

TIMBERS.—Of the various woods shipped from the West Coast of Africa as Mahogany, those at present most in favour come from Lagos and Benin. From a copy of the "Annual Circular for Mahogany, &c." kindly supplied by Messrs. Edward Chaloner and

Co., Timber Merchants, Liverpool, we learn that the total supply of West African "Mahogany" during 1905 was 16,965,137 ft., shipped from the following ports :—

	Feet.		Logs.
Benin	3,889,809	:	6,488
Axim	2,731,892	:	4,088
Lagos	1,978,060	:	3,269
Grand Bassam ...	1,708,049	:	2,258
Cape Lopez	1,600,441	:	3,470
Sekondi	1,524,151	:	2,842
Assinee	1,279,621	:	1,262
Sapeli	896,772	:	1,109
Gaboon	514,659	:	1,023
Grand Lahou... ...	383,597	:	410
Boutry...	134,654	:	205
Half Assinee	68,932	:	108
Osse	63,239	:	104
Bakana	58,521	:	58
Sassandra	35,682	:	52
Ekoybo	29,540	:	61
Beyin	28,885	:	40
Twin Rivers	23,239	:	42
Various other ports ...	20,394	:	62

It was found on enquiry that the timber formerly imported into this country as 'African Oak' or 'African Teak' and used for ship-building—*Oldfieldia africana* (*Euphorbiaceae*), an extremely heavy, close-grained and durable timber—is at present hardly known in the Liverpool timber-trade and is now seldom if ever imported. The wood at present being imported under the name 'African Oak' is *Lophira alata* (*Ochnaceae*), a hard and heavy timber. There is a growing demand for Australian Blackwood, sometimes known in Tasmania as Lightwood, as a substitute for American Black Walnut, *Juglans nigra* (*Juglandeae*). The Australian timber in question is yielded by *Acacia Melanoxylon* (*Leguminosae*) and is valued in Australia for its hardness and durability ; it is extensively used for cabinet-work, furniture and picture frames. Among the other interesting timbers noted during this visit were Java Teak, *Tectona grandis* (*Verbenaceae*) ; New Zealand Birch ; some fine planks of Austrian Ash ; African Padouk, *Pterocarpus erinaceus* (*Leguminosae*), a timber generally shipped in logs of about two tons in weight, but at present not greatly in demand. American White Oak is being superseded by the timber of an Oak imported from Japan, which is employed for sleepers and for scantlings for the floors of railway wagons. Washiba, a tough and elastic wood of a reddish-brown colour, imported from British Guiana was also noted. This wood is used for making bows, fishing rods, &c., and in this country is in demand for wheel-spokes. Washiba has been long known in commerce in this country, but although efforts have been repeatedly made by Kew to trace the botanical source of the tree which yields the wood, the point has not yet been satisfactorily settled. In recent works the wood has been stated to be derived from *Parinarium guianensis*? (*Rosaceae*), but this identification is at least doubtful. Specimens of Washiba in the Museum at Kew

are found on comparison to be undistinguishable from specimens in the collection of Poui, from Trinidad. These specimens of Poui have been referred to a species of *Tecoma* (*Bignoniaceae*) and though the particular species which yields the timber is as yet obscure there seems little room for doubt that the wood is that of a species of *Tecoma*. If the tree known in Trinidad as 'Green Poui' should prove to be plentiful, it might be worth while to ascertain whether its wood can be used as a substitute for that of the scarce Washiba of British Guiana.

The following note on Java Teak, one of the timbers noticed above, which appeared in Diplomatic and Consular Report No. 3403 Annual Series, on the Trade of Java for the year 1904 may be usefully reproduced here :—

"The output of Java Teak during the year was much more satisfactory than that of the previous year, being 6,356,000 cubic feet, as against 3,531,600 cubic feet in 1903. The demand for timber has been good, both for export to Europe and to India, while South Africa has taken about 547,000 cubic feet in the form of railway sleepers.

"It would appear that the Java Teak is not so well liked for high class work as the Burma and Siam wood, and the unsuitability of its length militates against its use for shipbuilding purposes."

ECONOMIC COLLECTIONS. In the Museum of Economic Products at the Hartley Laboratories, University of Liverpool, the specimens are arranged according to their uses. As yet this collection is small and many of the products occasionally imported into Liverpool are unrepresented; some even of those that are regularly imported have yet to be illustrated.

The Derby Museum contains a fine collection of Ethnological material from West Africa and Natural History is well represented. So far, however, the only vegetable economic product exhibited is Cotton.

At the Botanic Garden the economic plants of the collection have been as far as possible brought together. Among the plants exhibited are fine specimens of *Eugenia malaccensis*, *Bixa Orellana*, *Garcinia Xanthochymus*; this last and *Coffea arabica* were fruiting freely at the time of the visit. Among the interesting plants that were noted were Cotton, in pod; a *Dioscorea* (*D. bulbifera*) with numerous aerial tubers, *Brosimum Galactodendron*, and others.

XIV.—MISCELLANEOUS NOTES.

Sir MICHAEL FOSTER, K.C.B.—Owing to the death in London, on the morning of 29th January, 1907, of this distinguished physiologist, we mourn the loss of one who was also deeply versed in garden-craft and as such was a frequent and welcome correspondent of Kew.

Michael Foster was born on March 8, 1836, at Huntingdon, where his father, Michael Foster, F.R.C.S., practised as a surgeon. He was educated at Huntingdon Grammar School, at University College School, and at University College. He graduated M.B. in the University of London in 1859, practised as a surgeon at Huntingdon from 1860 till 1866, became in 1867 Teacher, and in 1869 Professor, of Practical Physiology at University College. In 1869 he was also chosen Fullerian Professor of Physiology at the Royal Institution. In 1870 he was appointed Praelector of Physiology at Trinity College, Cambridge. Having been elected a Fellow of the Royal Society in 1872 he became one of its secretaries in 1881. In 1883 a Professorship of Physiology was founded in the University of Cambridge and Foster was appointed to the chair. In 1899 he was President of the British Association at Dover and was made a K.C.B. In 1900 Sir Michael was elected Member for the University of London, and his professional duties at Cambridge were entrusted to a deputy. He continued to serve as a Secretary of the Royal Society till 1903 when he resigned both this post and his Cambridge chair. In 1906 he again stood for the University of London but was not elected.

As to Sir Michael's merits as an investigator this is not the place to speak. Nor is it appropriate here to say more of his qualities as a teacher than that his interest in his subject was extended to studies in vegetable as well as in animal physiology, and that his strong if quiet energy was given wholly to the advancement of knowledge.

His duties at Cambridge and at Burlington House, arduous though they were, did not deter him from undertaking useful public work. Thus, in 1884, at a critical period in its history, he gave his services to the task of putting the Royal Horticultural Society once more on a firm basis; when the Society entered on happier times, Sir Michael and his friend Sir W. T. Thiselton-Dyer, who had also devoted himself to the same task, retired together from the Council in February, 1889. Sir Michael served on the Royal Commission on Sewage Disposal; acted as Chairman of the Committee on Botanical Work which sat in 1900; and was appointed, in 1901, Chairman of the Committee on Tuberculosis.

At his home at Great Shelford, near Cambridge, Sir Michael made for himself a garden on which he bestowed much care. He was especially devoted to the genus *Iris*, as to which he possessed a knowledge that was as accurate as it was extensive, and that was placed by him freely at the disposal of others.

Auguste François Marie Glaziou.—The *Allgemeine Botanische Zeitschrift* for December, 1906, announces the death, in March last, of this veteran and enthusiastic botanical collector, at Bouscat, near Bordeaux, without any further particulars. Other German and English journals have repeated the announcement, but having failed to find a record of the event in any of the French papers we applied to Mr. Jules Poisson, of the Natural History Museum of Paris, who replied that it was indeed true

that his old friend had died as stated. Glaziou had no relatives, except a married daughter, who was at the time in Cochinchina, and no "billet de faire part" was issued.

A. Glaziou, as he invariably signed himself, a native of Brittany, was born, according to Mr. Poisson, in 1828. He qualified in Paris as a Civil Engineer, and studied Botany at the same time under Brongniart and Decaisne. In early life he went to Brazil, where he spent 35 years. During his long residence in Brazil he was actively engaged in the botanical investigation of the country and made enormous collections of dried plants, which he presented to the principal botanical establishments of Europe. In the introductory volume of the "Flora Brasiliensis" (1906) Dr. I. Urban gives some particulars (p. 27) of Glaziou's collections and journeys. Glaziou himself, "Bulletin de la Société Botanique de France," vol. lii., 1905, "Memoires," n. 3, in an Introduction to a "Liste des Plantes du Brésil Central recueillies en 1861–1895," has published a very condensed history of his botanical explorations in the States of Rio de Janeiro, São Paulo, Esperito Santo, Minas Geraes and Goyaz, from which it appears that he defrayed the whole of the expenses out of the limited means of a public functionary. Glaziou, it may be explained, was first Director of the Passeio Publico—Public Promenade—of the city of Rio, and subsequently Director of the Public Gardens and Forests of the State, and he mentions that the Ministers, both of the Empire and Republic, gave him full liberty and facilities for carrying out his botanical work. Altogether he collected specimens of upwards of 12,000 species, numbered 1–22,770, with about a thousand of the numbers 'bissed.' The specimens are excellent, and 200,000 is a low estimate for the total number. The collection included hundreds of previously undescribed species and numerous new genera. Of each of the first 4,000 numbers only two or three specimens were collected, but above that number a dozen or more were collected, where possible. From the beginning the first set went to the Editor, Dr. von Martius, of the "Flora Brasiliensis," and after his death to Berlin, for the continuation of this great work, under Dr. Eichler and Dr. Urban successively. The result from this arrangement is that Nos. 1–3266 are in Martius's herbarium, now at Brussels, and Nos. 3267–22770 are in the Berlin herbarium. Kew possesses an almost complete set of the numbers above about 4,000, and Glaziou, at a later date, went through his own set and divided the specimens, where it was practicable, with Kew. With regard to Glaziou's list, the title of which is given above, it is to be hoped that he had finished it and that the remaining and greater part will be duly published. This is of the greatest importance to the possessors of his plants, because they were distributed under their numbers, but without localities and without his field-notes. The list is systematically arranged according to the sequence of Bentham and Hooker's "Genera Plantarum," and it has appeared to the end of the *Crassulaceae*; the first part in November, 1905; the second part in July, 1906, after the author's decease. The species are separately numbered under each order, so that it is easy to see the extent of Glaziou's contributions in material to the "Flora Brasiliensis." Thus the *Violaceae* are represented by 34 species; *Polygalaceae* by 69;

Vochysiaceae, almost peculiar to Brazil, by 59 ; *Malpighiaceae* by 166 ; *Sapindaceae* by 120 ; and *Leguminosae* by 827 species.

Glaziou was the recipient of many distinctions, notably the Knighthood of the Order of the Rose of Brazil, and the Doctorate of Philosophy of the German Leopoldinean Academy, but he apparently set little store by them, as he did not use any of the titles in the paper cited above.

W. B. H.

ERNEST PFITZER.—Another of the regular and appreciative visitors to the Herbarium has passed away. Geheim Hofrath Dr. E. Pfitzer, Professor of Botany at the University of Heidelberg, and Director of the Botanic Garden there, died suddenly from apoplexy, on Dec. 3rd last, at the age of sixty. He attended the Conference on Hybridisation at the Royal Horticultural Society last summer and read a paper, and he also did a little work at Kew ; but for the first time, as he said, he took a rest in England. He went to the Isle of Wight and was so charmed with the place that he prolonged his stay in the island. Dr. Pfitzer was of a most cheerful disposition, and he always had the appearance of enjoying what he was doing, whether it was work or recreation. Engaging in manner and bright in conversation, he was always a very welcome visitor. He was author of a number of important treatises on the morphology and classification of orchids, in which he dwelt more especially on the importance of the vegetative characters. His "Grundzüge einer vergleichenden Morphologie der Orchideen," was the forerunner, and it is an admirable and most instructive book. Much of his work was done at Kew, and he was never tired of expressing his gratitude for the facilities he enjoyed. His widow and daughter have our deep sympathy in their sudden bereavement.

W. B. H.

J. N. WINTER.—The death of Mr. John Newnham Winter, M.R.C.S., L.S.A., which occurred at his residence at Kew, on January 18th, 1907, after a very brief illness, deprives Kew of another warm and generous friend. Mr. Winter, who was in his 76th year, had been for years a collector and grower of filmy ferns and in later life also of hardy alpine plants. He was for many years a successful and highly respected medical practitioner in Brighton. In early life he was fond of travel, his journeys extending as far as Palestine, but as his practice grew he was unable to go far afield and contented himself by bringing together a collection of ferns grown in glass-roofed caves under the yard attached to his residence at Brighton, that was remarkable alike for the extraordinary number of rare species which it contained and for the excellence of their cultivation.

Dr. Winter studied botany under Dr. Lindley at the Chelsea Botanic Garden and acquired a critical knowledge of plants which never was allowed to rust. He was his own gardener, holding that the true charm of plants lay in handling and tending them with the solicitude of a parent. This led to his devoting long

morning hours to his treasures and to his acquiring a wholly exceptional knowledge of their growth and requirements. This was particularly the case with regard to filmy ferns, which he employed collectors to procure for him from all parts of the world, though the bulk of his collection was obtained from New Zealand, the West Indies, and the Himalayas. His fondness for this group of plants led him to pay frequent visits to Kew for the purpose of comparing his various acquisitions with specimens in the living collection and in the herbarium.

When he retired from practice at the age of 70, Dr. Winter migrated from Brighton to Kew with the especial object of living in the vicinity of the Kew collection of filmy ferns and of enjoying the gardens. His kindly generous nature endeared him to all with whom he came in contact and he was a liberal donor of rare filmy ferns to the Kew collection ; to this branch of the establishment he occupied for years much the position occupied by the late Mr. G. C. Churchill with regard to the alpine collection.

Dr. Winter brought with him to Kew a portion of his collection of plants and grew them in a greenhouse against his residence in Lichfield Road. Here, too, he constructed an ingenious garden for alpine plants, in preparing which he made use of many tons of sandstone rock, where he grew many species with much success.

The Collection of Loniceras at Kew.—Except for a few of the climbing honeysuckles, the genus *Lonicera* is comparatively neglected in gardens, yet in regard to number of species it is one of the most important among cultivated hardy shrubs. The Kew collection comprises more than 60 species, besides a large number of hybrids and varieties. Mr. Rehder, in his recent synopsis of the genus (*Fourteenth Annual Report of the Missouri Botanical Garden*) enumerates 155 species. Many of the Loniceras, especially those belonging to the climbing (or Caprifolium) section of the genus, are amongst the most beautiful of hardy shrubs. In the Xylosteum section, which includes the species of bushy habit, there are also many attractive ones, but to enable them to make their most effective display they require abundant space and generous treatment at the root. Hitherto it cannot be said that the collection of Loniceras at Kew has had either. The plants have been somewhat cramped up in one of the narrow rectangular beds near the Himalayan House, where the space is strictly limited and where severe pruning was necessary to keep them to a convenient size. With the exception of a few species only represented by small plants, the entire collection has this winter been transplanted to the lawn north of King William's Temple ($\frac{8}{H}$ on the official Key-Plan of the Gardens), where there is plenty of space for their development. In view of this and the fact that a supply of good loam has been given to each plant, it is hoped that the beauty of many species, hitherto unrevealed, may be shown in their new quarters.

W. J. B.

Bird's Nest from Trinidad.—A bottle-shaped bird's nest was presented to the Museum by Mr. J. H. Hart, in July, 1900. A note regarding it appeared in the Proceedings of the Linnean Society for 1900-01, p. 3, where it was stated that it was believed to be composed entirely of the seeds of a species of *Tillandsia* (*Bromeliaceae*). It has, however, since been found to consist of the seeds of *Catopsis nutans*, Gris., belonging to the same order. These nests are solitary, but there may be two or three on the same tree.

The nest was sent as an interesting illustration of a mode of seed dispersal. It was attached to the underside of a branch of a large tree, but the donor was unable to supply the name of the bird to which it belonged, though he had assiduously watched for it. The nest measures a foot in length, and is between four and five inches across at its widest part.

During the summer of last year, Mr. Hart wrote that after continuous effort for over five years he had at last secured a specimen of the bird, which was caught before daybreak by means of a net attached to the end of a pole 30 feet long, so as to reach the nest, which was situated on the underside of a large branch of a Silk Cotton Tree *Eriodendron anfractuosum* (*Malvaceae*). Its companion escaped.

Mr. Hart forwarded the bird for determination. It was submitted to Dr. Bowdler Sharpe of the British Museum (Natural History), who has kindly furnished the name, *Paenyptila cayanensis*, Gmelin, the Little Collared Swift. The nest may be seen in Case 9, Museum No. II.

J. M. H.

Mrs. Jameson's herbarium.—In the record (*Kew Bulletin*, 1906, p. 131) of donations to the Herbarium, it is mentioned that Miss E. M. Piesse presented a collection of plants made in Cape Colony by Mrs. Hugh Jameson. The herbarium comprised about 500 species of plants from the Cape Peninsula; 20 species from the Falkland Islands, and a book of specimens of British Plants. Although the Cape plants are from a district that has been very thoroughly explored, and were probably all previously known, the specimens are valuable because they areall very carefully localized. Especially interesting among the British plants is a specimen of *Gentiana Pneumonanthe*, labelled "Fulham, 1840." Hounslow Heath is the only authenticated locality for this *Gentiana* in Middlesex recorded in Trimen and Dyer's "Flora," and the plant was then (1869) supposed to be extinct in the county. Mrs. Jameson was the wife of Hugh Jameson, F.R.C.S., Deputy Inspector, R.N., who served with distinction on various foreign and home stations. He was principal surgeon of the frigate "Castor" at the bombardment of St. Jean d'Acre, and as this ship bore the brunt of the enemy's fire, he had unusual opportunities of exercising his operative skill. Subsequently, about 1841, he served in the Winchester flagship at the Cape of Good Hope, and it was then that Mrs. Jameson made the collection.

W. B. H.

A memorial of the late Charles Baron Clarke, F. R. S.—Mr James Ramsay Drummond, who is engaged at the Herbarium on a Flora of the Punjab, has presented the establishment with one of the compound microscopes which belonged to the late Mr. C. B. Clarke. It is not the very large one, familiar to everybody, which Mr. Clarke used at the Herbarium; but a smaller, practical one which he carried about with him when travelling abroad or visiting other establishments in this country. The donor has performed a gracious act which is highly appreciated by the staff and other frequenters of the Herbarium. Attached to the box is a small plate bearing the inscription :—"In Recollection of Charles Baron Clarke, F. R. S., Ex-President of the Linnean Society. From J. R. D., Decr., 1906."

Botanical Magazine for January.—The plants figured are: *Lomatia ferruginea*, R. Br., *Aconitum gymnandrum*, Maxim., *Viburnum Carlesii*, Hemsl., *Tricuspidaria dependens*, Ruiz et Pav., and *Renanthera annamensis*, Rolfe, all of which are in cultivation at Kew. *Lomatia ferruginea* is a handsome plant with foliage not unlike that of *Grevillea robusta*, A. Cunn., and loose racemes of showy yellow and crimson flowers. It is a native of Southern Chili and Patagonia, and is hardy in the British Islands, at least in the warmer parts. The material figured was from a fine specimen growing in the garden of Earl Annesley, Castlewellan, Co. Down, Ireland. *Aconitum gymnandrum* is remarkable in having long-clawed lateral sepals. It is an annual, a native of Tibet and Western China, and was raised at Kew from seed sent by the Director of the Botanical Survey of India. This was collected at Gyantse during the Lhassa Expedition of 1904. The *Viburnum* is a dwarf shrub, with ovate-rotundate or almost round, toothed leaves, and rather large terminal cymes of pink and white flowers. The Kew plant was obtained from Messrs. L. Boehmer and Co., of Yokohama, in 1902. It is a native of Corea, and is hardy in this country. *Tricuspidaria dependens* is an attractive species, for the introduction of which English horticulture is indebted to Mr. H. J. Elwes, F.R.S. It is of rapid growth, and is readily propagated by cuttings. The synonymy of this and of another species, *T. lanceolata*, which has been long in cultivation, and is figured in the *Magazine*, t. 7,160, under the name *T. dependens*, was greatly confused until it was corrected in the *Gardeners' Chronicle*, 1905, vol. ii., by Mr. Watson; a fuller note on the synonymy and on the characters of the two plants has since appeared in the *Kew Bulletin* (1907, pp. 10-16). Regarding this species, Professor Sargent, Arnold Arboretum, writes, with reference to the account given in the *Magazine*: "Justice is hardly done to *Tricuspidaria dependens*, which is one of the largest of Chilian trees. At a place called Hospital, 30 or 40 miles south of Santiago, I saw a group of these trees that must have been 70 or 80 feet high. The largest of them, at any rate, had a trunk diameter of five feet and ten inches." The greatest heights previously recorded for *T. dependens* have been "30 feet," by Miers; "20–25 feet or even more," by Gay; and "6–8 metres," by Reiche. The Kew plant, raised from seeds brought home by Mr. Elwes in 1902, has already reached a height of 10 feet. *Renanthera annamensis* is

a new member of this genus, so like *R. Imschootiana* in habit that, until it bloomed, and the marked differences in the size and colour of the flowers proved it to be distinct, it was taken for that species. It was discovered in Annam, by Mr. W. Micholitz, a collector for Messrs. Sander and Sons. It flowered at Kew in May, 1906, under tropical treatment.

Botanic Garden, Hobart, Tasmania.—We are informed that Mr. F. Abbott, for many years Superintendent of the Hobart Botanic Garden, died some time ago, and has been succeeded by Mr Alexander Morton who holds the appointment conjointly with the Curatorship of the Natural History Museum at Hobart.

Specimens for use in Elementary Schools.—A limited number of sets of specimens of forty species of common trees and shrubs, each represented by a summer shoot, a winter shoot, flowers and, where possible, fruits, mounted on stiff cardboard, are available for use in Elementary Schools. Application for a set may be made to the Director, Royal Botanic Gardens, Kew. The price per set is £1. The specimens represent the following :—Acacia, Alder, Almond, Apple, Apricot, Ash, Barberry, Beech, Birch, Black Currant, Chestnut, Dog Rose, Elder, Elm, Gean, Hawthorn, Holly, Hornbeam, Horse Chestnut, Ivy, Laburnum, Larch, Lilac, Lime, Maple, Oak, Peach, Pear, Plane, Red Currant, Scotch Pine, Sessile Oak, Spindle Tree, Sweet Briar, Sycamore, Turkey Oak, Walnut, White Willow, Wych Elm, Yew.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1907.

XV.—GINSENG IN COREA.

(*Aralia quinquefolia*, Decne & Planch., VAR. *Ginseng*.)

In *Kew Bulletin* for 1902, p. 4, an account of Ginseng in China was given in which incidental reference was made to Corea as a country supplying the article. The importance of the substance in this latter country, and the care exercised in cultivating the plant which yields it, may be gathered from the subjoined account derived from a paper by the Rev. C. T. Collyer and reprinted from the *Queensland Agricultural Journal* for 1906, pp. 269–271.

In North America, Japan and China, where Ginseng is also cultivated, the crop requires three to four years to reach the stage at which its cultivation becomes profitable; in Corea, it will be observed, the plants are allowed to reach the age of five, six, or seven years before the roots are collected.

"The most esteemed variety of the plant is that grown in Corea. All the Ginseng collected in China is imperial property, and is sold to those who have the privilege of dealing in it at its weight in gold. Of two kinds, the white and the red, the former is most valued, and is accordingly becoming more valuable as its production decreases. The root generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from 2 to 4 inches. In price it ranges from 24*s*. to 48*s*., up to even £60 per ounce! In preparing a Ginseng garden, or Sam-po, as it is called in Corea, extensive preparations are made. In early winter thousands of loads of a variety of disintegrated granite are heaped up in separate mounds. Then this is covered with a rich mulch made from the leaves of the Chestnut Oak, known to Coreans as the 'Saug.' The leaves are gathered in the spring and summer, pulverised, and sprinkled with water to help decomposition. This mulch is the only fertiliser used. No other fertiliser has been found which is equally efficient.

"As soon as the frost is out of the ground the garden is ploughed up and thoroughly worked over with a spade operated by a gang of four or five men. We have seen this five-man spade

1375 Wt 72 3/07 D & S 29 27432

worked at Mackay in the preparation of the ground for sweet potatoes. The Corean spade is of wood, has an iron shoe or tip, and a handle 8 to 10 feet long, to the butt of which are fastened two straw ropes. The captain, as he may be called, manipulates the handle, while each half of the crew gives its attention to a rope. Then 'with a long pull, a strong pull, and a pull altogether,' an amazingly small quantity of dirt is thrown a distance of 2 feet or so. After the beds have been made high enough to prevent the possibility of water getting to the roots of the plants, they are dug out to the depth of about 6 inches and carefully edged with slabs of slate. Then the dug-out is filled with the artificial leaf soil.

"Sam is propagated from seed. Four-year-old plants will flower in July, but the seed of old plants is preferred. When the seed is gathered it is placed in grass-cloth bags and violently shaken in running water to remove the red husks. The seed, which is cream white, is then scattered on a sunk bed of sand, and a thick covering of sand is spread over the seed and watered every day until November. To shield the young seeds from early frosts, the bed is covered with a lath screen, and a straw thatch is put on at night. On the 26th July the seeds are dug up and sorted, and those seeds which have commenced to germinate are packed with sand in jars and buried in a shady place for the winter. The seed beds are carefully measured, and must face exactly N. N. E. $\frac{3}{4}$ E.

"On every $5\frac{1}{2}$ feet (one *kan*) 62 or 63 rows of germinated seed are sown, and from this time the plants require incessant care. As the weather gets warmer, they are watered twice every twenty-four hours, and the top mat of the sheds erected over the beds is rolled up during the middle of the day. When the rainy season of the summer solstice sets in, a thick covering of thatch is spread over the sheds, while the back and front are enclosed by rush blinds. Rain and dew must not be allowed to fall on the beds. Extreme warmth and extreme cold are unsuited to the nature of the plant. It is not until the 8th November has passed that the grower is able to rest easily. Up to that day he has to be continually on the alert, waging war against insects and weeds. Then, he pulls down the shades, and having put a layer of 7 or 8 inches of soil on the beds, he leaves the garden to the rigours of winter.

"On 21st March of the following year he prepares new beds, and removes the plants to these, placing ten or twelve rows of ten roots each to the 'kan' ($5\frac{1}{2}$ feet). These new beds consist of 8 bushels of mulch to 9 bushels of disintegrated granite. The roots now are worth stealing and the garden has to be watched night and day.

"In the following year, after the 21st March, the plants are again moved, and this time the 'kan' contains only eight rows of four roots each. This is intended to be the final planting, but, should the roots not thrive, they are moved to yet another location as soon as possible. Here should be noted a special point in Ginseng culture, one which is held as a close secret. Each time the roots are transplanted they are placed in the ground almost horizontally, slanting slightly downwards. The reasons for not

planting them vertically are: (1) That water may be evenly applied to the whole root; (2) to prevent the roots from dividing and spreading into fine rootlets, sometimes known as 'beard'; and (3) that they may be readily inspected. When the roots are so subject to blight, it is a matter of great importance to be able to inspect them without disturbance. When the plant is five, six, or seven years old, the root is dug up and handed over to the Government. As to the profitableness of sam-growing as an investment, of course, something large would naturally be expected when one has to wait from five to seven years for a return. From the best information—though it can hardly be considered absolutely reliable—a profit of about 60 per cent. is generally made on the original outlay and running expenses.

"During the drying process, the roots will lose two-thirds of their weight. They are first thoroughly washed, and are then brushed with brushes made of human hair. Packed in baskets 2 feet in diameter and 6 inches deep, they are placed in an earthenware steamer. The duration of the steaming is determined by the burning of a torch made of the bark and fibre of the locust-tree. For seven-year-old roots, $4\frac{1}{2}$ inches are burnt; for six-year-old, $3\frac{1}{2}$ inches; and for five-year-old, $2\frac{3}{4}$ inches. The Coreans reckon that this is more reliable than timing by a watch! After steaming, they are exposed to the sun till they stop steaming, and after a little longer exposure are carried to the drying house. The drying-house is rendered perfectly air-tight, and the roots are placed in trays placed on shelves all round the house. Then three large charcoal fires are lighted in holes in the ground. In half a day the sam is taken out, and it then appears red and so hard that it will not yield to the touch. The rootlets are then cut off with scissors. For about ten days the roots are exposed to the sun until they are as hard as stone. In this state they are so brittle that they will break if dropped on the floor, so it would be impossible to pack them without injury. A foreigner would pack them in cotton wool, but not so the Corean. He simply puts the roots in a hamper, which he places on the earthen floor of a damp storeroom. In a short while, the roots soften; they are then removed to a room with heated stone floor, and spread out covered with sheets of oil-paper, being thus left until they are so soft that they will yield to the touch. They can now be easily packed in paper bags and pressed into pinewood boxes without fear of injury. After being packed they again harden, becoming adjusted to the shape of the box."

A previous brief reference to Ginseng in Corea was given in *Kew Bulletin* for 1892, p. 107. An account of Ginseng in America is to be found in *Kew Bulletin* for 1893, pp. 71–74.

The price, £60 per ounce, given in the text as sometimes paid for Ginseng, is so great that it cannot fail to attract particular attention. It may of course be due merely to a typographical error for 60*s.* per ounce. But even if this be assumed, the prices cited call for examination. It is not easy to obtain definite figures in matters of this kind, but the following note, on the trade of Newchwang, contained in the Decennial Report for 1882–91 of the Chinese Imperial Maritime Customs, deserves careful consideration:—"So much has been written about the

enormous sums paid for even a single root of Wild Ginseng that it is believed by many persons to be far more valuable than it really is. During 1891 duty was paid on 1·97 piculs, which was worth on an average Hk. Tls. 80 per catty. Not unfrequently small lots have been passed worth as much as Hk. Tls. 120 per catty, and it has once happened in the course of the last two years that a few roots valued at the rate of Hk. Tls. 250 per catty made their appearance; but Ginseng at this price is more often heard of than seen."

If the Haikwan Tael referred to is taken at about 3*s*., the catty being equivalent to $1\frac{1}{3}$ lbs. avoirdupois, the prices are therefore usually about 11*s*. 3*d*., not infrequently as much as about 17*s*., very rarely as much as 35*s*. per ounce.

The subjoined table exhibits the figures relating to the export of Ginseng from Corea given in Diplomatic and Consular Reports Nos. 3407 and 3660 on the trade of Corea.

Year.	Ginseng.	Quantity.	Value.
		lbs.	£
1903	Red	110,909	110,459
	White	3,446	296
1904	Red	46,851	100,060
	White	1,866	243
1905	Red	107,485	112,351
	White	16,736	664

That the value should be in 1904 twice as great as in the previous and in the following year probably indicates a difficulty as regards supply. Taking the figures for 1903 and 1905 as possibly more nearly normal, we can see that the price per lb. is smaller according to these reports than the price per ounce quoted from Mr. Collyer's note.

Mr. Hurrier and Mr. Perrot (*Bull. des Sci. Pharm.*, vol. xiii.) record the detection by them of the following substances either mixed with or substituted for Ginseng :—Root of *Panax sessiliflorum*, Panch. (Acanthopanax sessiliflorum, *Seem.*); root of *Campanula glauca*, Thunb.; root of *Platycodon grandiflorum*, Benth. and Hook. f.; root of *Adenophora verticillata*, Fisch.; root of *Sophora angustifolia*, Sieb. and Zucc.; root of *Angelica polyclada*, Franch.; root of *Rehmannia chinensis*, Libosch; rhizome of *Apocynum Juventas*, Lour. (Tylophora ovata, *Hook.*); rhizome of a species of *Dioscorea*, identified by them with *D. sativa*, L., so that it is not clear what the actual species employed may be; and finally, rhizome of *Ophiopogon japonicus*, Ker-Gawl.

XVI.—PLANTS FROM LABRADOR.

Sir William MacGregor, K.C.M.G., Governor of Newfoundland, took advantage of the opportunity afforded by an official visit paid in August, 1905, to the Chidley Peninsula to make an extremely interesting collection of the plants met with. The

Chidley Peninsula forms the northern extremity of Labrador and lies between Lat. 60° and 60° 30′ N. A year later Sir William paid a brief visit to Anse Sablon, on the south coast of Labrador, and was then able to make a second small collection.

During these visits the Governor's attention was directed more particularly to an examination of the Moss and Lichen vegetation of Labrador, with reference especially to the possibility of introducing the reindeer to Labrador and of naturalising that animal there, the first step being to ascertain whether food suitable for its sustenance is to be found naturally and in adequate quantity in the country.

In furtherance of this design Sir William enlisted the co-operation of Bishop Martin, of the Moravian Mission, who obtained for him a collection of Mosses and Lichens made in the vicinity of Nain, and of Mr. Hettasch, of the same mission, who collected on his behalf in the neighbourhood of Hopedale.

The various collections were from time to time forwarded to Kew, where the species have been determined by members of the herbarium staff. The collection as a whole possesses considerable general interest, and a consolidated list of the determinations is given below. Having regard to the fact that the primary economic object of the formation of the collection has been to determine whether Labrador can offer a sufficiency of aliment for the reindeer, it has been indicated, in all instances where this is the case, whether the species dealt with occurs also in Lapland and Northern Scandinavia where the reindeer is at home.

In this connection the interest in the collection naturally chiefly centres in the Lichens enumerated in the list. These have throughout the enquiry received Sir William MacGregor's closest attention, and as the collections have been made in the Chidley Peninsula in the extreme north of the country, at Anse Sablon in the most southern tract, and in the vicinity of two distinct intermediate stations, they may with safety be taken as fairly representative of the Lichen flora of Labrador. Owing to the extreme care exercised in drying and packing these Lichens, the species, which consist chiefly of the larger foliose and fruticose species, arrived in excellent condition and in most instances admitted of positive determination. The following general note on this part of the collection has been made by Mr. A. D. Cotton, to whom the examination of the Lichens was entrusted.

"A striking feature of the Labrador Lichens is their similarity "to those of northern Europe. *Platysma nivale*, *Cetraria* "*islandica*, *Bryopogon jubatum* and species of *Stereocaulon* so "abundant in Norway and Sweden, flourish equally well in "Labrador; whilst, just as in Lapland, *Cladonia rangiferina*, the "'Reindeer Moss,' covers vast areas. *Nephroma arcticum*, one of "the most handsome of foliose Lichens, is well represented both "from the northern and southern localities; in Europe it is rare "except in the extreme north, where in common with many "boreal species it extends completely round the arctic circle. "Some tufts labelled 'a mixture as found everywhere on the hills "in dry places' show the character of the Lichen vegetation in

"such regions. The tufts in question consist of equal proportions "of *Cetraria aculeata*, *Cladonia rangiferina*, and *Platysma* "*nivale*. Elsewhere broad patches consisting of one species only "were the prevailing feature."

So far therefore as the Lichens are concerned the reindeer, if introduced into Labrador, would appear to have every prospect of finding an adequate supply of food. Judging from the notes that accompany the specimens, *Cladonia rangiferina*, the main winter sustenance of the reindeer, occurs in great abundance throughout the country, and two other species well known to form part of his food supply are found to be present in the Labrador flora.

A set of these specimens has been returned, after being named, to Sir William MacGregor, by whom they are being placed in the Museum at St. John's, Newfoundland. A set of the Lichens has at the same time been prepared as an exhibit, which may be seen in Kew Museum No. II., Room No. 11.

SPERMAPHYTA.

RANUNCULACEAE.

Ranunculus abortivus, *L.*—Anse Sablon.

Caltha palustris, *L.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Coptis trifolia, *Salisb.*—Anse Sablon.

Actaea rubra, *Bigel.*—Anse Sablon.

PAPAVERACEAE.

Papaver nudicaule, *L.*—Chidley Peninsula.

DISTRIBUTION. Lapland, Scandinavia.

CRUCIFERAE.

Arabis alpina, *L.*—Anse Sablon, Chidley Peninsula.

DISTRIBUTION. Lapland, Scandinavia.

Draba algida, *Adams.*—Chidley Peninsula.

Cochlearia officinalis, *L.*, var. **oblongifolia.**—Chidley Peninsula.

VIOLARIEAE.

Viola blanda, *Willd.*—Anse Sablon.

Viola palustris, *L.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

CARYOPHYLLACEAE.

Silene acaulis, *L.*—Anse Sablon, Chidley Peninsula.

DISTRIBUTION. Lapland, Scandinavia.

Lychnis alpina, *L.*—Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Lychnis apetala, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Cerastium alpinum, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Stellaria gracilis, *Lange.*—Chidley Peninsula.

Stellaria longipes, *Goldie.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Arenaria peploides, *L.*—Anse Sablon, Chidley Peninsula.

LEGUMINOSAE.

Astragalus alpinus, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Lathyrus maritimus, (*L.*) *Bigel.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

ROSACEAE.

Rubus arcticus, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Rubus Chamaemorus, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Rubus strigosus, *Michx.*—Anse Sablon.

Rubus triflorus, *Rich.*—Anse Sablon.

Dryas integrifolia, *Vahl.*—Anse Sablon, Chidley Peninsula.

Geum macrophyllum, *Willd.*—Anse Sablon.

Geum rivale, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Fragaria americana, *Britton.*—Anse Sablon.

Fragaria virginiana, *Duchesne.*—Anse Sablon.

Potentilla anserina, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Potentilla emarginata, *Pursh.*—Anse Sablon, Chidley Peninsula.

Potentilla maculata, *Pourr.*—Chidley Peninsula.

Potentilla nana, *Lehm.*—Chidley Peninsula.

Potentilla tridentata, *Ait.*—Anse Sablon.

SAXIFRAGACEAE.

Saxifraga Aizoon, *Jacq.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Saxifraga aizoides, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Saxifraga caespitosa, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Saxifraga cernua, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Saxifraga nivalis, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Saxifraga nivalis, *L.*, var.—Chidley Peninsula.

Saxifraga rivularis, *L.*—Chidley Peninsula.

Ribes rubrum, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

CRASSULACEAE.

Sedum Rhodiola, *DC.*—Anse Sablon, Chidley Peninsula.

DROSERACEAE.

Drosera rotundifolia, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

ONAGRARIEAE.

Epilobium alpinum, *L.*—Anse Sablon.

Epilobium angustifolium, *L.*—Chidley Peninsula.

Epilobium latifolium, *L.*—Chidley Peninsula.

UMBELLIFERAE.

Archangelica Gmelini, *DC.*—Anse Sablon.

Umbellifera (dub.)—Anse Sablon.

CORNACEAE.

Cornus suecica, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

CAPRIFOLIACEAE.

Viburnum pauciflorum, *Pylaie.*—Anse Sablon.

Linnaea borealis, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Lonicera coerulea, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

COMPOSITAE.

Solidago multiradiata, *Ait.*—Chidley Peninsula.

Erigeron uniflorum, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Antennaria alpina, *Gaertn.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Antennaria dioica, *Gaertn.*—Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Achillea Millefolium, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Taraxacum ceratophorum, *DC.*—Anse Sablon, Chidley Peninsula.

CAMPANULACEAE.

Campanula rotundifolia, *L.*, var. **linifolia.**—Chidley Peninsula.

Campanula uniflora, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

VACCINIACEAE.

Vaccinium Oxycoccus, *L.*—Anse Sablon.

Vaccinium pensylvanicum, *Lam.*—Anse Sablon.

Vaccinium pensylvanicum, *Lam.*, var. **angustifolium**, *Gr.*—Anse Sablon.

Vaccinium uliginosum, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Vaccinium Vitis-Idaea, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

ERICACEAE.

Arctostaphylos alpina, *Spreng.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Andromeda polifolia, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Kalmia glauca, *Ait.*—Anse Sablon.

Ledum latifolium, *Ait.*—Anse Sablon.

Pyrola rotundifolia, *L.*—Chidley Peninsula.
DISTRIBUTION. Scandinavia.

DIAPENSIACEAE.

Diapensia lapponica, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

PLUMBAGINEAE.

Armeria labradorica, *Wallr.*—Chidley Peninsula.

GENTIANACEAE.

Menyanthes trifoliata, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

BORAGINEAE.

Mertensia maritima, *Gray.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

SCROPHULARIACEAE.

Veronica alpina, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Veronica serpyllifolia, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Bartsia alpina, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Pedicularis euphrasioides, *Stev.*—Chidley Peninsula.

Pedicularis flammea, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Pedicularis groenlandica, *Retz.*—Chidley Peninsula.

Rhinanthus Crista-Galli, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

LENTIBULARIEAE.

Pinguicula vulgaris, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

PLANTAGINEAE.

Plantago borealis, *Lge.*—Anse Sablon.

POLYGONACEAE.

Polygonum aviculare, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Polygonum viviparum, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

URTICACEAE.

Urtica gracilis, *Ait.*—Anse Sablon.

SALICINEAE.

Salix arctica, *R. Br.*—Chidley Peninsula.

Salix sp., cf. **S. arctica,** *R. Br.*—Anse Sablon, Chidley Peninsula.

Salix Cutleri, *Tuck.*—Anse Sablon.

Salix glauca, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Salix polaris, *Wahl.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Salix sp., cf. **S. reticulata,** *L.*—Chidley Peninsula.

EMPETRACEAE.

Empetrum nigrum, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

ORCHIDEAE.

Platanthera hyperborea, *Lindl.*—Anse Sablon.

IRIDEAE.

Iris setosa, *Pall.*—Anse Sablon.

LILIACEAE.

Streptopus amplexifolius, (*L.*) *DC.*—Anse Sablon.

Streptopus roseus, *Michx.*—Anse Sablon.

Smilacina stellata, *Desf.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Maianthemum canadense, *Desf.*—Anse Sablon.

Clintonia borealis, (*Ait.*) *Raf.*—Anse Sablon.

JUNCACEAE.

Juncus balticus, *Willd.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Luzula hyberborea, *R. Br.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Luzula parviflora, *Desv.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

CYPERACEAE.

Eriophorum vaginatum, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Carex brunnescens, *Poiret.*—Anse Sablon.

Carex cuspidata, *Wahl.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Carex sp., cf. **C. holostoma,** *Drej.*—Anse Sablon.

Carex maritima, *Müller.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Carex pulla, *Gooden.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Carex stylosa, *C. A. Meyer.*—Chidley Peninsula.

Carex sp., cf. **C. supina,** *Wahl.*—Chidley Peninsula.

GRAMINEAE.

Hierochloa alpina, *R. et Sch.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Calamagrostis sp.—Chidley Peninsula.

Deschampsia flexuosa, *Trin.*—Anse Sablon.

Trisetum subspicatum, *Beauv.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Poa alpina, *L.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Poa annua, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Poa arctica, *R. Br.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Poa caesia, *Smith.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Poa sp., cf. **P. glauca.**—Chidley Peninsula.

Poa glumaris, *Trin.*—Anse Sablon.

Poa pratensis, *L.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

PTERIDOPHYTA.

FILICINAE.

Onoclea sensibilis, *L.*—Anse Sablon.

Cystopteris fragilis, *Bernh.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Nephrodium spinulosum, *Desv.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

EQUISETINAE.

Equisetum arvense, *L.*—Anse Sablon, Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Equisetum laevigatum, *R. Br.*—Anse Sablon.

LYCOPODINAE.

Lycopodium annotinum, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

BRYOPHYTA.

MUSCI.

Andreaea rupestris, *Turn.*—Chidley Peninsula.
DISTRIBUTION. Scandinavia.

Sphagnum acutifolium, *Ehrh.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Sphagnum fimbriatum, *Wils.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Sphagnum rigidum, *Schimp.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Aulacomnium turgidum, *Schwaegr.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Polytrichum commune, *L.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Polytrichum juniperinum, *Willd.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Polytrichum strictum, *Banks.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Bryum bimum, *Schreb.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Bryum, sp., cf. **B. Duvalii**, *Voit.*—Chidley Peninsula.

Dicranum elongatum, *Schwaegr.*—Anse Sablon.
DISTRIBUTION. Scandinavia.

Campylopus sp.—Chidley Peninsula.

Paludella squarrosa, *Brid.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Philonotis fontana, *Brid.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Barbula fallax, *Hedw.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Ceratodon purpureus, *Brid.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Rhacamitrium lanuginosum, *Brid.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Camptothecium nitens, *Schimp.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Hypnum aduncum, *Hedw.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Hypnum revolvens, *Sw.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Hypnum stramineum, *Dicks.*—Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Hylocomium splendens, *Bruch et Schpr.*—Chidley Peninsula.
DISTRIBUTION. Scandinavia.

HEPATICAE.

Blepharostoma setiformis, *Lindb.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Ptilidium ciliare, *Nees.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

THALLOPHYTA.

LICHENES.

Cladonia amaurocraea, *Schaer.*—Chidley Peninsula.
DISTRIBUTION. Lapland, Scandinavia.

Cladonia bellidiflora, *Schaer.*—Chidley Peninsula, Anse Sablon.
DISTRIBUTION. Lapland, Scandinavia.

Cladonia cornucopioides, *Fr.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Cladonia cornuta, *Fr.*—Chidley Peninsula.

DISTRIBUTION. Scandinavia.

Cladonia gracilis, *Schaer.*, var. **elongata,** *Fr.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Cladonia rangiferina, *Hoffm.*—Chidley Peninsula, Anse Sablon, Nain, Hopedale.

C. rangiferina, *Hoffm.*, var. **alpestris,** *Schaer.*—Chidley Peninsula, Nain, Hopedale.

C. rangiferina, *Hoffm.*, var. **major,** *Fl.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Cladonia turgida, *Hoffm.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Cladonia uncinalis, *Fr.*—Hopedale.

DISTRIBUTION. Lapland, Scandinavia.

Stereocaulon coralloides, *Fr.*—Chidley Peninsula.

DISTRIBUTION. Lapland, Scandinavia.

Stereocaulon paschale, *Ach.*—Anse Sablon, Nain, Hopedale.

DISTRIBUTION. Lapland, Scandinavia.

Alectoria ochroleuca, *Nyl.*—Chidley Peninsula, Anse Sablon, Nain, Hopedale.

DISTRIBUTION. Lapland, Scandinavia.

Bryopogon jubatum, *Link.*—Chidley Peninsula, Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Cetraria aculeata, *Fr.*—Chidley Peninsula, Hopedale.

DISTRIBUTION. Lapland Scandinavia.

Cetraria islandica, *Ach.*—Anse Sablon, Nain, Hopedale.

DISTRIBUTION. Europe, Lapland, Scandinavia.

Parmelia physodes, *Fr.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Parmelia saxatilis, *Ach.*—Anse Sablon.

DISTRIBUTION. Lapland, Scandinavia.

Parmelia stygia, *Ach.*—Hopedale.

DISTRIBUTION. Lapland, Scandinavia.

Platysma nivale, *Nyl.*—Chidley Peninsula, Anse Sablon, Nain, Hopedale.

DISTRIBUTION. Lapland, Scandinavia.

Ochrolechia tartarea, *Massal.*—Chidley Peninsula.

DISTRIBUTION. Lapland, Scandinavia.

Nephroma arcticum, *Fr.*—Chidley Peninsula, Anse Sablon, Nain, Hopedale.

DISTRIBUTION. Lapland.

Solorina crocea, *Ach.*—Chidley Peninsula.

DISTRIBUTION. Scandinavia.

Gyrophora sp.—Chidley Peninsula.

Pertusaria sp.—Chidley Peninsula.

FUNGI.

Cantharellus aurantiacus, *Fr.*—Chidley Peninsula.

DISTRIBUTION. Scandinavia.

Bovista nigrescens, *L.*—Chidley Peninsula.

DISTRIBUTION. Scandinavia.

Russula sp.—Chidley Peninsula.

XVII.—DISTILLATION OF CAMPHOR.

(*Cinnamomum Camphora*, Nees.)

The subject of Camphor was discussed in the volume of the *Kew Bulletin* for 1899; its distillation is dealt with on p. 61. In a recent communication from the Government of Madras (Revenue Department, G.O., 1013, dated October 10th, 1906) this part of the subject has been further dealt with, and an extract from a lecture delivered on May 14th, 1906, before the Ceylon Agricultural Society, by Mr. M. K. Bamber, is given in full. The extract, which is of value as supplementing the previous accounts of the process, is now reprinted.

"The still required for the purpose is of the simplest description and very similar to that used by the Japanese in Formosa, with slight improvements in the condensers as perfect condensation is absolutely essential for success. The slightest smell of escaping camphor may mean a loss of 20 per cent. or more as has been proved by several experiments, and the two means of preventing it and obtaining the maximum proportion of camphor to oil are absolute condensation and slow distillation with a minimum of heat.

"The still may consist of an ordinary wooden cask, but is better if somewhat conical in shape and should be about 6 feet high, 3 feet diameter at the bottom and 2 feet 6 inches at the top, and have a close fitting door at the lower end for the removal of the refuse prunings. The top or a portion of it must be removable

but capable of being hermetically closed. From near the top a large diameter bamboo 5 feet to 7 feet long passes to the condensing boxes of wood placed in a suitable tank and connected with short lengths of similar bamboo. The still has a perforated bottom and stands over an iron basin built into a small stone or brick furnace. The basin about 2 feet 6 inches to 3 feet in diameter is fitted with a supply tube for adding water as required and an overflow pipe closed with a plug during distillations. The condensing boxes consist of bottomless boxes of suitable size having three or more partitions in each with communications at opposite ends of each division to insure thorough circulation of the camphor and water vapours. The tops of the boxes are hermetically closed about 1 inch below the upper edges and the boxes are stood in the tank as mentioned above being connected by short bamboo lengths. Cold water from a stream flows from a pipe or bamboo on the top of each box and then overflows into the tank which has an outlet pipe 2 inches to 3 inches from the bottom. By this means a water seal 3 inches deep is kept round the bottom of the boxes. The mixture of camphor vapour and steam from the still enters the first box just above the water level, circulates round the various partitions, and so passes from box to box, the camphor being condensed in pure white crystals on the walls and partitions as it cools down. The last box is fitted with an outlet of bamboo, which can be kept closely plugged with straw. This acts as a safety valve and enables one to ascertain whether condensation is perfect, as there should be little or no smell of camphor observable. In working, the still is loosely filled with the fresh prunings as brought in, the top put on and well luted with clay, water poured into the basin, and a fire lit to bring it rapidly to the boil. As soon as this occurs and a slight smell of camphor or eucalyptus can be smelt at the escape tube on the last box, the fire is reduced and the water merely kept hot for several hours. A good plan is to have a glass let into the cover of the first (or all) of the condensing boxes and as soon as vapour begins to condense on it to immediately reduce the fire to a minimum, as the object to be gained is to drive off all the camphor with as little steam as possible. A small wooden spigot in the top of the still makes it possible to ascertain when all smell of camphor has disappeared, but care must be taken when opening it not to become scalded. When completed, probably in 3 to 4 hours, the door at the bottom of the still is opened, the prunings removed and the still recharged from the top. All water in the pan which contains much tannin, &c., in solution is changed by opening the overflow plug and pouring in a fresh quantity through the supply tube. During distillation it is necessary to occasionally add some water to the pan to maintain a constant level and prevent burning. To save time it would be best to have two stills connected with the condensers as with many citronella grass stills, since the one could be filled, while the other distillation was proceeding; the latter could then be allowed to cool down before opening without a loss of time. To preserve the heat in the top of the still and ensure the camphor passing away readily, the still should be thickly coated with clay or other non-conducting material, the Japanese method being to surround the still with cane work and ram clay into the space between.

"When a condenser is seen to contain sufficient camphor, it should be opened and the camphor carefully scraped out, every precaution being taken to keep it free from dirt, or fragments of any description; otherwise redistillation would be necessary if the best price is to be obtained. A wooden scraper should be used, contact with metal being avoided as far as possible, while in the moist condition. The camphor should be placed in a well-made box like a tea-chest having a perforated false bottom 4 inches or 5 inches from the actual bottom and the top perfectly closed. In a few days, most of the oil will have drained into the lower portion of the box which should be zinc-lined and the dry camphor can be removed and carefully packed in zinc-lined cases for despatch.

"By reducing the camphor-oil to a low temperature fully 50 to 60 per cent. of solid camphor separates out and can be removed with a cloth strainer and well drained, the temperature being kept as low as possible, while the excess of oil is draining away.

"Should any of the camphor be accidentally discoloured, it should be thrown back into the still with a subsequent charge of prunings for redistillation. The question of purification by sublimation, redistillation of the oil for the production of safrol, white oil and other products will be fully gone into in the circular previously referred to and need not be discussed here. The chief uses of camphor are for the manufacture of celluloid, smokeless explosives, fireworks, &c., and medicinally in the treatment of influenza, dysentery and cholera. For the latter disease, it was used most successfully in Naples in 1854, all the cases treated recovering, and it was employed with equal success in Liverpool in 1866. Any outbreak of influenza increases consumption at once, but the chief demand is for the manufacture of smokeless powders and celluloid; it is also said to be employed in one of the numerous rubber substitutes now manufactured."

XVIII.—CHLAMYDITES: A NEW GENUS OF COMPOSITAE.

J. R. Drummond.

Char. gen.—*Herba* demissa, lanata, scapigera; folia, plerumque radicalia, parva. *Capitula* heterogama, radiata homochroma (?); flosculi ♀ omnes externi uniseriati ligulae-formes, breves, apice sub-acuto; ☿ in disco pluri-seriati infundibuliformes 5-lobulati, lobis aequalibus acutis, lobulo quoque sub apicem villorum canescentium cristâ flosculum supereminante externe ornato. *Phyllaria* infrâ connata involucrum poculiforme 5-vel pluri-lobatum formantia. *Antherarum* bases rotundatae integrae. *Styli* brachia sub-clavata denique acuminata, papillosa. *Achaenia* linearia sub-compressa hispida, omnia papposa; pappi setae ∞ seriatae, subaequales, barbellatae.

Observ.—Asteroidearum sub-tribus "Heterochromearum" hodie prompter nonnullas species in regione Indo-Sinensi nuper detectas

quibus homochroma sunt capitula constare nequitur; itaque haec nova species inter Asteroideas facilius locari posset, si vero, quod in exsiccatis incertum manet, flosculi discoidei purpurpeo-lilacini inveniantur; sed cum ad involucri faciem, ab *Asteroidearum* normâ toto caelo remotam atque alias notas respiciamus, tunc proprior affinitas cum *Senecionideis*, praesertim cum *Tussilagineis* indicabitur, at maxime cum singulari illâ planta quam b. Decaisnius (in Jacquem. Itin.) sub nomine '*Ligularia nana*' primum descripsit, postea illustr. G. Benthamius in genus '*Werneria*' transtulit. *Werneria* reverâ hodierno consensu inter fines Asiae nusquam expectanda videtur; "Werneria nana," cl. Hemsleium sequentibus, inter Cremanthodia locanda, vel, duce cl. Franchetio in volumine Senecionium submergenda, erit: plantam Himalae Boreali occidentalis, quae ill. Hookerio fil in Fl. Br. Ind. III. p. 357. "Werneria Ellisii" constituit, a *Senecionis* (*Ligulariae*) specie "S. arnicoides, Wall." p. 351 ibidem distinguere difficile videtur. Cum *Cremanthodium*, sicut aliqui suaserunt, pro genere abrogare conveniat, tum quidem planta nostra ab omnibus *Senecionibus* propter disci flosculos cristatos dissociari debet, qui character, tanquam in *Arctotidis* pro generico non ponderatus fuit, cum inter omnes ceteros *Compositarum* tribus abesse videtur, in *Senecionideis* majoris aestimationis dignus apparet. Typus hic, forsan archaicus, nulli existenti arctius alligatus inter *Tussilaginem* et *Seneciones* (*Cremanthodiis* inclusis) allocandus videtur. Nomen propter indumentum plantae, atque flosculorum ♀ lobulos quasi chlamydii laciniis villosis cristatos e voce 'Chlamys' (chlamydion) assumpsum.

Chlamydites Prainii, sp. nov.

Rhizoma satis robustum sub-lignosum perenne, petiolis senectis imbricatum, mox in plures caules divisum, quarum ex unâ scapus horizontalis seu ascendens uniflorus editur, ab alteris officium stolonum agitur; scapo vix semipedali unicum capitulum, sesquiunciali diametro, disco amplo, involucro villosissimo sustinetur. *Folia* radicalia longepetiolata laminâ ad 4 cm. productâ spathulatâ, margine obscure et remote sinuato-dentato, apice obtusato, caulina pauca sessilia, omnia plus minus candide lanata, seu sericeo-villosa, radicalia crassiora. *Scapus* sub-capitulum valde incrassatus. *Involucri* lobi basi duplo longiores, lineari-lanceolati obtusati, parte inferiore villis coactis versus apices distinctis vestiti. *Ligulae* super involucrum parum extrusae lineari-lanceolatae planae sub-acutae, persistentes. *Discus* sub-convexus alveolatus, ad semiunciam latus; flosculi discoidei purpureo-lilacini. *Achaenia* arguta 6–8 mm. longa hispido-canescentia; pappus luteo-albescens, ligulis brevior, achaeniis 2–3-vicem longior, maturus involucrum supereminans.

HAB. TIBET: Kambajong, *D. Prain*, Sept. 1903; Lhasa, *Walton*, Aug. 1904.

In habit this somewhat resembles certain Allardias; also, but less closely, a plant regarded by Asa Gray as akin to *Aster pygmaeus* (but named by him *Erigeron Muirii*), as well as *Erigeron lanatus*, Hooker; while the shape and proportion of the ligules, the arrangement of the florets and their colouring recall certain Gerberas; but the true affinity is clearly with the curious

Tibetan plant which Mr. Hemsley has named *Cremanthodium Deasyi* (Werneria nana, *Benth.*; Senecio Clarkeanus, *Franch.*; etc.) *Werneria* is almost exclusively an Andine genus, with perhaps a scanty representation in the Atlantic and Abyssinian regions of North Africa; and in any case we should follow Mr. Hemsley in excluding the 'Ligularia nana' of Decaisne from *Werneria*; but the very remarkable villous tufts on the segments of the disc-florets of the E. Tibetan plant suggest the propriety of placing it in a genus by itself though near to *Cremanthodium*, or —if that must be merged in *Senecio*—then between *Senecio*, (section *Cremanthodium*) and *Tussilago*. The name refers to these appendages which resemble ermine tufts on a mantle or tippet.

XIX.—ALPINE NOTES FROM SIKKIM.

(With Plate.)

Mr. I. H. Burkill, Reporter on Economic Products to the Government of India, paid an autumn visit to Phallut in 1906 in search of Aconite tubers. The following extracts from a letter recently received from him give particulars of the interesting country through which his route lay. The accompanying plate has been prepared from two photographs sent with the letter. The upper view shows a group of trees of *Rhododendron arboreum*, Smith, with, in the foreground, part of an alpine meadow filled with an *Iris*, probably *I. Clarkei*, Baker. The lower view shows a group of trees of *Abies Webbiana*, Lindl.; in the distance is seen the Sandakphu ridge; the open glade in front is occupied by *Aconitum spicatum* and a hybrid Aconite, *A. spicatum* × *laciniatum*.

"Calcutta, 15th October, 1906.

"I found my second trip to Phallut interesting and agree-
"able . . . One result is the few enclosed seeds. You will
"note that there are three packets of Impatiens seed; 27688 is
"undoubtedly *I. radiata*, I send its seed because of the cleistogamy
"of its latest flowers. I think that the other two are *I. longipes*
"and *I. stenantha*, and if Sir Joseph Hooker could see them alive
"the great general similarity yet with conspicuous differences
"would interest him.

"It is very desirable that species of Impatiens should be figured
"from life; dead, the difficulty of discriminating them is
"increased a thousandfold. The seed labelled *I. stenantha* is of
"a plant with red speckles on the yellow flower which run
"together into blotches on the spur, while the *I. longipes* is pure
"lemon yellow. Both are the same size, and equally oblique-
"flowered, but the spur of 'stenantha' turns up at the tip and the
"spur of 'longipes' does not. The flowers on 'stenantha' are
"far more abundant than on 'longipes', the leaves denser and the
"pods a little thicker. I had some difficulty in getting ripe seed.





VIEWS IN SIKKIM.

"In the Corydalis packet are seeds of three species; the "common yellow one of Phallut; the very similar white one of "beyond Phallut; and one which has no leaves on its flowering "stem. In the last I have little interest, but it is very pretty. "With the two first when they grow together is a tawny-flowered "similar plant and I wondered if the two could hybridise to form "the tawny-flowered plant. I have botanical specimens which "will enable me to name the plants.

"The last packet is of the Viola of Tonglu. Hooker in *Hooker's* "*Journ. Bot.*, vol. ii., 1850, p. 118, and Clarke in the Linnean "Society's *Journal*, vol. xv., p. 132, mention it without a name. "I have not seen flowers, but I collected the seed because these "Violas want figuring from nature. The angle at which the "lateral petals stand, and the position of the upper ones, in a "moment distinguish two species that from herbarium material "were united in the *Flora of British India*.

"Now that I have explained what has made me send these "seeds I will go on to the trip. I had a halt of one day at "Sandakphu where my coolies collected for me *Aconitum* "*laciniatum* and *A. laciniatum* × *spicatum*; but the halt gave me "no time for botanising as I had to go out with the coolies and to "indicate every root that was to be dug up and into which basket "it should go. Then I had two days' halt at Phallut. On the "first I went in the rain to the top of Singlela, having sent my "coolies out in two parties, one to hunt *A. heterophyllioides* and the "other to dig up all there was at an indicated spot on Sabarkum. "On the second day, as the coolies had brought me in *A. spicatum* "and not *A. heterophylloides*, I was obliged to go out with them "again . . . Fortunately my Lepcha bearer-sirdar proved his "value by going off in another direction and bringing me in just "what I wanted, so I returned with six cooly loads of roots.

"The weather gave me morning views—up to 8 a.m.—on more "than half of the days out, and only drenched me twice, so that "I have not to complain of it. The season was late and I was "early—my other visit was in the middle of October, so that I saw "the plants in flower that I had only seen dead before. Sandak- "phu was covered with flowering *Aconitum spicatum*. The lilac "Asters in the grass of Sebarkum were not all over. There "were lots of white Umbellifers on Phallut and Corydalis in "quantity beyond. *Meconopsis paniculata* was not wholly over. "Two Pedicularis were still out. *Saxifraga diversifolia*, which "is everywhere, was only just at full flower, and two other yellow "Saxifrages were not quite over. Even *Potentilla fruticosa* had "a few flowers on it. But Phallut and Singlela were red with the "autumn leaves of an Euphorbia and beyond Sandakphu the "beginning of the end of the season was obvious.

"I amused myself by the wayside making flower pollination "notes and am now writing up a short paper. Two things come "out strongly; 1, there is not a tree in flower in autumn up there, "but there are very many herbaceous plants; and 2, an unusual "proportion of the flowers face the earth, *e.g.*, the Rosae, the "Heliotrope-set, Triplostegia—in which one would not expect "earth-facing species, and things like Crawfurdia, the Aconite,

"Satyrium, Impatiens. I think they would all 'like to go into "'the ark for to get out of the rain.'

"I got two diminutive Utricularias in moss, one at Jorpokri "(lilac) and one on Sabarkum and the summit of Singlela (white). "I found plenty of my *Swertia tonglensis* on Tonglu and "Kalipokri. I found a new form at Jorpokri, something like *S.* "*Dalhousieana* but not it.

"The bees I collected visiting flowers I cannot name. It strikes "me that they are very ill known. A very handsome yellow-"ringed fellow goes to *Impatiens arguta*. Aconite is much "visited by them. The long-tubed Composites get the visits of "the long-tongued flies of the genus Vollucella. I caught one of "these flies and measured its tongue, which stretched to 22 mm.; "most likely the insect can suck honey from a tube 18 mm. long "which is just what the largest *Bombus hortorum* can do in "England. The bees of Sikkim go to work in the rain, which "is what English bees do not."

XX.—REDUCTIONS OF THE WALLICHIAN HERBARIUM.—II. GESNERACEAE.

C. B. Clarke.

Gesneraceae.

407. *Wulfenia obliqua*, Wall. (2 sheets) = Rhyncoglossum obliquum, Blume, var. parviflora, C. B. Clarke.

408. *Wulfenia intermedia*, Wall. (2 sheets)=Rhyncoglossum obliquum, Blume.

409. *Wulfenia Notoniana*, Wall. (1 sheet) = Klugia Notoniana, A. DC.

777. *Didymocarpus punduana*, Wall. (1 sheet), is good.

778. *Didymocarpus Rottleriana*, Wall. (3 sheets), is good.

779. *Didymocarpus crinita*, Jack (1 sheet), is good.

780. *Didymocarpus frutescens*, Jack (2 sheets), is good.

781. *Didymocarpus cordata*, Wall. (1 sheet), is good.

782. *Didymocarpus subalternana*, Wall. (2 sheets), is good.

783. *Didymocarpus macrophylla*, Wall. (3 sheets), type sheet is good; sheet 784 β = Didymocarpus pedicellata, R. Br.; sheet 784 γ is good.

785. *Didymocarpus aromatica*, Wall. (1 sheet), the chief part is good. The example in late fruit, in the right hand lower corner of the sheet, marked by D. Don in his own hand as the type of his *D. plicata*, is D. macrophylla, Wall. (as stated by R. Br.).

786. *Didymocarpus obtusa*, Wall (1 sheet) = DIDYMOCARPUS CINEREA, D. Don.

787. *Didymocarpus reptans*, Jack (1 sheet), is good.

788. *Didymocarpus ? hamosa*, Wall. (3 sheets); type sheet, sheet 788 β = CHIRITA HAMOSA, R. Br.; sheet 788 γ = CHIRITA HAMOSA, R. Br.? var. FINLAYSONI, C. B. Clarke.

789. *Didymocarpus ? helioteroides*, Wall. (1 sheet) = BAEA WALLICHII, R. Br.

790. *Didymocarpus mollis*, Wall. (1 sheet), is good.

791. *Didymocarpus lanuginosa*, Wall. (1 sheet), is good.

792. *Didymocarpus conchorifolia*, Wall. (1 sheet), is good.

793. *Didymocarpus ? multiflora*, Wall. (1 sheet) = BAEA MULTIFLORA, R. Br.

794. *Aeschynanthus bracheata*, Wall. (2 sheets), is good.

795. *Aeschynanthus longiflora*, Wall. (1 sheet) = AESCHYNANTHUS SUPERBA, C. B. Clarke.

796. *Aeschynanthus parasitica*, Wall. (3 sheets); type sheet contains 3 plants, viz.:—

Upper left hand marked X = AESCHYNANTHUS MACULATA, Lind.

Upper right hand marked Y = AESCHYNANTHUS GRANDIFLORA, Spreng.

At the bottom marked Z = AESCHYNANTHUS MICRANTHA, C. B. Clarke.

Sheet 796 β contains 2 plants, viz.:—

Upper left hand marked M = AESCHYNANTHUS GRANDIFLORA, Spreng.

Upper right hand marked N = AESCHYNANTHUS MACULATA, Lindl.

Sheet 796 γ = AESCHYNANTHUS GRANDIFLORA, Spreng.

797. *Aeschynanthus fulgens*, Wall. (1 sheet), is good.

798. *Aeschynanthus radicans*, Jack (2 sheets), type sheet = AESCHYNANTHUS WALLICHII, R. Br.; second sheet = AESCHYNANTHUS GRIFFITHII, R. Br.

709. *Aeschynanthus ramosissima*, Wall. (1 sheet), is good. (This is marked by D. Don in his own hand as his *Trichosporum parviflorum*.)

800. *Calosacme grandiflora*, Wall. (2 sheets) = CHIRITA VERTICAEFOLIA, Buch.-Ham.

801. *Calosacme flava*, Wall. (1 sheet) = CHIRITA PUMILA, D. Don.

802. *Calosacme acuminata*, Wall. (3 sheets); type sheet, sheet 802 β = CHIRITA ACUMINATA, R. Br.; sheet 802 γ = DIDYMOCARPUS ACUMINATA, R. Br.

803. *Calosacme dimidiata*, Wall. (1 sheet) = CHIRITA DIMIDIATA, R. Br.

804. *Calosacme polycarpa*, Wall. (3 sheets) = LYSIONOTUS SERRATA, D. Don.

805. *Calosacme macrophylla*, Wall. (2 sheets) = CHIRITA BIFOLIA, D. Don.

—— Sheet found next n. 806, marked "Amongst the Didymocarpeae n. 34, *see* Notes" = Rubiacea (very badly preserved).

807. *Cyrtandra frutescens*, Jack (3 sheets), type sheet contains 2 plants, viz. :—
Left hand = CYRTANDRA DECURRENS, De Vriese.
Right hand = CYRTANDRA DISPAR, DC.
Sheet 807 β = CYRTANDRA DECURRENS, De Vriese; sheet 807 γ = CYRTANDRA DISPAR, DC.

808. *Cyrtandra ? acuminata*, Wall. (2 sheets) = CYRTANDROMAEA ACUMINATA, Benth. et Hook. f.

—— Sheet found next 808 marked "*Chelone ? latifolia*, Goyalpara," by Buch.-Ham. = RHYNCOTECHUM LATIFOLIUM, Hook. f. & T. Thoms.

809. *Loxonia ? alata*, Wall. (1 sheet) = DIDYMOCARPUS INCANA, Benth. et Hook. f.

4410. *Platystemma violoides*, Wall. (1 sheet), is good.

4411. *Platystemma majus*, Wall. (1 sheet), = PLATYSTEMMA VIOLOIDES, Wall.

6394. *Glossanthus malabarica*, Klein (2 sheets) = KLUGIA NOTONIANA, A. DC.

6395. *Glossanthus ? grandiflora*, Benth. (1 sheet) = STAURANTHERA GRANDIFLORA, Benth. (errore typogr. *Stauranthera grandifolia*).

6395. *Didymocarpus Missionis*, Wall. (1 sheet), is good.

6397. *Aeschynanthus acuminata*, Wall. (1 sheet), is good.

6411. *Corysanthera elliptica*, Wall. (1 sheet) = RHYNCOTECHUM ELLIPTICUM, A. DC.

[7131]. *Cyrtandra ? lanuginosa*, R. Br. (1 sheet) = ISANTHERA PERMOLLIS, Nees (but the sheet is without any Wallichian ticket or number).

7495. *Cyrtandracea* (1 sheet) = SYLVIANTHUS BRACTEATA, Hook. f., inter Rubiaceas.

[9073]. *Isanthera permollis*, Nees. This number is wholly missing in the Wallichian Herbarium, but the duplicate sheet of this number at Kew is good.

[9079]. *Rhyncotechum ?* (1 sheet), contains 2 plants, viz. :—
a. Upper = BAEICA FILIFORMIS, C. B. Clarke.
b. Lower = BAEICA GRIFFITHII, C. B. Clarke.
(This sheet was found without Wallichian number or label. I have placed it under 9079 because the duplicate sheets of that number at Kew contain *Baeica filiformis* and *B. Griffithii*.)

[9080]. *Epithema ?*. Number wholly missing in the Wallichian Herbarium. The duplicate sheet of n. 9080 at Kew = EPITHEMA CARNOSUM, Benth.

XXI.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: II.

The appearance of "The Wild Fauna and Flora of the Royal Botanic Gardens, Kew," which was referred to in the *Bulletin* for 1906, p. 42, has been followed by the receipt of numerous letters, some of them critical as to matters of detail, but all of them in accord as to the debt of gratitude due to Sir W. T. Thiselton-Dyer for the happy thought which inspired and the perseverance which, in spite of many difficulties, brought to a successful issue the preparation of the work. It is particularly gratifying to be able to add that neither those whose allusions are merely appreciative nor those whose remarks take the form of welcome, because justifiable, criticism have shown any desire to rest content with mere comment. To some the work bids fair to prove an inspiration to prepare for other localities a corresponding record ; to others, and this more immediately concerns us, it has suggested the idea that the way in which they can most practically show their appreciation of what has already been done is to endeavour to supplement it. Simultaneously with the appearance of the work itself, the first addition to the wild fauna and flora of Kew appeared in the *Bulletin* (New and Additional Species of Fungi occurring in the Royal Botanic Gardens, Kew : *K. B.*, 1906, p. 46), and it is proposed to place on record from time to time the results obtained by the willing workers who are engaged in the study of the various natural groups dealt with in the original work. The present note, which deals with the Coccids or Scale Insects, is therefore the second of a series of supplementary articles, the contents of which may, it is hoped, at a later date be incorporated in a revised edition of the original work.

HEMIPTERA-HOMOPTERA.

COCCIDAE (Scale Insects).

R. NEWSTEAD.

This supplementary list of the Coccids includes but a single species that is new to the Kew fauna, but the list of food plants has been considerably augmented, and from this point of view

the records are of additional interest and value to the student in this group of insects. They are also important from an economic point of view as determining the nature and extent to which the various species confine their attacks to one or more groups of plants.

At Kew we have discovered up to the present 46 species representing 24 genera, and, as previously stated,* this far surpasses any other record for an equal area in the British Isles, representing, in fact, about one-half of the recorded species for this country. Of this grand total about 74 per cent. are aliens, and have been introduced on imported plants. Of these aliens three have been completely exterminated—formerly there were four—but of these *Gymnococcus agavium* has apparently been re-introduced since the publication of the first list of these insects.

Our thanks are due to Mr. G. Nicholson and his colleagues for the care and attention they have given to the collecting of the material.

Freshly imported plants may often be found to harbour coccids, and a careful search should invariably be made with a view to preventing the introduction of a new pest. I shall at all times be pleased to examine any material that may be sent to me.

The nomenclature of the Coccidae has considerably changed since the publication of the first list, but in order to avoid confusion the names given in the previous catalogue have been retained. Any changes in the generic or specific names are given in brackets.

DIASPINAE.

Aspidiotus (*Chrysomphalus*) **personatus,** *Comstock.* Male and female puparia. On *Tillandsia Griesseniana.* Coll. R. Kett. This minute species confines its attacks almost exclusively to various species of *Tillandsia* in this country, but is rare. Outside the British Isles it has been recorded from the West Indies, Mexico, and British Guiana.

Aspidiotus hederae, *Vall.* Male and female puparia. On *Haworthia semipapillosa* (House No. 7), and *Mesembryanthemum Bolusii* (House No. 5). Coll. C. P. Raffill.

Aspidiotus zonatus, *Frauenf.* Male puparia only. On *Quercus pedunculata.* Coll. G. Nicholson. This is an indigenous species, and new to the Kew fauna. The male puparia are invariably formed upon the leaves, and the specimens from Kew made the prettiest little colonies I have yet seen. The females locate themselves on the smaller branches of the oak, and from their colour, which closely resembles the bark, they are most difficult to detect.

Diaspis boisduvalli, *Sign.* All stages. On *Phormium tenax* (Winter Garden). Coll. W. Taylor. This plant also harboured *Dactylopius citri* (q.v.). Also on *Cymbidium Aloifolium, C. Lowianum, Cattleya Aclandiae, Ornithidium coccineum,* and *Laelia*

* The Wild Fauna and Flora of the Royal Botanic Gardens, Kew Bull. of Miscel. Information. Additional Series V., p. 21.

purpurata. Coll. G. Nicholson. This is a greenhouse pest in this country. It also occurs, under glass, in the United States, and in the open air in Mexico, West Indies, Brazil, Australia, New Zealand and elsewhere. It feeds on a variety of plants.

Chionaspis (*Hemichionaspis*) **aspidistrae**, *Sign.* In all stages on the stem scales of *Zamia Loddigesii*. Coll. R. Kett. This is a fairly common species in Great Britain. It has also been recorded from Australia, Brazil, Trinidad, India, Japan, in Canada (under glass), and elsewhere. Its favourite food plants are various kinds of ferns, but it has also been found on orange, mango, fig, pepper, &c.

Pinnaspis buxi, *Bouché*. Female only. On an unnamed monocotyledon, and on *Monstera deliciosa*. Coll. G. Nicholson. Less common than the preceding species in Great Britain. Common in the West Indies, and has been recorded from the United States (? under glass), and elsewhere.

Mytilaspis pomorum, *Bouché* (= *M. ulmi*, Linn.). Females only. On *Cotoneaster* sp., *Cornus alba*, and *Helianthemum* sp. Coll. W. Dallimore. This is the well-known "Mussel Scale" of the apple. It feeds, however, on a variety of plants, and has a wide geographical distribution.

LECANIINAE.

Lecanium (*Calymnata*) **hesperidum**, *Linn.* Females and male puparia. On *Carludovica palmata*. Coll. G. Nicholson. This common species is largely parthenogenetic, the males being extremely rare—in fact have been discovered on two or three occasions only. The finding of the male puparia at Kew is therefore of great scientific interest. It is a general feeder, and almost cosmopolitan in its distribution.

Lecanium (*Calymnata*) **hesperidum**, var. **alienum**, *Douglas*. Females only. On *Furcraea macrophylla* and *Aloe ciliaris* (House No. 5). Coll. G. Nicholson. Common and generally distributed.

Lecanium (*Eulecanium*) **persicae**, var. **sarothamni**, *Douglas*. Females only. On *Cotoneaster*. Coll. G. Nicholson. This may be considered a phytophagous variety of the common peach scale; it is smaller than typical examples from the peach, but does not differ in any other particular.

Lecanium sp.? Possibly *L. hesperidum*, but the specimens were all badly parasitised with a chalcid larva, and could not be definitely fixed. On *Aloe ciliaris* (House No. 5). Coll. W. Down.

Lecanium (*Saissetia*) **oleae**, var. **testudo**, *Curtis*. Females only. On *Furcraea* sp. and *Aloe ciliaris* (House No. 5). This variety has not occurred outside the British Isles. It is much smaller and browner than typical *oleae*.

Dactylopius (*Trechocorys*) **citri**, *Risso*. Females only. On *Phormium tenax* (Winter Gardens). Coll. W. Taylor. This is the common "Mealy Bug," and has been met with on a variety of plants in nearly all parts of the world.

Dactylopius (*Trechocorys*) **longispinus**, *Targ.* Females only. On *Cypripedium grande*. Coll. G. Nicholson. Almost as common and as widely distributed as the preceding.

Gymnococcus agavium, *Douglas.* In all stages but the perfect males. On *Agave deserti* and *A. Wislizeni* (House No. 5). Coll. W. Down. This species was first described from material discovered at Kew in 1888. Since that date the insect has been lost sight of until it was re-discovered at Kew in October, 1906. It is an interesting species, and has, I believe, not been recorded from any other habitat.

XXII.—MISCELLANEOUS NOTES.

MR. W. J. GALLAGHER, a graduate of the Royal University of Ireland, has been appointed, on the recommendation of Kew, Mycologist to the Agricultural Department of the Federated Malay States. At the date of his appointment Mr. Gallagher held a Research Studentship from the Commissioners of the 1851 Exhibition, and was engaged in the study of plant diseases at Münden in Germany.

DR. OTTO KUNTZE.—The "Gardeners' Chronicle" of February 16 announces the death of this well-known botanist on January 28, at San Remo, where he had resided for several years. He was most widely known from his publications on botanical nomenclature, wherein he applied certain rules as to priority with a relentless severity. But he was a sound systematist, and, apart from some peculiarities of thought, mainly the result of his extreme zeal in matters relating to names, he was a most agreeable, amiable and well-informed gentleman. He was, we believe, originally a manufacturing chemist, but having attained a competence he abandoned his business and made botany his principal study. His first work was a "Taschen-Flora von Leipzig," which appeared in 1867. In 1874 he started on a journey round the world, returning home in 1876 with a botanical collection of some 7,700 numbers. During his travels he wrote a series of letters which, in 1881, he published under the title "Um die Erde. Reiseberichte eines Naturforschers." A second edition of this original, entertaining and instructive book appeared in 1888. In the spring of 1887 he settled at Kew in order to work out his botanical collections. At that date the "Index Kewensis" was in course of compilation, and this fact may have had some influence on the direction of his subsequent researches in botanical literature. He soon developed into an uncompromising reformer of botanical nomenclature and became so convinced of the justice of his own views that he characterised the work of others in this direction who did not agree with him in unmeasured terms. In 1890 he completed his work at Kew and published the results under the title of "Revisio Genera Plantarum . . . cum Enumeratione Plantarum Exoticarum in Itinere Mundi Collectarum"—a volume of more than a thousand pages. In 1891 he went to South America

on a journey of 14 months' duration, crossing the continent twice and making botanical collections equal to those of his earlier travels. The results were published in 1891 under the same title and as Part iii. of the same work, and form a volume of nearly 800 pages, largely devoted to the discussion of questions of nomenclature. In addition to these bulky volumes Dr. Kuntze wrote numerous articles and pamphlets on his favourite subject, the last appearing only a few weeks ago. It is entitled: "Motivierte Ablehnung der angeblich vom Wiener Kongress 1905 angenommenen inkompetenten und fehlerreichen botanischen Nomenklatur-Regeln, sowie Vorschläge zur international endgueltigen Reform auf dem Bruesseler Kongress 1910." It should be added that although Dr. Kuntze's proposals are not all accepted, or acceptable, his writings teem with historical facts of the greatest interest, and well repay study.

W. B. H.

Hardy Heaths at Kew.—The soil of Kew, being of light quality and quite free from calcareous substances, proves to be admirably adapted for many members of the ericaceous family. The Rhododendron Dell, the Azalea Garden, and in a less degree the botanical collection near King William's Temple and the groups in the sunk garden west of the Palm House, have long been popular features of the garden. Several species of *Erica* itself thrive particularly well, especially those that blossom in the spring. During the past few years advantage has been taken of this fact to plant a few large groups in various parts of the garden. Two more have been added during the winter, one on a portion of the railed-in wild garden near the Berberis Dell, the other on a mound south-west of the Palm House. In the former more than a thousand plants were put out. *Erica mediterranea* enters largely into the composition of the spring-flowering groups. It is a beautiful Heath of which several varieties are in cultivation, one —*hibernica*—being found wild in the West of Ireland. Associated with it are *E. lusitanica*, *E. arborea*, *E. Veitchii* and *E. carnea*. It is believed these groups will become permanent and effective features. The plants commence to flower in February and early March, and provide ample breadths of charming colour for three months. All that is done by way of preparation is to trench the ground and add a little peat. This is also found to provide an admirable medium for growing choice, delicate-rooted plants like *Stewartia* and *Styrax*; they not only thrive in the soil, but rejoice in the root shelter the undergrowth of Heath affords.

The Lake.—The chief piece of work in the Arboretum during the past winter has been the removal of the mud from the bed of the Lake. It is nine years since this was last done thoroughly. The Lake is filled by water taken from the Thames at high tide which brings with it in suspension a large quantity of mud. In some parts of the Lake it was found that this alluvial deposit had reached a depth of 1 foot 8 inches. This shows that a layer more

than 2 inches thick is being deposited yearly in some parts. At the upper end of the Lake, however, farthest away from the intake, the nine years' accumulation of mud was not more than 6 inches in thickness. A gang of 16 to 20 men was employed on the work for about seven weeks, and it is estimated that more than 4,000 cubic yards of mud were wheeled out. The mud when dry and aerated resolves into a soil of great richness. It makes an admirable top-dressing for lawns and trees, and for enriching the borders proves to be quite as valuable as top-spit loam.

Catalpa Bungei, *C. A. Meyer*.—The catalogues of many dealers in hardy trees and shrubs offer plants of *Catalpa Bungei* at very ordinary prices. But it is safe to say that not one of these nurserymen could supply a single plant of the true *C. Bungei* of C. A. Meyer. And, although many of the continental botanic gardens offer seeds of this tree also, they are really in similar case. For many years past we have desired to acquire this tree for the Kew collection. Seeds and plants from the sources above-mentioned have been from time to time procured, but they have always proved to be either *C. Kaempferi* or a dwarf variety of *C. bignonioides*. Now that we are fortunate to have obtained the true plant through the liberality of Professor Sargent of the Arnold Arboretum, it may be well to record its first genuine introduction to Britain.

The species was first described by Meyer as long ago as 1837 in the *Bulletin of the Imperial Academy of Sciences* of St. Petersburg. It is a native of several provinces of China and has been found by several collectors in the neighbourhood of Pekin. One of them—Mr. W. Hancock, F.L.S.—found it in flower there in May, 1880, and described it as "a handsome tree 20 to 30 feet high, with numerous purple and white flowers." The species is distinct enough not to be confused with the others in cultivation. The inflorescence, which is corymbose rather than thyrsoid, carries but few flowers compared with the other cultivated species, the number on each varying from three to twelve; the corolla is $1\frac{1}{2}$ inches long and the same in width. The leaves are small in comparison with those of the American species or the *C. Kaempferi* with which it is so often confounded; the largest in the Kew Herbarium is $7\frac{1}{2}$ inches long and $4\frac{1}{2}$ inches wide, the smallest only $1\frac{1}{2}$ inches long. They are ovate-acuminate, with a truncate or cuneate base, sometimes entire, but often coarsely scalloped so as to form from one to five or six large teeth on each side towards the base.

A figure of *Catalpa Bungei* may be found in the *Nouvelles Archives du Muséum d'Histoire Naturelle*, 3rd series, t. 4, where M. Edouard Bureau gives an elaborate review of the genus. Here he observes that he only knew of one genuine example of this species in France. It was in the Arboretum of the late M. Lavallée at Segrez.

W. J. B.

Wet Blocking of Rubber.—The following note, dated Peradeniya, 18th January, 1907, has been received from Dr. J. C. Willis :—

"At the Ceylon Rubber Exhibition it was suggested by Dr. Willis that it might be advisable, instead of as at present drying the plantation rubber till it only contains about 5 per cent. of moisture, to block it in the wet freshly coagulated condition. Experiments with this object were at once carried out by Mr. Kelway Bamber, the Ceylon Government Chemist. He prepared the rubber with creosote (to prevent decay and mould), and blocked it at once, getting blocks containing about 9 per cent. of water. These sold in London for 5*s.* 6*d.* per lb., against 5*s.* 7*d.* to 5*s.* 9*d.* for the ordinary dry Ceylon rubber, thus really getting a much better price. A circular ('Circular and Agricultural Journal of the Royal Botanic Gardens,' Peradeniya, Vol. IV., No. 1) has been lately issued dealing with this matter, and it would seem likely that the old way of making dry biscuits or sheets will soon be extinct."

Distribution of Rubber Plants from Kew.—The importance of rubber as a cultivated crop in our Asiatic possessions engaged the attention of the India Office about the year 1872, and the introduction into India, through the agency of Kew, of the principal American rubber-yielding plants was shortly thereafter decided upon.

The first stock of Central American Rubber, *Castilloa elastica*, was raised from cuttings brought by Mr. R. Cross in 1875. In June 1876, 70,000 seeds of Para Rubber, *Hevea brasiliensis*, were brought to England from the Rio Tapajos by Mr. H. A. Wickham, who had been commissioned to collect them. These were followed in November by about 1,000 young plants obtained by Mr. Cross, who had been sent to South America to bring home living plants in the event of its proving impossible to transmit alive to this country the very perishable seeds which Mr. Wickham had been commissioned to procure. As a matter of fact only about $3\frac{3}{4}$ per cent. of the seeds germinated and an extremely small proportion of the plants ultimately survived. At the same time Mr. Cross brought home seeds and plants of Ceara Rubber, *Manihot Glaziovii*. At a later date *Hevea Spruceana* was obtained.

For the introduction of African Rubbers belonging to the genus *Landolphia* in 1878–9 Kew was indebted to Sir J. Kirk, then H.B.M. Consul-General at Zanzibar. More recently the introduction of *Funtumia elastica* was effected from West Africa.

The following tabular statement shows the distribution of living plants of the various rubbers mentioned. In addition to plants, seeds were obtained from time to time and distributed to places where they were considered likely to thrive.

Species.	Localities.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.
Hevea brasiliensis.	Burma	—	—	—	50	—	—	—	—	—	—	—	—
	India (Calcutta)	6	—	—	—	50	—	—	—	—	—	—	—
	Ceylon	—	—	—	2,019	100	—	—	—	—	—	—	—
	Java	—	—	—	18	4	—	—	—	—	—	—	—
	Singapore ..	—	—	—	100	22	—	—	—	—	—	—	—
	Fiji	—	—	—	—	—	2	—	—	—	—	—	—
	Mauritius ..	—	—	—	—	37	—	—	—	—	—	—	—
	West Africa ..	—	—	—	—	6	—	—	—	—	—	—	—
	West Indies ..	—	—	—	30	6	—	—	—	—	—	—	—
	Great Britain..	—	—	—	692	—	—	—	—	—	—	—	—
Hevea Spruceana.	India (Calcutta)	—	—	—	—	—	—	—	—	—	—	—	—
	Ceylon	—	—	—	—	—	—	—	—	—	—	18	—
	Java	—	—	—	—	—	—	—	—	—	—	—	—
	Singapore ..	—	—	—	—	—	—	—	—	—	—	—	—
	Fiji	—	—	—	—	—	—	—	—	—	—	—	—
	West Africa ..	—	—	—	—	—	—	—	—	—	—	—	—
	West Indies ..	—	—	—	—	—	—	—	—	—	—	—	—
Castilloa elastica.	India (Calcutta)	—	—	5	—	—	—	—	—	—	—	—	—
	Ceylon	—	—	—	34	24	—	30	—	—	—	2	—
	Java	—	—	—	6	—	—	—	—	—	—	—	—
	Singapore ..	—	—	—	—	6	—	—	—	—	—	—	—
	Fiji	—	—	—	—	—	—	—	—	—	2	—	—
	Mauritius ..	—	—	—	—	6	—	—	—	—	—	—	—
	West Africa ..	—	—	—	—	3	—	—	—	—	—	—	1
	West Indies ..	—	—	—	1	—	—	1	12	—	—	—	—
Manihot Glaziovii.	India (Calcutta)	—	—	—	—	50	122	—	—	—	—	—	—
	„ (Madras)	—	—	—	—	—	120	—	—	—	—	—	—
	Ceylon	—	—	—	—	50	—	—	—	—	—	—	—
	Java	—	—	—	—	—	2	—	—	—	—	—	—
	Singapore ..	—	—	—	—	4	—	—	—	—	—	—	—
	Fiji	—	—	—	—	—	6	—	—	—	—	—	—
	West Africa ..	—	—	—	—	4	—	—	—	—	—	—	1
	West Indies ..	—	—	—	—	—	28	3	3	—	—	—	—
Landolphia	India (Calcutta)	—	—	—	—	—	—	—	—	—	—	2	4
	Ceylon	—	—	—	—	—	—	—	—	—	—	—	—
	Java	—	—	—	—	—	—	—	1	58	8	—	—
	Singapore ..	—	—	—	—	—	—	—	—	—	—	—	—
	Fiji	—	—	—	—	—	—	—	—	4	—	—	—
	Mauritius ..	—	—	—	—	—	—	—	—	10	12	—	—
	West Indies ..	—	—	—	—	—	—	—	—	—	—	3	—
									48	36	32	25	2
Funtumia elastica.	India (Calcutta)	—	—	—	—	—	—	—	—	—	—	—	—
	Ceylon	—	—	—	—	—	—	—	—	—	—	—	—
	Java	—	—	—	—	—	—	—	—	—	—	—	—
	Singapore ..	—	—	—	—	—	—	—	—	—	—	—	—
	West Indies ..	—	—	—	—	—	—	—	—	—	—	—	—

1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	Remarks.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	106	—	—	9	6	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	To nurserymen and others.
—	—	6	—	—	—	—	6	—	—	—	—	—	—	—	
—	—	6	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	12	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	12	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	
—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	12	—	—	—	—	24	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	3	2	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	
—	—	—	—	—	—	—	36	—	—	—	75	50	6	4	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Presentations to Museums.—A section of the stem of *Ipomoea peltata*, Choisy (*Convolvulaceae*), has been forwarded to the Museum by Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore. The section is 6 inches in diameter, and will be found in Case 81; Museum No. I.

With this came also a portion of the stem of *Entada spiralis*, Ridley (*Leguminosae*), which well illustrates the characteristic spiral growth. *See* Case 43; Museum No. I.

Mr. Ridley has also presented an interesting illustration of a branching palm stem. It is of an Areca Nut Palm (*Areca Catechu*), from Pulau Kukub, Singapore. The stem has five branches, and we understand from the donor that a description of the palm has been sent for publication in the *Annals of Botany*. This latest addition to the Museum has been placed near the door in the west end of the Timber Museum.

FATTY OILS.—The Museum is indebted to Messrs. James Bibby and Sons, of Liverpool, for a valuable collection of oils and their products, including cocoa-nut, cotton, linseed, &c., which have been placed in their respective natural orders in Museums No. I. and No. II.

SWEDISH BEER FLAGONS.—Mr. R. H. Beamish, Glounthaune, Cork, has presented two beer flagons, used by the Dalecarlian peasants. They are formed of several woods, but chiefly of Norway spruce (*Picea excelsa*, Link; *Coniferae*) and beech (*Fagus sylvatica*, L.; *Cupuliferae*). These have been placed in the Annexe, Museum No. III.

Dr. Engler, Director of the Royal Botanic Gardens and Museum, Berlin, has forwarded for the Museum some illustrations from the *Botanische Jahrbücher* of several species of *Cecropia* (*Urticaceae*) as they grow in their native habitat, and showing their peculiar structure. These will be found in Case 115, Museum No. I., where are also some articles made of the wood of the Trumpet tree (*C. peltata*), of Tropical America. The hollowed trunk and branches of this species are used by the natives for musical instruments; the wood, which is exceedingly light and soft, is employed for floats for fishing. The bark yields a tough fibre, and the rough leaves are used as a substitute for sand-paper.

J. M. H.

Botanical Magazine for February.—The plants figured are: *Nerine Bowdeni*, W. Wats.; *Olearia speciosa*, Hutchinson; *Meconopis punicea*, Maxim.; *Ribes mogollonicum*, Greene; and *Saccolabium rubescens*, Rolfe, all of which are represented by examples in the living collections at Kew. The *Nerine* is allied to *N. lucida*, Herb., from which it differs in its longer pedicels, and larger flowers with broader segments. It was introduced from Cape Colony by Mrs. Cornish Bowden, of Newton Abbot, and several bulbs were presented by her to Kew. The *Olearia* is a

new species from Australia, seeds having been received from the Botanic Gardens, Melbourne, in 1888. It is an ornamental species resembling *O. dentata*, Moench, differing in having oblong-elliptic leaves, fewer ray-florets, and almost glabrous achenes. At Kew it is cultivated in the Temperate House. The handsome *Meconopsis*, from Tibet and Western China, is one of the recent introductions of Messrs. J. Veitch & Sons, who presented seeds to Kew. It is a stemless plant, and the large crimson pendulous flowers are borne on slender scapes 16–20 in. long. It is the only species at present known in which the flowers remain pendulous after expansion, and, like *M. integrifolia*, Maxim., and *M. Oliveriana*, Franch. and Prain, it has a sessile stigma. *Ribes mogollonicum*, Greene, a native of the South-Western United States, is noteworthy in having erect dense racemes of greenish flowers, followed by bluish purple berries. The material figured was obtained from a plant raised from seed received from Mr. H. Henkel, of Darmstadt, in 1900. The *Saccolabium* has been introduced from Annam by Messrs. F. Sander & Sons, and was described last year in the *Kew Bulletin*. It differs from *S. ampullaceum*, Lindl., in having a taller stem, broader subrecurved leaves, a pedunculate raceme, and much smaller sepals and petals. The Kew plant, which was received from Messrs. Sander, flowered in March, 1905.

Rubber in the East.—In the brief account of the Rubber Exhibition held in Ceylon in September, 1906, contributed by Dr. J. C. Willis to the present volume of the *Bulletin* (No. 1, p. 34), reference is made to the projected publication of a Hand-book as an official record of the exhibition. A copy of this work* has now been presented to the Library of the Royal Gardens, Kew, and the study of its contents shows that it is a valuable and reliable addition to the general literature of rubber, alike from the standpoint of the planter and of the dealer. The following extract from the preface indicates the purpose of the work :—"The dura-
"tion of the exhibition allowed of its being a Rubber Congress,
"lectures being given upon the various branches of the subject,
"from cultivation to vulcanisation. These lectures, with the dis-
"cussions following them, proved to be one of the most valuable
"and most appreciated features of the exhibition. In the follow-
"ing pages these lectures and discussions are given in a fully
"revised form. All lectures have been fully revised by lecturers,
"and have then been arranged in a logical order with the hope of
"making this account a standard treatise upon the rubber industry
"as it at present exists. In the same way, the lists of entries, the
"prize winners, the reports of the judges, reports of the visitors,
"and other matter have been incorporated, each in its proper
"sequence, so that almost the whole subject is covered."

---

* Peradeniya Manuals, I. Rubber in the East; being the official account of the Ceylon Rubber Exhibition, held in the Royal Botanic Gardens, Peradeniya, in September, 1906. Edited by J. C. Willis, M. Kelway Bamber, and E. B. Denham. 8 vo. 269 pp., with illustrations, maps, and plans. Colombo. 1906.

The opening chapters relate the inception of the exhibition, and describe the buildings. In Chapters III. to X., the lectures and demonstrations and discussions are reproduced. This part of the work, pages 18–224, deals with every aspect of the rubber industry; a concluding chapter on "The work of the Ceylon Agricultural Society in connection with the Rubber Exhibition" supplies information regarding miscellaneous exhibits.

The illustrations are instructive and well reproduced; the book is clearly printed, and is provided with a satisfactory index. It is a work that should be studied by every one who is in any way interested in rubber.

J. M. H.

Fungi as Decorative Plants.—Certain kinds of fungi are sometimes used for decorative purposes, and taking into consideration the quaint forms and brilliant tints met with in many of the members of this group, it is somewhat surprising that they are not more utilised in this direction. Leaving out of consideration the numerous ephemeral kinds, commonly known as Toadstools, there are many forms that are fairly persistent, lasting for three or four weeks in an unchanged condition. Among such may be mentioned the "Candle-snuff fungus"—*Xylaria hypoxylon*—with its jet-black velvety stem and snow-white tip. The "Crimson cup"—*Dasyscypha coccinea*—resembles in form a champagne glass with a short stem. The cup varies in size from one to two inches in diameter, clear crimson inside, outside white and minutely downy. It grows on dead fallen branches during late winter and early spring, and is very abundant in some districts. Pieces of rotten wood bearing specimens of this fungus, accompanied by the bright green moss amongst which it grows, are often offered for sale in Scarborough, and it is difficult to conceive anything more beautiful than a group of this fungus in a setting of green moss arranged in a suitable shallow vessel or on the soil in a Wardian case. If the moss is kept just damp the fungi last from three to four weeks. Miss Harvey Hart of Kew has succeeded in growing this beautiful fungus from year to year by keeping the branches on which the fungus grows partly buried in moss and constantly damp. The spawn or mycelium of various other kinds of decorative fungi is also perennial in rotten wood, and might be cultivated in a similar manner, and would add much to the beauty and interest of a fern-case.

The numerous kinds of more or less woody fungi, resembling in shape a horse's hoof or an inverted bracket, that grow on the trunks of trees, make very ornamental brackets for a conservatory, and are also very durable.

G. M

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1907.

XXIII.—GUTTA PERCHA TREES OF THE MALAY PENINSULA.

J. S. GAMBLE.

The recent publication by the Asiatic Society of Bengal of Part 17 of the "Materials for a Flora of the Malay Peninsula," by Sir George King and the writer, makes it possible to attempt to identify the chief trees, mostly belonging to the natural order *Sapotaceae*, which yield the very valuable "gutta percha." It appears that, so far as is at present known, the *Sapotaceae* of the Malay Peninsula belong to eight genera and include 50 species, mostly large trees, valuable not only for gutta percha but as yielding strong and durable timbers, mostly of a reddish colour, hard, and suitable for building purposes and engineering work. The species are here enumerated, with such information about them as has been obtained :—

1. CHRYSOPHYLLUM, one species, *C. Roxburghii*, G. Don. The Star-apple; a moderate-sized tree with edible fruit and useful wood.

2. SARCOSPERMA, one species, *S. paniculatum*, Stapf & King. A moderate-sized tree chiefly found among large bamboos, on river banks, or in mixed forest; not known to be a producer of gutta percha.

3. SIDEROXYLON, five species, with a sixth (*S. Wallichianum*, G. Don) of doubtful identification. The most important species is *S. malaccense*, Clarke, which, according to Mr. Cantley, gives the valuable 'Daru' or 'Dedâru' wood. This statement is, however, objected to by Mr. H. N. Ridley, who says, in the *Agricultural Bulletin of the Straits and Federated Malay States* for March, 1906, that the 'Daru' trees he had been shown in Sumatra certainly did not belong to this species. He thinks that probably 'Daru' wood is yielded by more than one species, most of it coming from Sumatra. The question ought to be gone into

1375 Wt 4/07 D & S 29 27805

and definitely settled, and it may be hoped that Mr. Ridley may find time to do it. Of the other species, the most common is evidently *S. ferrugineum*, Hook. & Arn., a small tree which extends also to Burma, the Andaman and Nicobar Islands, the Archipelago, and even to the Philippines and China. *S. firmum*, Pierre, has only been once collected in the Peninsula, but extends to Bangka and the Philippines. The other two species are Peninsular only, *S. Maingayi*, Clarke, and *S. Derryanum*, King & Gamble, the last-named found so far only in Perak. None of the species of this genus are recorded as yielding gutta percha.

4. ISONANDRA, two species, both small trees from Perak, and both apparently rare and new to science, *I. perakensis*, King & Gamble, from elevations of 1,000 to 1,500 ft., and *I. rufa*, King & Gamble, from rather lower down.

5. PAYENA, nine species, some of which are important as giving gutta percha of minor quality. *P. Maingayi*, Clarke, is a large tree with leaves which resemble those of *Palaquium Gutta* in having the lower surface covered with golden-brown pubescence. On this Ridley says : "A quite worthless but beautiful tree which is very often mistaken at first sight for gutta percha. Its conspicuous golden leaves, usually much longer than those of *Palaquium Gutta*, at first glance suggest those of that plant. Its gutta, too, when fresh drawn and set, has the same red speckled appearance as first-class gutta, but never hardens, remaining a putty-like mass which usually at least becomes quite black after a short time. It is very common in Malacca and open country generally in the Peninsula. It is known as 'Malaim Pata,' and is said to give a good durable timber, heavy, and dark brown, used in house-building. It attains the height of about 70 feet. It is one of the numerous plants known as 'Niato,' a name applied to a large number of gutta-producing plants, and, according to Mr. Curtis (late Superintendent of the Penang Botanic Gardens), the Malays call it 'Taban Percha,' the real gutta percha being always known as 'Getah Taban,' and not as '-percha.' The seeds are imported from Sumatra for oil." An allied species, but with glabrous leaves, so far known only from Perak and Borneo, is *P. longipedicellata*, Brace. Both these have rather large flowers.

There are four species with small or medium-sized flowers. Of these the most important is *P. Leerii*, Benth. & Hook. f., which, according to Ridley, is the white gutta percha, 'Getah sundek,' occurring all over the Peninsula as well as in Sumatra, Bangka, Borneo, and Amboina. He says that at one time a good deal of the 'Getah Sundek' was collected in the Dindings, the produce of *P. Leerii*. A full account of the information then available regarding this kind of gutta percha is given in the "Report on the progress and condition of the Royal Gardens at Kew for 1881," p. 40. The first specimens which admitted of identification were sent by M. Bran de St. Pol Lias and Mr. (afterwards Sir Hugh) Low, British Resident in Perak, to Dr. Beauvisage, who identified them with *Kerataphorus Leerii*, Hassk., which species was merged in *Payena* in the "Genera Plantarum." Specimens sent at the same time to Dr. H. Trimen, Director of the Royal Botanic Garden, Peradeniya, were identified by him (Report for 1880) as belonging

to *Payena*. Previous to this, in 1878, Dr. Dennys, Assistant Curator of the Raffles Museum, Singapore, had reported that 'Gutta Sundek' was a somewhat inferior variety of gutta percha to that yielded by 'Gutta Taban' (*Palaquium Gutta*). The information of 1881 was supplemented in 1884 by the following extract from notes by Mr. Wray, published in the "Tropical Agriculturist" for October, 1884, p. 289 :—

"This species grows in swampy places near the coast, and I found one tree with its root in a small creek, the water of which was quite salt, and only a short distance from the regular mangrove trees fringing the stream. The leaves are small, shiny, and have a reddish tint when young. The bark is about three-eighths of an inch thick and dark brown in colour, moderately rough.

"The flowers are white, and the fruit is sweet and eaten by the Malays. Its gutta is like 'Taban Sutra' in appearance, and is collected by scoring the bark, catching the sap and boiling it until it coagulates. A tree measuring 2 feet and 8 inches in circumference at 3 feet from the ground, and 38½ feet to the first branch, that I had felled gave 6½ oz. of gutta."

In the Malay Archipelago *Payena Leerii* appears to be a much more important source of gutta percha than had been suspected. From the important "Observations on Gutta Percha" by Dr. Burck, translated in the "Tropical Agriculturist," it appears to be not uncommon in Southern Sumatra.

In the Palembang district it is known as 'Balam Tandock,' 'Balam Tjabe,' 'Balam Sonte,' 'Balam Troeng.' According to Dr. Burck, M. Van Leer, Health Officer of the 1st Class, from whom Messrs. Teysmann and Binnendyk obtained their specimens, remarks that the 'Pohon Balam' is a tree frequent on high lands, attaining to a great age and exceptionally large girth. Bees form nests on it, and on this account the tree is planted and cultivated more for its wax than for gutta percha. The natives only fell them for the gutta percha when they think them too old to be useful for wax production. The method of collecting the gutta consists "in cutting the tree down, cutting off the crown and making a number of incisions in the trunk and principal branches."

In the district of Soepajang the gutta is called 'Balam Pipis.' Dr. Burck states that the tree grows above elevations of 2,000 ft. in humus soil in thick woods and needs shadow and moist ground. The fruits are pear-shaped, green and hard.

In Bangka the tree, according to Dr. Burck, is known as the 'Koelan.' "The tree produces a large amount of gutta, the fruit is eaten, and the gutta is used for making the handles of billhooks and for buckets, whilst the wood serves for household furniture and oars of prahus."

In West Borneo Dr. Burck identifies with this species the gutta-producing tree known as 'Niato.'

M. de Beauvisage, in his "Contribution à l'étude des origines botaniques de la Gutta-Percha," Paris, 1881, mentions that the tree is called 'Balam Soentei' in the Rhio Archipelago.

Allied to *P. Leerii* is a species, perhaps more common in the Peninsula, extending northwards to Kedah and across to Borneo, *P. Havilandi*, King & Gamble. According to Ridley, it is known as 'S'marum,' and has a gutta percha as good as that of *P. Leerii*.

The most common species of *Payena* in the Malay Peninsula is, however, *P. lucida*, A. DC., of which Ridley says: "A common tree of no great size known as 'Niato,' 'Niato Putih,' 'Niato Balam,' 'Tanjong Hutan' (from a resemblance to *Mimusops Elengi*), but giving no gutta. The timber is poor and not large." Near it, distinguished by ferruginous-pubescent instead of glabrous leaves, is *P. dasyphylla*, Pierre, a large tree, reaching 80 to 100 feet in height and a considerable girth. It has been found on the hills of Larút in Perak and extends to Sumatra and Java, and, according to de Vriese, gives a gutta percha only used for adulteration, though Motley seems to consider this unlikely as so little is produced that it would not be worth using.

There are three other species of *Payena*, so far only imperfectly known and hitherto undescribed: *P. sessilis*, King & Gamble, collected by Ridley in Singapore; *P. obtusifolia*, King & Gamble, collected by Father Scortechini in Perak; and *P. selangorica*, King & Gamble, collected by Ridley in the Bukit Kutu woods of Selangor. None of these have, so far, been reported as giving gutta percha.

6. BASSIA contains, so far as at present known, 17 species, of which no less than 13 have now been described for the first time. *B. aristulata*, King & Gamble, is a tree found by Father Scortechini in Perak and said by him to give a gutta percha. *B. malaccensis*, King & Gamble (*Payena malaccensis*, Clarke), is a tree of Perak, Malacca, and Singapore, apparently quite common and reported by Wray to give a sticky gutta in small quantities. *B. Curtisii*, King & Gamble, a tree of Penang and Perak, is the 'Getah Ganau' of which Wray reports: "It grows on the hills up to an elevation of 2,600 feet. The bark is light grey and the wood seems to be of good quality. The gutta is white and hard and is used only for mixing with better kinds." *B. Motleyana*, Clarke, is an erect lofty tree of swampy places, first described as *Isonandra Motleyana* by de Vriese from specimens collected in Borneo, where it is called 'Kotian.' He says that it produces plenty of gutta, but of bad quality, resinous, and brittle. He says also that the seeds give a clear, yellow viscous oil with the taste of bitter almonds, and that this oil is used in sweetmeats and is much esteemed in Bandjermassin. The remainder of the Malay Peninsula species of *Bassia* are not reported to give gutta percha. The species are: *B. Kingiana*, Brace, a good-sized tree of Perak and Singapore; *B. Kunstleri*, Brace, a tree of the hills of Perak; *B. penicillata*, King & Gamble, a large tree of Province Wellesley, said by Mr. Curtis to be common and to be called 'Minjoto'; *B. lauri-folia*, King & Gamble, a good-sized tree of Perak, one variety of which extends to Kedah; *B. rupicola*, King & Gamble, *B. perak-ensis*, King & Gamble, and *B. cuprea*, King & Gamble, trees of Perak; *B. argentea*, Clarke, a large tree of Malacca; *B. Braceana*, King & Gamble, a spreading tree apparently very common in Penang and Perak, and *B. longistyla*, King & Gamble, of Perak and Singapore, a tree closely allied to it; *B. cuneata*, Blume, a tree of

Malacca and Singapore ; *B. penangiana*, King & Gamble, and *B. erythrophylla*, King & Gamble, trees of Penang only collected by Mr. Curtis and apparently scarce.

7. PALAQUIUM, 12 species, among which is the most important of the gutta percha yielders, *P. Gutta*, Burck. It is a large evergreen tree with obovate coriaceous leaves densely covered beneath with golden pubescence. It was first described by Sir W. Hooker in 1847 as *Isonandra Gutta*. In the Kew Gardens Report for 1881 is given a long extract from the report of Dr. Dennys, Curator of the Raffles Museum in Singapore, in 1878, who said that the trees are chiefly found on the slopes of low hills in dense forest, and that in order to procure the juice the "tree is felled and the bark ringed in spaces a foot wide and about 15 to 18 inches apart. The upper end of the tree is usually cut off, as this is said to cause it to bleed more freely. Buckets made of wood, cocoa-nut shells or leaves stitched together are used to collect the juice, which is then poured into a hollow bamboo." The juice is then heated until it solidifies and can be moulded into a convenient shape for transport.

The tree is known as 'Gutta Taban' or 'Taban Merah,' 'merah' meaning *red*. Dr. Dennys says that the term is applied on account of the colour of the flower, but there seems some reason to think that it is from the colour of the gutta percha. Various other names are given by different writers and collectors, but it seems so doubtful that they have properly identified the tree that it is well to leave them for further local investigation.

The following extract is from Mr. Wray's notes and describes his experience of the tree in Perak :—

"This tree, from which the best kind of Gutta Percha is obtained, grows, or rather used to grow, throughout the jungles of the plains of Perak and a short way up the sides of the hills.

"It seems to like a considerable amount of moisture, and will even grow with its roots in a running stream. It is a tree of large size, attaining a diameter of 4 to 5 feet, and a height of between 100 and 200 feet.

"It has large thin buttresses around its base, which often present, on their upper portions, a convex profile, and, on a large tree, attain a height of 6 to 8 feet, and a span at the base of 4 to 5 feet from the trunk. As far as I have yet seen, they never form an arch, but have their lower parts buried in the earth, from the trunk to their extremities.

"When growing in the forest the tree has a clean, straight appearance, the former being due apparently to the bark peeling off in irregular pieces. The bark is of a rich brown-red colour, and from one third to half-an-inch in thickness.

"Inside the epidermis it is of an Indian-red tint ; and when cut, the milk white sap comes out, at first in small beads, which, enlarging, soon join and cover the injured part with a coating of a cream-like consistency. The leaves are lanceolate on a young tree, and roundish oval, with abruptly acuminate points on a tree of mature growth. The margin is entire, and they are covered on their undersurface with minute silky warm-brown hairs. The

leaf stalks and young wood are also covered in a similar manner, which gives the whole tree, when looked at from below, a brownish tint, by which it may generally be recognised. The upper surface of the leaf is dark green, and the veins are not prominent. The calyx consists of six sepals, three of which are superior to the others and alternate with them. They are coated, like the backs of the leaves, with silky brown hairs. The corolla is white, and is divided into six petals. The style, which is simple, is sometimes persistent, and may be seen on the ripe fruit. There are six ovules, but one or two seeds only arrive at maturity.

"On the apex of the young fruit the six carpels of which it is formed can be distinctly traced. The fruit is coated like the backs of the leaves, with brown down ; its flesh is soft, and it is sweet, but it has a disagreeable flavour of gutta percha.

"The seeds are very oily, and they are, together with some of the seeds of nearly allied species, collected by the Malays and the Sekais, who dry them in the sun for some days, and then express the oil by putting them between two flat pieces of wood, and applying pressure by clamps and wedges.

"The oil, which is solid at the ordinary temperature (that is up to 90°), is highly esteemed for cooking purposes. Birds, squirrels, monkeys, &c., are very fond of the fruit and of the seeds, which adds to the difficulty of obtaining them.

"It flowers in the month of March and ripens its fruit in June, but the Malays assert that it only fruits once in three or four years.

"The gutta of this variety is red, and the colour is not due to an admixture of bark as is frequently stated. It is probable that other varieties of gutta may be sometimes mixed with bark to make them look like 'Taban Merah' and so command a higher price than they otherwise would; but the true 'Getah Taban Merah,' is red *per se*, and the water in which it is cleaned, although changed many times, still becomes deeply dyed with that colour. Specimens of this, in fruit, together with wood, bark and gutta, I sent to the Royal Gardens at Kew, Calcutta and Ceylon, on May 30th, 1883."

There is a form of *Palaquium Gutta* known as var. *oblongifolium* which was considered by Dr. Burck to be a distinct species, but which the authors of the "Malay Materials" as well as Mr. Ridley and others agree in making a variety only. It is a very large tree, reaching 80 feet in height and two feet in diameter, and it has larger leaves and rather larger flowers than the type, like which it is an important yielder of gutta percha. Wray gives its name as "Getah Taban Sutra," and says that it prefers the banks of streams at an elevation of about 500 to 600 feet. He says that the gutta percha is of a pale reddish brown and is collected in the same way as that of "Taban Merah."

Allied to *Palaquium Gutta* and having the leaves beneath covered with a similar golden pubescence, is *P. Oxleyanum*, Pierre (*Dichopsis pustulata*, Hemsl.), a common species found in all the provinces of the Peninsula. It is known to Malays as "Taban Sutra" or "Taban Putih" or (according to Wray) "Taban Chaia," and gives a gutta percha of rather inferior quality. Mr. Derry

reports that it is "good but does not yield so freely as, and is not so highly priced as the produce of 'Taban Merah.'" The following extract from Wray's notes as "Taban Putih" seem to refer to this species :—

"This tree cannot be told, by its outward appearance, from *Palaquium Gutta*, except that its leaves are rather larger. It has large buttresses, with convex tops, and the bark is nearly of the same shade, but rather browner. The fruit also seems to be similar, and the flowers are white ; so that it is not until the tree is felled, that any very distinctive character appears. It is then found that the sap, which is much more copious, does not coagulate quickly, and when it does, it is of a dirty white colour, and has a much higher softening point than any of the higher kinds, even boiling water not being sufficiently hot to thoroughly soften it. This tree grows on the hills up to an elevation of 2,500 feet above sea-level.

"I have never seen it growing on the plains, nor in fact lower down than 1,800 feet. It ripens its fruit in the month of February.

"The gutta is collected by felling the tree, ringing the bark, and placing leaves, bamboos, &c., under it to catch the sap ; which is afterwards boiled, and the natives often add salt to hasten its coagulation.

"It is frequently adulterated with the gutta from 'Kayu Gelutong' (*Dyera costulata*, Hook. f.), and from two or three of the species of *Bassia*.

"The usual method of mixing them is to do so before the sap has coagulated, as afterwards, owing to the high melting point of 'Taban Putih,' they cannot be so easily and intimately combined. A tree of ten inches of diameter at four to five feet from the ground, gave 2 lbs. 11 ozs. of fairly clean gutta percha.

"There is a variety which differs from the above in having smaller leaves, and in the shape of the fruit, which is longer in proportion to its breadth. I have found it growing on the hills at 2,300 feet elevation, and it ripens its fruit in the month of February."

The variety referred to is that mentioned in the "Malay Materials" as *P. Oxleyanum* var. *glabrata*, King and Gamble.

P. obovatum, (Griff.) King and Gamble, is a large tree, common throughout the Peninsula and extending northwards to Tenasserim and westwards to Sumatra. It gives, according to Curtis, "only a low class bastard gutta percha of little value ;" but Mr. Kurz reported it as yielding a fair sort of gutta percha, and Ridley also gives it a better character saying that it yields "a fairly good second class white gutta." He gives it the name "Taban Putih," which is also one of the names given to *P. Oxleyanum*, and says, after Curtis, that it is also called "Niato Bunga," "Niato Tembaga," and "Niato Balam," both the words "Niato" and "Balam" being Sumatran equivalent for the Peninsular "Taban." Ridley considers the *Dichopsis Krantziana*, Pierre, to be closely allied to this species. It is a tree of the forests of Cambodia and Cochin China, and its gutta is said by Mr. Ridley to be exported from French Indo-China in the form of twists, but to be only of low value.

P. Maingayi, (Clarke) King and Gamble, is a tree somewhat like *P. obovata*, but has the leaves golden-pubescent instead of grey beneath. It is found in Perak and Malacca, and according to Wray is called "Getah Taban Simpor" also "Gelutong Batu" but has no connection with the real "Gelutong" (*Dyera costulata*, the produce of which is an india-rubber rather than a gutta percha). The following is Wray's account of this species and its gutta percha.

"This tree may be readily distinguished from the foregoing by its large dark green leaves, and by its prominent veins at the back, which are covered by coarse, silky light-brown hairs, the back of the leaf itself being only sparingly covered by them. The bark is about half-an-inch thick, rough, and of a reddish-brown colour, much covered by a greyish lichen. It has medium-sized buttresses, with a concave outline. One tree that I measured was 3 feet 3 inches in diameter, at 6 feet from the ground, and from that height the buttresses sloped out until they reached the ground, having a spread of about 3 feet from the trunk.

"The flower is white, and comes out in the beginning of April or the end of March, but its fruit I have not yet seen.

"I had one tree felled, which, at 3 feet from the ground measured 17 inches in diameter and 63 to the first branch, The weight of gutta obtained was 12 oz. The sap, by the aid of heat, and stirring, coagulated in twenty-three hours after tapping.

"This gutta is sold under the name of 'Getah Putih.' The tree grows on hills up to about the same height as 'Taban Putih.'"

P. Clarkeanum, King & Gamble, is closely allied to *P. Maingayi*, but differ in having much more hairy leaves. It is found in the hills of Perak, and (according to Ridley) Selangor. Wray says of it: "it has not enough gutta in it for it to be worth extraction," and Ridley says: "Mr. Arden, who sent specimens from Selangor, says that the Malays call it 'Getah Ketapang' (doubtless from its resemblance to the 'Ketapang' tree [*Terminalia Catappa*]), and find its latex useful for adulterating gutta percha."

P. xanthochymum, Pierre, the *Dichopsis rubens* of the Flora of British India, is a large handsome tree of Perak, Malacca and Singapore, extending to Borneo, the leaves of which turn bright red when they dry. According to de Vriese it produces a gutta percha of a yellowish colour and second quality, but Ridley says he has never heard of its being utilized in the Peninsula.

P. bancanum, Burck, is a gigantic tree reaching, according to Curtis, 100 feet in height, according to Kunstler 120 feet. It seems to be common in the Peninsula and to be found, across the Straits, in Bangka. Curtis has reported that it gives a kind of gutta percha, and on this Ridley remarks that "it certainly does contain a small quantity, but it appears to be very scanty." He says there is a splendid specimen of it in the Singapore Botanic Gardens.

The remaining five species are mostly scarce and of little importance for gutta percha. *P. Ridleyi*, King & Gamble, which Ridley says is known as "Niato Hitam" or "Maiang," is a large

tree of Singapore with a heavy timber used in house-building, flexible and durable, but difficult to saw.

P. microphyllum, King & Gamble, is a small-leaved species of Singapore, and *P. hexandrum*, (Griff.) King & Gamble, a tree of Malacca and Singapore, described in the Flora of British India as *Dichopsis hexandra*, and said to extend to Burma. *P. Herveyi*, King & Gamble, is a large tree known as "Jongek" or "Jungak." It is found in Perak and Malacca, and Wray says it gives a sticky worthless gutta. Ridley says that it has an inferior light wood and that it does not seem to be common. *P. stellatum*, King & Gamble, is a *Bassia*-like species only once collected, viz., in Perak by Scortechini, who reported it to yield good gutta but in small quantities.

8. MIMUSOPS. In this genus come the two well-known and important trees *M. Elengi*, L., and *M. Kauki*, L., neither of which is, however, known to yield gutta percha.

The result of this enumeration of the Sapotaceous trees of the Malay Peninsula seems to be that the only really important gutta percha tree is *Palaquium Gutta*, the "Taban Merah," with its variety *oblongifolium*, "Taban Sutra"; that three other species afford a second class product, viz.: *P. Oxleyanum*, usually called "Taban Putih" or "Taban Chaia," *P. obovatum*, also called "Taban Putih," and *Payena Leerii* "Sundek"; that a few others give small quantities of poor quality and little value, and that the rest yield none at all. It would seem, therefore, advisable that so far as possible artificial cultivation should be restricted to the four species mentioned, and this is practically what is being done. A brief account of what is being done in the forests of the Peninsula to increase the out-turn of gutta percha, and to utilize in the best way possible the produce of the natural forests, may here be of interest.

In 1900, Mr. H. C. Hill, who had been acting as Inspector-General of Forests in India but was then on furlough, was asked by the Colonial Office to visit the Straits Settlements and the Federated States and advise on forest questions. His concise but very interesting and valuable Reports were printed by the Straits Government. His recommendations, as regards the Straits Settlements, were :—

"(1) The reservation of all areas where the trees (there are several species of *Palaquium* yielding good gutta percha) are found growing naturally, or can be planted with good prospect of success.

"(2) The discontinuance of the experimental planting of all sorts of indigenous and exotic trees, and the concentration of efforts on the formation of one or two large plantations of the most valuable indigenous tree, the Gutta Percha." He further recommends the appointment of an experienced Indian Forest Officer, preferably from Burma, to supervise forest work.

As regards the Federated States his proposals were :—

(1) To declare all "Taban" (*Palaquium*) trees to be "reserved," and to prohibit their being felled.

(2) The reservation of the gutta percha-providing forests and their working by means of a simple working plan. The following extracts give the details of his proposals.

"The systematic working of these forests should be arranged for by means of a plan by which the same area would come under operation after an interval of not less than five years and not more than 10 years. The forest should be divided into a number of blocks (from 5 to 10), and these should be gone over annually one by one. The operation would consist in giving more space and light to each *Palaquium* species tree, and in uncovering the crowns of the trees by either felling or girdling all trees overtopping them, interfering with their side development or tending to suppress them. At the same time, care must be taken not to too suddenly isolate trees that have till then been growing under dense shelter.

"All trees over a certain size, say, 1 foot 6 inches in girth, should be enumerated, when found, and be marked with a ring of white paint, and all suppressed seedlings and saplings, which are not required to form the crop in that particular place, should be dug up for transplantation elsewhere.

"The extraction of the gutta percha, both from the trees and the leaves and twigs, is an important matter.

"It has been the custom of the hill tribes to cut down the tree, and that has led to the disappearance of most if not all of the mature trees. It is rare to find a tree over 1 foot 6 inches in girth. From small incisions made in the bark, I see no reason why trees should not yield up their gutta percha, just as other trees yield their rubber; but should this process fail, it will be necessary to cut down the trees at a suitable age for the production of coppice shoots. In the meantime, experiments should be made in extracting the gutta at different seasons from the living trees, so that by the time the selected and tended areas are fit to yield gutta percha it will be known whether they have to be coppiced or not.

"Processes have been patented for extracting gutta percha from the leaves and twigs, but it is doubtful whether they can be worked profitably at any distance from the forest producing the leaves. The eventual method of treating these forests must remain for future determination.

"The working plan should also prescribe the planting up of all blank areas, in which no *Palaquium* species are growing naturally, the forest being gone over block by block as plants are available and the forest rendered complete. Blanks of less than a square chain (66′ × 66′) need not be considered. This work, owing to the uncertainty of procuring plants, can only follow the improvement fellings and must be independent of them.

"The making of suitable paths and lines of export, in so far as the block divisional lines are insufficient, should also be prescribed in the working plans."

It is interesting to note that he estimates the gutta percha of *Palaquium Gutta* as worth $500 a pikul (133$\frac{1}{3}$ lbs.), *i.e.*, 3$\frac{3}{4}$ dollars a pound, while that of *P. Oxleyanum* and *Payena Leerii* is only worth $150 a pikul, *i.e.*, 1$\frac{1}{8}$ dollars a pound.

The officer appointed as Conservator of Forests was Mr. A. M. Burn-Murdoch, and his important paper in Vol. xxxi., p. 309 of the "Indian Forester" 1905, "Some facts about gutta percha" gives a full and valuable account of what has been done to follow out Mr. Hill's recommendations. It is impossible to do better than to quote the following extracts from Mr. Burn-Murdoch's paper.

"*Palaquium Gutta* is found in all four States, the best areas lying between two degrees and five degrees north. It must be considered as a dominant species, but exists at present, owing to the unregulated and wholesale fellings by natives some years ago, only in the seedling and small pole stage.

"It occurs most frequently on the low hills and plains, often on steep hill sides, and up to 2,000 feet above sea-level, and even 3,000. It is found well represented in large blocks of forest, varying in size from a few hundred acres to 10,000 or 15,000 acres in extent, while it may be practically absent in other areas for long distances. On close examination a great many of the young plants are found to be stool shoots, but there are many seedlings also, although seed trees are not now to be found. This looks as if the felling of mature trees did not cease until comparatively recently. The 'Taban' tree is a shade bearer of the most pronounced description, and is able to maintain the struggle for existence successfully, if slowly, in these dense evergreen forests. It grows to a considerable size; the largest I have actual knowledge of in this country was in Penang, and measured when blown down 52 feet in height and 42 inches in circumference at 14 feet from the ground. I have seen mention of a tree 140 feet high in the Philippines, and there is no doubt that it is an exceedingly slow grower. At present poles 30 to 40 feet high are fairly common in these States, but large trees are rarities."

"The qualities of gutta percha became known about 1845, and the demand steadily increased from that time, till in the seventies there was a rush for it by the natives of these States, the price rising rapidly till 1902. Between 1895 and 1900 the exports from Singapore rose from 2,642 tons to 5,831 tons. It may safely be said that from 1890 onwards the natives of these States were doing their best to obtain gutta percha. Their method of extraction consisted in felling every tree they came across and extracting the latex in a wasteful, rough and ready manner, so that by the time the authorities awoke to the fact that *Palaquium* was being exterminated (about 1898), it was too late to save trees large enough to produce gutta percha. It is difficult to see how this could have been prevented, however, as at the time there was no properly organised Forest Department, and whatever measures might have been adopted it would have been impossible to effectively carry out in these dense, unpopulated, evergreen forests.

"In Perak the export of gutta percha was prohibited in 1881, but allowed again in 1887, the issue of passes to collect being prohibited in 1900. The first timber rules, published in 1898 by the British Residents of the various States, contained the initial protective measures, which were to the effect that no rubber-bearing tree should be felled if of less than eight inches diameter.

This rule could not, I imagine, be enforced in practice, owing to the want of an organised staff. In 1899 and 1900 the matter was taken up by the High Commissioner and the Resident-General, and in the latter year the British Resident, Pahang, issued orders to all his officers to do all that lay in their power to prevent the destruction of gutta percha producing trees.

"The question of planting was also discussed, but not in a very practical manner.

"The Forest Department was started in each State by the appointment of a local man, in Perak in 1895, in Selangor in 1898, in Negri Sembilan, in 1899, and in Pahang not till 1902, when a member of the Indian Provincial Forest Service was sent over on deputation at my request, I having been deputed from India in October 1901, as Conservator of Forests.

"Early in 1902 I suggested that an export duty of 80 per cent. *ad valorem* be imposed on all gutta percha leaving these States, as a means of putting a stop to the extraction and collection of this product, a considerable period of absolute rest being obviously indicated for all gutta percha producing trees.

"The rules were also amended and the felling of trees for the extraction of the latex was prohibited. In addition to these precautions departmental instructions were issued to the effect that no licences for the extraction of gutta percha were to be issued. At the present time therefore it must be difficult to collect gutta percha and export it in sufficient quantities to make it pay. That a certain amount of smuggling goes on I have no doubt, from the fact that two or three cases have come to light in which Chinamen were found in possession of small quantities and were convicted of the offence. Since 1902 the staff of the Forest Department has been greatly increased, and I have reason to believe that the Government have done and are now doing all that is in their power to assist in the preservation of this valuable product.

"As regards measures for protection from other causes of destruction, such as alienation of land for mining and agriculture, the only plan is to reserve all the valuable *Palaquium* areas, constituting them forest reserves wherever possible, without interfering with valuable tin-bearing land. We already have an area of about 60,000 acres reserved, fairly rich in young *Palaquium*, chiefly in Perak and Selangor, and probably as much more remains to be taken up in Pahang and elsewhere.

"Again, before any large area of land is alienated the department is referred to, and if alienation takes place in spite of the presence of *Palaquium*, we are given the opportunity of taking away the young plants and transplanting them into reserved areas, In the course of time, when all forest reservation has reached its natural limit, *Palaquium* is bound to disappear from all tracts outside, nor does this matter, as it is only practically possible to watch defined areas when placed completely under the control of the Forest Department.

"The systematic exploitation of the gutta percha areas will only be possible in reserved forests, tracts being taken in hand annually.

"The natural regeneration of *Palaquium*, as already stated, is very good, but growth is slow and assistance must be given. Our object now is to encourage only the best species, *P. oblongifolium* and *P. Gutta*. Regular plantations, *i.e.*, planting in cleared areas from seed, is at present impossible in these States, as no seed is available. The method followed by the Forest Department here is to cut lines through the dense undergrowth in the forest reserves, taking up regular areas in turn, and to transplant into these lines young *Palaquium* seedlings taken from outside the reserve in forests that cannot for various causes be protected, or taken from groups inside the reserve where they are growing too close together. At the present time we have an area of more than 1,000 acres so planted in Selangor.

"In the Trollah reserve in Perak *Palaquium* seedlings are so numerous in the seedling and pole stage that planting over a considerable area is unnecessary. Here we resort only to improvement fellings, transplanting young plants into blanks only wherever necessary. The improvement fellings consist in clearing away undergrowth interfering with young *Palaquium* plants, the operation being repeated yearly or once in several years, as may be necessary. By this means the rate of growth of the young tree is greatly increased. I have found the effect of this process to be very beneficial even in the two years since it was started. By such simple methods as these it is hoped in a few years to have a very considerable area of young *Palaquium* trees about 40 to the acre. One advantage in this system is the freedom from the attacks of insects to which trees grown in pure plantations are liable. A similar area to that in Selangor exists in Malacca, but the plants are put in closer together and were obtained from Sumatra. Similar plantations exist at Bukit timah in Singapore, and at Batu ferringi in Penang, but on a small scale."

Thus it will be seen that the Government of the Straits Settlements and Federated Malay States has taken strong measures to prevent the destruction of the gutta percha forests and to provide for a permanent supply when the reserves and plantations after some years can begin once more to produce a regular yield.

XXIV.—FUNGI EXOTICI: VI.

G MASSEE.

Of the ten new fungi here described from material in the Herbarium at Kew, five are Indian species collected by Mr. I. H. Burkill, Reporter on Economic Products to the Government of India; two, from Christmas Island and from Borneo respectively, collected by Mr. H. N. Ridley, Director, Botanic Gardens, Singapore; one from British Guiana, collected by Mr. A. W. Bartlett, Superintendent, Botanic Gardens, Georgetown; one from West Africa, collected by Mr. W. H. Johnson, formerly Director of Agriculture, Gold Coast; and one from New South Wales, collected by Mr. Cheel.

Agaricaceae.

Collybia lutea, *Massee.*

Pileus carnosulus, e convexo explanatus, glaber, laevis, luteus, 0·5–1 cm. latus. *Lamellae* subdistantes, angustae, postice rotundatae adnexae vel fere liberae, albidae. *Sporae* ellipsoideae, basi oblique apiculatae, hyalinae, 5 × 3 μ. *Stipes* aequalis, cartilagineus, pileo concolor vel pallidior, circa 2 cm. longus, 1 mm. crassus.

Bengal. Ballygunge, Calcutta ; on a wall, *Burkill*, No. 3, cum icon.

Distinguished amongst known species of *Collybia* by its minute size, yellow colour and almost free gills, not closely approximating to any described species.

Omphalia fuliginosa, *Massee.*

Pileus submembranaceus, convexo-umbilicatus, hygrophanus, glaber, margine crenulatus, fuliginosus, 5–7 mm. latus. *Lamellae* distantes, longe decurrentes, fuliginosae aetate albo-pulverulentae, acie integra. *Stipes* subcartilagineus, glaber, politus, pileo concolor dein expallens, sursum incrassatus, basi subattenuatus alboque tomentosus, 1–1·5 cm. longus, 0·1 mm. crassus. *Sporae* hyalinae, ellipsoideae, 3·5 × 2 μ.

Bengal. Calcutta ; growing on a wall, *Burkill*, No. 1, cum icon.

The fungus is of a uniform smoky colour, the gills becoming somewhat lighter in colour when mature, owing to the dusting of white spores. Superficially resembling *Omphalia umbellifera*, Fr., more especially the dull green form of that species, differing, however, in its smaller size, the absence of striae on the margin of the pileus, and its smaller spores.

Omphalia Oedipus, *Massee.*

Pileus submembranaceus, e convexo expanso-depressus, siccus, laevis, candidus, 1–1·5 cm. latus. *Lamellae* angustae, confertae, longe decurrentes, pileo concolores. *Sporae* hyalinae obovato-elongatae, 5–6 × 3–3·5 μ. *Stipes* cartilagineus, glaber, fistulosus, deorsum forte incrassatus, albidus, 3–4 cm. longus, apice 1·5–2 mm. basi 6–8 mm. crassus.

Bengal. Calcutta ; on the ground at the base of a wall in one of the streets, *Burkill*, No. 4.

Entirely white ; allied to *Omphalia micromeles*, Berk. & Broome. The essential features of the present species are the white colour of every part ; narrow crowded gills, and the very much swollen basal portion of the stem.

Pleurotus Cheelii, *Massee.*

Pileus membranaceus, dimidiatus, conchiformis, margine interdum fisso, fimbriatus, mox eximie longitudinaliter fibrillosus, postice glaber, stramineus, marginem versus albidus, 2–3 mm. longus, 3–4 mm. latus. *Lamellae* distantes, ventricosae, adnatae, albidae, acie fimbriata. *Sporae* hyalinae, ellipsoideae, basi oblique apiculatae, 5–6 × 3 μ.

AUSTRALIA. Eden, Twofold Bay, N.S.W.; on dead branches, *Cheel*, No. 7.

A very minute species growing in dense troops. When dry the pileus contracts into a ball, and resembles a minute *Peziza* or *Cyphella* in appearance. Allied to *Pleurotus canus*, Quelet, which differs in the lobed margin, larger spores, and in growing on the ground.

Panus Bartlettii, *Massee*.

Pileus carnoso-lentus, tenuis, orbicularis seu reniformis, margine ex involuto expanso, ochraceo-fulvus, dense squamoso-fibrillosus, 3–5 cm. diam. *Lamellae* subconfertae, adnexae seu variantes emarginatae, pileo concolores, acie albida. *Stipes* lateralis, brevis, circa 1 cm. longus, concolor. *Sporae* hyalinae, ellipsoideae, $7 \times 5\ \mu$.

WEST INDIES. River Aruka, British Guiana, *Bartlett*, No. 8603.

A very fine and well marked species, interesting on account of its extending the Pleuropod section of the genus to the American tropics. Most nearly allied to *P. stypticus*, Fries.

Nolanea nana, *Massee*.

Pileus carnosulus, conico-campanulatus dein expanso-umbonatus, hygrophanus, laete roseo-carneus mox ambitu ochraceo-suffusus, siccus, 3–5 mm. latus. *Lamellae* confertae, ventricosae, postice attenuato-adnexae, e candido roseo-carneae. *Sporae* subglobosae, nodulosae, carneae, 4–6 μ diam. *Stipes* fistulosus, fibrilloso-striatus, deorsum leviter attenuatus, pileo concolor, circa 1 cm. longus, supra 2 mm. crassus.

BENGAL. Ballygunge, Calcutta; growing on walls, *Burkill*, No. 2, cum icon.

Allied to *Nolanea elaphines*, Berk. & Broome, from Ceylon, differing in its smaller size, bright colour and smaller, coarsely warted spores. An interesting addition to the Fungus Flora of India, as hitherto very few of the Rhodosporeae or pink-spored section of Agarics have been recorded from that country.

Psalliota Burkillii, *Massee*.

Pileus carnosulus, convexus dein expansus, subgibbosus, sericeo-fibrillosus, aureo-fulvellus squamis floccosis miniatis obtectus, margine primitus involutus, velo lacero appendiculis dentiformibus cinctus, 3–4 cm. latus. *Lamellae* postice liberae, confertae, e roseis nigrescentes, acie integra. *Sporae* ellipsoideae basi oblique apiculatae, brunneae, $3{\cdot}5 \times 2\ \mu$ *Stipes* solidus, 2–2·5 cm. longus, subaequalis, pileo concolor, infra annulum floccis squamosis evanescentibus tectus. *Annulus* amplus superus, infra squamulis praeditus.

BENGAL. Calcutta; on the ground under a wall in one of the streets, *Burkill*, No. 5, cum icon.

A beautiful and at the same time very marked species. Distinguished at once from every known *Psalliota* by its golden-tawny colour, squamulose ring and the very minute spores with a pronounced oblique basal apiculus.

Hydnaceae.

Hydnum lateritium, *Massee.*

Pileus carnosus, e late umbilicato infundibuliformis, subirregularis, margine saepe sinuato, squamuloso diffractus, lateritius, marginibus rufescentibus, 2–4 cm. latus. *Aculei* decurrentes, acuti, pallide rosei. *Sporae* hyalinae, subglobosae, verruculosae, 5–6 μ diam. *Stipes* solidus, subaequalis, fibrillosus, pallide roseus, 2–4 cm. longus.

Gold Coast. Aburi; growing in humus, *Johnson.*

A very distinct and beautiful fungus, growing singly or in small clusters when the pilei sometimes become concrescent. Somewhat resembling certain forms of *Hydnum ferrugineum*, Fr., in colour and habit, but distinguished by the deeply funnel-shaped pileus, thin flesh and pale-pink or rose-coloured stem.

Polyporaceae.

Daedalea papyracea, *Massee.*

Pileus orbicularis, tenuissimus, lentus, margine acuto interdum lobato, in prima evolutione fusco-aeruginosus, dein pallescens, tomentosus, concentrice zonatus, 16–18 cm. diam. *Pori* flexuosi, in sinulos subcontortos seu lamellosos, labyrinthiformes abeuntes, acie acuta. *Stipes* excentricus, brevissimus, pallidus. *Sporae* hyalinae, subglobosae, 6–7 μ diam.

Malaya. Christmas Island, *Ridley.*

Although a typical *Daedalea* in the tough consistency of the whole plant, and the very sinuous pores, the present species departs from all described forms in the very thin substance of the pileus. Seen from above the plant bears a very close resemblance to *Stereum lobatum*, Fries.

Sphaeriaceae.

Didymosphaeria tetraspora, *Massee.*

Ascomata sessilia, erumpentia, dense gregaria, convexa, glabra, circa ostiolum depressa, ostiolo subprominente, nigra, 0·5 mm. lata. *Asci* cylindracei, basi sensim attenuati, apice obtusa iodo haud tincti, 100 × 20–22 μ, tetraspori. *Sporae* fusoideae, 1–septatae, brunneae, 32–35 × 8–10 μ. *Paraphyses* filiformes, ascis longiores, aequales.

Malaya. Sarawak, Borneo; on dead twigs, *Ridley.*

The ascophores vary in form from circular to broadly elliptical, and are slightly depressed round the short ostiolum, readily distinguished by the tetrasporous asci, and the large brown fusiform spores. In *Didymosphaeria minuta*, Neissl., the asci sometimes only contain four spores; the spores, however, are elliptic-oblong, and much smaller than in the present species.

XXV.—A REVISION OF DUBOUZETIA.

T. A. Sprague.

A sketch of the history of *Dubouzetia* was given in Kew Bull., 1907, No. 1, pp. 10–11, where the genus was compared with *Tricuspidaria*, and the arguments were stated for and against its being generically distinct from the latter. The results of the comparison were somewhat negative, owing to the lack of material preventing the verification of certain alleged generic characters. The matter remaining doubtful, the genera were kept separate provisionally, and two new species of *Dubouzetia* were described in No. 2, pp. 57–58.

Through the kindness of Dr. O. Lignier, Professor at the Faculty of Sciences, and Director of the Botanical Institute at Caen, we have now been able to examine the material of *Dubouzetia* contained in Vieillard's own herbarium, with the following results :— 1, the confirmation of three generic characters, making it evident that *Dubouzetia* is distinct from *Tricuspidaria* ; 2, the reduction of *D. parviflora*, Brongn. et Gris, to *D. elegans*, Brongn. et Gris ; 3, the description of an additional new species, of which imperfect material already existed in the Kew Herbarium.

At p. 10, it was stated the "capsule of *D. elegans* . . . . . is *loculicidal*, with only a very faint indication of a septicidal split, or none at all, so that the distinction drawn between *Dubouzetia* and *Tricuspidaria*, as regards the dehiscence of the fruit, now breaks down."

It now appears, however, in the light of the fresh material, that the condition just described for *D. elegans* is merely the *first stage* of dehiscence : the loculicidal split extends only a short distance (the uppermost $\frac{1}{4}$–$\frac{1}{2}$ of the capsule) and stops ; and the capsule then undergoes almost complete *septicidal* dehiscence, the old fruit finally separating into open cocci, which fall off from a persistent central column about the same time as the expansion of the next set of flowers. By this time the pericarp has separated into a brittle exocarp, and a tough, almost woody, endocarp [*Vieillard*, 2355, in Herb. Inst. Bot. Caen]. In *D. leionema* the dehiscence of the capsule is apparently similar.

In the figure of *D. campanulata* given by Brongniart and Gris in Nouv. Arch. Mus. Hist. Nat. Paris, vol. iv. t. 13, a distinct loculicidal split is shown, which extends from the apex about a third of the way down the capsule, and their description of the dehiscence is as follows :—"Fructus . . . . . septicide dehiscens, carpellis simul apice secundum nervum medium incomplete fissis et marginibus placentiferis disjunctis, demum omnino liberis et endocarpio lignoso incurvato ab epicarpio secedente, columna centrali haud placentifera sola persistente."

The dehiscence of the capsule of *Dubouzetia*, therefore, is *mixed*, with predominance of the *septicidal* type ; that of *Tricuspidaria* on the other hand, is purely *loculicidal*.

The second generic character confirmed for *Dubouzetia* is the orientation of the carpels when all five of them are present, namely, that they are opposite the petals, as stated by Szyszylowicz ; this has now been verified for *D. acuminata* and *D. leionema*, n. sp.

The third character confirmed is the presence of a spiral strophiole at the chalazal end of the seed; this has been verified for *D. leionema*.

It may be useful to give a brief generic description of *Dubouzetia*. The one published by Szyszylowicz in Engl. Jahrb., vol. vi. (1885), p. 453, is excellent, but he unfortunately overlooked the two additional species described by Brongniart and Gris in 1863, which necessitated a widening of the generic characters, and it is stated in his description that the stamens are inserted below the ovary and disk, instead of between them. This is apparently a typographical error, *infra* being inserted in place of *inter*. The same mistake occurs in the description of *Crinodendron* on the same page.

Dubouzetia, Panch. ex Brongn. et Gris in Bull. Soc. Bot. France, vol. viii. (1861) p. 199; Benth. et Hook. f. Gen. Plant. vol. i. p. 240; Szysz. in Engl. Bot. Jahrb. vol. vi. (1885), p. 453; K. Schum. in Engl. u. Prantl, Pflanzenfam. vol. iii. pars. vi. p. 6.

Sepala 5, libera, valvata. *Petala* 5, infra discum inserta, induplicato-valvata (apice excepta), basi bigibbosa. *Discus* hypogynus, 5-lobatus, pilosus, lobis 2-lobatis. *Stamina* 20–40, libera, inter discum et ovarium inserta; antherae lineares, papillatae, apice dehiscentes. *Ovarium* 5-loculare, loculis oppositipetalis, vel 3–4-loculare; loculi 6–13-ovulati, ovulis 2-seriatis; stylus subulatus. *Capsula* lignoso-coriacea, septicide et incomplete loculicide dehiscens. *Semina* 1–3 in loculis, strophiola carnosa spirali chalazica instructa, albumine carnoso. *Cotyledones* planae, ellipticae vel orbiculares. Frutices erecti vel arbor, foliis alternis, pedunculis axillaribus 2-plurifloris, floribus longipedicellatis. *Crinodendron*, Baill. Hist. Pl. vol. iv. p. 198, *pro parte*, non Molina.

According to Szyszylowicz, *Dubouzetia* is closely allied to *Crinodendron* (*Tricuspidaria*), and more distantly to *Elaeocarpus*. For further taxonomic and morphological details, Szyszylowicz's paper should be consulted; and for the anatomy of *D. campanulata*, Boodle's analysis in Kew Bull., 1907, pp. 11–12.

Clavis specierum.

I. Pedicelli et calyces extra dense rufo- vel fulvo-tomentosi:—
  - A. Folia coriacea, mucronulata, margine revoluto ... ... 1. *campanulata*.
  - B. Folia herbacea, caudiculata, margine haud revoluto ... ... 2. *caudiculata*.

II. Pedicelli et calyces extra pubescentes vel puberuli:—
  - A. Folia glabra vel fere glabra; sepala circ. 1 cm. longa (exsiccata, haud explanata) ... ... 5. *elegans*.
  - B. Folia subtus appresse tomentella; sepala ultra 1·5 cm. longa ... ... 3. *acuminata*.
  - C. Folia subtus nervis densiuscule pilosis, mesophyllo puberulo vel glabro ... ... 4. *leionema*.

1. **D. campanulata**, Panch. ex. Brongn. et Gris in Bull. Soc. Bot. France, vol. viii. (1861), p. 199, et *l.c.*, vol. x. (1863), p. 476 ; Ann. Sci. Nat., Sér. V. vol. i. (1864), p. 352 ; Nouv. Arch. Mus. Hist. Nat. Par., vol iv. p. 34, t. 13 ; Schlechter in Engl. Jahrb. vol. xxxix. p. 183 (1906).

An erect shrub, 1–1·5 m. high, with large red or orange-red flowers.

NEW CALEDONIA. Near Kanala, *Vieillard*, 49 ; without precise locality, *Pancher* ; at Ngoye, 100-300 m., *Schlechter*, 15145, 15222 (ex Schlechter).

2. **D. caudiculata**, Sprague in Kew Bull., 1907, p. 57.

An erect shrub, 1–2 m. high, with large white flowers. The petals in the fully developed flower are spathulate-oblong, about 3·7 cm. long and 1·7 cm. broad. Fully developed petals were not available when the species was described.

NEW CALEDONIA. Near Gatope, *Vieillard*, 2354 ; *Caldwell.*

3. **D. acuminata**, Sprague in Kew Bull., 1907, p. 58.

Flowers large, yellow. Since the publication of the description, a further specimen of *D. acuminata* has come to hand, in which the sepals are hardly acuminate and the filaments puberulous.

NEW CALEDONIA. Near Noumea, *Calawell* ; mountain of Dzumae, *Franc*, 539.

4. **Dubouzetia leionema**, *Sprague*, sp. nov.

Ramuli pubescentes. *Folia* oblonga vel obovato-oblonga, apice rotundata, costa in apiculum producta, basi rotundata vel obtusissima, 4–8 cm. longa, 1·5–2·5 cm. lata, inconspicue repando-dentata, marginibus leviter reflexis, supra primum molliter puberula demum glabrescentia, vena media et lateralibus valde impressis, subtus venis densiuscule pilosis ceterum puberula vel glabriuscula, venis prominentibus, venulis prominulis ; petioli 5–6 mm. longi, dense patule pilosi. *Stipulae* filiformes, pilosae, circ. 4 mm. longae. *Pedunculi* fere 1 cm. longi, breviter pubescentes, pilis longioribus adjectis, 2–3-flori ; pedicelli 2–3 cm. longi, pilosi ; bracteae obsoletae (? vel caducae). *Sepala* anguste lanceolata, acuta, subacuminata, 2·6 cm. longa, circ. 5 mm. lata, extra patule sparsiuscule pubescentia, intus densiuscule appresse pubescentia. *Petala* spathulato-oblonga, 3·5 cm. longa, 1·5 cm. lata, intus prope basin pubescentia, ceterum glabra. *Discus* 2·5 mm. altus, pilosus. *Stamina* circ. 27 ; filamenta usque ad 1·3 cm. longa, glabra ; antherae 9–10 mm. longae, minutissime puberulae. *Ovarium* circ. 4 mm. altum, tomentellum pilis longiusculis adjectis, 5-loculare, loculis 9-ovulatis intus glabris ; stylus circ. 1·7 cm. longus, basi pubescens, medio puberulus, apice glaber. *Capsula* subglobosa, circ. 2 cm. diametro, sparse pubescens, primum parum loculicide, denique perfecte septicide dehiscens. *Semina* 1–3 pro loculo, ellipsoidea, circ. 7 mm. longa, nigra, nitida, strophiolo spirali chalazico instructa. *Cotyledones* orbiculares, vix 4 mm. diametro ; radicula cylindrica, ultra 1 mm. longa.

The specific name refers to the glabrous filaments.

New Caledonia. Summit of Mt. Ouatendé, near Gatope, *Vieillard*, 2353.

5. **D. elegans**, Brongn. et Gris in Bull. Soc. Bot. France, vol. x. (1863), p. 476 ; Nouv. Arch. Mus. Hist. Nat. Par. vol. iv. p. 36.—*D. parviflora*, Brongn. et Gris in Bull. Soc. Bot. France, *l.c.*

A shrub or tree, with medium-sized yellow flowers. *Vieillard*, 166, on which *D. parviflora* was founded, is evidently a young state of *D. elegans*, with slightly larger leaves than usual.

New Caledonia. Near Balade, *Vieillard*, 224, 166 ; near Wagap, and near Kanala, *Vieillard*, 50, 2355.

XXVI.—NEW ORCHIDS : DECADE 30.

291. **Bulbophyllum dichromum**, *Rolfe ;* a *B. fuscopurpureo*, Wight, sepalis lateralibus apice connatis, petalis brevibus ciliatis nec longe setiferis differt.

Rhizoma validum. *Pseudobulbi* ovoideo-oblongi, obscure tetragoni, circa 5 cm. longi, monophylli. *Folia* petiolata, coriacea, oblonga, obtusa, circa 17 cm. longa, 4·5 cm. lata ; petiolus 5 cm. longus. *Scapus* suberectus, circa 25 cm. longus, basi vaginis oblongis subobtusis tectus ; racemus laxus, circa 12-florus. *Bracteae* ovato-oblongae, acutae, 8–10 mm. longae. *Pedicelli* subgraciles, 2·5–3 cm. longi. *Flores* speciosi, vitellini, labello purpureo. *Sepalum* posticum ovato-oblongum, subacutum, concavum, 2 cm. longum ; sepala lateralia lanceolata, acuta, apice connata et laeviter recurva, facie minutissime puberula. *Petala* patentia, oblique triangularia, breviter acuminata, ciliata, 4 mm. longa, basi latissima, columnae pedi adnata. *Labellum* carnosum, trilobum, 8 cm. longum ; lobi laterales oblongi, incurvi, 3 mm. longi, apice denticulati ; lobus intermedius recurvus, late oblongus, obtusus, convexus, minutissime papillosus, 5 mm. longus ; discus bicarinatus, profunde canaliculatus. *Columna* latissima, 5 mm. longa, alis crassis acutis ; pes 5 mm. longus.

Annam. *Micholitz.*

A very distinct and striking species, introduced by Messrs. Sander & Sons ; flowered in the Royal Botanic Garden, Glasnevin, in February last, when it was sent to Kew for determination by Mr. F. W. Moore, A.L.S. The contrast between the dark purple lip and the bright yellow of the rest of the flower is very striking. A figure has been prepared for the Botanical Magazine.

292. **Bulbophyllum tridentatum**, *Rolfe* ; ad *B. mandibulari*, Reichb. f., accedit, sed sepalis lateralibus attenuatis angustis, petalis brevibus, et columnae brachiis tridentatis differt.

Folia elliptico-oblonga, subobtusa, coriacea, circa 15 cm. longa, 4·5 cm. lata ; petiolus 2·5 cm. longus. *Scapi* 2·5–4 cm. longi, 2–3-flori. *Bracteae* ovato-oblongae, breviter acuminatae, basi tubulosae, 1·2–1·8 cm. longae. *Pedicelli* 3–4 cm. longi. *Sepalum* posticum ovato-lanceolatum, acuminatum, basi concavum, 2·5–3 cm. longum ; sepala lateralia attenuata, lineari-oblonga, acuta, 4·5–5 cm. longa. *Petala* ovata, acuta vel subobtusa, 1·2 cm. longa. *Labellum*

carnosum, recurvum, acutum, lateraliter subcompressum, margine valde acutum, 1·2–1·4 cm. longum. *Columna* lata, 1 cm. longa, brachiis acuminatis inaequaliter tridentatis.

BRITISH NEW GUINEA. Milne Bay, *Micholitz*.

Introduced by Messrs. Sander & Sons, in whose nursery at St. Albans it flowered in May, 1902. The sepals and petals are dull yellowish green, spotted with dull purple, the lip light brown, suffused with purple on the sides and apex, and the column green. The specific name is given in allusion to the tridentate arms of the column, there being a broad tooth at the base in front, and a narrower one about the middle behind.

293. **Coelogyne Mooreana**, *Hort. Sand.*; affinis *C. cristatae*, Lindl., foliis longioribus, scapis altioribus, bracteis deciduis et floribus minoribus differt.

Pseudobulbi ovoideo-oblongi, obtuse tetragoni, canaliculati, circa 7 cm. longi, apice angusti, diphylli. *Folia* elongato-lanceolata, acuta, 7-nervia, basi in petiolum attenuata, 24–50 cm. longa, 3–4 cm. lata, arcuata. *Scapi* erecti, 30–40 cm. alti; racemi 4–7-flori. *Bracteae* deciduae. *Pedicelli* 2·5–3·5 cm. longi. *Flores* speciosi, albi, labelli disco aureo-maculato et pilis subclavatis flavis instructis. *Sepala* elliptico-oblonga, acuta, laeviter carinata, 4–5·5 cm. longa. *Petala* elliptica, acuta, 4–5·5 cm. longa. *Labellum* trilobum, 3–3·5 cm. longum, basi concavo-saccatum; lobi laterales oblongi, obtusi, incurvi et columnam involventes; lobus intermedius ovatus, obtusus; discus crebre piloso-papillosus, pilis gracilibus 3–4 mm. longis et apice subclavatis. *Columna* gracilis, late alata, circa 2·5 cm. longa.

ANNAM. Laos side of the Lang Bian Range, at 1,300 m. alt., *Micholitz*.

Introduced by Messrs. Sander & Sons, St. Albans, with whom it flowered in December, 1906. It is dedicated to Mr. F. W. Moore, A.L.S., Keeper of the Royal Botanic Gardens, Dublin, who also flowered it at about the same time. It is the nearest ally of the well-known *C. cristata*, Lindl., which has yet appeared, and closely resembles it except in the characters above pointed out.

294. **Calanthe burmanica**, *Rolfe*; affinis *C. Ceciliae*, Low, floribus minoribus, segmentis angustioribus et calcare gracilius differt.

Folia elliptico-lanceolata, acuminata, plicata, subtus puberula, basi in petiolum attenuata, lamina circa 20–25 cm. longa, 3–5·5 cm. lata. *Scapus* erectus, circa 45 cm. altus, velutinus; racemus multiflorus, 10 cm. longus. *Bracteae* ovatae, acuminatae, undulatae, velutinae, apice recurvae, 6–10 mm. longae. *Pedicelli* velutini, 2–2·5 cm. longi. *Sepala* elliptico-ovata, acuta vel apiculata, 10–12 cm. longa. *Petala* elliptica vel elliptico-lanceolata, acuta, 10–12 mm. longa. *Labellum* columnae adnatum, profunde trilobum, 14–16 mm. longum; lobi laterales oblongi, obtusi, 6 mm. longi; lobus intermedius anguste obtriangularis, medio bifidus, segmentis obovatis; crista tricarinata, carinis tuberculoso-verrucosis; calcar gracile, laeviter incurvum, 1·5–2·5 cm. longum. *Columna* lata, 4 mm. longa, alae late auriculatae.

BURMA. Shan States.

Flowered with Mr. F. W. Moore, A.L.S., at the Royal Botanic Garden, Glasnevin, in September, 1896, and subsequently. The flowers are mauve-purple, with a yellow crest.

26364 295. **Cymbidium pumilum**, *Rolfe;* a *C. ensifolio*, Swartz, foliis et scapis brevioribus, floribus minoribus et labelli canaliculo omnino aperto et edentato differt.

Pseudobulbi ovoidei, parvi, 3-5-phylli. *Folia* elongato-linearia, subacuta, canaliculata, recurva, 15–30 cm. longa, 6–12 mm. lata. *Scapi* suberecti, 10–15 cm. longi, basi vaginis lanceolatis acutis paucis obtecti, multiflori. *Bracteae* triangulari-subulatae, 2–4 mm. longae. *Pedicelli* 2–2·5 cm. longi. *Sepala* subpatentia, oblonga, subobtusa, circa 2 cm. longa. *Petala* subconniventia, anguste elliptico-oblonga, subobtusa, 1·5 cm. longa. *Labellum* suberectum, trilobum, 12–14 mm. longum ; lobi laterales erecti, oblongi, obtusi ; lobus intermedius oblongus, obtusus, recurvus ; discus canaliculatus et obscure bicarinatus ; canaliculo aperto et edentato. *Columna* incurva, angulata, 12 mm. longa.—*Kinriyohen*, Somoku Zusetsu, xviii. t. 13.

China. Yunnan ; Tsekou, *Manberg*.

This Orchid has long been known from a figure in the above-cited Japanese work, but I cannot find that it has ever been described. Plants were introduced by Mr. Peter Barr, through a Japanese nurseryman, and flowered at Kew in May, 1900. It was believed to be only a garden plant in Japan, and recently it has appeared in a collection of dried plants made in Yunnan by Père T. Manberg, and presented to Kew by Mr. A. K. Bulley. The sepals and petals are light reddish brown, the latter shading off to yellow at the margin, and the lip is white, with a few red-brown spots on the front lobe, numerous minute lines and dots on the side lobes, and the disc and keels bright yellow.

26363 296. **Stauropsis chinensis**, *Rolfe;* a *S. gigantea*, Benth., foliis duplo minoribus, floribus paullo minoribus differt.

Herba epiphytica, erecta. *Caules* circa 12 cm. alti, radicantes. *Folia* approximata, coriacea, lineari-oblonga, brevissime et obtuse biloba, 15–20 cm. longa, 2–3 cm. lata. *Scapi* axillares, suberecti, 15–20 cm. longi ; racemus multiflorus. *Bracteae* patentes, late ovatae, subobtusae, concavae, 6–8 mm. longae. *Pedicelli* crassi, circa 1·5–2 cm. longi. *Flores* speciosi, flavi, brunneo-maculati. *Sepala* obovato-oblonga, obtusa, 2–2·5 cm. longa, circa 1·5 cm. lata ; lateralia infra apicem apiculata. *Petala* sepalis similia sed paullo angustiora. *Labellum* trilobum ; lobi laterales erecti, oblique triangulares, obtusi, 4 mm. lati ; lobus intermedius lateraliter compressus, lanceolato-oblongus, obtusus, 2 cm. longus ; callus laminatus, erectus, triangularis, subobtusus, 3 mm. latus. *Columna* crassissima, circa 5 mm. longa.

China. Kwangsi ; 20 miles from Lungchow, on the way to Telang, epiphytic on trees, *Morse*, 552.

The flowers are said to have a strong and disagreeable perfume, and the blotches on the sepals and petals to consist of red circles. It bears a close resemblance to the Burmese *S. gigantea*, Benth. (*Vanda gigantea*, Lindl., Bot. Mag. t. 5182), except in its much less robust habit.

26362 297. **Stauropsis luchuensis,** *Rolfe ;* habitu *S. undulatae,* Benth., sepalis petalisque obovato-oblongis obtusis nec undulatis et flavis brunneo-maculatis.

Herba scandens. *Caules* 30 cm. alti, radicantes. *Folia* disticha, coriacea, oblonga, brevissime et obtuse biloba, 10–14 cm. longa, 2–3 cm. lata. *Scapi* suberecti, 15–40 cm. longi, vaginis cupulatis tecti ; racemus multiflorus. *Bracteae* squamiformae, obtusae, circa 2 mm. longae. *Pedicelli* 2 cm. longi. *Flores* speciosi, flavi, brunneo-maculati. *Sepala* obovato-oblonga, obtusa, 1·3–1·5 cm. longa. *Petala* sepalis paullo angustiora. *Labellum* carnosum, subtrilobum, 1·5 cm. longum, basi saccatum ; lobi laterales columnae adnati, breves, 3 mm. lati ; lobus intermedius oblongus, obtusus, lateraliter compressus, medio gibbosus, basi concavus ; saccus obtusus, 3 mm. longus. *Columna* crassa, 5 mm. longa. —*Niumen-Ran*, Somoku Zusetsu, xviii. t. 23.

Luchu Archipelago. Island of Niumen (Iriomote).

A specimen of this Orchid was presented to Kew by Prof. J. Matsumura, D.Sc., LL.D., who remarks that it has been cultivated in greenhouses at Tokio for a long period, under the name of *Niumen-Ran* (Niumen-Orchid), under which name it was figured in the Japanese work cited above as long ago as 1856. Specimens were not previously available for comparison.

298. **Saccolabium Woodfordii,** *Rolfe* ; a *S. flexo*, Reichb. f., sepalis petalisque nec ligulatis, labelli lobis lateralibus membranaceis obtusis nec minutis distinctum.

Caulescens, rami flexuosi. *Folia* 2–2·5 cm. distantia, linearioblonga, inaequaliter biloba, 8–15 cm. longa, circa 1·5 cm. lata. *Pedunculi* axillares, crassiusculi, 4–5 cm. longi ; racemi ovoidei, densiflori. *Bracteae* . . . . *Pedicelli* graciles, 7 mm. longi. *Sepalum* posticum ovato-ellipticum, obtusum, concavum, 4 mm. longum ; *sepala* lateralia elliptico-oblonga, obtusa, subobliqua, 4 mm. longa. *Petala* ovata, obtusa, 4 mm. longa. *Labellum* trilobum ; lobi laterales lati, obtusi, membranacei, 1 mm. longi ; lobus intermedius late elliptico-oblongus, obtusus, subcarnosus, 2 mm. longus ; calcar inflato-oblongum, obtusum, 5 mm. longum. *Columna* lata, 1 mm. longa. *Capsula* fusiformi-oblonga, 2·5 cm. longa.

Solomon Islands. Rennell Island, *C. M. Woodford.*

A drawing, accompanied by a few dried flowers, was sent for determination by Mr. C. M. Woodford, Resident and Deputy-Commissioner in the Solomon Islands, who remarks that the flowers are pale vermilion, tipped with brown on the inside of the lip, and that it has not been observed on any other island.

299. **Cleisostoma secundum,** *Rolfe* ; a speciebus Burmannicis labelli lobis lateralibus subobsoletis facile distinguendum.

Caulis brevis. *Folia* lanceolato-oblonga, subacuta, laeviter recurva, crasso-coriacea vel subrigida, 9–13 cm. longa, 1·3–1·5 cm. lata. *Scapus* decurvus vel subpendulus, 7–10 cm. longus, 10–12-florus ; flores secundi. *Bracteae* latet riangulares, obtusae, 2 mm. longae. *Pedicelli* 1·3–2 cm. longi. *Sepala* patentia, elliptico-oblonga, obtusa, 6 mm. longa. *Petala* sepalis angustiora, caeterum

similia. *Labellum* subintegrum, elliptico-oblongum, obtusum, carnosum, 6–7 mm. longum, medio concavo-canaliculatum; calcar saccato-oblongum, 4–5 mm. longum; callus late oblongus, apice bilobus. *Columna* crassa, 4 mm. longa; rostellum 1 mm. longum.

BURMA.

Introduced by Messrs. Hugh Low & Co., Enfield, who flowered it in May, 1890; it was also subsequently sent from the Royal Botanic Gardens, Glasnevin, by Mr. F. W. Moore, A.L.S. The flowers are light rose-pink, with the front lobe of the lip rose-purple.

300. **Disa Bakeri**, *Rolfe*; *D. Deckenii*, Reichb. f., accedit, sed fere omnibus partibus duplo majoribus et calcare elongato differt.

Herba erecta, robusta, glabra, circa 45 cm. alta. *Folia* radicalia vel subradicalia lineari-oblonga, subobtusa, suberecta, subcoriacea, 15–20 cm. longa, 1·8–2·5 cm. lata, caulina in vaginas gradatim decrescentia, acuta, 5–15 cm. longa. *Spica* densiflora, 10–15 cm. longa, circa 4 cm. lata. *Bracteae* lanceolatae, acuminatae, 2–3 cm. longae. *Pedicelli* circa 1·5 cm. longi. *Sepalum* posticum cucullatum, late ovatum, obtusum vel apiculatum, circa 1 cm. longum; calcar lineare, incurvum, 1·5 cm. longum; *sepala* lateralia oblique ovato-oblonga, obtusa, patentia, circa 1 cm. longa. *Petala* ovato-oblonga, obtusa, 5 mm. longa. *Labellum* lineari-oblongum, obtusum, circa 7 mm. longum. *Columna* brevis, lata; anthera erecta.

BRITISH EAST AFRICA. Kinagop Hill and Mau, at 2,400 to 3,000 m., *G. Sandbach Baker*. "Pink Orchid."

XXVII.—MISCELLANEOUS NOTES.

SIR THOMAS HANBURY, K.C.V.O.—The loss to Kew of another generous friend has to be recorded in the death after a short illness, on the evening of March 9th, at his Riviera home, the Palazzo Orengo, La Mortola, Italy, in his 75th year, of Sir Thomas Hanbury.

Thomas Hanbury, third son of Daniel Bell and Rachel Hanbury, was born on June 21, 1832, at Clapham. At the age of nine he was sent to a school at Croydon, afterwards at Epping, where the majority of the boys were members of families belonging to the Society of Friends. After leaving school Thomas Hanbury was placed for a time with a tutor, Mr. Richardson, and thereafter at the age of 17 entered the employment of Messrs. W. J. Thompson & Sons, tea brokers, of 38, Mincing Lane. His capacity and the character of his work in the counting house of this firm were such that at the age of 21 he was considered capable of joining, along with his cousin Thomas Christy, two other gentlemen, William Crampton and Charles Pullam, in a business partnership, that of Hanbury & Co., which started at Shanghai.

From 1853 till 1872, with two short breaks in 1858–9 and 1866–8, when he took holidays to Europe, Thomas Hanbury lived the life of a merchant in China. During his business connection with Shanghai, Hanbury served on the Municipal Council and

took an active part in laying out and improving the amenities of the foreign settlement. At the same time he distinguished himself during the troublous times of the Taiping rebellion, which was in progress when he went to China, and was not finally put down till 1864, by his unbroken friendship for the native merchants and by his protection of their interests, so that more than any Englishman of his time he gained the confidence and affection of the Chinese business community.

In March, 1867, during his second holiday in Europe, Hanbury, to escape the rigours of the English spring, visited the south of France, where his brother Daniel had already travelled and sketched. While staying at Mentone he paid a visit to the promontory of La Mortola two miles within the Italian frontier, where the ruined Palazzo Orengo stood among its olive groves and vine terraces. Realising its possibilities as regards gardening, and charmed with its natural beauty, Hanbury purchased the house and a piece of ground round it in May 1867, with the intention of making the place his home on retirement, and of creating, in conjunction with his brother Daniel, the eminent authority on medicinal plants, a botanic garden in the grounds around the house.

In March 1868, Hanbury married Katherine Aldam Pease, the eldest daughter of Thomas Pease, of Westbury-on-Trym, near Bristol, member of a branch of the well-known North Country family of the name belonging to the Society of Friends. After two years' residence at Shanghai, where their eldest son was born, Hanbury and his wife settled down to a winter life at the Palazzo Orengo, their summers being spent in England, or in the mountains of the Alpes Maritimes, or in Switzerland.

Education in Liguria when Hanbury first settled there was in a very backward state. To remedy this so far as he could he built in 1880 a school for the boys and girls of the three villages of La Mortola, Ciotti, and Grimaldi, and in 1892 another for the children of the valley of Latte and its villages. In the latter year also he built a Botanical Institute at Genoa which he presented to the University there in commemoration of the fêtes in honour of Columbus. In 1897 he built at Ventimiglia a library to hold the books of the ancient Approsian library which had long been neglected. In the same year he built at Alassio a hall and library for the benefit of English winter visitors, and to commemorate the Diamond Jubilee of Her Majesty Queen Victoria, he presented a memorial drinking fountain to the town of Mentone. A short time ago it was announced that he had provided funds for the establishment of a public garden at Ventimiglia.

Hanbury's services to the cause of Italian education were recognised by his being created in 1885 Cavaliere, and in 1888 Commendatore, of the Order of the Crown of Italy. Later he was further honoured by being created Commendatore of the Order of SS. Maurizio and Lazzaro, and in 1892 he was awarded a gold medal as a benefactor of public instruction.

The fame of the garden at La Mortola, which is known throughout the world of horticulture, has grown with the years that have elapsed since its first inception. The task of originally furnishing

it was facilitated by the intimate intercourse established with the leading horticultural establishments of Europe, but more particularly with Kew and with Antibes. The intercommunication between La Mortola and Kew has been close and unbroken since the date of Hanbury's settlemeut on the Riviera and the exigencies of space forbid an exhaustive account of the exchanges that have taken place between the two establishments. A catalogue of the plants in the garden, published in 1889, enumerates some 3,600 different species, a number that has since been augmented by the addition of further species of scientific or economic interest and value. With characteristic thoughtfulness an entrance fee was charged to the public for permission to enter the garden, the proceeds being devoted to the maintenance of the hospital at Ventimiglia.

Among the numerous contributions to the collections of living plants at Kew sent in exchange from the garden at La Mortola may be mentioned many succulents, especially Agaves, Aloes, Euphorbias, and Stapelias; species of *Citrus*; many Bamboos. In addition to these, numerous sub-tropical plants raised from seeds received from La Mortola have been added to the collections.

Among the gifts from the same source to the Museum collections at Kew from 1881 onwards especially valuable are a fine collection of fruits of various species of *Citrus*, and sections of the stems of *Casuarina equisetifolia*, *Euphorbia abyssinica*, *Juniperus oxycedrus*, *Quillaia saponaria*, all grown in the grounds of the Palazzo Orengo.

The Library at Kew was indebted to Hanbury for the gift of some 30 rare and valuable volumes on botanical subjects, as recorded in the *Bulletin* for 1893, p. 22. In 1893 also he presented to Kew, as an addition to the collection of portraits of botanists there, a copy of the portrait of Matthioli which is preserved in the Museum attached to the Botanic Garden at Pisa. The name of the artist who painted the original is unknown. The copy was made for Hanbury's brother Daniel by Giuseppe Miniati of Pisa, in May 1872. It was also due to Hanbury's kind intervention that in the same year the original plaster cast of the medallion by Woolner of his brother Daniel, the gift of which was recorded in the *Bulletin* for 1893, p. 187, was deposited at Kew.

Kew, however, was by no means the only recipient in England of Hanbury's bounty. Among his thoughtful gifts to his own countrymen may be mentioned especially the presentation in 1892, to the Museum of the Pharmaceutical Society, of the valuable collection of "Materia Medica" accumulated by his brother Daniel, and the gift to the Library of the same Society of an equally valuable collection of books bearing on the same subject. Again, in 1903 Sir Thomas purchased the garden, 60 acres in extent, at Wisley, in Surrey, which had been made famous by the efforts of its former proprietor, the late Mr. G. F. Wilson. This garden he presented to the Royal Horticultural Society, who have since moved there from Chiswick and have expressed their gratitude for the gift that permitted them to change their abode.

In the *Botanical Magazine* Sir Thomas took a great and ever increasing interest, supplying freely from among the rarities at

La Mortola material for the figures given in that work. The first of the series was *Senecio Haworthii* (vol. 99, t. 6063 : 1873), a flowering specimen of which was sent to Sir J. D. Hooker by D. Hanbury, who obtained it from the garden of his brother T. Hanbury. The next to appear is given in the volume for 1891, and the subjoined list, showing this and all that have appeared since, is of interest and may be useful for reference purposes :—

Vol. 117 : 1891.	t. 7194.	*Citrus Aurantium.*
„ 120 : 1894.	t. 7333.	*Kalanchoe marmorata.*
„ 122 : 1896.	t. 7473.	*Pittosporum eriocarpum.*
„ 123 : 1897.	t. 7516.	*Bignonia buccinatoria.*
	t. 7524.	*Grevillea Hilliana.*
	t. 7529.	*Tristania laurina.*
	t. 7568.	*Quillaja Saponaria.*
„ 125 : 1899.	t. 7655.	*Dahlia Maximiliana.*
	t. 7662.	*Yucca Whipplei.*
	t. 7667.	*Aloe Schweinfurthii.*
	t. 7670.	*Ephedra altissima.*
„ 128 : 1902.	t. 7837.	*Aloe pendens.*
„ 129 : 1903.	t. 7882.	*Aloe vulvoviolacea.*
„ 130 : 1904.	t. 7948.	*Aloe Baumii.*
	t. 7988.	*Cydonia sinensis* (fruit).
„ 132 : 1906.	t. 8065.	*Polygala apopetala.*
„ 133 : 1907.	t. 8122.	*Aloe pallidiflora.*
	t. 8134.	*Aloe campylosiphon.*

The one hundred and nineteenth volume of the *Botanical Magazine* was dedicated by Sir J. D. Hooker to Hanbury, the letter of dedication being worded as follows :—

"My dear Hanbury,—It is no less a duty than a pleasure to offer to you the dedication of a volume of the *Botanical Magazine* as a tribute to the value of your services to Scientific Horticulture in creating a garden of Exotic plants at Mentone which, in point of richness and interest, has no rival amongst the private collections of living plants in the world ; and in munificently founding the 'Istituto Botanico Hanbury' in the Botanical Gardens of the University of Genoa, the early years of which are already so full of promise for the future of Scientific Botany in Europe."

In 1882 Her Majesty Queen Victoria, during her stay at Mentone, paid two afternoon visits to La Mortola and sketched the views from the windows of the Palazzo Orengo. In 1898 His Majesty the King, then Prince of Wales, visited La Mortola in company with the Grand Duke Michael of Russia, and in the same year Her Majesty the Empress Frederick paid several visits to the spot during her stay at Bordighera. In 1901 the King honoured Hanbury by creating him a Knight Commander of the Royal Victorian Order.

Great as is the sorrow which Sir Thomas Hanbury's death brings to all those who knew him intimately, it may be confidently

said that those, outside the circle of his own family, who most feel his loss are the countless poor who have benefitted by his wise generosity. His funeral, which took place on March 11th, bore striking testimony to the esteem in which he was held by his Italian neighbours of all classes. As the cortege passed along the coast from La Mortola to San Remo, where the body was cremated, the shops in every place were closed and the whole population joined the sad procession; about 7,000 people were present to pay their last respects to one who had been in the truest sense their friend.

A substitute for Coca.—Mr. E. M. Holmes lately sent to Kew for determination some fragments of a plant from the Hanbury Herbarium of the Pharmaceutical Society, collected in Peru, by Warscewicz, in 1853. There is an accompanying note that the plant called *Tampusa* was used like Coca when ascending the Cordillera. It has been identified by Mr. Sprague as *Werneria dactylophylla*, Schultz-Bip., a species occurring in Bolivia and Peru at altitudes of 16,000 to 18,000 feet. *Werneria* is a genus of high-level *Compositae* almost or perhaps quite peculiar to the Andes. Many of them, including the one in question, are dwarf, densely tufted shrubs, though commonly described as herbs.

W. B. H.

Splachnobryum delicatulum, *Broth.*—A specimen of this new species has been presented to the Herbarium by Mr. H. N. Dixon, M.A., F.L.S., by whom it was described in the Journal of Botany, 1907, p. 81, tab. 484, fig. A. It was discovered by Mr. G. Webster, of York, in October, 1904, growing on brickwork in a stove containing orchids at Baldersby Park, Yorkshire. Later in the year the plant had disappeared, but reappeared the following autumn (being probably an annual), when it was also found under similar conditions in an orchid-house at Harrogate. Since then it has been found in a similar situation at York. As in two of these cases the orchids were exclusively South American, it is possible that the moss also had been introduced from that region.

The stem is from 3 to 8 mm. high and simple, or nearly so. The dark green crowded leaves are ovate or oblong-subspathulate, and rounded at the apex; their cells are large and irregularly long hexagonal-rhomboid, except in the upper part, where the marginal row is much smaller, subquadrate, and forms a distinct border. The minute theca is borne on a seta about 3 mm. long, and is covered by a conic-beaked operculum. A special feature is the ring of hyaline cells between the rim of the capsule and the true peristome teeth, which projects above the former and constitutes a form of "pre-peristome." A single cell of this ring is situated opposite to, and is double the width of each peristome tooth, appearing (when viewed from without) like a wide hyaline border to the base of the papillose orange tooth, which is destitute of a median line. The peristome teeth originate so deeply within the theca that they are exserted for only half their length.

The systematic position of the genus *Splachnobryum*, founded by C. Mueller in 1869, has been the subject of much difference of opinion. Dr. V. F. Brotherus (in Engl. & Prantl, Nat. Pflanzenf. i. iii. 420) places it in *Pottiaceae* and enumerates 23 species; since then three others have been described in addition to the present one. Most of these are tropical or sub-tropical, but two have been found under circumstances similar to those of *S. delicatulum*. One of these, *S. Wrightii*, C. Muell., a West Indian species, was found on the top of a wall in a forcing-pit at the Royal Botanic Gardens, Glasnevin, and an account of it was published by Dr. R. Braithwaite in the Journal of Botany, 1872, p. 193. The other, *S. Corbieri*, Ren. et Card. (Bull. Soc. Roy. Bot. Belg. xli. p. 61, 1905), was described from plants growing on a rotten stump in the hot-houses at Parc Liais, Cherbourg.

C. H. W.

Research in Jodrell Laboratory in 1906 :—

Boodle, L. A.—The Monoecism of *Funaria hygrometrica*, Sibth. (Ann. Bot., Vol. XX., pp. 293–299, with four Figs. in text.)

Boodle, L. A.—Lignification of Phloem in *Helianthus*. (Ann. Bot., Vol. XX., pp. 319–321.)

Hill, T. G.—On the Seedling-Structure of certain Piperales. (Ann. Bot., Vol. XX., pp. 161–175, t. 10, and three Figs. in text.)

Hill, T. G.—On the Presence of a Parichnos in Recent Plants. (Ann. Bot., Vol. XX., pp. 267–273, tt. 19 and 20.)

Massee, G.—Revision of the Genus *Hemileia*. (Kew Bull., 1906, pp. 35–42, with one plate.)

Massee, G.—Plant Diseases : IV.—Diseases of Beet and Mangold. (Kew Bull., 1906, pp. 49–60, with five Figs. in text.)

Massee, G.—Perpetuation of "Potato Disease" and Potato "Leaf-Curl" by means of hybernating mycelium. (Kew Bull., 1906, pp. 110–112.)

Massee, G.—Plant Diseases : V.—Diseased Apples and Melons from the Cape of Good Hope. (Kew Bull., 1906, pp. 193–196, t. 1.)

Massee, G.—Plant Diseases : VI.—Potato Leaf-Curl. (*Macrosporium solani*, Cooke. Syn., *M. tomato*, Cooke.) (Kew Bull., 1906, pp. 242–245.)

Massee, G.—Fungoid Diseases of the Sweet Pea. (Sweet Pea Annual, 1906, pp. 18–22. London; Nat. Sweet Pea Soc.)

[**Massee, G.**]—"Canker" Fungus and Woolly Aphis. (Journ. Board Agric., Vol. XIII., p. 55.)

[**Massee, G.**]—Tree Root Rot. (Journ. Board Agric., Vol. XIII., pp. 111–114, with one Fig. in text.)

[**Massee, G.**]—The Perpetuation of Potato Disease and Potato Leaf-Curl. (Journ. Board Agric., Vol. XIII., pp. 232–235.)

[**Massee, G.**]—The Spread of Fungus Diseases by means of Hybernating Mycelium. (Journ. Board Agric., Vol. XIII., pp. 257–264.)

[**Massee, G.**]—Prevention of Decay in Ripe Fruit. (Kew Bull., 1906, pp. 399–400.)

[**Massee, G.**]—A Method of Preventing the Rapid Decay of Ripe Fruit. (Journ. Board Agric., Vol. XIII., pp. 562–565.)

Salmon, E. S.—On *Oidiopsis taurica* (Lév.), an endophytic member of the Erysiphaceae. (Ann. Bot., Vol. XX., pp. 187–200, tt. 13 and 14.)

Scott, D. H. and Maslen, A. J.—Note on the structure of *Trigonocarpon olivaeforme*. (Ann. Bot., Vol. XX., pp. 109–112.)

Scott, D. H.—The structure of *Lepidodendron obovatum*, Sternb. (Ann. Bot., Vol. XX., pp. 317–319.)

Scott, D. H.—On the structure of some Carboniferous Ferns. (Journ. R. Micr. Soc., 1906, pp. 519–521.)

Scott, D. H.—The Occurrence of Germinating Spores in *Stauropteris Oldhamia*. (New Phytologist, Vol. V., pp. 170–172, with two Figs. in text.)

Scott, D. H.—The Fern-like Seed-Plants of the Carboniferous Flora. (Ueber die wichtigsten neueren Ergebnisse der Phytopaläontologie. Résultats scientif. du Congrès internat. de Bot. Wien 1905, Jena 1906, pp. 279–296, with 17 Figs. in text.)

Scott, D. H.—On *Sutcliffia insignis*, a new Type of Medulloseae from the Lower Coal-Measures. (Trans. Linn. Soc. Bot., 2 ser., Vol. VII., pp. 45–68, tt. 7–10.)

Scott, D. H.—The Present Position of Palaeozoic Botany. (Progressus Rei Botanicae, Vol. I., pp. 139–217, with 37 Figs. in text.)

Worsdell, W. C.—The Structure and Origin of the Cycadaceae. (Ann. Bot., Vol. XX., pp. 129–159, with 17 Figs. in text.)

Mr. L. A. Boodle made an examination of *Funaria hygrometrica* with a view to explaining the contradictory statements in the literature regarding the distribution of the sexes in this plant, and obtained the result that this species is generally or perhaps always monoecious. He also extended some earlier observations on lignification of phloem in *Helianthus*, and studied some cases of fasciation, and some points in the structure of the ovules of *Cephalotaxus* and *Cycas* : see above.

Sir Dietrich Brandis carried out an investigation on the structure of the leaves of Bamboos, and found a striking uniformity in the main structural features, combined with diversity in details.

Mr. Hickling, of the Victoria University, Manchester, studied the structure of the Calamarian cone *Palaeostachya* with special reference to the course of the vascular bundles supplying the sporophylls, this being a character of some importance for comparison with other cones belonging to the fossil Equisetales.

Dr. A. A. Lawson, of Stanford University, California, completed a research on the gametophytes, fertilisation and embryo of *Cephalotaxus drupacea*, which he had begun three years previously in America. This work forms one of his series of investigations on the morphology of the Gymnosperms, and yields data which are regarded as important in phylogenetic considerations, and appear to indicate that *Cephalotaxus* is not to be regarded as a primitive type of Conifer.

Dr. D. H. Scott and Mr. A. J. Maslen investigated the structure of two species of *Trigonocarpus*, the fossil seeds of Palaeozoic plants probably related to *Medullosa*. The seeds, in various states of preservation, are well known in deposits belonging to the Coal-Measures, and prove to have a micropylar beak of considerable length : see above.

Dr. Scott completed his work on the structure of *Sutcliffia insignis*, a new type of Medulloseae from the Lower Coal-Measures. The specimen consists of a stem with leaf-bases attached. The vascular system of the stem consists of a main stele (of the protostelic type), from which subsidiary steles were given off, and by subdivision gave rise to numerous leaf-traces. Dr. Scott also examined the structure of *Lepidodendron obovatum* in a specimen showing both internal structure and satisfactory external characters, and obtained the result that these two classes of characters do not necessarily correspond in the Lepidodendreae. Dr. Scott also described the occurrence of germinating spores in a fossil sporangium (*Stauropteris Oldhamia*). The mode of germination of the spores shows that *Stauropteris*, which probably belongs to the Botryopterideae, is a true fern, and not a Pteridosperm. Dr. Scott also wrote a general review of the present position of Palaeozoic Botany, which was specially called for on account of the rapid progress of this subject in recent years : see above.

Mr. R. B. Thomson, of the University of Toronto, examined the structure of the ovule, the pollen-tubes, &c., in the Araucarieae.

Mr. W. C. Worsdell continued an extended study of the vascular anatomy of numerous Dicotyledons, for the purpose of determining, on these lines, their relationship to Monocotyledons, and the nature of the primitive type of structure from which the present vascular structure of both groups of plants has been derived. Mr. Worsdell was also engaged in making drawings and collecting data for the production of a general morphological work on Vegetable Teratology. He also published a summary of his investigations on the Cycads, with a statement of his views as to their origin from Pteridosperms. The vascular structure of the stem is regarded as derived from that of the Medulloseae : see above.

Investigations in Plant Pathology at Kew during 1906.—During the past year some four hundred reports bearing on various plant diseases have been issued. Some of the material for investigation and report was received through the Board of Agriculture and Fisheries, some was addressed directly to Kew from various

correspondents scattered throughout the United Kingdom. The preparation of these reports involved a considerable amount of laboratory work, as in the case of unusual or little known diseases the presence of one or more fungi on the diseased portion did not necessarily prove them to be individually or collectively the cause of the mischief. Under the circumstances each fungus present had to be obtained as a pure growth, and afterwards each one tested separately as to its power of primarily reproducing the disease on a healthy plant of the same kind as the diseased one from which the infecting material was obtained. Bearing on this question, it may be stated that extended observations strongly suggest, and in many instances prove, that, apart from the "rusts" (*Uredineae*), "smuts" (*Ustilagineae*), and certain other truly parasitic forms, fungi are not so frequently the primary cause of disease as they are generally supposed to be. For example, the minute fungus called *Pythium debaryanum*, Hesse, is considered the primary cause of the "damping off" of seedlings. In reality this fungus can only grow in a very damp situation, and consequently only destroys seedlings that are growing in damp, badly ventilated and badly lighted places. When seedlings are growing in open ground exposed to light and air, they resist infection by the fungus. Hence, "damping off" is primarily due to bad cultivation. The host of fungi known as wound-parasites are all secondary agents in promoting disease, the primary cause being the agent causing injury to the tissues, and thus enabling the fungus to enter. The punctures made by mites, "green fly," "scale insects," &c., serve as starting points through which fungi gain an entrance to the living tissues.

The exceptional weather of last season was the cause of some unusual forms of injury to plants. The somewhat severe late frosts suddenly following a period favourable to rapid growth, resulted in the collapse and death of the young foliage of many kinds of plants. Cabbages suffered severely. The sudden thawing of the frozen leaves caused the epidermis of the under surface of the leaf to separate from the adjoining tissue. A few days later, when the comparatively uninjured upper surface of the leaf again commenced to grow, it assumed a curled or puckered appearance, due to the unyielding dead epidermis. Eventually leaves thus injured shrivelled and died. The leaves of various evergreens, *Aucuba*, &c., were also injured in a similar way.

The following, among other subjects, were also investigated in the Jodrell Laboratory :—A disease attacking apples from Cape Colony ; the transmission of disease in potatoes from one generation to another by means of hybernating mycelium in the tubers ; prevention of rapid decay of ripe fruit ; the cause of "winter-rot" in potatoes ; "heart-rot" of swedes and mangolds, &c.

Plant nurseries and fruit farms, situated in different parts of the country, were visited for the purpose of studying and reporting on diseases.

Botanical Magazine for March.—The plants figured are : *Aloe pallidiflora*, A. Berger, *Blepharocalyx spiraeoides*, Stapf, *Primula deorum*, Velen., *Caiophora coronata*, Hook. & Arn., and *Paphiopedilum villosum*, Pfitzer, var. *annamense*, Rolfe. The *Aloe* is

probably South African. It is a stemless plant, with a dense rosette of linear-lanceolate leaves, dull green above, and marbled with long whitish marks. The branched inflorescence of pale flesh-coloured flowers is $2\frac{1}{2}$–4 ft. high. The material figured was from a plant which flowered in the garden of the late Sir Thomas Hanbury, K.C.V.O., at La Mortola. *Blepharocalyx spiraeoides*, from Brazil, is a new species with small lanceolate-linear leaves and terminal cymes of many small pale yellow flowers. It was sent to Kew by Baron Capanema, Director of Telegraphs of Brazil, in 1885. The genus is closely allied to *Myrtus*. *Primula deorum* is a pretty alpine species belonging to the section *Auricula*, and is a native of Bulgaria. It has been in cultivation at Kew since 1892. The specimen figured was received from Mr. Max Leichtlin, of Baden-Baden, in 1904. *Caiophora coronata* is a Loasaceous plant furnished with stinging bristle-like hairs. It has bipinnatifid leaves, and rather large white flowers borne singly on long peduncles. The specimen figured was grown in the garden of Mr. H. J. Elwes, F.R.S., having been raised from seed collected by him in the Andes, where it is found, from the Argentine Republic to Peru, at elevations of 9,300–14,600 ft. The *Paphiopedilum* has been introduced from Annam by Messrs. Sander & Sons, who presented a flowering plant to Kew about a year ago. It differs from the type, a native of Burma, in having longer, narrower and more erect leaves, and in the colour of the dorsal sepal.

Botanical Magazine for April.—The plants figured are *Diospyros Kaki*, Linn. f., *Arctostaphylos Manzanita*, Parry, *Calliandra portoricensis*, Benth. var. *major*, Sprague, *Meconopsisis bella*, Prain, and *Cymbidium erythrostylum*, Rolfe. The *Diospyros* is a native of Eastern India, China, and Japan, where it is also very much cultivated, in numerous varieties, for the sake of its edible fruit, popularly known as the Date Plum. Its introduction into cultivation in this country dates from the year 1789, but it has never become common. The Kew plant which supplied the material figured was purchased from a nurseryman at Montpellier in 1890, and first produced fruit, while still in a young state, in 1893. It has since fruited annually, and is now a standard about 7 feet high. The Californian *Arctostaphylos Manzanita* is a shrub or small tree, with broad leathery leaves and terminal many-flowered panicles of white or pinkish flowers. As in other arborescent species of the genus, the bark peels off annually. The specimen figured was obtained from a plant raised from seeds purchased from an American nurseryman in 1897. This plant is now about a yard in height and width, and has proved to be quite hardy here. *Calliandra portoricensis*, a native of Mexico and Central America, has, under various names, long been an inhabitant of our gardens. The variety, which was purchased in 1906 from a nurseryman in Hyères as "*Inga alba*," differs from the type in having deltoid calyx-lobes and longer stamens. Its flower-heads are globose, about 2 inches in diameter, and pure white, their ornamental character being due to the very numerous long-exserted stamens. *Meconopsisis bella* is known only from two localities on the eastern frontier of Nepal, where it was first discovered in 1888

by one of Sir George King's collectors. It is the smallest species of the genus and an exceedingly pretty one, but, unfortunately, difficult to cultivate. Success in flowering it has at last been achieved in the Royal Botanic Garden, Edinburgh, where plants had been raised from seeds distributed from the Royal Botanic Garden, Calcutta. One of these plants bearing a number of rather large pale blue flowers borne singly on scapes 1½–3 ins. long, was presented by Prof. Bayley Balfour, F.R.S., in August, 1906, and from it the figure was prepared. The beautiful *Cymbidium* is another of Messrs. Sanders' introductions from Annam. It flowered for the first time under cultivation in the Royal Botanic Garden, Glasnevin, in November, 1905, and material having been sent to Kew for determination, a figure was prepared for the magazine. The specific name was given on account of the crimson column. The rest of the large flower, except part of the lip, which is red-purple, is white.

Bitter Pit in Cape Apples.—Writing from Pretoria, 4th December, 1906, on the subject of the *Kew Bulletin*, the Government Horticulturist, Transvaal Department of Agriculture, remarked :—"I am specially interested in the Horticultural section, and whilst I do not by any means agree with many conclusions arrived at in the pages of your publication, I am anxious to keep in touch with English ideas." Replying to this passage from Kew, 31st December, 1906, it was said :—"It is inevitable that the same subject, if at all a debatable one, should present itself under different aspects to different minds which may be occupied in considering it. But while we may be led at Kew to suggest particular conclusions from a consideration of the facts at our disposal, we endeavour at all times to remain receptive to new facts and to modify any conclusions which new facts show to be untenable. I should therefore feel extremely grateful to you if you will be so good as to favour us with a reference to those conclusions arrived at in the pages of the *Bulletin* with which you find yourself unable to agree. If at the same time you will further favour us with your reasons for disagreeing with them, this might materially assist in promoting, what I feel is our common object, the advancement of knowledge."

Mr. R. A. Davis, Government Horticulturist, Transvaal, has courteously responded to this invitation in a letter dated Pretoria, 25th February, 1907. From this letter it transpires that the conclusions with which he does not agree are contained in an article which appeared in the *Kew Bulletin* for 1906, pp. 193–5, embodying a report on a consignment of diseased apples forwarded officially for examination by the Cape of Good Hope Commercial Agency, with the explanation that the disease by which these apples were affected appeared to prevent the fruit from being of any commercial value. The apples in question were made the subject of a very careful examination which failed to afford any indication that either fungi or insects could be held accountable for their condition. The conclusion was formed that the disease under consideration is of a purely physiological nature, and in

summing up his conclusions the writer of the report expressed the view that "the injury was due to the fruit being subjected to too high a temperature during the period of ripening. Whether this occurred previous to or during the voyage could not be determined. The fact that the lower half of each apple that was buried in the packing material remained perfectly free from disease suggests that if the fruit was completely covered with packing material so as to exclude the free access of air, no injury would be sustained."

In his covering letter Mr. Davis explains that he appreciates the fact that the writer of the report approached the subject dealt with under some difficulty, and the additional information he appends is sent in the hope that it may be of some assistance to the investigator in arriving at a solution of a somewhat difficult problem. How real the difficulty is may be gathered from the fact that the writer of the report found in every instance the lower half of each apple that was buried in the packing material perfectly free from disease, and that this is borne out by the lower of the two figures in the plate which accompanies the report. That figure, it is hardly necessary to say, represents, as accurately as it is possible by means of a photograph to represent, the conditions present in what was justifiably considered a typical instance of the disease as exemplified by the apples in the consignment submitted for report. It is therefore interesting and instructive to find that Mr. Davis has to say that this plate "does not give a clear impression of the disease. This originates much nearer the core of the fruit in nearly every case, and apparently develops towards the outside of the apple."

With regard to the possibility that the injury may be due to the fruit being subjected to too high a temperature during the first period of ripening, Mr. Davis says:—"I have seen apples ripen perfectly for many years past in climates hotter than that from which the specimens came on which the report was made. I have also watched them in Cape Colony, and it is only within the past few years that this disease has been observed. Apples are shipped to this colony from Australia, Tasmania, and Canada; the disease is apparent in consignments from *each* of these colonies, also in America, both in the Eastern and Western States." With regard to the possibility that the condition is the effect of subjection to too high a temperature during the voyage, and to the suggestion that if the fruit were completely covered by packing material no injury would have occurred, Mr. Davis writes:—"I would state that I have unfortunately seen thousands of specimens having identically the same appearance as those submitted hanging on the trees; have packed them, examined them and found no difference between them and others which have been picked from the same trees, wrapped and packed completely over with suitable material, excepting that the latter seemed to develop the disease more rapidly. Cold storage experiments made with fruit half ripe and nearly ripe, placed in storage without sign of mark on them, have shown that when taken out disease has developed to even a greater extent than in the previous cases with the same peculiar susceptibility to pitting at the *calyx end of the fruit only*."

From this Mr. Davis is of opinion that the appearance of the fruit cannot be explained by the practice of "half" packing. He continues :—"I agree . . . . . that it" [the disease] "is of purely physiological nature. At one time I held the opinion that it might be due to the widespread use of 'Northern Spy' stocks, as this apple is itself the most subject of all to the trouble, also the wood is given to 'canker' in some instances. This also is a fallacy, as I have found 'Bitter Pit' on trees grafted on 'French Crab' and other stocks, but in no instance, so far, on seedlings. Our natural varieties which reproduce themselves truly are all immune."

If, as Mr. Davis explains, 'Bitter Pit' is not confined to South Africa, and if, as was stated when apples so affected were first sent to Kew for examination, this disease destroys the commercial value of the fruit, it is to be anticipated that its study will be undertaken by workers in other apple-producing countries. For the information of all who are, or are likely to become, interested in the subject, it seems advisable to make available without delay the observations recorded by Mr. Davis.

Flowering of Orchis longibracteata, *Biv.*—Through Dr. A. Günther Kew received in February, 1906, and again on February 22nd of the present year, a specimen of *Orchis longibracteata*, Biv., syn. *Aceras longibracteata*, Reichb. f., and *Barlia longibracteata*, Parl., which flowered in the open ground at Bury St. Edmunds at this early period. This orchid is a native of the north littoral of the Mediterranean, from Spain to Italy and Greece, and its flowering season is from January to March. Mr. Duncan Parker, J.P., of Clopton Hall, near Bury St. Edmunds, brought home tubers from Hyères in 1904 or 1905, and planted them in a meadow. Each year since some of them have developed vigorous spikes of flowers in February. So far as my experience in Sussex goes, our earliest orchids, *Orchis mascula* and *O. Morio*, do not flower before April, and Bromfield gives the same for the Isle of Wight. That this Mediterranean orchid should have preserved the power and habit of flowering so early in the season when transferred to a much colder climate is a biological fact of sufficient interest to be placed on record.

W. B. H.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1907.

XXVIII.—N'HANGELLITE AND COORONGITE.

L. A. BOODLE.

A short time ago a sample of a curious substance (N'hangellite) found in Portuguese East Africa and described as elastic bitumen* was forwarded to Kew by Sir Boverton Redwood, D.Sc., M.I.M.E., who supplied the following information as to its mode of occurrence from a report made by Mr. J. Gething Hancock, M.I.M.E. :—

"N'hangellite is an elastic description of bitumen, and may be termed a mineral india-rubber. It is dark green in colour, and is lighter than water, and has probably been formed in the oxidation of petroleum. It is most prevalent in the plain to the north and north-west of Lake N'hangella, and to a large extent may be described, as far as this neighbourhood is concerned, as peculiar to that locality.

"The N'hangellite, in occurrence, is generally about half-an-inch in thickness, and lies in patches varying from a few square yards to probably half-an-acre in extent. It is chiefly found in long narrow strips on the surface-anticlines of slightly undulating ground, and gives the impression that it has been washed there by water, having largely the appearance of a high-tide mark. On the other hand, it is occasionally found in small pans, again indicating that it has been taken there by water and remained after the water had subsided. . . . I made the most searching enquiries . . . and was informed by many that after the rains it is possible to see this deposit gradually collecting, and that it is then of a light brown colour and gelatinous in appearance."

Specimens of this substance, when examined microscopically, prove to consist of a yellowish matrix, in which are embedded diatoms, sand-grains, and sometimes sponge-spicules, pollen-grains, spores, &c. ; but these inclusions are unimportant, forming

* The word "bitumen" will be used here in its extended sense.

1375 Wt 87 5/07 D & S 29 28065

only a small proportion of the mass. Fungal hyphae are also present, and are often crowded and very distinct near the surface of the specimens, more sparse, and forming an irregular reticulum in the interior.

The yellowish matrix, when examined in thin sections under a high power, is usually seen to contain numerous very small cells, which are more refractive and for the most part more coloured than the substance in which they are embedded. The latter may appear colourless in very thin sections, while the cells in question are yellow, or brownish, or pale green. They are usually elongated, and their sectional shape is elliptical or pyriform, or circular when seen in end-view. In length they vary from 2 μ to 6 μ, or occasionally 8 μ, and their breadth may be about half as great or more. Frequently no definite arrangement can be distinguished, but occasionally in favourable places one can demonstrate that the cells are grouped in colonies, which appear to be roughly spherical when small, elliptical or botryoida. when large. The cells are arranged so that their length is radial with regard to the colony, in which they form a peripheral layer, one or sometimes two or more cells thick. Their lateral distance from one another is variable, but generally greater than their own diameter. When rather crowded, they are sometimes clearly arranged in pairs or groups of four. The substance in which the cells are embedded shows no structure, and might well be the product of mucilage only. It is only here and there that colonies of definite shape can be distinguished; the scattered arrangement of the cells in other parts of the matrix may be explained as either due to flattening or distortion of colonies of similar form and size, or to the colonies having had indefinite growth, so that only young stages would show a regular form.

From such details as can be determined, there seems to be no doubt that the matrix has been derived from a gelatinous organism belonging almost certainly to the blue-green Algae, among which it would be classed under the Chroococcaceae. Prof. G. S. West, F.L.S., who kindly examined the organism for me, agrees that it certainly appears to be a blue-green Alga, and compares it with *Coelosphaerium*, Naeg., but adds that it is not exactly like anything with which he is acquainted. Its precise determination must be reserved until living material, or such as represents early stages in the formation of N'hangellite, can be obtained. Conversion into bituminous substance must imply extensive chemical changes in the mucilage, whereby the original characters of the Alga may have been altered to some extent as regards the spacing and form of the cells. Changes have no doubt also taken place in the cell-contents, hence the occasional greenish colour of the cells may be secondary and not a remnant of their original pigment. On soaking or boiling a section in water the cells undergo a curious change; their cavities become enlarged and often appear as though empty, but, when transferred to strong glycerine, they gradually regain their original appearance.

In some parts of the specimens the matrix shows no structure, but, as the loss of structure is often not abrupt but preceded by a transitional boundary where the algal cells are collapsed or in-

distinct, it is probable that the structureless condition is secondary and due to more destructive changes than those which took place elsewhere. One may therefore assume that the whole of the matrix represents a gelatinous Alga.

The fungus consists of septate hyphae, which are usually slender, colourless, yellow, or brown, and often collapsed in the interior of the specimen, but much coarser and brownish or black near the surface, where they sometimes show distinctive characters. Mr. G. Massee, F.L.S., kindly examined some preparations in which the fungus was specially well shown, and found that it agreed closely with *Cladosporium* in its type of structure, viz., in producing microsclerotia and storage-cysts. The latter are very similar to those illustrated by him in Fig. 4 of the plate accompanying his article* on "Gummosis of *Prunus japonica*, Thunb." The fungus may have grown in the mucilage after the death of the Alga, or it may have been associated with the living Alga ; in the second case the two organisms together would be described as a gelatinous lichen.

A few words may be added on the subject of the other bodies included in the matrix. Probably many different species of diatoms are present, as would be seen by collecting them from a fair-sized specimen of the substance. But it was not found possible to clean the diatoms satisfactorily either by burning or by the nitric acid and chlorate of potash method ; consequently they had to be examined in thin sections of N'hangellite mounted in balsam or cresol, and this was not specially favourable for showing their more minute characters. Some preparations were submitted to Prof. G. S. West, who was able to determine the following forms :—*Epithemia gibberula*, Kuetz., *Mastogloia* sp., *Campylodiscus* sp., and *Cocconema* sp. The diatoms are scattered through the thickness of the specimens, and are in some cases fragmentary, but sometimes the frustules are intact, and may contain two greenish-brown masses apparently representing the contracted or disintegrated cell-contents. The sponge-spicules are very few and quite fragmentary. Mr. R. Kirkpatrick kindly examined one of the fragments, and found, as was to be expected, that it was impossible to identify it. The pollen-grains and spores found in one specimen were embedded close to the upper surface, and also in the interior. The fungus grew (or possibly only completed its growth) on the gelatinous Alga after it had become exposed by the subsidence of the water. This is proved by the fact that the special characters, shown by the fungal hyphae at the surface of the specimen, are also to be seen in the bounding surface of cracks, which are evidently due to drying. It is not possible to come to a satisfactory conclusion as to whether the Alga grew or collected at the bottom, or floated at the surface of the water.†

A substance of a somewhat similar appearance to N'hangellite, showing a similar mode of occurrence, and also described as an

---

* *Kew Bulletin*, 1898, p. 321.

† To the kindness of Sir Boverton Redwood we are indebted for a chemical report on a sample of N'hangellite which forms the subject of the next article in the present number of the *Bulletin*.—[Ed.]

elastic bitumen, was discovered on the surface of the ground in South Australia in the neighbourhood of the Coorong (a lagoon) in 1865. It will be useful to quote some information regarding the Australian "bitumen," and to compare the two substances.

In an article written in 1872, Mr. (now Sir) W. T. Thiselton-Dyer* summed up what was known with regard to this substance, to which the following names had been given :—"Australian caoutchouc," "Coorongite," and "Mineral Gamboge." Its occurrence is thus described :—"It consists of sheet-like masses somewhat more than an inch in thickness . . . " and "is confined to a depressed portion of the district, the bottom of which is sandy and grass-covered ; it occurs on the banks forming the margins of the depression, and also on the sides of island-like elevations which are scattered about it." The precise nature of the substance appeared very doubtful, in the first place on account of the divergent views expressed by different scientific observers. M. J. Berkeley gave his opinion that there was no doubt that it was a collemal† in an imperfect state. Whittell found a mycelium and dark brown sporules (?) and several diatoms. Another observer described a granular and cellular structure with entangled fibres of decayed fungi. Archer came to the conclusion that the substance was "certainly organic,—some kind of gum with accidental things included, such as bits of vegetable tissue, some confervoid or fungal threads, and the like."

Thiselton-Dyer, in commenting on these different views and other data which he had obtained, wrote as follows :—"The suggestion which occurred to Mr. Berkeley, that it is the residue of some cryptogamic plant, is, at first sight, very plausible. One can imagine such a residue being formed by *Bromicolla aleutica*,‡ which forms in the Aleutian Isles a layer two feet thick of a Nostoc-like substance, covered with a gramineous vegetation. One can imagine it also to result from the drying up of a lake covered with *Hormonema fluitans*,§ the 'vegetable turtle fat' described by Dr. Seemann as a jelly-like mass several feet thick, with a tall species of Sedge growing on it." But after quoting an analysis‖

---

* On a substance known as "Australian caoutchouc," *Journ. Bot.*, pp. 103–106.

† In a letter printed in the "Express and Telegraph" (Aug. 29, 1871) Berkeley is quoted as describing the substance as related to *Pyrenopsis tasmanica*, Naeg. This is a lichen in which the Alga is a *Glococapsa*.

‡ The general appearance of this organism was described by Eichwald (Om en ätbar Alg : *Bromicolla aieutica*, Eichw. ; Skand. Naturf. Förhandl., III., 1842, pp. 615–6), but there is no adequate description. The cells are described as scattered in a completely homogenous gelatinous substance, and the Alga is compared with *Nostoc*, on account of its gelatinous character, but stated to differ in showing no definite arrangement of the cells.

§ I have altered the spelling from *Hoomonema*, which was evidently a misprint, to *Hormonema*. Seemann, in Viti (1862), p. 28, states that Berkeley identified a sample of the "vegetable turtle fat" as *Hormospora* [sphalm. *Hoomospora*] *transversalis*, Brébisson, but re-named it *Hormonema* [sphalm. *Hoomonema*] *fluitans*. Brébisson's species is a filamentous form placed by De Toni (Sylloge Algarum) as a synonym of *Schizogonium thermale* (Menegh.), Kuetz.

‖

Moisture	0·4682
Carbon	64·7300
Hydrogen	11·6300
Ash	1·7900
Fixed carbon	1·0050
Oxygen and unestimated matters ...	20·3768

of Coorongite made at his request by Dr. Bernays, he points out that "any residue left by a Cryptogam (assuming of course that no extensive change of composition had taken place in it, except the loss of water)" would have a considerably different chemical composition, and for this reason inclines to regard the substance as of mineral origin, and being derived from an oily matter which originally floated on the surface of the water.

In an article on the same subject J. R. Jackson* quotes the observations of G. Francis, who concluded that Coorongite was in all probability a vegetable production, and on chemical examination found it to be "resolvable into two educts: (1) soft semi-fluid, like a balsam . . . and, except in its semi-fluidity, resembling vegetable wax"; and "(2) a tough pulverulent substance," apparently a "modified form of cellulose associated, but not chemically combined, with the first described educt."

Some further information relating to the occurrence and formation of Coorongite may be quoted from the correspondence on the subject in the years 1866 and 1867. The substance accumulates on the surface of the flood waters, which form a shallow swamp in the winter but recede annually, leaving it on the soil, so that it can be collected in summer when the ground is hard. In some places where the deposit was destroyed by fire one summer, it was again found covering the ground in the following summer. In one locality, when the deposit was removed from the surface of the ground, other layers were found buried in the sand beneath it.

In 1903 Cumming† made chemical analyses of Coorongite and gained some further knowledge of the composition of this substance. He found that, besides the ash, two constituents were present, one of them being a wax-like solid which can be extracted with carbon-disulphide; the other is insoluble in carbon-disulphide, but can be saponified by hot alcoholic solution of caustic potash, forming a soluble soap. For the soluble constituent of Coorongite he obtains the formula $(C_{10}H_{18}O)_x$, with $_x$ probably equalling 8, and for the other constituent $C_{10}H_{20}O_3$, the figures given by the analyses being as follows :—

	Soluble Constituent.	Insoluble Constituent.
Carbon	77·91	64·22
Hydrogen	11·92	10·52
Oxygen	10·17	25·26

Cumming suggests that the insoluble constituent may have been derived from the soluble one by hydration and oxidation.

On examining samples of Coorongite in the Museum at Kew, I found that this substance bears a distinct resemblance to N'hangellite. There is a yellowish matrix which, though much more generally structureless than in the other case, shows an Alga

---

* J. R. Jackson, Coorongite or Mineral Caoutchouc of South Australia (Pharm. Journ. and Trans., 1872, pp. 763-4 and 785).

† Cumming, Coorongite, a South Australian Elaterite, "Chemical News," vol. 87 (1903), p. 306.

of the same type here and there; diatoms are present and are decidedly more numerous, and there is a fungus, which again is more distinct near the surface of the specimens; fragments of parenchymatous tissue are also present. I submitted a slide to Prof. G. S. West, who notes that the Alga is very similar to that in N'hangellite, and certainly belongs to the same genus, but differs in its larger and more crowded cells. Besides the diatoms he observed other aquatic organisms, viz., *Peridinium* sp., and some Desmids (*Cosmarium* 2 spp., *Xanthidium* 1 sp.). A list of diatoms present in Coorongite was made by E. O'Meara in 1872. The species were named by him as follows:—*Denticula tenuis, Cymbella helvetica, C. maculata, Tabellaria flocculosa, Mastogloia Smithii, Synedra capitata, Epithemia gibba, E. rupestris, Nitzschia palea, Amphora minutissima, Navicula rhomboides, N. gibberula.* He also pointed out that they were all fresh-water forms, and Prof. West mentions that the same is true of the *Cocconema* sp. and *Epithemia gibberula* found in N'hangellite. One may, I think, safely assume that Coorongite had a similar origin to N'hangellite, but, since the Alga is only visible here and there, the evidence for the origin of the matrix is not so strong. It may perhaps include additional components, but on the other hand it is quite likely that the bulk of it is the product of the gelatinous Alga (or Algae). Thus one observation gives passable evidence that parts at any rate of the structureless regions of the matrix are of this nature. A few small colonies, bounded by brownish outlines and containing their Algal cells, were seen embedded in a matrix in which there was no structure beyond brownish outlines of the same size and shape as those of the adjacent colonies referred to.

Taking it as established that the greater part of the substance in N'hangellite has been derived from a gelatinous Alga, there remains the problem as to how the mucilage has become transformed into a material showing the characters of bitumen, and whether the change took place under water or on dry ground. In neither of these positions does it appear likely that a gelatinous mass should have become uniformly infiltrated by bitumen or petroleum, so one must assume that chemical changes have taken place in the mucilaginous substance itself. The nature and cause of these changes may ultimately be determined by chemical investigation combined with observations in the locality where N'hangellite is said to be seen in process of formation. If this substance is formed every year, as appears to have been observed in the case of Coorongite, it is very surprising that extensive chemical changes should take place in such a short space of time and under such apparently ordinary conditions. Assuming the original gelatinous substance to consist largely of muco-cellulose, a considerable loss of oxygen must take place. Without any clue to other agents, one can only suggest the possibility of an enzyme being concerned.

N'hangellite is extremely interesting as being apparently comparable to certain fossil deposits, viz., examples of kerosene shale and boghead coal, &c., in which gelatinous Algae sometimes formed the chief part of the deposit. These Algae, which are occasionally well-preserved, were examined by Bertrand and

Renault,* who gave names to the different forms. One of these, *Pila australis*, Bertr., was a gelatinous Alga forming colonies, in which the cells were peripheral. It was probably one of the Cyanophyceae, and differed from the Alga in N'hangellite in several particulars, though the arrangement of the cells in the colonies was similar to that in the small colonies seen in N'hangellite. In those deposits which were formed chiefly from gelatinous Algae, Bertrand regards the substance derived from the mucilage as having become infiltrated by bitumen. In other cases where the Algae are less abundant he attributes a great part of the substance to the deposition of humic compounds in gelatinous form from the water in which the Algae grew.

The conclusion to be drawn from the examination of N'hangellite is that the substance has been derived, chiefly at any rate, from masses of a gelatinous Alga, and that chemical changes must have taken place in the mucilage, giving it a bituminous character. Whether humic acid may have contributed in some degree to the formation of the substance remains to be proved, but that extraneous petroleum should have done so is entirely improbable. Hence the occurrence of N'hangellite gives no evidence for the presence of petroleum in the district in which it is found, but in a permanent lake-region similar deposits may well have been formed from time to time, giving rise ultimately to fossil deposits of bitumen or strata containing petroleum.

XXIX.—REPORT ON A SAMPLE OF N'HANGELLITE FROM INHAMBANE, PORTUGUESE EAST AFRICA.

Sir BOVERTON REDWOOD.

The greater part of the sample consisted of fragments of various sizes about half-an-inch in thickness, the remainder consisting of pieces about one-eighth of an inch thick. Both were elastic. The thinner pieces were translucent and of a brown colour by transmitted light. The thicker pieces on being cut through appeared to be fairly uniform throughout, but the weathered surfaces seemed to be less elastic than the interior. The thinner pieces showed signs of lamination and could be split into layers.

---

* Bertrand et Renault, *Pila bibractensis* et le boghead d'Autun, *Bull. Soc. d'Hist. Nat. d'Autun*, 1892; Bertrand, Le Kerosene Shale de la Nouvelle-Galles du Sud, *ibid.* 1896; Renault, Les Organismes des Cannels, *Bull. Muséum d'Hist. Nat.*, Paris, 1898; Bertrand, Kerosene Shale de Megalong Valley, *Ann. Soc. Géol. du Nord*, Lille, 1900; Bertrand, Charbons gélosiques et charbons humiques, *Compte-rendu du VIII. Congrès géologique internat.* 1900, Paris, 1901; and other papers.

Portions of the sample furnished the following results :—

—	Thick.	Thin.
	Per cent.	Per cent.
Moisture	1·1	2·4
Other volatile matter	89·5	86·6
Fixed carbon	5·2	3·8
Ash	4·2	7·2
	100·0	100·0

Dried Sample.

Ash	5·94	per cent.
Sulphur	0·06	„

Chemical composition, calculated on the ash-free substance :—

Carbon	69·63	per cent.
Hydrogen	10·35	„
Nitrogen	2·50	„
Oxygen (by difference) ...	17·52	„
	100·00	„

Yield on destructive distillation :—

—	1.	2.	Average.
	Per cent.	Per cent.	Per cent.
Oil distillate	56·9	46·2	49·6
Aqueous distillate	9·0	9·5	9·3
Coke	18·3	22·7	21·4
Loss (incondensable gas)	15·8	21·6	19·7
	100·0	100·0	100·0

The oil had a specific gravity of 0·857 and a flash-point of 75° F. (close test). It resembled the mineral oil obtained by the destructive distillation of bituminous substances and could doubtless be separated by fractional distillation into similar hydrocarbon commercial products. It yielded 3·8 per cent. of solid hydrocarbons (paraffin) with a melting-point of 120° F.

Soluble in benzene (C_6H_6) :—

Thick	12·0	per cent.
Thin	10·5	„

The extracted matter had a balsamic odour.

The N'hangellite exhibited considerable charring on being heated with strong sulphuric acid; and on being heated with strong nitric acid it passed into solution, but a precipitate was thrown down on cooling.

XXX.—AMERICAN RUBBER PLANTS.

W. B. Hemsley.

In 1898 a beginning was made in *Hooker's Icones Plantarum* with the publication of figures and descriptions of American Rubber Plants, partly of authenticated specimens of more or less known species, partly of species believed to be previously undescribed. Any notes by collectors respecting the quality of the rubber yielded by the species under consideration were reproduced. The genera *Hevea*, *Sapium*, and *Castilloa* have been partially illustrated, and it is intended to continue the series from time to time as circumstances permit. More rapid progress has been prevented by other work. The genus *Sapium*, especially, was in a chaotic condition, due in a great measure to the fact that botanists had followed each other in placing a large number of quite distinct species as varieties of *Sapium biglandulosum*. About a dozen such species have already been figured in the *Icones Plantarum*, and drawings of the dissections of the flowers of many others have already been made in continuation of the revision. Meanwhile, Dr. J. Huber, of Para, Brazil, has taken up the study of both *Hevea* and *Sapium*, much on the same lines, and his work is mostly in sympathetic accord with what has appeared in the *Icones Plantarum*, and our future illustrations will usefully supplement his excellent synopses. Dr. Huber's "Ensaio d'uma Synopse das Especies do Genero *Hevea* sob os pontos de vista Systematico e Geographico" appeared in the *Boletim do Museu Goeldi* for March, 1906, pp. 620 to 651, without illustration of any kind. The same author's revision of the species of *Sapium* was published in the *Bulletin de l'Herbier Boissier*, 1906, vol. vi., pp. 345 to 364 and 433 to 452, with numerous small but critical figures in the text, under the title: "Revue critique des Espèces du Genre Sapium." When the Kew collection of *Sapium* has been critically elaborated in connection with Huber's "Revue," we shall have some observations to make on the points of agreement and otherwise.

Dr. Huber classifies the species of *Hevea* as follows :—

Section 1. Euhevea, Muell. Arg. Anthers in one whorl of 5.

1. *guayanensis*, Aubl.
2. *nigra*, Ule.

Section 2. Bisiphonia, Muell. Arg. Anthers in two whorls.

Series **Luteae.** Anthers in two incomplete whorls. Inflorescence yellowish or gray. Buds of the male flowers acuminate.

1. Disk of the male flower rudimentary.
   3. *lutea*, Muell. Arg.
   4. *apiculata*, Muell. Arg.
   5. *cuneata*, Huber.

2. Disk of the male flower stellate.		6. *Benthamiana*, Muell. Arg. 7. *Duckei*, Huber. 8. *paludosa*, Ule.
3. Disk of the male flower with elongated segments.		9. *rigidifolia*, Muell. Arg.

Series **Intermediae.** Anthers in two complete series. Inflorescence pale yellow or white. Buds of the male flowers acuminate.

1. Style well-developed ...	...	10. *minor*, Hemsl. 11. *microphylla*, Ule.
2. Style obsolete ...	...	12. *Randiana*, Huber. 13. *brasiliensis*, Muell. Arg.

Series **Obtusiflorae.** Anthers in two complete series. Inflorescence whitish or more or less violet. Buds of the male flowers obtuse.

1. Disk of the male flower composed of 5 obtuse glands.		14. *Spruceana*, Muell. Arg. 15. *similis*, Hemsl. 16. *discolor*, Muell. Arg.
2. Disk of the male flower composed of acuminate glands.		17. *pauciflora*, Muell. Arg. 18. *confusa*, Hemsl.
Of uncertain position	...	19. *nitida*, Muell. Arg. 20. *viridis*, Huber. 21. *Kunthiana*, Huber.

It is not intended to criticise the foregoing classification, nor to question the limitation of the species, as both are doubtless the result of a much more extended study of the genus than the writer can lay claim to; but it may be mentioned that *Hevea cuneata*, Huber, is the same as, or at least intended by the author to include, *H. peruviana*, Lechler. In *Hooker's Icones Plantarum*, t. 2574, the latter and *H. apiculata*, Baillon, are regarded as synonymous with *H. lutea*, Mueller.

It may be useful to add here a list of the American Rubber Plants already figured and described in the *Icones Plantarum*.

I.—Hevea.

H. apiculata, Baill., vol. xxvi., t. 2574, f. 11–14. Male and female flowers.

H. Benthamiana, Muell. Arg., vol. xxvi., t. 2571 and t. 2575, f. 16 and 17. Seeds.

H. brasiliensis, Muell. Arg., vol. xxvi., t. 2573, f. 1–7. Analysis of male and female flowers. t. 2575, f. 1–7. Germinating seeds.

H. confusa, Hemsl., vol. xxvi., t. 2570 and t. 2574, f. 1–3. Male and female flowers. t. 2575, f. 12 and 13. Seeds.

H. discolor, Muell. Arg., vol. xxvi., t. 2573, f. 18–21. Male and female flowers. t. 2575, f. 8–11. Seeds.

H. guianensis, Aubl., vol. xxvi., t. 2573, f. 8–10. Male and female flowers.

H. janeirensis, Muell. Arg., vol. xxvi., t. 2573, f. 1 and 2. Male and female flowers.

H. lutea, Muell. Arg., vol. xxvi., t. 2574, f. 11–14. Male and female flowers.

H. membranacea, Muell. Arg. = *H. pauciflora*, Muell. Arg.

H. minor, Hemsl., vol. xxvi., t. 2572.

H. pauciflora, Muell. Arg., vol. xxvi., t. 2574, f. 4–7. Male and female flowers. t. 2575, f. 14 and 15. Seeds.

H. peruviana, Aubl. = *H. guianensis*, Aubl.

H. peruviana, Lechler, vol. xxvi., t. 2574, f. 19–21. Male and female flowers.

H. rigidifolia, Muell. Arg., vol. xxvi., t. 2573, f. 11–13. Male and female flowers.

H. similis, Hemsl., vol. xxvi., t. 2576.

H. Spruceana, Muell. Arg., vol. xxvi., t. 2570 and t. 2573, f. 14–17. Male and female flowers.

Where no explanation is given, the whole plate is devoted to the species in question with a representation of the foliage and inflorescence, natural size, and usually with analysis of the flowers, enlarged.

II.—Sapium.

S. aereum, Kl., vol. xxvii., t. 2682.

S. aucuparium, Jacq., vol. xxvii., t. 2650.

S. ciliatum, Hemsl., vol. xxvii., t. 2683.

S. cupuliferum, Hemsl., vol. xxvii., t. 2679.

S. Jenmani, Hemsl., vol. xxvii., t. 2649.

S. lateriflorum, Hemsl., vol. xxvii., t. 2680.

S. mexicanum, Hemsl., vol. xxvii., t. 2680.

S. Moritzianum, Kl., vol. xxvii., t. 2677.

S. paucinervium, Hemsl., vol. xxvii., t. 2648.

S. Poeppigii, Hemsl., vol. xxvii., t. 2678.

S. stylare, Muell. Arg., vol. xxviii., t. 2757.

S. suberosum, Muell. Arg., vol. xxvii., t. 2681.

S. subsessile, Hemsl., vol. xxvii., t. 2684.

S. verum, Hemsl., vol. xxvii., t. 2647.

Dr. Huber does not agree with our view of *S. aucuparium*, Jacq., and he may be right; but we shall return to this question again after our final revision of the Kew materials. It is the *S. Hemsleyanum* of Huber (*Bull. de l'Herb. Boiss.*, 1906, vol. vi., p. 361, f. 22), who further identifies *S. mexicanum*, Hemsl., with the type of *S. macrocarpum*, Muell. Arg.

III.—Castilloa.

C. australis, Hemsl., vol. xxvii., t. 2676.

C. Tunu, Hemsl., vol. xxvii., t. 2651.

Under tab. 2651 we have reduced *Castilloa Markhamiana* to *C. elastica*, and given reasons for the opinion that *C. costaricana*, Liebm., belongs to the same species.

XXXI.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: III.

LEPIDOPTERA.

A. Langley Simmons.

The season of 1906 was not a good one for the collection of insects belonging to this order. The prevalence of cold winds in the early summer retarded both insect and vegetable life generally, and particularly in the South of England the absence of butterflies was most marked. With the exception of parts of the Dorset and Kent coasts it is many years since they were so scarce. Near London this scarcity will no doubt be more noticeable every year, especially of the butterflies belonging to the genus *Vanessa*, the larvae of which feed principally on the nettle. As the suburbs grow so will the wild food plants disappear, with the consequent diminution of insect and other life. In the Gardens the absence of the *Rhopalocera* was also observed, the most plentiful species being the second broods of *Vanessa urticae*. Very few *V. atalanta* or *V. io* were seen and only one *V. cardui*. Of the *Lycaenidae*, *Cyaniris argiolus* was strangely very much more plentiful than *C. icarus*, while not a single species of the *Hesperiidae* was observed during the whole of the season. *Apatura iris* was carefully watched for in the Queen's Cottage grounds, but it does not seem now to obtain there, although it has been taken recently in Richmond Park. Queen's Cottage grounds with its glorious oaks and necessary *Salix Caprea* for the food plant would seem to provide an ideal reserve for the propagation of "his majesty." While lying under the trees on the hottest afternoons watching the tops of the massive oaks, standing out in all their midsummer glory against the blue sky, it seemed that it just wanted the iridescent flash from the wings of the "emperor" soaring up into the sunlight to complete an otherwise perfectly lovely scene. All true lovers of nature would be sincerely pleased to know that this magnificent insect could be seen amid such surroundings, and although not observed this season one may yet hope that it will make an appearance in this part of the gardens.

Not any additions were made to the list of butterflies already published, nor were any exotic specimens seen.

Probably no small area of ground has ever been so thoroughly and systematically worked for the lepidopterous fauna in all stages of its existence as the gardens were during the late spring, summer and autumn of 1906. The list of the species obtained appearing at the end of these notes together with the list which appeared in the *Kew Bulletin*, Additional Series V., speaks for itself as to the richness of the gardens in the order under notice. One ought not, perhaps, to be surprised at the results obtained when it is remembered that the two essentials for the natural propagation of insect life, namely variety and profusion of the necessary food plants, here prevail and there is an area, principally in the Queen's Cottage grounds, in which the surface of the ground and plants are absolutely undisturbed. Remembering even these fortunate circumstances, the fact remains that the gardens are within eight miles of the metropolis, a distance which does not prevent the soot and dirt of a great city under favourable conditions settling on and darkening the plant life. This has caused in many cases pronounced forms of melanism. It is interesting to compare these melanic variations, when they occur with normal types, the darkening process being quite as apparent in the micro-lepidoptera as in the larger species.

The gardens appear to be, fortunately, very free, with one exception, from those species of lepidopterous larvae which at times cause such devastation to plant life in country districts and on the continent. It may be remembered that this year saw a wonderful visitation of *Orgyia antiqua* in the London parks. In Hyde Park during July and August the trees were in numbers of cases defoliated by the ravages of the handsome little caterpillar. They covered the ground, trees, seats and palings in countless thousands, and the idea that the plane trees were immune from these attacks was completely upset—these were the trees that suffered the most. Only two males were seen in the gardens, and not one of the apterous females has been collected. The larvae of *Pygera bucephala* appeared to be rather abundant, and large clusters were seen hanging on the lime trees. The imagos will probably be very plentiful during the summer of 1907. This species also at times causes much damage to *Carpinus Betulus*, *Corylus Avellana* and *Ulmus campestris*. The cobweb like structures made by the larvae of *Yponomeuta euonymellus* were seen thickly covering bushes of a variegated form of *Euonymus europaeus*, a plant not usually selected by this caterpillar for its food, *Prunus Padus* generally affording the required sustenance. Where the bushes had been attacked they had been stripped clean of leaves. *Tyria jacobaea* was plentiful in all parts of England during the early summer, but only one moth was caught in the gardens. Later in the season, however, a quantity of larvae were discovered feeding on *Senecio alpinus* in the Herbaceous grounds; this plant is very different in aspect from *S. Jacobaea* and *S. vulgaris*, its ordinary food plants. In Devonshire it is known to feed at times on the potato, quite clearing the stalks of leaves.

The usual "baits" were employed for the enticing and snaring of moths. Sugaring was commenced in April and continued till the end of October, but, until the 8th of August, met with but scant success. This may be accounted for perhaps by the fact that

during the greater part of the summer there were countless flowering plants in the gardens giving off strong scents which would prove more attractive to the moths than black treacle and rum. When the ivy is in blossom in the autumn, this usually successful mixture is a failure. But it was interesting to notice that as soon as most of the heavily scented flowering plants had ceased blooming the sugar bait became effective. The only insects which were unable to resist the subtle effluvia thrown off by the treacle before August were a few *Dipterygia pinastri*, *Agrotis corticea*, *Agrotis pronuba*, *Hadena polyodon*, *Agrotis exclamationis*, *Euplexia lucipara* and *Rusina tenebrosa*, caught in the order named. Some of these became old friends. Night after night the same individuals were to be observed imbibing on the same tree until in the course of time fate overtook them; they paid the penalty of over indulgence and the patch of treacle knew them no more. Two toads evidently understood the connection between treacle, moths, and the satisfying of their appetites. They had placed themselves at the base of an elm tree and awaited patiently for what the gods sent them in the shape of inebriated moths. One toad had emulated the tree-climbing propensities of its cousin the climber and by dint of great exertion managed to climb three feet up the trunk of the tree to get at its prey.

A remarkably interesting flashlight photograph of moths at treacle was taken in September by Mr. W. J. Holman and is reproduced on the opposite page. There are seven moths, all of the same species (*Noctua xanthographa*), shewn feeding on the treacle placed on the trunk of a large oak tree. At the moment the magnesium was flashed there were over fifty of these moths and of *Cosmia diffinis* on the tree. Great efforts were made to induce a very large *Catocala nupta*, which was on the treacle at the time, to come into the field of operations, but in spite of all blandishments and gentle tickling the red underwing could not be persuaded, and finally shewed his objection to this treatment by soaring into the shades of the night. The photograph shews how well the moths approximate in colour and conformation to their surroundings. A few minutes after the flash the moths had returned to the treacle and were feeding as busily as before.

A specially constructed light trap was also used on all favourable nights in the summer, but this met with scarcely any success. It was usually placed in the open glades in the Queen's Cottage grounds. On one occasion it was put by the side of the lake under an oak tree, and in the morning considerably over a hundred *Crambus geniculeus* were found inside. This was the only night that it caught any number of moths. A strong light was on many occasions hung from the trees at an altitude of about twenty feet—this also was not a success.

Mr. R. South, F.E.S., who compiled the first list of Lepidoptera which appeared in the *Kew Bulletin*, Additional Series, V., issued last year, very kindly went through the list of species captured, along with the insects, and checked the naming. The writer wishes to record the assistance he has received in obtaining the most recent facts and records from the late Mr. C. Barrett's magnificent work "The Lepidoptera of the British Isles," and from Meyrick's



Photo by W. G. Holman, Kew.

Flashlight photograph of moths (*Noctua xanthographa*) at treacle, on an oak tree. Taken at 10.30 p.m., September 1st, 1906.

"Handbook of British Lepidoptera" for information respecting the Microlepidoptera. Mr. Alfred Sich, F.E.S., has also kindly lent his valuable assistance, and with his aid the list will no doubt in time be greatly extended. A word of thanks must be paid to Mr. G. Nicholson, F.L.S., for his indefatigable efforts in collecting. Without his work the list would not have assumed the proportions it has. The officials in the Gardens have also been most obliging in retaining any specimen which they thought might be interesting; their co-operation in the good work is of the greatest importance.

HETEROCERA.

NOTODONTINA.

SPHINGIDAE.

Deilephila elpenor, *L.* "The Large Elephant Hawk-moth."

Larva of this species taken full fed. Also many pupae found under various trees. A fairly common hawk-moth generally distributed over the British Isles and belonging to a genus which is large and nearly cosmopolitan. Larvae feed on *Galium*, *Epilobium*, *Fuchsia*, &c.

Macroglossa stellatarum, *L.* "The Humming-bird Hawk-moth."

A dead specimen was found by Mr. G. Nicholson inside Q.C. A common insect much more plentiful some years than others. The only representative in Britain, where it occurs generally, of a large genus found all over the world. A day flyer, feeding on the wing. Larva feeds on *Galium*.

(A large number of hawk-moths were seen flying during the summer months, but their flight was, of course, too rapid to enable them to be identified. Their favorite haunts were about the large clumps of rhododendron. The larvae of *Smerinthus populi*, *S. ocellatus* and *Dilina tiliae* were found to be plentiful.)

NOTODONTIDAE.

Notodonta camelina, *L.* "The Coxcomb Prominent."

Generally common throughout British Isles; also N. & C. Europe, N. Asia. On oak, beech, hazel, &c.

Tyria jacobaeae, *L.* "The Cinnabar Moth."

Common to British Isles except N. Scotland; Europe generally and W. C. Asia. On *Senecio Jacobaea*, *S. vulgaris*, and *S. alpinus*.

CARADRININA.

LIPARIDAE.

Orgyia. A genus of some extent and general distribution in the northern hemisphere. The moths fly freely in the sunshine.

Orgyia antiqua, *L.* "The Common Vapourer."

Males only seen. The female, which has only rudimentary wings was fortunately not observed. It occurs generally throughout the British Isles, also Europe, Asia Minor, N. Africa, N. America. On rose, hawthorn, hazel and many other plants. It has during the last two or three years been a pest in the London parks, defoliating the plane trees.

TRIFIDAE.

NOCTUIDAE.

This family is very extensive, in fact a dominant one in the temperate regions of the northern hemisphere. In the phylogeny of lepidoptera it takes an extremely high position, melanism also occurring more frequently in species belonging to this family than in any other. There are more than three hundred moths represented in the Noctuidae in Britain alone, and considerably over two thousand in the various portions of the globe.

Acronycta aceris, *L.* "The Sycamore."

Not so common as others of the same genus. To be found resting on the trunks of sycamore and other trees. Generally distributed in England, also Europe and Asia Minor. Larva feeds on sycamore, oak, horse-chestnut, maple and birch.

Acronycta rumicis, *L.* "The Knot Grass."

Common to the British Isles, Europe, C. Asia, N. Africa. Appears in the early summer, the very dark specimens formerly known as var. *A. Salicis* preponderating. On *Polygonum*, *Salix*, *Veronica*, &c.

Leucania, *O.* An extremely large genus common everywhere, especially in New Zealand, and often difficult of identification as between the various species. The larvae all feed on *Gramineae.*

Leucania lithargyrea, *Esp.* "The Clay."

Common all over Britain. On grasses.

Agrotis, *O.* Another very large genus occurring all over the world especially plentiful in the northern hemisphere. The larvae are very indiscriminate in their tastes, often feeding on almost any low plant; they are frequently subterranean in habit and usually emerge by night to feed. Included in this genus are many species which are at times most destructive to vegetation, but happily not of frequent occurrence in the garden.

Agrotis segetum, *Schiff.*

One extremely dark specimen, the imago emerging in January! The larva was taken by W. Dallimore in his garden at the Lion Gate. This is the caterpillar which in some years attacks in its thousands the young turnips, mangold wurzel, carrots, cabbages and most root crops. Dressings of gas lime appear to diminish their number, and it is a caterpillar of which the rooks are very fond. The farmer has cause to bless the rook for his partiality for this particular form of diet.

Agrotis saucia, *Hb.* "The Pearly Underwing."

Taken by Mrs. Hemsley at light. Generally distributed in Britain and N. hemisphere. Some years, for unknown reasons, very scarce. On *Rumex*, *Trifolium*, *Stellaria*.

Agrotis corticea, *Hüb.* "The Heart and Club."

This species appeared in the previous list, and is only mentioned again to record the marked melanic forms captured. While an extremely variable insect, those captured were abnormally dark, in many cases the reniform and orbicular markings being absent.

Agrotis puta, *Hüb.* "The Shuttle-shaped Dart."

A moth fairly well distributed over the South of England but becoming rarer. At one time common near London, but now much scarcer. Also S. Europe and N. Africa. Dark specimens taken in nearly every case, males and females being scarcely distinguishable. On *Polygonum*, *Taraxacum*, *Lactuca*.

Triphaena subsequa, *Hüb.* (*T. orbona*, Hb.) "The Lunar Yellow Underwing."

This rarest insect of the genus was seen at sugar, but a too eager effort failed to box the prize. It is a pleasure, however, to be able to record its occurrence. Very local in Britain, but commoner in other parts of Europe. On grasses, *Primula*, *Ranunculus*, *Stellaria*, *Phalaris*, &c.

Triphaena janthina, *Esp.* "The Lesser Broad-border Yellow Underwing."

Abundant in the gardens, especially Q. C., general in the southern and midland counties; also S. Europe and Asia Minor. On *Arum*, *Atriplex*, *Primula*, *Stellaria*, and low plants.

Triphaena interjecta, *Hüb.* "The Least Yellow Underwing."

The smallest member of the genus. Fairly common in south of England; scarcer towards the north. West Europe only. On *Primula*, *Salix*, *Rumex*.

Noctua triangulum, *Hufn.* "The Double Square Spot."

Taken freely in most English counties, Europe, and N. America. In the autumn the larva feeds on dock, chickweed, wood spurge; in the spring the same and bramble, sloe, hawthorn, sallow, &c.

Noctua rubi, *View.* "The Small Square Spot."

A double-brooded species, the moth appearing in May and August. Very plentiful in Q.C. Common in Britain, Europe, and N. America. On low-growing plants generally.

Noctua neglecta, *Hüb.* (*castanea*, Staud.). "The Gray Rustic."

Widely distributed but not common. Scarce in Surrey. The one specimen taken was captured by W. G. Holman and was of the rich red recurrent form. Generally found on heaths. Also W. Europe and Italy. On *Calluna*, &c.

Charoeas graminis, *Liv.* "The Antler."

The only representative of the genus in Britain. Common and widely distributed over the northern hemisphere. At times appearing in amazing profusion. In 1881 Lancashire and Yorkshire were visited by countless thousands, and Wales in 1884, the caterpillars devastating the land over which they passed. Visitations of this lepidopterous pest are most destructive to grass lands, and the damage caused on the Continent is sometimes severe. The winter is passed in the egg state; the larva is principally a grass feeder on the harder aud smoother species.

Xylophasia hepatica, *Hüb.* "The Clouded Brindle."

Common to English counties, C. Europe, and N. Asia. A grass feeder.

Hadena, *Schrk.* A genus of considerable extent distributed over both hemispheres but not touching New Zealand.

Hadena chenopodii, *Fab.* (*trifolii*, Staud.). "The Nutmeg."

Rather a local species, but apparently abundant at Kew. Generally found in waste places and on the coast where *Chenopodium* is plentiful. Commoner in Scotland than England, but not Ireland. Cosmopolitan. The moth feeds at *Knautia arvensis* or *Centaurea* in the daytime, and the larva on *Chenopodium album*, *C. Vulvaria*, *C. Bonus—Henricus*, *C. botryoides*, and *Atriplex patula*. Double-brooded.

Dianthoecia cucubali, *Fuesl.* "The Campion."

Found throughout the British Isles and right across Europe and Asia to Japan. Double-brooded. In seed capsules of *Silene* and *Lychnis*.

Dianthoecia capsincola, *Hüb.* "The Lychnis."

Common over the British Isles and generally distributed throughout the northern hemisphere, especially in mountainous regions. On seeds of *Silene*, *Lychnis*, and *Dianthus*. Double-brooded.

Cerige cytherea, *Fab.* (*matura*, Hufn.). "The Straw Underwing."

The only representative of the genus. Plentiful in Q.C., and all taken being extremely dark. A common European moth. On grasses—*Poa*, *Nardus*, &c.

Apamea basilinea, *Fab.* "The Rustic Shoulder-knot."

A very common moth all over the United Kingdom and the temperate regions of the globe. On wheat grains, grasses, *Taraxacum*, &c.

Apamea ophiogramma, *Esp.* "The Double-lobed."

A local species, found only in England and a few localities in Ireland. Some years ago it was plentiful in the suburbs of London, but is now much scarcer. Several specimens were taken near the lake. It has a wide habitat in Europe and C. Asia, but is nowhere common. The larva feeds in the autumn on *Phalaris*

arundinacea, living in the central stem and eating out the young growing shoot. It hybernates in the ground in the winter, feeding again in the spring on the same food plant.

Apamea unanimis, *Tr.* "The Small Clouded Brindle."

A rather scarce insect and uncertain in its appearance. Found locally in the southern and northern counties and fen districts; C. Europe to the Urals. On *Phalaris arundinacea*, *Triticum repens*, *Deschampsia flexuosa*, and other grasses. Those taken were abnormally dark, the marbling being just apparent.

Miana strigilis, *Cl.* "The Marbled Minor."

A species subject to great variety in marking. Melanism most marked in all the specimens taken, some being quite black without shewing any appearance of the marbling. The black variety (*aethiops*) seems to be the typical form in the Gardens. Common throughout Britain, Europe, Asia Minor, and Vancouver Island. On grasses.

Miana literosa, *Haw.* "The Rosy Minor."

Local, but widely distributed in Britain, Europe, and C. Asia. In the stems of *Carex glauca*, *Dactylis glomerata*, *Iris foetidissima*, *Elymus arenarius*.

Miana furuncula, *Hüb.* "The Cloaked Minor."

Common all over Britain, Europe, and Asia Minor and N.-W. Asia. The var. *bicoloria*, Vill., was also taken. In the stem of *Festuca arundinacea*, *Deschampsia caespitosa*, *Arrhenatherum avenaceum*, and coarse grasses generally.

Miana fasciuncula, *Haw.* "The Middle Barred Minor."

Common to Britain, C. and S. Europe. On the leaves and stems of grasses.

Mania maura, *L.* "The Old Lady."

The only representative of the genus. A large sombre-coloured species with a peculiar flapping flight. Common to Britain and C. Europe. On *Salix*, *Rubus*, *Primula*, dock, lettuce, cabbage, and other low-growing plants.

Amphipyra tragopogonis, *L.* "The Mouse."

Common to Britain and northern hemisphere. On *Plantago*, *Aquilegia*, *Artemisia*, *Serratula* and herbaceous plants generally.

Amphipyra pyramidea, *L.* "The Copper Underwing."

Fairly distributed in woods in the southern and midland counties of England; extensive range over Europe and Asia. Very plentiful in Q.C. On oak, sallow, poplar, birch, elm, plum, rose and other shrubs.

Caradrina, *O.* A large genus of almost universal distribution, but absent from New Zealand.

Caradrina morpheus, *Hafn.* "The Mottled Rustic."

Common in England, C. and N. Europe. Those taken were all extremely dark. On *Sedum*, *Salix*, *Rubus*, etc.

Caradrina ambigua, *Fab.*

A recently introduced species and extremely rare. It has at intervals been taken in the Isle of Wight, Kent, Dorset, Devon, and Cornwall. From having been captured in the gardens its habitat would appear to be spreading. It is found also in C. and S. Europe and Spain. Barrett gives the food plants as lettuce, chickweed, dandelion, plantain and other low-growing plants.

Caradrina alsines, *Brh.* "The Uncertain."

Common to British Isles, N. and C. Europe, Asia Minor and N. Asia. On *Stellaria, Rumex, Viola.*

Calymnia affinis, *L.* "The Lesser Spotted Pinion."

Fairly common in England as far as the Humber, C. Europe and Japan. On *Ulmus campestris.*

Orthosia, *O.* A large genus found all over the world, the imagines generally appearing in the autumn, their coloring being well adapted for hiding among the falling leaves.

Orthosia ferruginea, *Schiff* (*circellaris*, Staud.). "The Brick."

Common throughout United Kingdom, Europe and N. America. On seeds and buds of wych elm, poplar, ash, and *Salix.*

Orthosia pistacina, *Schiff.* "The Beaded Chestnut."

An extremely variable species, imagines of all shades were captured, especially the extremely dark variety. Abundant in England and Ireland, scarce in Scotland ; also S. Europe and Asia Minor. On *Carex, Ranunculus bulbosus, R. acris, R. repens* and chickweed, clover and other low-growing plants.

Orthosia lota, *Cl.* "The Red Line Quaker."

Distributed throughout British Isles, Europe and Asia. On *Salix fragilis.*

Orthosia lunosa, *Haw.* "The Lunar Underwing."

Common in England and Ireland, scarcer in Scotland ; also France and Spain only. On *Poa annua* and other grasses.

Xanthia cerago, *Schiff* (*fulvago*, Staud.). "The Lemon Sallow."

Generally distributed through British Isles, with a wide range throughout Europe, Tartary, and the mountainous districts of C. Asia. Larva when young feeds inside the catkins of *Salix Caprea*, later upon the leaves.

Cerastis spadicea, *Esp.* "The Dark Chestnut."

Common to England only and C. Europe. On *Lonicera* and hawthorn.

Xylocampa lithoriza, *Bark.* (*Areola*, Staud.) "The Early Grey."

One of the earliest moths of the year, being on the wing in March. Not one of the commonest species. Generally distributed throughout British Isles, W. Europe and Asia Minor. Imago feeds on the wing at the sallow blooms ; larva on *Lonicera.*

Plusia moneta, *Fab.* "The Golden Ear Moth."

A recent importation to England, it having been unobserved before 1890. It is a singularly handsome moth, the markings being delicate and metallic. One specimen was taken on the wing at the Lion Gate by W. Dallimore. It seems confined to gardens, and has been taken as far north as Leicester and Norfolk, and from recorded captures seems to be establishing itself in this country. It has also a wide range in C. Europe and N. Asia. The larva feeds on *Aconitum Napellus*, *A. Lycoctonum*, and various species of *Delphinium* and *Trollius europaeus*, feeding on the blossom as well as the leaves.

Habrostola triplasia, *L.* "The Dark Spectacles."

Fairly common throughout British Isles, being especially abundant in Ireland. Also Europe, W. C. Asia, N. Persia and N. Africa. On Nettle, *Humulus* and *Lamium*.

Gonoptera libatrix, *L.* "The Herald."

Common to Britain and Ireland, also Europe, Asia to Turkestan and N. America. The moth is fond of hiding in out-houses. On *Salix* and hawthorn.

Rusina tenebrosa, *Bdv.* "The Brown Feathered Rustic."

Abundant throughout B. Isles, W. and C. Europe. On *Viola*, *Rumex* and *Polygonum*.

Luperina testacea, *Hüb.* (*guenei*, Dbld.) "The Flounced Rustic."

Common generally in B. Isles (not W. Scotland), and C. Europe. Subject to extreme variations in the Gardens, the melanic form prevailing. On roots and lower stems of grasses.

GEOMETRIDAE.

This is another extensive group which is commoner in the old world than the new, and is also found in Australia but not New Zealand. The peculiar mode of progression assumed by the larvae when walking, consisting of a series of loops, owing to the middle legs being absent, has given the group the name as above. They are therefore generally easily identified when found. This does not apply to the imagines. In many cases, as in that of the genus of small moths termed the *Eupithecia*, identification is often most difficult. In a great number of instances the color of the moths is a clear green, which is comparatively rare in the *Heterocera*, but is here so constant as to be almost of systematic value. As will be seen the *Geometridae* is extremely well represented in the Gardens, and no doubt further additions will be made to this important and highly interesting group.

Boarmidae.

Cabera pusaria, *L.* (*rotundaria*, Haw.) "The Common White Wave."

A very common geometer abounding throughout British Isles, N. Europe and N. Asia. On hazel, birch, &c.

Cabera exanthemaria, *Sc.* "The Dingy White Wave."

Common to British Isles, with a wide range across Europe and Asia. On sallow, alder, birch and other deciduous trees.

Aspilates citraria, *Hüb.* (*ochrearia*, Staud.) "The Yellow Belle."

An interesting capture, the moth probably never having been recorded in Surrey previously. It was taken by Mr. G. Nicholson on the wing in the sunshine. It obtains locally in the S. and S.W. counties, S. Wales; also S. Europe, Asia Minor and N. Africa. On *Crepis taraxifolia*, *Daucus Carota*, *Plantago Coronopus* and various low plants.

Selenia illunaria, *Hüb.* (*bilunaria*, Esp.). "The Early Thorn."

Found throughout the British Isles, Europe and Asia. On blackthorn, hawthorn, dogwood, bramble, honeysuckle, &c.

Hybernia progemmaria, *Hüb.* (*marginaria*, Bkh.). "The Dotted Border."

Taken by Mr. G. Nicholson, March, 1907. The wings of the female have the appearance of being aborted, the hind wings being longer than the forewings. One of our earliest geometers. Generally occurring throughout Gt. Britain and Ireland and C. Europe. On hornbeam, whitethorn, blackthorn, hazel, oak and many other trees.

Hybernia rupicapraria, *Schiff.* "The Early Moth."

Two of the curious short-winged little females taken in March, both extremely dark. British Isles generally, C. Europe and Asia Minor. On hawthorn and blackthorn.

Biston prodromaria, *Schiff* (*stratarius*, Hüb). "The Oak Beauty."

Never very abundant, but occurring generally in England and C. Europe. A very dark one taken by H. M. Simmons on April 1st at rest on the trunk of an oak tree. On birch, oak, elm, lime, maple, blackthorn, &c.

Biston betularia, *L.* "The Peppered Moth."

Several larvae taken by W. Dallimore feeding on elm. The imago is never plentiful but occurs generally throughout the British Isles, with an extensive range in Europe, Siberia, and C. Asia. On birch, oak, sallow and many other trees.

Boarmia rhomboidaria, *Hüb.* (*gemmaria*, Brh.; *perfumaria*, Newm.). "The Willow Beauty."

British Isles generally, very common in the southern English counties. Also all over Europe, mountainous regions of C. Asia and Japan. Subject to great variation, those taken in the gardens were of the pronounced melanic variety, sometimes referred to as var. *perfumaria*. On privet, ivy, elder, lilac, hawthorn, rose, honeysuckle, clematis, jasmine, laurel, snowberry, vine, broom, and many other plants.

Anisopteryx aescularia, *Schiff.* "The March Moth."

Both the male and completely apterous female taken. The female moth strews hairs from the anal tuft over her eggs which are laid with almost geometrical precision. Common throughout England, Wales and Ireland, scarcer in Scotland; also C. Europe. On oak, beech, hornbeam, ash, &c.

Lomaspilis marginata, *L.* "The Clouded Border."

Extremely plentiful in Q.C. grounds and very variable in its markings. Common to British Isles and the temperate regions of the northern hemisphere. On *Salix Caprea.*

ACIDALIIDAE.

Acidalia scutulata, *Schiff.* (*dimidiata*, Hufn.). "The Single Dotted Wave."

Common throughout British Isles (unfrequent in Scotland); also C. Europe, Madeira, W.C. Asia and W. Persia. On *Galium*, *Pimpinella*, *Anthriscus.*

Acidalia visetata, *Hufn.* "The Small Fan-footed Wave."

Common to British Isles, C. Europe, W. and N. Asia. On *Taraxacum* and *Cardamine.*

Acidalia dilutaria, *Hub.* (*interjectaria*, Bdv.; *osseata*, Stn.) "The Dark Cream Wave."

Local in S. of England only to York. Also C. Europe, Corsica and N. Asia. On *Taraxacum* and *Anagallis.*

Acidalia remutaria, *Hüb.* "The Cream Wave."

Common to British Isles and N. and C. Europe, On *Galium*, *Asperula*, birch, sallow, knotgrass and dock.

Acidalia straminata, *Tr.* (*marginepunctata*, Stn.) "The Dotted-border Cream Wave."

Generally distributed in the home counties; a rare local variety occurring in Lancashire and Cheshire known as *A. circellata*; also C. Europe, Finland, Dalmatia, and W.C. Asia to Turkestan. The wild food plant is not known. In captivity the larva will feed on bramble and knot-grass.

Acidalia aversata, *L.* "The Ribbon Wave."

Extreme variation characterized those taken, from the light form without the postmedian band to a dark variety with a very dark ribbon and the discal dot apparently absent. Extremely plentiful in Q.C. Abundant where it occurs in England, local in Scotland, scarce in Ireland; also Europe and Asia Minor. On *Cerastium*, *Galium*, *Ononis*, *Rumex*, *Lysimachia*, *Geum*, *Myosotis* and many other plants.

Acidalia virgularia, *Stn.* (*incanaria*, Hüb). "The Small Dusty Wave."

Very common in England, scarcer in Scotland, questionable in Ireland: also C. Europe, Asia Minor, Morocco and Algeria. On dandelion, knotgrass and withered leaves.

Bradyepetes amataria, *L.* (*amata*, L.). "The Blood Vein."

One specimen of this beautiful moth taken by Mr. Nicholson. Common in England and S. Ireland, local in Aberdeenshire. Throughout temperate zone of the N. hemisphere to Japan. On dock, chickweed, sorrel, and low-growing plants.

GEOMETRIDAE.

Pseudoterpna cytisaria, *Schiff.* (*pruniata*, Hufn.). "The Grass Emerald."

Generally found on heaths and open woodlands where its food plants abound. One captured in Q.C. grounds by J. B. Nicholson. General in the S. of England, Midlands, Ireland (common), and scarce in Scotland; also C. and S.E. Europe. On *Cytisus*, *Ulex*, *Genista*.

Iodis vernaria, *L.* "The Small Emerald."

Abundant in the S. and E. counties of England; throughout Europe and N. Asia. On *Clematis Vitalba*.

Iodis lactearia, *L.* "The Little Emerald."

Common throughout British Isles and temperate regions of northern hemisphere. When freshly emerged the moth has a beautiful greenish-blue metallic appearance. On birch, oak, &c.

LARENTIDAE.

Melanthia ocellata, *L.* "The Purple-bar Carpet."

Found generally throughout British Isles, Europe, and W. Asia On *Galium verum*, *G. Mollugo*, and other species of bedstraw.

Melanthia albicillata, *L.* "The Beautiful Carpet."

Plentiful in Q.C. grounds. Those caught had the ground colour in the forewings silky-white and the basal blotch blue-black. In England and Ireland generally, S. Scotland, Europe, Tartary, C. Asia, and Japan. On raspberry, bramble, and wild strawberry.

Melanthia rubiginata, *Fb.* (*bicolorata*, Hufn.). "The Blue-bordered Carpet."

This pretty little moth was found to be abundant all over the Gardens. Throughout British Isles, Europe, and Asia to Japan. On alder, blackthorn, &c.

Coremia fluctuata, *L.* "The Garden Carpet."

One of our commonest geometers. British Isles, Europe, C. Asia, N. Africa, and N. America. On *Brassica*, *Raphanus*, hedge garlic, and other cruciferous plants.

Coremia propugnata, *Schiff.* (*designata*, Rott.). "The Flame Carpet."

Common to British Isles and N. and C. Europe, N. Asia, N. America, to Arctic circle. On *Cruciferae*.

Emmelesia. An interesting genus, principally found in temperate regions of both hemispheres. The larvae feed mainly on seeds within the capsules of herbaceous plants.

Emmelesia decolorata, *Hüb.* "The Sandy Carpet."

A local species fairly plentiful in suitable spots, rare in Scotland and Ireland. Found throughout Europe, C. Asia, and N. Africa. On *Lychnis alba* and *L. diurna.* The late Mr. C. Barrett says it feeds within the calyx upon the stamens of the male flower, or piercing the capsule and devouring the unripe seeds in the case of the female flower. As it grows it hides in the partially emptied capsule. When young it eats out the contents of the unopened flower-bud.

Cidaria russata, *Schiff.* (*truncata*, Hufn.). "The Marbled Carpet."

An extremely variable species. Those obtained in the Garden were of pronounced melanic form with the dark copper colour patch in the central portion of the forewings and which have at various times been termed var. *saturata* and var. *perfuscata.* The number of intermediate forms, however, render these names useless. It is found generally throughout the British Isles and widely distributed through N. and C. Europe, Asia to Japan, and N. America from Labrador to California. On *Fragaria*, *Polygonum*, *Geranium*, sallow, birch, elm, &c.

Cidaria dotata, *L.* (*associata*, Bkh.). "The Spinach."

This species appears to be confined to gardens and their immediate neighbourhood. Not plentiful, but generally occurring throughout England; also C. Europe, Finland, and C. Asia. On *Ribes rubrum* and *R. nigrum.*

Pelurga comitata, *L.* "The Dark Spinach."

Sparsely distributed in British Isles; also C. and N. Europe, E. Siberia, and C. Asia. On *Atriplex* and *Chenopodium.*

Scotosia rhamnata, *Schiff.* "The Dark Umber."

A local insect usually found in chalk districts, occurring in the southern and midland counties; also C. Europe, Asia Minor, and Japan. On *Rhamnus cathartica.*

Phibalapteryx lignata, *Hb.* (*vittata*, Bkh.). "The Oblique Carpet."

A rather local insect generally distributed throughout British Isles and N. and C. Europe. On *Galium saxatile*, *G. palustre*, and other bedstraws.

Thera variata, *Schiff.* (*obeliscata*, Hüb.). "The Shaded Broad Bar."

Extremely plentiful wherever fir trees exist. Abundant in the British Isles and temperate zones of N. hemisphere to Corea and Japan. On *Pinus sylvestris* and *Abies pectinata.*

Ypsipetes elutata, *Hüb.* (*sorditata*, F.). "The July Highflyer."

Very common throughout British Isles, N. and C. Europe, N. Asia, Japan and N. America. On *Salix*, hawthorn, &c.

Cheimatobia brumata, *L.* "The Winter Moth."

Female semi-apterous. Abundant in British Isles and N. and C. Europe. At times a great pest to the orchards, the larva

attacking the buds and later stripping the trees of leaves. Gardeners find a layer of cart grease applied to the tree-trunks effective in stopping the female, which is unable to fly, from ascending the trees. It feeds on most deciduous trees.

Oporabia dilutata, *Bkh.* (*autumnaria*, Gn.) "The November Moth."

General (often in great abundance) throughout the British Isles, N. and C. Europe, W. and N. Asia and N. America. On oak, birch, blackthorn, &c.

Chesias spartiata, *Fab.* "The Streak."

Common to British Isles and W. C. Europe. On *Cytisus scoparius*, the dried open seed pods of which the imago curiously resembles. Only extremely black specimens observed. Taken by Mr. Dallimore.

Eupithecia, Curt.—A large genus of small moths, the larvae of which usually feed on flowers, seed vessels, or seeds. The moths are practically cosmopolitan, and the large number and great similarity of those found in these islands often render their determination somewhat difficult. They are vulgarly known as "pugs."

Eupithecia centaureata, *F.* (*oblongata*, Thb.). "The Lime-speck Pug."

A very common species in the South of England and Ireland, scarcer in Scotland; also Europe and W. Asia, and common on the rock of Gibraltar. On flowers and seeds of many *Umbelliferae*, *Compositae*, &c.

Eupithecia succenturiata, *L.* "The Bordered Lime-speck Pug."

Habitat much the same as *E. centaureata.* The larvae feed on the upper surface of leaves of *Artemisia vulgaris* and occasionally on *A. maritima* and *Achillea.*

Eupithecia vulgata, *Haw.* "The Common Pug."

The commonest member of the genus being abundant throughout Great Britain and C. and S. Europe. On *Rubus*, *Senecio*, and many low-growing plants.

Eupithecia minutata, *Hub.* "The Wormwood Pug."

Fairly distributed throughout British Isles, and abroad in Holland and Germany only. On flowers of *Erica*, *Calluna* and *Scabiosa.*

Eupithecia punilata, *Hb.*

A common little moth flying about the furze bushes in the hot sunshine of July and August, and found in most of our English counties, also Scotland and Ireland. On flowers of *Ulex*, *Cytisus*, *Erica*, &c.

Eupithecia scabiosata, *Bkh.* (*subumbrata*, Gn.). "The Shaded Pug."

A local insect found in the South of England, N. and W. Ireland and C. Europe and W. C. Asia. On flowers of *Scabiosa*, *Centaurea*, *Gentiana*, &c.

Eupithecia assimilata, *Gn.* "The Currant Pug."

Common to England and S. Scotland. On *Ribes* and *Humulus.*

Eupithecia sobrinata, *Hb.* "The Juniper Pug."

Common to British Isles, N. and C. Europe. On *Juniperus.*

PYRALIDINA.

This is another large group of insects, the moths of which are remarkable for their delicate build and long spiny legs. The genera are much broken up geographically, some appearing only in S. America, others apparently confined to Australia, and many not occurring in Europe at all.

PYRAUSTIDAE.

An extremely large family; to be found all over the world, principally in the tropics.

Pyrausta ostrinalis, *Hüb.* (*purpuralis*, L.).

Common to British Isles, Europe, and Asia Minor. On *Mentha arvensis, Thymus vulgare, T. Serpyllum, Calamintha Acinos.*

Botys ferrugalis, *Hb.*

One dark specimen taken in October by Mrs. Hemsley. Uncertain in its appearance; possibly some years an immigrant in large numbers. Found generally throughout the British Isles and all over the globe with the exception of Australasia. On *Stachys, Eupatorium, Fragaria.*

Pionea stramentalis, *Hüb.* (*straminalis*, Hüb.). "The Chequered Straw."

Three specimens captured near the lake. A local species found only in damp woods in the southern portion of England; also C. Europe and N. America. On *Cardamine, Barbarea, Brassica* and other cruciferae.

Pionea prunalis, *Schiff.*

A moth common throughout the British Isles; C. Europe. On *Urtica, Teucrium, Stachys,* &c.

Spilodes verticalis, *Schiff.* (*ruralis*, Sc.). "The Pearl Moth."

Extremely abundant all over the Gardens wherever the nettle abounds. Also plentiful in England, scarce in Scotland and Ireland and generally throughout Europe and Asia to Japan. On the spun leaves of the stinging nettle.

Nomophila noctuella, *Schiff.* (*hybridalis*, Hüb.). "The Rush Veneer."

The only member of the genus which is found generally distributed throughout the British Isles and all over the world. On clover, grass, knotgrass, &c.

Pyralidae.

Pyralis glaucinalis, *L.* "The Double Striped."

Found locally in England as far north as Yorkshire, also temperate and sub-tropical portions of the northern hemisphere. On decayed leaves on inside twigs of birch, dead raspberry leaves, and decayed thatch.

Aglossa pinguinalis, *L.* "The Tabby."

Abundant in the British Isles, except the islands on the West Coast of Scotland, also Europe, and Asia to China, and S. Africa. Generally found in stables and outhouses. Mr. W. Buckler took great trouble to discover the actual food plants, and found that the larva confined itself to corn débris, ground corn, waste grass seeds, and dried vegetable refuse.

Aethia tarsipennalis, *Tr.*

Common in England, S. Scotland, W. Ireland, C. Europe, and N. Asia. On *Salix*, *Rubus*, *Polygonum*, &c.

Aethia grisealis, *Hüb.*

Extremely plentiful in Q.C. Common in England, N. and E. Ireland, C. Europe, and N. Asia. On *Quercus*, *Sisymbrium.*

Hypena rostralis, *L.* "The Buttoned Snout."

Locally distributed through England and Scotland, N. and C. Europe, and N. and W. Asia. On *Humulus.*

Hyphena proboscidalis, *L.* "The Snout."

Common to British Isles and temperate portions of the northern hemisphere. Extremely abundant by the lake and in Q.C. On *Urticae.*

Hydrocampidae.

Of all the *Lepidoptera* this family is perhaps the most extraordinary so far as their methods of life are concerned. The moths fly and enjoy the air as much as any others, and cannot be distinguished from those whose caterpillars live on dry land. Their breathing apparatus is like that of other moths, and they have the habits of the other night moths. But the larvae live in the water and respire in two manners. In some species of the family the larvae live in the water surrounded by a globule of air, and others positively have gills, and are surrounded and bathed by water. This is a most extraordinary fact, for the imagines which are produced by metamorphosis from these larvae resemble each other to a great extent, and it tends to show how slight the distinction may be between aquatic and air-breathing animals, and how nearly the origin of the separate conditions may be allied. The larva first mines leaves ; the pupa is generally found in a cocoon amongst leaves under water. Principally a European family.

Cataclysta lemnalis, *Schiff.* (*lemnata*, L.).

Generally distributed over England and Ireland, scarce in Scotland ; also C. and S. Europe. Larva in portable oval case of leaf fragments of *Lemna* and *Hydrocharis Morsus-ranae.*

Hydrocampa nymphaelis, *Schiff.* (*nymphaeata*, L.). "The Brown China Mark."

Common throughout British Isles, Europe and Asia Minor. Larva lives in a case composed of portions of its food plants, and floating at or near the surface of the water. On *Potamogeton*, *Sparganium*, *Myosotis palustris*, *Hydrocharis*, *Alisma*, *Nymphaea*, and other aquatic plants.

Hydrocampa stagnalis, *Gn.* (*stagnata*, Don.).

Much scarcer than the previous species. Local throughout England, Ireland and parts of Scotland; also S. Europe and Asia Minor, Siberia and Tartary. On *Sparganium*, *Nuphar* and *Nymphaea*.

Hydrocampa stratiotata, *L.* "The Ringed China Mark."

Common to England and Ireland, not Scotland; also C. Europe. The larva feeds in a web amongst leaves of *Potamogeton*, *Elodea*, *Ceratophyllum*, &c., and continually undulates the body rapidly for about twenty seconds at intervals of one to three minutes, a movement connected with respiration. (Meyrick.)

ENDOTRICHIDAE.

Endotricha flammealis, *Schiff.* "The Rosy Flounced."

Local in South of England; also Finland, C. and S. Europe and Asia Minor and N. Africa. The only member of the genus to reach Europe. On fallen leaves of hazel, *Salix*, *Lotus*, &c.

SCOPARIIDAE.

Scoparia, *Haw.* A large genus mostly found in temperate regions and mountains of sub-tropical countries. The larvae usually feed on lichens and moss, forming galleries, although one species (*S. cembrae*) is known to feed on roots. Obscurely marked and difficult to distinguish.

Scoparia ambigualis, *Tr.* (*basistrigalis*, Kngs., *atomalis*, Dbdd.).

In woods in the S. and Mid. counties, also Yorkshire, Northumberland and Cumberland; C. and S. Europe, Asia Minor. On mosses growing on trees.

Scoparia mercurella, *L.* (*frequentella*, Stn.).

Common in suburbs of London and British Isles, also C. and S. Europe and N. Africa. On *Hypnum cupressiforme*, and other mosses.

Scoparia cembrae, *Hw.* (*Zelleri*, Kngs.).

British Isles generally and C. Europe. Larvae feed in a slight web on fleshy roots of *Picris hieracioides* and *Tussilago Farfara*.

PTEROPHORIDAE.

A family of curious moths. The wings are in most cases cleft, the hind wings closely folded, the bodies long and thin, and the legs unusually long and spiny. They are universally distributed,

and owing to their feathery wings are commonly known as "plume" moths. Most of the species fly at sunset, and the "white plume" (*Pterophorus pentadactylus*) must be familiar to all who take a walk in the country lanes in the cool of the summer evening. One species, *Orneodes polydactyla*, has the wings cleft into twenty-four "plumes," but this is only a "plume" in the popular sense.

Pterophorous monodactylus, *L.* (*pterodactylus*, Stn.).

Common to British Isles, also temperate portions of N. Hemisphere. On *Calystegia sepium*, *Convolvulus arvensis*. This species hibernates, and was taken at sugar in the late autumn and at ivy blossom.

Gillmeria pallidactyla, *Haw.* (*bertrami*, Rsl.).

This species has been taken, but is not common in the Gardens. The larva feeds in the shoots of *Achillea Millefolium*.

Crambidae.

A large family found principally in the temperate regions. In all the species the palpi are more or less elongated and this is characteristic of the family. The larvae usually feed in silken galleries on grasses or mosses and the imagines may sometimes be disturbed at every step when passing through fields of tall grass.

Crambus, *F.* A very large genus found all over the world, except in Australia. Seven species have so far been found in the garden.

Crambus pinellus, *L.* (*pinetellus*, L.). "The Pearl Veneer."

Two specimens of this extremely beautiful moth were taken. It occurs generally throughout the British Isles, N. and C. Europe and Asia Minor. Larva feeds among stems of grasses, *Aira*, *Eriophorum*, &c.

Crambus hortuellus, *Hüb.* "The Garden Veneer."

A very common moth found all over the British Isles, Europe, Asia, and N. America. Among stem-bases of grasses.

Crambus tristellus, *F.* "The Common Veneer."

A very common "veneer," occurring throughout British Isles, Europe, Asia Minor, and N. Asia. In silken galleries among stems of *Deschampsia flexuosa*, &c.

Chilo phragmitellus, *Hüb.*

One specimen taken by the lake. At one time it was taken freely in the Hammersmith marshes, but has long since disappeared so that it is interesting to find it still occurring in the district. Its home, however, is in the eastern counties especially in the fen district; it is also found locally in the north of England; C. and S.W. Europe, Russia, Sweden, and W. Asia to Turkestan. On *Phragmites* and *Glyceria*, in the internal lower portions of the stems. The larva often feeds below the water.

Schoenobius forficellus, *Thnb.* "The Pale Hook-tip Veneer."

Fairly common in the southern and midland counties of England, local in S. of Ireland; also C. Europe, W. Asia, N. America. In stems of *Carices*, *Phragmites communis*, *Glyceria aquatica*.

TORTRICINA.

A group of insects containing at least 350 species in the British Isles. The families and genera are closely allied and the determination of these small moths is not always an easy matter. The characteristic of the group is the costal fold, a portion of the costal margin being extended, dilated and folded back in the same way that the lapels of a coat are folded. The larvae have sixteen feet and can move quickly forwards or backwards with equal facility. The group occurs principally in the temperate portions of the globe.

TORTRICIDAE.

Tortrix podana, *Scop.* (*pyrastrana*, Hüb.). "The Great Hook-tip Tortrix."

Generally occurring throughout England, Ireland and W. Scotland, and right across the temperate zone of Europe and Asia to Japan. On hawthorn, blackthorn, oak, rose, conifers and flowers of *Azalea*. A very dark form generally found near large towns was also taken.

Tortrix costana, *Fab.* (*spectrana* Gn., *latiorana*, Wilk.). "The Straw Oblique Tortrix."

Found in England and Scotland; local in Ireland. It occurs as a rule in marshy places and fens, the specimens obtained being taken while flying over the Ha-ha. Also C. Europe and S. Russia. The moth is double-brooded and the larva feeds on the top of *Spiraea Ulmaria*, *Epilobium hirsutum*, *Potentilla palustris*, sea-lavender, sea-wormwood and most of the herbaceous plants growing in wet places.

Tortrix rosana, *L.* (*laevigana*, Gn.). "The Rose Tortrix."

Extremely plentiful in all portions of the gardens, always variable, the dark form predominating. Found throughout British Isles, Europe, Asia Minor and N. America. On deciduous trees and bushes.

Pandemis heparana, *Schiff.* "The Dark Oblique-bar Tortrix."

Throughout England, S. Scotland, local in Ireland; also temperate regions of Europe and Asia to Japan. On sallow, dewberry, birch, oak, beech, and many other trees and shrubs.

Pandemis dumetana, *Tr.* "The Thicket Tortrix."

This is an extremely local insect and hitherto has apparently been confined to Cambridgeshire, Hants, Sussex, and Kent. This would appear, therefore, to be the first record of its capture in Surrey. One specimen was taken in Q.C. grounds. It is generally found on the chalk and occurs throughout the temperate portions

of the eastern hemisphere and N. India. On *Symphytum*, *Lysimachia*, *Knautia arvensis*, *Centaurea Scabiosa*, *C. nigra*, *Malva sylvestris*, *Scrophularia aquatica*, *Mentha aquatica*, &c.

Lozotaenia unifasciana, *Dup.*

Common to S. and midland counties of England, S. Scotland, and Ireland; S. & W. Europe, Asia Minor, and N. Africa. Food plant not actually known, but believed to be *Ligustrum vulgare.*

Heterognomon forsterana, *Fab.* (*adjunctana* Tr., Gn.). "The Forsterian Tortrix."

One of the largest of the *Tortricidae.* Local in British Isles; generally throughout Scandinavia and N. Europe. On *Vaccinium*, *Sedum*, ivy and oak.

Dictyopteryx loeflingiana, *L.* "The Loeflingian Tortrix."

Very abundant in the gardens, and common in oak woods of the south of England. Local in Scotland and Ireland; also C. and S. Europe and Asia Minor. On oak, hornbeam, and maple, rolling the leaves.

Dictyopteryx bergmanniana, *L.* "The Bergmannian Tortrix."

Plentiful in the gardens. Common throughout British Isles. On rose; when young folding the leaves in the middle and living in them, later, in the shoots, drawing the leaves together.

Dictyopteryx holmiana, *L.* "The Holmian Tortrix."

Generally distributed in England, local in Scotland and Ireland; also Europe generally (not Russia) and Asia Minor. On hawthorn, blackthorn, pear, plum, and rose, drawing the leaves together.

Dictyopteryx forskaleana, *L.* "The Forskalian Tortrix."

Moderately common in the S., E. and W. counties of England, C. Europe, Scandinavia, Italy, and Greece. On maple and sycamore in rolled leaves.

Batodes angustiorana, *Haw.* "The Red-bar Tortrix."

Common in Q.C. grounds. Locally distributed throughout British Isles, commoner in the southern English counties. Also Europe (not Russia), Asia Minor and N. Africa. On privet, yew larch, apricot, oak, and herbaceous plants.

Peronea comparana, *Hüb.* Three specimens taken at rest on poplar in Q.C. Generally in England, S. Scotland, and Ireland; also C. Europe. On *Salix*, *Rubus*, *Potentilla palustris*, *Vaccinium Myrtillus*, and blackthorn.

Peronea variegana, *Schiff.* (*abildgaardana*, *Fröl.*). "The Rough Wing Tortrix."

Common all over the gardens but extremely variable. Generally throughout British Isles, Europe, and Asia Minor. On hawthorn, rose, bramble, apple, sloe, cherry, hazel, and elm.

Peronea asperana, *Hüb.*

Commonly found in the chalk districts of the United Kingdom; also C. Europe, Dalmatia, Sweden, and Ireland. On *Spiraea*,

Poterium, *Rosa*, *Potentilla palustris*, *Alchemilla vulgaris*, and *Helianthemum vulgare*, folding the leaves together and feeding within.

Cnephasidae.

Sciaphila virgaureana, *Tr.* (*wahlbomiana*, L.).

Abundant throughout British Isles, C. Europe, Siberia, and Syria. On herbaceous plants, drawing the leaves together.

Sciaphila subjectana, *Gn.* (*incertana*, Tr. ?).

A very common moth, plentiful throughout British Isles; also C. Europe and Greece. On *Plantago*, *Rumex*, *Ranunculus*, *Lotus* and vetches, *Chrysanthemum* and other composites.

Sciaphila nubilana, *Hüb.*

England only, principally southern counties; also C. and S.E. Europe. In the shoots of hawthorn, blackthorn, and apple, drawing the leaves together.

Lozoperidae.

Commophila maculosana, *Haw.*

Common in Q.C. where the blue bell abounds, and general throughout England; local in Scotland and Ireland; also S. France, N. Germany, and Spain. In the seed capsules of *Scilla festalis*. When full-fed the larva bores into rotten wood, a dead oakgall, or a dry stem, swallowing the gnawings and there pupating.

Exuanthis hamana, *L.* "The Hook-mark Straw Tortrix."

Widely distributed throughout the British Isles, C. and S.-W. Europe, W.-C. Asia, and N. Persia. Larva probably feeds on roots of *Carduus*.

Sericoridae.

Poecilochroma corticana, *Schiff.*

Extremely abundant in the Gardens, on a favourable evening there being clouds of the moth in Q.C. General throughout the United Kingdom, local in Ireland; Europe. On the soft inner substance of the currant-shaped galls of the oak catkin (*Neuroterus baccarum*); also fresh soft oak-apple galls (*Biorhiza aptera*) and in rolled oak-leaves.

Trypanidae.

Trypanus cossus, *L.* (*ligniperda*, F.). "The Goat Moth."

This moth has been observed by Mr. Nicholson at various times in the Gardens, and evidence of the larvae is constantly met with when trees are felled. It is common in the British Isles, Europe, Asia, and W. Africa. The larva, which gives out a strong and unpleasant smell (hence its vulgar name), is a wood-feeder in elm, ash, poplar, and other trees, usually living two or three years in that state before it pupates.

Penthina variegana, *Hüb.* (*cynosbatella*, L. "The Rose Long-cloak Tortrix."

Distributed throughout the United Kingdom, also C. and S. Europe, Scandinavia, Russia, Finland, Asia Minor, and Armenia. On hawthorn, blackthorn, cherry, plum, apple, mountain ash, bird cherry, sweet gale, birch, alder, sallow, and ash, drawing the leaves together.

Hedya dealbana, *Fröl.* (*incarnana*, Haw.) "The White Short-cloak Tortrix."

Common in the southern and eastern counties of England, local in the Midlands, scarce in Scotland and Ireland; also C. and N. Europe, Italy, and California. On sallow, hawthorn, aspen, oak, and hazel, and in the spring on the young shoots. The larva hibernates on the twig under shelter of young buds.

Spilonota rosaecolana, *Dbd.*

Moderately common throughout England, one specimen observed in Scotland in the Botanical Gardens at Glasgow; also C. Europe, Jutland, and Trans-Caspian region. On *Rosa*, especially the cultivated varieties.

Aspis uddmanniana, *L.* "The Udmannian Tortrix."

Three taken at rest on poplar in Q.C. Generally distributed throughout England; local in Scotland and Ireland. On bramble and raspberry, drawing the leaves together.

Epiblema tripunctana, *F.* "The Black-cloaked."

Common in the British Isles, C. and S. Europe, W. Asia, and Persia. On rose, bramble, &c.

Pammene argyrana, *Hüb.* (*vernana*, Kngs.).

A very common moth abundant throughout the United Kingdom; also C. Europe. Larvae in oakgalls and fruits of apple.

Retina buoliana, *Schiff.* "The Silver-striped Orange Spot."

One specimen of this brilliant little insect captured. Moderately common in the S. and E. counties of England; also Europe and Asia to Korea. The larva hibernates, feeding in the autumn on the young buds of *Pinus sylvestris*, and in the spring on the young shoots of the same tree.

Sericoris rivulana, *Scop.* (*conchana*, Hüb.).

Plentiful locally in the S. of England, scarce in the north, Scotland and Ireland; also Europe and Asia to Siberia. It was found in Oregon, N. America, by Lord Walsingham. On *Spiraea Filipendula*, *Genista tinctoria*, *Orchis maculata*, boring into the soft stem, causing the flowers to droop and feeding among them.

Sericoris cespitana, *Hüb.*

A lively little moth found generally on the sand hills of the coast and chalk downs. Abundant in the South and Eastern counties of England, locally plentiful in some districts of Scotland and Ireland; also Europe generally, Asia Minor and Armenia. The wild food plant has not been discovered.

Sericoris lacunana, *Schiff.*

Very plentiful throughout the United Kingdom; also Europe and Western China. In the young shoots of almost all kinds of herbaceous plants and shrubs. It is sometimes double-brooded.

Steganoptycha nigromaculana, *Haw.*

Generally distributed through S. and W. counties, scarce in the Midlands, Scotland and Ireland; also C. Europe and Croatia. In the flower and seed heads of *Senecio Jacobaea*, *S. nemorensis* and allied plants. The larvae hibernate, pupating without further feeding.

Lithographia nisella, *Cl.*

Never plentiful, but widely distributed throughout the British Isles; also C. and S. Europe and Spain. In the catkins of sallow.

Halonota pflugiana, *Haw.* (*scutulana*, Schiff.).

A large tortrix, plentiful all over the Gardens. Found generally in wild and damp country throughout the British Isles; also C. and S. Europe. The larva feeds from the Autumn till May on *Cnicus palustris*, *C. lanceolatus*, *Carduus nutans* and other plants; feeding first on the leaves and flower heads, later in the stem, where it passes the winter.

Carpocapsa pomonella, *L.*

The well-known "codlin" moth. At times very destructive in orchards. It is cosmopolitan, indeed is to be found wherever the apple is grown. The larva eats a hole through the apple to get at the pips on which it feeds. As it passes from apple to apple, eating the pips only, it has been found that if the fruit is examined, and the apples that have been bored on *one* side only are picked off, a good deal of the crop may be saved.

Carpocapsa splendana, *Hüb.*

A local insect in the south of England and a few western counties; also C. Europe and Madeira. On acorns, and sometimes walnuts and Spanish chestnuts.

STIGMONOTIDAE.

Semasia woeberiana, *Schiff.* "The Woeberian Tortrix."

This common but beautifully marked little moth is abundant in the Gardens. It is to be found throughout the United Kingdom, very scarce in Ireland; also Europe and Asia to Siberia. Larva feeds on the inner bark of fruit trees, the excrement being pushed outside through a small hole.

Gypsonoma aceriana, *Dup.*

Larva in shoot of poplar in Q. Occurs locally in England; also in Europe.

Grapholitha ulicetana, *Haw.* (*succedana*, Fröl.).

Extremely abundant in the Gardens, little clouds of the moth hovering in the sunshine over the furze. Found throughout the

United Kingdom, also C. and S. Europe, Iceland, Asia Minor and N.E. Africa. Lord Walsingham also found it in Oregon, N.A. In pods of *Ulex*, *Genista*, *Lotus*, &c.

Dischrorampha alpinana, *Tr.* (*politana*, Gn.).

Local in the southern English counties (plentiful where found), scarce in the midlands and north; very scarce in Scotland and Ireland; also C. and S. Europe and Asia Minor. Lord Walsingham found it in Oregon, N.A. In the root stocks of *Achillea Millefolium*.

Dischrorampha plumbagana, *Tr.*

Common in the S. and N. of England, local in Scotland, coast only in Ireland; Europe and Asia Minor. In the stems of *Achillea Millefolium* and *Chrysanthemum Leucanthemum*.

Lipoptycha plumbana, *Scop.* (*ulicana*, Stn.).

Abundant in England, scarce in Scotland and Ireland; also C. and S. Europe, N. America and California. In the roots of *Chrysanthemum Leucanthemum*.

TINEINA.

This probably is the largest and most ancient group in the order, but owing to the small sizes of the species (at times almost microscopical), has not received the attention from entomologists which has been bestowed on the larger moths. There are probably nearly 750 moths in this group in the British Isles alone, but in a very large number of instances the life history of the insect is but little known owing to many of the species being so closely allied, the distinction between the genera so subtle and the imagines in many cases being unicolor, the classification is rendered exceedingly difficult. Many of the moths can therefore only be determined by obtaining a knowledge of the food plants, methods of feeding and pupation and following the insect through its life history. The phylogeny of the group, so far as can at present be traced, would rather tend to shew that the branch from which it has come has not been discovered, or possibly the original and intermediate forms may have disappeared ages ago.

Gelechiadae.

A very extensive family, practically cosmopolitan, not being so plentiful however in Australasia.

Tachytilia populella, *Cl.*

Plentiful in the S. and Mid. counties of England and S. Ireland. On *Salix*, poplar and birch.

Gelechia nigra, *Haw.* (*cautella*, Zell.).

A local insect occurring in the S. and Mid. counties and Northumberland; also C. Europe. On *Populus alba* and *P. Tremula*.

Gelechia ericetella, *Hüb.*

Very common throughout the British Isles, Europe, and Asia Minor. Among spun shoots of *Erica* and *Calluna*. Extremely dark forms captured.

Gelechia fugitivella, *Z.*

Fairly common throughout England, C. and S. Europe. On elm.

Ypsolophus semicostellus, *Hüb.* (*paranthesella*, Haw.). "The White Shouldered Moth."

Local in S. and Mid. counties of England; E. and C. Europe. Food plant unknown.

Symmoca quadripuncta, *Haw.*

Never abundant, occurring in the E., S., and S.W. of England, E. Ireland, C. and S. Europe, W.C. Asia to Persia. Food plant uncertain.

Aphanaula nanella, *Hüb.*

South of England from Essex to Gloucester, local; also C. Europe. One specimen taken by W. Dallimore. The larva mines in leaves of fruit trees in autumn, and in the buds in spring, after hybernation. Especially fond of the Apricot.

OECOPHORIDAE.

A family distributed all over the world, but especially numerous in Australia, nearly a thousand species being known already from that region. The larvae nearly all feed among spun leaves on seeds or in decayed wood, rarely mining in leaves.

Carcina quercana, *F.*

A common moth to be found all over England and Ireland; C. Europe. It feeds in a web on the underside of leaves of oak, beech, apple, &c. It has been found in the gardens on *Arbutus Unedo* and *Viburnum Tinus*.

Chimbache fagella, *F.*

A little moth found all over the gardens in the early spring at rest on the trunks of trees. It is subject to great variation, extremely light and dark forms being taken from the same tree, the dark form predominating. It is distributed throughout the British Isles and C. Europe. On leaves of beech, oak, birch, &c., between joined leaves.

Depressaria, *Haw.* A large genus found throughout the temperate regions of the northern hemisphere. The larvae feed on rolled or spun leaves of *Umbelliferae*, or *Compositae*, and many of the species hibernate in the imago state.

Depressaria arenella, *Schiff.*

Very common throughout the British Isles, C. and S.-E. Europe. On *Centaurea*, *Carduus*, and *Arctium*, in the folded leaves.

Depressaria subpropinquella, *Stn.* (*rhodochrella*, Hs.).

Found generally throughout the British Isles, C. and S. Europe and Asia Minor. Larvae feed in a web beneath leaves of *Carduus* and *Centaurea*.

Depressaria applana, *F.*

Extremely abundant all over the British Isles, N. and C. Europe, and N. America. In the rolled leaves of *Anthriscus*, *Heracleum*, *Angelica*.

Oecophora sulphurella, *F.*

A pretty little moth common all over the British Isles, C. and S. Europe, and Asia Minor. The larvae feed in decayed wood.

Acompsia pseudospretella, *Stn.*

Common throughout the British Isles and practically cosmopolitan. The moth is very fond of hiding in houses, barns, and outbuildings. Larvae on seeds, skins, &c. Often destructive.

ELACHISTIDAE.

Coleophora, *Hüb.* A large genus of extremely small moths, a great similarity existing among all the species. Their determination is difficult without a knowledge of the food plants and the habits of the larvae. The markings on the wings are frequently absent or very faint. Immediately the larva is hatched it starts to mine, afterwards making and inhabiting a portable case. This it adjusts to its food and bores into the interior. Mr. Alfred Sich, F.E.S., has given this genus particular study, and has kindly imparted much information and named most of those species taken. Much remains to be done in the way of collecting these minute moths. They are rarely taken on the wing, the larvae or pupae having to be hunted for in the likely localities. There is no doubt that a large number of species will be found to occur in the Gardens.

Coleophora laricella, *Hüb.*

Several larvae taken in their cases by Mr. Sich attached to larch twigs. It seems to be very abundant in the Gardens, and is common throughout the British Isles and C. Europe. It has recently been found to occur at Ottawa in Canada. It is supposed that this species was introduced to Britain with the larch. Found on all the cultivated species of Larix.

Coleophora fuscedinella, *Zell.*

Several cases on elm in P.

Coleophora lutipenella, *Zell.*

Larval cases found by Mr. Sich on *Quercus Cerris* and *Q. pedunculata* in Q. Common in England, C. Europe, and Asia Minor. On oak and birch.

Coleophora nigricella, *Stph.*

Cases on Hawthorn in Q. Found by Mr. Sich.

Coleophora hemerobiella, *Scop.*

Cases on Hawthorn in Q. Found by Mr. Sich.

Coleophora viminetella, *Zell.*

Larva, in case, feeding on *Salix viridis* in A. Found by Mr. Sich.

Coleophora saturatella, *Stn.* (*tinctoriella*, Coverdale).

A few cases taken on broom by Mr. Sich. This is a local insect, and Meyrick says that it only occurs from Sussex to Norfolk and Denbigh. On *Cytisus* and *Genista.*

Coleophora argentula, *Zell.*

Fairly common in the southern and midland counties; also C. Europe. Cases found by Mr. Sich on seed-head of *Achilleu Millefolium.*

Elachista rufocinerea, *Haw.*

Common to British Isles (except N. Scotland). In the leaves of *Poa trivialis*, *P. annua*, &c.

Chrysoclista linneella, *Cl.*

A rare insect hitherto found only in Kent, Middlesex, Gloucester, and N. Ireland ; also C. Europe and Asia Minor. Larvae feed in bark of *Tilia*. Occasionally the moths swarm on Limes around London.

Mompha fulvescens, *Hüb.* (*epilobiella*, Schrk.).

Plentiful throughout England, E. Ireland, and C. Europe. On spun shoots of *Epilobium hirsutum*.

Scythris chenopodiella, *Hüb.*

A local insect found hitherto only in Middlesex, Essex, Gloucester, and York ; also Europe, W.-C. Asia, and N. Persia. Among flowers and shoots of *Chenopodium* and *Atriplex*.

Endrosis lacteella, *Schiff.* (*fenestrella*, Stn.).

One of the so-called "clothes" moths. At times very destructive. Found a great deal in houses, feeding on seeds, dry refuse, &c. It is cosmopolitan.

PLUTELLIDAE.

This family is not largely represented in Britain, and appears to be more at home in Australasia. The larvae feed generally in a slight web on leaves and seeds.

Yponomeuta vigintipunctatus, *Retz.*

Mr. G. Nicholson took a small colony of caterpillars in September, 1906, feeding on the heads of *Sedum Telephium*, its usual food plant. When full fed they spun up in a thick web and emerged in the first week of April, 1907. It is a rather scarce insect, being local in Kent to Dorset and Norfolk ; also C. Europe.

Yponomeuta padellus, *L.*

One of the commonest of the genus. Plentiful in Q. Found throughout England and Ireland ; also Europe and W.C. Asia to Turkestan. On blackthorn, hawthorn and apple.

Glyphipteryx fuscoviridella, *Haw.*

A common moth in England and S. Europe. The larva was discovered by Mr. Sich feeding in stems of *Luzula campestris*.

Cerostoma radiatella, *Don.*

Extremely abundant throughout the British Isles. On oak.

Plutella maculipennis, *L.* "The Diamond-back Moth."

This insect is in some years very plentiful and a great nuisance to the farmer. Last year, 1906, in most southern English counties especially Essex, the larva became a pest, attacking the root crops. It was also recorded as being abundant in the neighbourhood of Aberdeen.

TINEIDAE.

A very large family of small moths, some species being almost microscopical. Although the genera are closely allied the forms at times are greatly at variance. Outside Europe the study of this

portion of the *micro-lepidoptera* has received attention in a perfunctory manner only, so that the habitat of the various species is but indifferently known. The family is probably cosmopolitan.

Lithocolletis, *Hüb.* A large and difficult genus to determine. It occurs principally in the northern hemisphere, one species only being known to occur in Australia. The larvae mine in leaves making a small patch on one side of the leaf only, either the upper or underside.

Lithocolletis concomitella, *Bnks.*

The distribution of this species is little known, as it was only separated by Mr. Bankes in 1899. The larva mines the leaves of apple; underside. Dissected by Mr. Sich.

Lithocolletis oxyacanthae, *Frey.*

Separated by Mr. Bankes and Dr. Wood in 1899. Probably common in Q. One off hawthorn (dissected by Mr. Sich).

Lithocolletis faginella, *Zell.* (*triguttella*, Stn.).

Abundant throughout the British Isles and C. Europe. In leaves of beech; underside.

Lithocolletis quercifoliella, *Zell.*

A common species throughout Europe. Mines leaves of oak; underside.

Lithocolletis messaniella, *Zell.*

Bred from *mines* taken on an evergreen oak by Mr. Sich. Plentiful in England, S. Scotland, N. and E. Ireland, C. Europe and Asia Minor. In leaves of *Quercus Ilex*; underside. The mines are abundant in the Gardens.

Lithocolletis cramerella, *Zell.*

Very common throughout the British Isles, N. and C. Europe, Asia Minor. In leaves of oak; underside.

Lithocolletis carpinicolella, *Stn.*

Local in the S.E. of England and Norfolk; C. Europe. In leaves of hornbeam; upperside.

Lithocolletis corylifoliella, *Haw.*

A common species. The larva mines the leaves of hawthorn, apple, &c.; upperside.

Lithocolletis tristrigella, *Haw.*

Rather local. Mines in elm leaves, underside, in July and September.

Ornix anglicella, *Stn.* (*fragariae*, Stn.).

Taken on the wing by Mr. G. Nicholson and Mr. Sich along the hawthorn hedge in Q. Very common in England and N. Ireland. Within conically-folded leaves of hawthorn and *Fragaria*.

Ornix scoticella, *Stn.*

A northern species. One imago on bark of *Pyrus pinnatifida*.

Gracilaria syringella, *F.*

Abundant throughout the British Isles; Europe generally. In rolled leaves of ash, *Syringa* and *Ligustrum.*

Leucoptera spartifoliella, *Hüb.*

Common to the British Isles and C. Europe. Larvae in the stems of *Cytisus scoparius.*

Bucculatrix, *Zell.* A genus remarkable on account of the absence of palpi in the imago, and of the curious ribbed cocoon spun by the larva.

Bucculatrix ulmella, *Zell.*

The larva feeds on oak in this country, but is attached to elm on the Continent. Possibly the oak-feeder is a distinct species; if so, Stainton's name, *sircomella*, will have to be restored. Taken by Mr. G. Nicholson in Q., where the cocoons are not rare on oak trunks.

Nepticula, *Zell.* A large genus containing the smallest British moths. The larvae feed on the parenchyma between the cuticles of leaves. Many species doubtless occur in the Gardens.

Nepticula gratiosella, *Stn.*

This species measures considerably less than a quarter-of-an-inch from tip to tip of the wings. The colours are golden-brown and violet. The larva feeds up to maturity in a single lobe of a hawthorn leaf. Taken by Mr. G. Nicholson on hawthorn in Q.C.

Argyresthia, *Hüb.* An interesting genus of little moths. In repose all the species sit with the back part of the body raised from the surface so that they appear to be standing on their heads. The larvae pupate in a thick white cocoon.

Argyresthia nitidella, *F.* (*purpurascentella*, Stn.).

Abundant thoroughout British Isles, also C. Europe. Larva in shoots of hawthorn.

Argyresthia ephippella, *Fab.*

Common in England and N. Ireland; also C. Europe and Asia Minor. In shoots of *Prunus Cerasus.*

Incurvaria muscalella, *F.* (*masculella*, Hüb.).

Common in England, S. Scotland, and N. and E. Ireland; Europe. On hawthorn, *Ribes.*

Tineola biselliella, *Hüm.*

A local insect occurring in England, S. Scotland, E. Ireland; also Europe, N. Africa, N. America, Australia, and New Zealand. Artificially spread by human agency. In hair, wool, and dry substances.

Tinea, *L.* A very large genus found all over the world. Many of the species are minute, and the larvae feed on many and various foods, from lichen and fungi to dead wood and cloth.

Tinea granella, *L.*

Found generally in granaries; common all over the world, spreading artificially. On corn grains.

Tinea cloacella, *Haw.* (*ruricolella*, Stn.).

Abundant in British Isles; generally throughout temperate regions of the northern hemisphere. In fungi and dead wood. Plentiful in Q.

Tinea lapella, *Hüb.* (*ganomella*, Tr.).

Fairly plentiful in England and E. Ireland; also C. Europe and Asia Minor. Larvae in nest of birds.

Tinea semifulvella, *Haw.*

Common in England and S. Scotland; C. Europe. Larvae in nest of birds.

Nemophora swammerdammella, *L.*

Abundant in United Kingdom and E. Ireland; C. Europe, W.-C. Asia, and N. Persia. Larvae in cases of leaf fragments, low plants, and fallen leaves.

Nemophora schwarziella, *Z.*

Generally distributed throughout the United Kingdom, N. and E. Ireland; C. Europe. Food plant not known.

Adela, *Latr.* A genus of brilliant little moths with metallic colourings. The antennae are in some species from four to five times as long as the body. The larvae feed in flowers and in flat cases on leaves, and the imagines fly in the hottest sunshine during the early summer months. They are particularly plentiful in the Gardens.

Adela viridella, *Sc.*

Common all over England, especially where there are oak underwoods; also Europe and Asia Minor. On the leaves of oak and hawthorn.

Adela degeerella, *L.*

All over England and S. Ireland; Europe and Asia Minor. On leaf fragments, in flat cases, of many low plants and fallen leaves.

Adela cuprella, *Thnb.*

A scarce insect found in a few localities only in England, Scotland, and E. Ireland; also N. and C. Europe. On flowers of *Salix Caprea*.

MICROPTERYGINA.

HEPIALIDAE.

The moths belonging to this family have been deposed from the high position they once occupied. Formerly it was the custom to place them almost immediately following the *Sphingidae*, but a closer study has relegated them to the opposite end of the order. They are no doubt among the most ancient existing forms of *Lepidoptera*, and are apparently an offshoot from the *Micropterygidae*, and mark a line of evolution quite distinct from other groups. The moths are not small, some exotic species measuring six inches across the wings. They are cosmopolitan.

Hepialus sylvinus, *L.* "The Orange Swift."

Moderately common throughout the British Isles; also N. and C. Europe and Asia Minor. The specimen taken by Mrs. Dallimore. On roots of *Rumex*, *Taraxacum*, &c.

ERIOCRANIIDAE.

These are curious, brilliantly coloured little moths which delight to fly on warm afternoons in early spring. As yet only one species has been taken in the Gardens, but others are certain to occur.

Eriocrania unimaculella, *Zett.*

Taken by Mr. G. Nicholson off birch trees. The footless larva mines in leaves of birch.

XXXII.—AFRICAN TREE RUBBER.

(*Funtumia elastica*, Stapf.)

The *Funtum* or *Ire*, one of the most important sources of West African rubber, was definitely determined and fully described in the *Kew Bulletin* for 1905, pp. 56–58, by Dr. O. Stapf. The economic information regarding the tree and its products has been given in the *Bulletin* for 1895, pp. 241–247; for 1896, pp. 76, 77; for 1897, pp. 414, 415; for 1899, pp. 29–35. More recently it has been ascertained that the species is not confined to West African forests, but that it occurs in the forests of Uganda, where it is now also being planted. As recently explained (*K.B.* for 1907, No. 3, pp. 103–105) this rubber has been introduced from West Africa and distributed from Kew to the East and the West Indies. The information regarding this species contained in the notes reproduced below is therefore of general interest.

TAPPING FUNTUMIA RUBBER.

In a letter addressed to the editor of the *Agricultural News*, Barbados, which appeared in that journal, vol. vi., No. 127, p. 77, Mr. H. Hesketh Bell, C.M.G., supplies an interesting account of the system of tapping indigenous *Funtumia elastica* trees in Uganda, and of the subsequent treatment of the latex and preparation of the product for the market:—

Government House,
Entebbe, Uganda,
January 3, 1907.

"I have just been reading in the Bulletin of the Imperial Department of Agriculture a very interesting account by Mr. Joseph Jones of the experimental tapping of various kinds of rubber trees in the Dominica Botanic Station, and I note that he is rather troubled by the dark colour of the produce, more especially that yielded by the Funtumia trees. In view of the great interest that is now being taken in the cultivation of rubber in the West Indies, it may be useful to some of your readers to know how the latex of rubber is treated in Uganda.

"In some of the great forests of this territory, considerable numbers of trees of the *Funtumia elastica*, or 'Lagos Silk Rubber' are found, and concessions for the sole right of tapping these trees are held by various companies. While visiting the Budonga Forest lately, I had an opportunity of observing the manner in which the crude latex is treated. The milk is obtained by making small 'herring-bone' incisions in one side of the trunks of the trees. These incisions are made with a V-shaped tapping tool, and reach from the base of the tree up to a height of 40 or 50 feet. Funtumia, growing in a forest in its natural condition, has a slender straight stem of great height, and branches only at the top. The trees are tapped every three months, so that, in each year, every side of the trunk has been made to yield its milk. The average yield of latex, at each tapping, is about 1 quart from each tree, and each stem may be expected to give about 1 lb. of pure rubber per annum.

"The milk is brought at once to the factory and is allowed to stand for a couple of days in large earthenware pots. It is then strained through pieces of red cotton, known as 'Turkey red,' for the removal of impurities. An equal quantity of water is added to the latex, and about a pint of the mixture is placed at a time in a small earthenware vessel. This small pot is then placed in a larger vessel containing water maintained at a temperature just below boiling point, after the fashion of a 'bain-marie.' Carbonate of potash is added in the proportion of 1 per cent. to the latex and water, and the mixture is stirred with a wooden spoon until it coagulates. This usually occurs after three or four minutes. In the factory which I inspected there was a rough and ready 'range' of six small fires, so that half a dozen lots of latex could be dealt with simultaneously. Each pot, however, required the attention of one man. The carbonate of potash appears to prevent the rubber from turning to a dark colour. As soon as the latex has coagulated, the 'dollop' of rubber is taken out of the pot and placed under a press, so that all the moisture may be extracted from it. The press is very much like the sort used for taking copies of letters in offices, and being supplied with four or five boards can deal with several cakes of rubber at a time. The one I saw was worked by two men, and the pressure exerted was so great that each clot of rubber was quickly transformed into a very thin 'pancake' of creamy-white colour, each bearing the initials or brand of the company. This process very effectually extracts not only all the water but also nearly all the resin in the rubber. The pancakes, after passing through the press, are thoroughly washed in water and placed to dry in the shade, on shelves made of reeds. The rubber gradually assumes a dark amber colour, but it is almost perfectly clean and transparent. In a few days it is fit for transport. I have much pleasure in sending you a sample of the rubber thus prepared, and would ask you, after inspection to send it to the Curator of the Botanic Station at Dominica.

"A considerable quantity of Funtumia has been planted in the West Indies during the last two or three years and these notes may be of interest to the planters there. I may add that the produce of the Funtumia, obtained by the process above described, is now selling in London at 5*s.* 6*d.* per lb., a price almost equalling

that obtained for the best Para. It has heretofore been thought that Funtumia rubber could not compare in value with the product of Para or of Castilloa."

Funtumia Rubber in Ceylon.

From the Report for 1906 of the Government Entomologist, Ceylon (vol. iii., No. 22, December, 1906), it is to be gathered that the experimental cultivation of *Funtumia elastica* in that island has proved unsuccessful owing to the injury caused by a leaf-rolling caterpillar, *Caprinia conchydalis*, Green. The report is as follows :—

"The pests of the various rubber-producing trees have naturally attracted considerable attention, but with the exception of a leaf-rolling caterpillar that defoliates 'Kickxia rubber' (*Funtumia elastica*), no really serious insect pests have yet asserted themselves in Ceylon.

"We cannot, however, rely upon any long-continued immunity. With the great extension of rubber plantations now in progress, fresh pests are sure to appear. It will behove rubber planters to keep a careful watch for any signs of attack. If taken in time most insect pests can be checked. Fortunately, latex-bearing trees—while in good health—are self-protected from bark and wood-boring insects. This protection is lost when, from any cause, the supply of latex is reduced. Root diseases have so far proved the most fertile source of such debility, and are almost invariably followed by the invasion of 'white ants' (Termites) and boring beetles of various kinds. These insects are generally wrongly credited with the death of such fungus-infected plants. Any attempt to penetrate the latex-bearing tissues of a healthy rubber plant must inevitably result in the defeat and probable death of the invader. The period of latex-reduction that follows systematic tapping will be a time of danger, and artificial means of protection may be necessary at such times. Careless tapping, resulting in injury to the cambium, will render the trees particularly susceptible to attack. 'Ceara rubber' trees, under tapping, appear to be exceptionally liable to disease, and many fatalities from this cause have been recorded.

"The cultivation of 'Kickxia rubber' is rendered impracticable in Ceylon owing to the systematic assaults of a leaf-rolling caterpillar (*Caprinia conchydalis*, Green). Defoliation commences even in the nursery and is continued during the growth of the plant, at more or less regular periods of three months, when the young trees are denuded of every single leaf. Under such circumstances it is impossible for the plants to make good growth, and it is surprising that they even continue to exist. The pest can be checked by repeated spraying with arsenical compounds ; but on a large clearing this would be quite impracticable, or at least would render the cultivation of this species of rubber unprofitable in comparison with the hardier *Hevea*."

Funtumia Rubber in the East Africa Protectorate.

The subjoined information is extracted from *Colonial Report*, No. 519, East Africa Protectorate, for 1905-6, p. 80, regarding the Government Experimental Station at Meritini (Mazeras).

Lagos Rubber (*Funtumia elastica*).—A consignment of seed of this tree was received from the Botanic Station at Lagos. It germinated well, and the young plants have grown very freely. Nineteen were permanently planted out in November of the year under review.

The same species of rubber tree has recently been discovered in Uganda, and a parcel of seed has been received from the Department of Agriculture and Forestry there. This seed also germinated freely, and the plants are healthy. Upwards of 2,000 *Funtumia* plants will be available for planting during the next rainy season. It is intended to plant out several acres of this tree near the station. If the *Funtumia* should succeed there, as would soon be seen, large areas could be dealt with.

XXXIII.—MUD-BINDING GRASSES.

(*Spartina stricta*, Linn., and allied forms.)

The question of sea-defence work, now occupying the attention of the Royal Commission on Coast Erosion, is one of great general interest. Much has been recorded with regard to mechanical devices for arresting the removal and promoting the accretion of shingle, while the preservation and fixation of dunes by sand-binding grasses and other sand-loving plants has been dealt with so often that the subject now possesses a voluminous literature of its own. This literature has been fully summarised by Gerhardt in *Handbuch des deutschen Dünenbaues*,* pp. 629–644, Berlin, 1900, to which reference may be made by those who may desire full information on the subject.

The latest and one of the most comprehensive accounts of sand-binding grasses enumerated by Gerhardt is that by Mr. Lamson-Scribner, published in the *Year Book of the United States Department of Agriculture for 1898*, pp. 405–420. A perusal of this paper may be recommended to all who desire to find the salient facts clearly presented in a concise manner.

As compared with the effects of vegetation in preserving sandy shores and fixing sandy foreshores, the action of plants in assisting the accretion of mud and in fixing and preserving muddy foreshores has received comparatively little systematic attention. A sketch of these processes as they present themselves in the great Gangetic delta has been given in the *Records of the Botanical Survey of India*, vol. ii., No. 4, pp. 231 *et seq.*,† and incidental allusions to the subject are to be found scattered throughout the literature of topographical and geological botany. The subject is, however, one that is of much interest everywhere from the purely scientific point of view, and one that even in this country may be of considerable practical importance.

---

* Handbuch des deutschen Dünenbaues im Auftrage des Kgl. Preuss. Ministerium der öffentlichen Arbeiten und unter Mitwirkung von Dr. Johannes Abromeit, Paul Bock, Dr. Alfred Jentzsch, herausgegeben von Paul Gerhardt; Berlin, 1900, pp. i.–xxviii., 1–656, with 445 figures in the text.

† See especially a reference to the action of *Oryza coarctata*, Roxb., at p. 357.

Giving evidence recently before the Royal Commission on Coast Erosion, Lord Montagu of Beaulieu is reported as follows: "The mud-banks on his property had recently been increasing very rapidly. The accretion was due to a somewhat extraordinary fact. Some years ago a ship came up Southampton Water from the River Plate with a quantity of rice-grass on board. The seeds of this grass became distributed about the shores of Southampton Water, with the result that the whole of that estuary was now covered with this grass. It was a plant which grew very rapidly and spread in circles, and now the 20 miles from Hurst Castle to Southampton were covered with this grass, as were the mud-banks on his foreshore. The stiff and sharp points caught the seaweed which came over it, causing the bank to increase rapidly in height . . . . There was no knowledge of the grass, so far as he could understand, up to 10 years ago."

To anyone knowing the vegetation of the coast of Southampton Water, it was evident that the grass in question must be a member of the genus *Spartina*, though the names "rice-grass" and "sea-rice" are unknown in botanical literature, and unknown, we believe, to those most versed in the popular names of British plants.

Supplementary to his evidence before the Commission, Lord Montagu sent to Kew some old culms and some living clumps of the grass, with a view to its identification and for any particulars that could be given of its history and origin.

The fact that some botanists now recognise three distinct species of *Spartina* in the British Flora, whilst others regard the three recognisable English Spartinas as varieties, or sometimes only as forms hardly entitled to rank as varieties of one species, rendered it necessary to reply in some detail, though it is by no means unlikely that the local names cover the three, whatever status be given them. The subject is perhaps of sufficient importance for us to put on record here the substance of the reply made to Lord Montagu and other inquirers, together with some additional particulars of a more technical character.

Whether the three forms of *Spartina* be regarded as distinct species or as only varieties or forms of one species, is of minor importance. But from the practical standpoint it is well, if they can be distinguished at all, to indicate clearly how they differ because of the possible possession by one or the other of the "species," as they will for the sake of convenience be here termed, of greater vegetative vigour than the rest, thus rendering a particular form of more importance than the others, so far as mud-binding is concerned.

The alleged distinctive characters of the three species, all of which grow in Southampton Water, are extracted from the ninth edition of Babington's "Manual of British Botany" (1904), edited by H. and J. Groves, who have made a special study of the genus *Spartina*, as represented in the United Kingdom.

1. *S. stricta*, Roth; leaves jointed to their sheaths, falling short of the spikes; spikelets 2 or 3; rachis scarcely extending beyond the last spikelet, outer glume hairy. Stem 1–2 feet high. Leaves

narrowing to the base, where they easily separate from their sheaths. Spikes pressed close together. A remarkably rigid plant.

2. *S. Townsendi*, Groves ; leaves jointed to their sheaths, falling short of the spikes ; spikelets 4–9 ; rachis produced beyond the spikelets and flexuose ; outer glumes slightly downy. Stem 1½–4 feet high. Leaves broadest at base. Spikelets rather spreading.

3. *S. alterniflora*, Loisel. ; leaves continuous with their sheaths, equalling or exceeding the 6–8 spikes ; spikelets many ; rachis produced beyond the spikelets and flexuose ; outer glume glabrous. Stem 2–3 feet high. Leaves broadest at the base. Spikes loosely pressed together.

Accompanying the specimens sent by Lord Montagu was the following memorandum :—

"MEMORANDUM on a certain reed locally called 'Rice-grass' or 'Sea-rice' growing in Southampton Water, Beaulieu River, and on the mud-flats from Hurst Castle eastwards along the Hampshire Coast.

"This grass, which was only to be found in a small patch in Southampton Water till a few years ago, has now extended over a very great area which might be estimated between 6,000 and 8,000 acres. It flowers in the early summer, and its seeds are apparently a great favourite with birds, while cattle, rabbits, &c., also feed on it through the summer and autumn. It spreads with remarkable rapidity, and the young plants take a circular form, so it apparently grows outwards from the common root. I am sending herewith some specimens for examination at the request of the Chairman of the Royal Commission on Coast Erosion, Mr. Ivor Guest, M.P. The Commission desire to know the exact name of the plant, its origin, and what is known about it. Locally it is supposed to have come accidentally from the River Plate in a grain ship."

So far as may be judged from the plants sent by Lord Montagu, the grass to which reference is made in his evidence and memorandum is the one to which the name of *Spartina alterniflora* has been applied, and not the typical *Spartina stricta*, though definite determination must await the flowering of the plants sent ; these are being cultivated at Kew with this object.

On the authority of Townsend ("Flora of Hampshire," ed. 1, 1883, p. 400), the first record of *Spartina stricta* occurring in Hampshire is by Dean Garnier in "The Annual Hampshire Repository" for 1799. From this earliest record up to 1836, all the *Spartina* collected in Southampton Water was regarded as *S. stricta*, but in that year Dr. W. Arnold Bromfield, the talented author of the "Flora Vectensis," published in Hooker's "*Companion to the Botanical Magazine*," vol. i., pp. 254–263, a detailed account of what he regarded as a different species, which he identified at first with *S. glabra*, Muhlenb., and subsequently with *S. alterniflora*, Loisel. Dr. Bromfield devoted a great deal of time to the investigation of this plant, as distinguished from *S. stricta*, and he has put on record that it then occupied different areas, the two never intermingling, though patches of the two

grew side by side. He found *S. alterniflora* only on the Itchen, and the following details of the conditions under which it grew, and the uses to which it was put at that date, are of considerable interest :—

"The proportion in quantity between *S. alterniflora* and *S. stricta* at Southampton is very unequal, the predominance in favour of the new species being, on the most moderate estimate, at least ten to one. *S. alterniflora* seems, as far as I can ascertain, to be the only kind above the Itchen Ferry, where it occurs in vast profusion, in irregular patches or fields of very various dimensions, from a dozen yards to two or three hundred in circumference, thickly scattered over the great beds of mud and ooze, partly covered, and partly above the surface at high water, the treacherous and shifting soil of which, our plant, amongst its other valuable qualities, contributes, with its densely fibrous and matted roots and runners, materially to consolidate. These Spartina-swamps extend along each side of the river, beginning just above the village of Itchen, to within a few hundred yards of Northam Bridge, beyond which I have never met with either kind. Our *Spartina* adds to the richness of the view from Pear-tree Green, and other elevated spots, by the mellow tint of its masses that clothe the shores ; the culm and leaves acquiring, in incipient decay, at this season (Oct. 23rd), a fine reddish-brown or tawny hue, totally unlike the pale, dull, ashy colour which *S. stricta* puts on late in the year. Below the ferry and descending towards the junction of the Itchen and Southampton rivers, *S. alterniflora* reappears in smaller quantity and of less luxuriant growth ; and here, for the first time, *stricta* begins to show itself in detached portions, often growing side by side with the former, but never mingling with it.

"The people employed about the ferry are unanimous in asserting that *S. alterniflora* was not found below that point till of late years, it being a tradition among them that the plant was brought from some place higher up the stream on the first melting of the ice after a hard winter, about twelve or fourteen years back, as far as I can collect, though of the precise date no one pretends to speak positively. Nor do any of them profess to know how long it has been growing above the ferry, though all agree it is much more abundant there now than ever, and is still increasing annually. One old man declared to me, he remembered it all his life on the upper station ; another that there was none of it in his younger days. It is difficult to reconcile such conflicting accounts, except by supposing different plants to be confounded together—*Scirpus maritimus*, perhaps, which is plentiful along the shore, yet far less so than our *Spartina*. I have traced its termination upwards, which finishes below Northam Bridge. Much higher it could not occur, as the Itchen soon loses the character of a tide-river, and at Wood Mills, not above three or four miles from its junction with the Southampton estuary, becomes a freshwater stream.

"It is possible our Southampton *alterniflora* may have been imported from America, either in ballast, or as a packing material in stowing the hold, and so have become naturalized with us. Its prodigious quantity is against the supposition ; and, indeed, we are

only justified in suspecting its exotic origin from the account just given (one not very conclusive of the inference), and from the fact, that as far as we know, this species of *Spartina* has not before been detected elsewhere in this or any other European country.

"The poorer classes of Southampton employ *Spartina alterniflora* for thatching the roofs of out-houses, cattle-sheds, &c., in lieu of reeds; more extensively for litter, and subsequently for manure. Horses are stated to eat it greedily, and for all these purposes it is regularly mown at the end of September, at which time large quantities may be seen lying on the shore to dry, previous to carting. Hardly a single accessible patch, either on the upper or lower station, is suffered to remain uncut, so that it is a plant of real economical utility. I cannot learn that it is known amongst the inhabitants by any other name than that of Sedge."

It will be understood from the foregoing that Bromfield suspected that the plant was a colonist, and in a later article (*Phytologist*, 1850, vol. iii., p. 1095–1908), he says:—"Although unable to ascertain with any precision the date of its introduction to this country, I cannot persuade myself that this fine grass is aboriginal in this county. My objections to receive it as a strictly indigenous grass are, first, its limitation in Europe to a couple of stations on the western coasts, both sea-ports having constant communication with America, where it is very abundant. Secondly, the weight of local evidence goes to prove that the many-spiked cord-grass was unknown at Southampton within the memory of persons now living, and although the evidence I have been able to collect be sufficiently confused and contradictory to show that very little is known about the origin of this grass with certainty, it is not so weak that we can safely set it aside in a case so open to suspicion as the one before us."

In 1850 Bromfield still only knew of the Itchen station in Southampton Water, and in the eighth edition of Babington's "Manual," 1881, no other locality is given, though others may have been on record elsewhere. But from the first edition of Townsend's "Flora," 1883, we learn that it was then abundant from Hythe to Eling, on the Hamble and at Hill Head.

The following summary of the distribution of *Spartina* in Hampshire is extracted from Townsend's "Flora of Hampshire," 2nd edition, 1904, p. 479; the wider distribution is derived from various authorities.

S. stricta: shore at Exbury in plenty; along the Yare, near the shore at Norton, Yarmouth, Newtown, &c. (Isle of Wight) abundantly; Hythe; banks of Southampton river, plentiful; Itchen ferry; Southton; about Portsmouth, abundant; Hayling Island; coast near Warblington church.

DISTRIBUTION IN THE UNITED KINGDOM.—Devon, Hampshire, Sussex, Kent, Essex, Suffolk, Norfolk, and Lincoln.

DISTRIBUTION BEYOND THE UNITED KINGDOM.—Coast of Europe, from Holland to Gibraltar, and in the Adriatic; South Africa; North America, common on the Atlantic coast, rare on the Pacific.

S. Townsendi: near Lymington; between Milford and Hurst castle; near Yarmouth and west side of Medina river at Werrar, (Isle of Wight); abundant south of Hythe, less plentiful northward, and not noticed above Crocknore Hard; Havant to Emsworth; Hayling Island.

DISTRIBUTION IN THE UNITED KINGDOM.—Dorset, Hampshire, Sussex, and Kent.

DISTRIBUTION BEYOND THE UNITED KINGDOM.—No station recorded, but Husnot ("Graminees," p. 13), with Southampton specimens before him treats *S. Townsendi* as a variety of *S. stricta*.

S. alterniflora: Lymington; Hythe to Eling, abundant; Redbridge to Millbrook, plentiful; by the Itchen, from the sea upwards to beyond Southton, profusely; Hamble and Hill Head; about the mouths of Shirley brook; coast road from Southton to Netley.

DISTRIBUTION IN THE UNITED KINGDOM.—No record of it having been found outside of the Southampton district.

DISTRIBUTION BEYOND THE UNITED KINGDOM.—Banks of the Adour, Bayonne, and at Fuenterrabia, just over the Spanish boundary; North America.

Figures of the three species are given in the publications cited below:—

S. stricta: Eng. Bot. ed. 1, 1797, vol. vi., t. 380—specimen from Aldborough; ed. 2, 1832, vol. i., t. 190; ed. 3, 1872, vol. xi., t. 1687; Reichenb. Ic. Fl. Germ., 1834, vol. i., t. 25; Sowerby, Grasses of Great Britain, 1861, t. 140.

S. Townsendi: Journ. Bot. 1882, t. 225.

S. alterniflora: Baxter, Brit. Bot. 1836, vol. iii., t. 203 (*S. stricta* on plate); Eng. Bot., ed. 1, Suppl. 1838, vol. iii., 2812; ed. 3, 1872, vol. xi., t. 1688; Sowerby, Grasses of Great Britain, 1861, t. 141; Pratt, Fl. Pl. Great Britain, vol. vi., t. 272, f. 4.

In connection with the discovery of *S. alterniflora*, it may be mentioned that there is a specimen in Borrer's Herbarium, at Kew, collected by him at Southampton in July, 1829, seven years before Bromfield's discovery. It was at first named *stricta*, and subsequently altered in his own handwriting.

S. alterniflora was described by Loiseleur (Fl. Gall., ed. 1, par. 2, p. 719) in 1807, from specimens collected on the banks of the river Adour, near Bayonne.

S. Townsendi, Groves, was first recorded, from Hythe specimens, in the "Journal of Botany," 1879, p. 277, as a variety of *S. stricta*, and subsequently described and figured as a distinct species in the "Report of the Botanical Exchange Club" for 1880-1, p. 37.

With regard to the popular name applied to this kind of grass, as stated above, Bromfield heard no other than Sedge, of which Saga or Sagg, given by Townsend under *S. alterniflora*, are probably corruptions.

As to whether *S. alterniflora* was originally introduced from America into Europe, tradition, and its very restricted distribution

in Europe, favour the hypothesis. Coste, "Flore de la France," 1906, vol. iii., p. 554, "Landes, Basses-Pyrénées," does not necessarily extend thc area in France, as the Departments are bounded by the river Adour. American botanists mostly treat *S. stricta* and *S. alterniflora* as varieties of one species, and Britton and Brown, "Illustrated Flora," 1896, vol. i., p. 177, state that "our plant does not seem to have been satisfactorily identified with the European."

It may be useful to add that there is a manuscript monograph at Kew of the genus *Spartina* by J. Gay, with the inscription at the beginning: "Commencé le 29 Juillet et fini, pour la quatrième fois, le 3 Août, 1819."

In response to a letter asking whether any light could be thrown on the name "rice-grass," which has now for the first time been quoted in connection with *Spartina*, the vernacular name hitherto given being "cord-grass," Lord Montagu of Beaulieu, writes on May 2, 1907, :—"Mr. Rankin, of the Portsmouth Marine Biological Institute, who was at Beaulieu last Saturday, told me he thought the plant growing on my foreshore was *Spartina stricta*, and not the *alterniflora*. He seemed to be quite aware of the term 'rice-grass,' though I did not specifically ask him what the plant was called locally in the neighbourhood of Portsmouth, whcre it also abounds. Certainly round the estuary of the Beaulieu river and in the district around Lymington I have never heard it called by any other name, but I will make inquiries this week end, and find out whether there are any people who call it 'Sagg.' Personally I have never heard this word."

The day before this letter was written an interesting and valuable paper on "The protection of Seashores from Erosion" was read before the Society of Arts by Mr. A. E. Carey. In the discussion on this paper Lord Montagu of Beaulieu took part. After recapitulating the evidence already given by him before the Royal Commission on coast erosion, and referring to the report he had received from Kew, as to the identity of the grasses concerned, Lord Montagu is reported to have said, with regard to *Spartina alterniflora*, that "the first record he personally found of it was about 1833, when it was mentioned in some Hampshire records as having existed at what was then known as Itchen ferry, on what is now known as the Woolston shore of Southampton Water." This is interesting as being a record three years prior to that made by Dr. Bromfield, though it is still four years subsequent to the first known collection of the grass in the same neighbourhood by Mr. Borrer.

Continuing, Lord Montagu is reported as having said that the grass "certainly did not exist on the mudflats in the Solent until within the last ten years. He could recollect when there was none in the Beaulieu river, which was a large estuary; but it was now entirely choked up with it, although the main waterway was as open as ever it was. He could not help thinking that the grass would be a most valuable addition to the means of reclaiming mud and sand flats near the mouths of rivers. He did not know that it would act in very exposed places, but he had noticed in the

Solent, when there was a considerable sea on, and where the grass grew down to the water's edge, that when big waves came it seemed to withstand their action very much better than where the mud existed without grass."

XXXIV.—MISCELLANEOUS NOTES.

G. D. HAVILAND.—The Court of Probate has recently presumed the death of Dr. George Darby Haviland who had been missing since 1901.

Dr. Haviland has been a contributor to the Kew Herbarium since 1891. All his collections were made in Northern Borneo, and chiefly in Sarawak, where he acted till 1893 as medical officer to the Sarawak Government, and afterwards as curator of the Government Museum at Kuching. He returned to England in 1895, and worked for some time in the Herbarium at Kew on a revision of the *Naucleae*, which was published in the *Journal of the Linnean Society* in 1897 (Bot. vol. xxxiii., pp. 1–94, tab. 1–4), and on a monograph of the genus *Acranthera*. The latter remained, however, unfinished. Subsequently he went to South Africa for the purpose of studying the habits of the Termites a paper on which from his pen appeared in the *Journal of the Linnean Society* in 1897 (Zool. vol. xxvi., No. 169) under the title "Observations on Termites with descriptions of new species." He was so successful in this field that his mode of classification has, we understand, been adopted by the workers on the subject, while his collections of Termites are regarded as the finest ever brought to Europe. In 1901 he was staying with relations at Estcourt, Natal. One day he went out on his bicycle apparently for a trip into the hilly country around. He never returned, nor was he heard of again. His bicycle, however, was found a year afterwards near the ascent.

The collections presented to Kew by Dr. Haviland comprise about 2,500 specimens, prepared with considerable care and often under difficult conditions. When his duties as curator of the Kuching Museum claimed most of his time he employed, for collecting, Dyaks whom he had trained, and he always made it a point to mention their names on the labels. Later on his name was, on the labels, coupled with that of Dr. Charles Hose, nephew of the Bishop of Singapore and Sarawak. The first set of specimens was not numbered, but provided instead with a cumbrous system of ciphers, the first letter standing for the year of collecting (*a* for 1888, *b* for 1889, &c.), the second for the half-month (*a* for Jan. 1–15, *b* for Jan. 16–31, &c.), the third for the day of the half-month (the letters after *r* being used when the day was not quite certain), the fourth for the number of the plant collected on the day corresponding to the preceding letters. Where a fifth letter occurs it indicates that he believed the plant to be identical with one collected previously and denoted by the first four letters.

The collections proved very rich in novelties, a certain number of which have been described in the *Kew Bulletin* and in other publications. The most important contribution was, however, a

collection made by Dr. G. D. Haviland and his cousin Dr. H. A. Haviland on Kinabalu in 1892. This, together with an earlier collection by Sir Hugh Low, formed the basis of a memoir by the writer on the Flora of Mount Kinabalu (*Trans. Linn. Soc.*, ser. ii., vol. iv., pp. 69–263, tt. 11–20).

Dr. Haviland, who was born at Warbleton, Sussex, in 1857, was a man of considerable ability, but of a retiring disposition, and almost morbid modesty where his own work was concerned. He was an idealist and a great lover of nature who, with a little more self-confidence, might have achieved much as a naturalist. Under a somewhat austere outside he concealed what was really a kind-hearted and generous nature.

O. S.

Radermachera pentandra.—A young tree of this Bignoniad is now in flower in the Temperate House at Kew. It was presented by Messrs. J. Veitch & Sons in 1901, along with a set of plants raised from seeds collected by Mr. E. H. Wilson during his first visit to China. He described it as a large tree, but Dr. Henry, who first discovered the species in Mengtze, Yunnan, at 5,000 feet, says he did not see any trees of it more than 20 or 30 feet high. The genus *Radermachera* used to be included in *Stereospermum* which comprised about a dozen species, all of them trees of good size and yielding useful timber. *R. pentandra* was figured in *Hooker's Icones Plantarum*, t. 2,728 (1905), and described by Mr. Hemsley from specimens collected by Dr. Henry. The plant in the Temperate House is 16 feet high, and it has a stem 4 inches in diameter. It has a few leaves near the top, the largest being 4 feet long and 3 feet wide, 2–3-pinnate, the leaflets ovate-lanceolate, from 5 to 12 inches long, green, smooth, and leathery in texture. The flowers, which are cream-yellow, are 3 inches wide, bell-shaped and regular, and are not unlike those of *Beaumontia grandiflora*. The Kew plant has produced only a small panicle of flowers, but the wild specimens show a large many-flowered panicle. The tree should be a good addition to tropical and sub-tropical gardens; it is not likely to thrive in the open air in any part of the British Islands, and it is too large for glass houses except such as the Kew Temperate House.

W. W.

Anti-Opium Plants. *Combretum sundaicum*, Miq. (*Combretaceae*) and *Mitragyne speciosa*, Korth. (*Rubiaceae*).—Mr. J. B. Carruthers, Director of Agriculture Federated Malay States, has forwarded for the Museum from Kuala Lumpur dried specimens of the first-mentioned plant, which has recently attracted considerable attention as the "Anti-Opium Plant."

Further specimens have been received from Mr. L. Wray, I.S.O., who has discussed the subject very fully in the *Journal of the Federated Malay States Museum*, No. i., vol. ii., 1906. There is also a note by Mr. E. M. Holmes in the *Pharmaceutical Journal*, vol. 78, p. 77, and one by Mr. J. B. Carruthers in *Agricultural*

Bulletin of the Straits and Federated Malay States, No. ii., vol. vi., 1907, which deals with the matter, and in the latter volume at p. 453 is given an abstract of Mr. Wray's observations on the plant, and a communication from Mr. D. Hooper drawing attention to an article by Mr. H. N. Ridley in *Journal of the Asiatic Society* for July, 1897, wherein the writer refers to the leaves of *Mitragyne speciosa*, Korth., as being employed in Perak as a remedy for the opium habit. The leaves of an allied species (*M. parvifolia*) are employed in India as a fodder for cattle, but do not appear to be put to any other use.

Specimens of *Combretum sundaicum* have also been received at the Herbarium from Dr. T. B. Sprague of Edinburgh; these came from the Batu Caves Estate, Kuala Lumpur, and were obtained through the kind offices of Mr. Christopher Meikle, whose attention was drawn to the plant by seeing Chinamen carrying off bundles of it to be used as an anti-opium remedy. For this purpose the whole plant, except the thickest stems, is chopped up and infused.

In the Straits *Agricultural Bulletin*, No. ii., vol. vi., Mr. H. N. Ridley mentions two plants that have been referred to him as being of value in combatting the opium craving. One of these appears to be *Combretum sundaicum*; the specimens came from Kuala Lumpur. The other, which was described as a herb from China, is a species of *Gynura* (*Compositae*), Mr. Ridley has been unable to distinguish from *G. ovalis*, DC.

The specimens are exhibited in Case 52, Museum No. I.

J. M. H.

Presentations.—GARDEN. A number of living plants exhibited at the South African Products Exhibition were, at its close, presented to Kew. Among these were some fine masses of several species of *Lycopodium*, from Pietermaritzburg; *Sarcocaulon Burmanni*, the torch plant, from Cape Colony; *Ornithogalum lacteum* and *O. thyrsoides*; also several orchids. Various seeds were also presented; these included a collection of the varieties of *Zea Mays* and of *Ricinus communis*, with seeds of Acacias, of *Calodendron capense* (wild chestnut), and other trees.

MUSEUMS. At the close of the same exhibition, which was held in London between February 22nd and March 16th, 1907, large and varied collections of Vegetable Economic Products, including food-grains, tanning barks, tobacco, cotton, fruits, medicinal plants, &c., were presented to the Museums at Kew on behalf of their respective Governments by Mr. C. du Chiappini, Trades Commissioner for the Cape of Good Hope, Mr. J. Burtt Davy, Government Agrostologist and Botanist, Transvaal, and Mr. T. R. Sim, Conservator of Forests, Natal.

The Museums are further indebted to Sir D. Morris, K.C.M.G., Commissioner, Imperial Department of Agriculture, West Indies, for an excellent series of miscellaneous vegetable products, prepared by Mr. W. Robson, Curator of the Botanic Station, Montserrat,

for the Colonial Products Exhibition held at Liverpool between March 12th and 24th, 1907. At the close of the exhibition the collection was transferred to Kew.

HERBARIUM. A suite of specimens representing four species of *Fraxinus* and one of *Styrax*, from Japan, has been presented to Kew by the Hon. Vicary Gibbs. The specimens which form this valuable gift were obtained for Mr. Gibbs by Mr. R. Walter from Dr. Fukuba, of the Imperial Gardens, and Dr. Hirosawa, of the Forestry Department, Tokio.

LIBRARY. A copy of *Food for the Tropics*, a work containing short descriptions of the cereals, vegetables, root crops and fruits usually cultivated in the Tropics for domestic use, compiled by the late Mr. T. M. MacKnight, has been presented by Mrs. McKnight to the Library at Kew. Mrs. MacKnight has also generously supplied twenty additional copies of the same work for presentation to "those men who go out trained from Kew Botanic Gardens to the Tropics."

Benthamiana.—The library is indebted to Sir J. D. Hooker, G.C.S.I., C.B., for the gift of a further series of valuable manuscripts, remains of the late Mr. Bentham. These include Mr. Bentham's journals, diaries and autobiography.

Botanical Magazine for April.—The plants figured are: *Caesalpinia vernalis*, Champ., × *Odontioda heatonensis*, *Aloe campylosiphon*, A. Berger, *Primula orbicularis*, Hemsl., and *Hoodia Currori*, Decne. The *Caesalpinia* is a climbing shrub with elegant bipinnate leaves and rather long racemes of lemon-yellow flowers, bearing on the upper petal a scarlet blotch. It is known only from Hongkong, and seeds were sent to Kew in 1883 from the Botanic Gardens there. *Odontioda heatonensis* is a garden hybrid between *Odontoglossum cirrhosum* and *Cochlioda sanguinea*, Benth., having been raised by Messrs. Charlesworth & Co., Heaton, Bradford, who presented the plant figured to the Kew collection. There are now four hybrids between *Odontoglossum* and *Cochlioda*, the first to appear, *Odontioda Vuylstekeae*, is depicted at t. 7,990 of this work. *Aloe campylosiphon* has recently been introduced from German East Africa by Dr. Engler, Director of the Berlin Botanic Garden, who sent a plant to the late Sir Thomas Hanbury, in whose gardens at La Mortola it flowered in 1905, and again in 1906. The plate was prepared from material furnished by the La Mortola plant. Mr. Berger regards it as a very distinct species somewhat resembling *A. saponaria*, Haw. *Primula orbicularis* is a new introduction from Western China, where seeds were collected for Messrs. James Veitch & Sons by Mr. E. H. Wilson. The flowers are pale yellow and fragrant, and are arranged in a terminal umbel borne on a stout scape 15 inches high. The corolla-limb, and its lobes too, are orbicular in shape, whence the name. *Hoodia Currori* is an Angolan plant belonging to the *Asclepiadaceae*. The

purplish-red saucer-shaped flowers are 3½–5 in. across, and are borne 2 to 4 together at the apex of the tuberculate spiny succulent stem. The specimen figured was sent to Kew by Mr. J. Gossweiler, Curator of the Botanic Gardens at Loanda. Placed in a moist stove it made active growth and flowered in June, 1906.

A Russian estimate of Kew.—Mr. V. J. Lipsky, one of the Principal Botanists of the Imperial Botanic Gardens at St. Petersburg, has twice visited Kew and made a stay of considerable duration on each occasion, and each visit has been followed by a report on various European Botanical Gardens, including Kew, published as appendices to the "Acta Horti Petropolitani." These reports are entirely in Russian, but with the help of Miss Olivia Garnett, who is acting as a Temporary Assistant in the Herbarium, we have been able to learn something of their nature and scope. Mr. Lipsky's first visit was in 1900, and in 1901 he published a report on the Botanical Establishments of Vienna, Munich, Geneva, Paris, London (Kew, British Museum, and Linnean Society), Brussels and Berlin. Some 30 pages out of 123 are devoted to Kew, dealing successively with the Herbarium, the Library, the "Park," the North Gallery, the Glass Houses and the Museums. There is an excellent reproduction of the "Key Plan" to the garden and the installation and working arrangements of the various branches of the establishment are described at length.

The second report, issued towards the end of last year, is a more detailed one, running to 267 pages, though it only deals with the Botanical Establishments of Madrid, Lisbon and Kew; 190 of those 267 pages are devoted to Kew. In 1905 Mr. Lipsky spent the greater part of six weeks at the Herbarium, examining the Tibetan plants collected by English travellers. His spare time was devoted to the gardens, and 127 pages of this report are occupied with the living plants, their arrangement, and the housing of the tender ones. He takes successively the collections of *Lilium*, *Iris*, *Rosa*, *Rhododendron*, *Clematis*, &c., &c., giving complete lists of the species, with remarks on their numbers, appearance and condition. The same treatment is given to the collections under glass.

Mr. Lipsky appeared particularly struck by the gardens as affording a reflection of the social life of Englishmen; his remarks are enthusiastic and complimentary. He has studied many public gardens, he says, but not only is there not one that can compare with Kew, not even all of them put together. The gardens at Kew are, he thinks, for the people who visit them in tens of thousands with perfect freedom, unhindered by officialdom, educational in the best sense. He describes the grass, explaining how it is cut and kept, and how visitors are allowed to walk or lie upon it. The report is illustrated by excellent views of the Palm House, the Temperate House and the North Gallery.

Diagrams of Plant Diseases.—The Board of Agriculture and Fisheries have issued a further series of coloured diagrams prepared under the supervision of the Director of the Royal Botanic Gardens, Kew, to accompany the first series, which deals with diseases of forest trees. The second series deals with diseases of fruit and fruit-bearing plants. These diagrams, which are suitable for lecture rooms, museums, schools, &c., are contained in seven sheets, 21 in. by 15 in., price 1*s.* each sheet, or 6*s.* 6*d.* a set. They will be sent post free on receipt of the money with the order. Remittances should take the form of cheques or postal orders, and not stamps. Each diagram is accompanied by a brief account of the disease, together with a statement of the measures to be taken for their prevention or eradication, printed in large type, in the form of a wall sheet. A small hand-book giving similar information can also be had, price 1*d.* The following diseases are included in the diagrams :—

No. 1. Strawberry leaf-spot, Strawberry mildew, Apple-rot, Cherry scab.

No. 2. Apple mildew, Apple canker, heart-wood rot, tree-root rot.

No. 3. Bladder Plums, Peach leaf-curl, shot-hole fungus, leaf blight.

No. 4. Apple scab, Pear scab, brown rot.

No. 5. Vine leaf-blotch, Vine leaf-scorch, black rot of Vine, powdery mildew of Vine.

No. 6. Pear leaf cluster-cups, Apricot rust, American Gooseberry disease.

No. 7. Walnut leaf-blotch, Cherry leaf-scorch, Hazel mildew, silver leaf.

The diagrams in the first series, dealing with forest trees, referred to above, are as follows :—

No. 1. Coral-spot disease, Plane leaf-scorch, Apple tree canker, golden tree-agaric.

No. 2. Pine trametes, Apple heart-wood rot, scaly tree-polyporus, common hairy stereum, false tinder fungus.

No. 3. Conifer cluster-cups.

No. 4. Collar rot, Birch polyporus, Conifer root-rot, tinder fungus, slimy tree-agaric.

No. 5. Heart-wood rot, Birch polyporus, dry rot, wet wood-rot.

No. 6. Peach leaf-curl, Apple-tree mildew, Pear leaf cluster-cups, Sycamore leaf-blotch.

No. 7. Larch canker, conifer rust.

No. 8. "Witches' Brooms" of Silver fir.

No. 9. Conifer seedling blight, Spruce canker, Pine branch twist, seedling mildew, Osier rust.

These diagrams can be obtained at the office of the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1907.

XXXV.—THE GRASSES OF BRITISH SOMALILAND.

OTTO STAPF.

When in 1888 the first list* of plants from what is now British Somaliland was published, not a single species of grasses was known from that country, and indeed very few from the remainder of the Somali Peninsula. But although the members of the James Expedition, from whose collections that list was drawn up, did not bring home any grasses, there are passages in F. L. James's book "The Unknown Horn of Africa" which refer to the occurrence of grass lands in the interior. To throw light on their character and constitution was reserved for the Italian expeditions of L. Robecchi-Bricchetti and Prince Ruspoli, who between 1890 and 1893 did so much towards lifting the veil from the interior of the peninsula.

The grasses collected by Robecchi-Bricchetti on his journey from Obbia to Berbera were published by Dr. E. Chiovenda in 1896.† The majority (14 species) of them are from British territory and were gathered in the western Haud and the Habr Awal country in the last two weeks of August, 1891. In the same year, Prof. Keller, of Zürich, who accompanied Prince Ruspoli on his first expedition, botanised in that region; but only one or two grasses,‡ new species described from his collections, can be claimed for British Somaliland.

The next contribution to our knowledge of Somali grasses was by Dr. Riva, Prince Ruspoli's naturalist on his second expedition.

---

* Oliver in F. L. James, "The Unknown Horn of Africa" (1888), pp. 318–323, tt. 1–4.

† E. Chiovenda, Graminaceae dell' Harar e dei Somali racallte dell I. L. Robecchi-Bricchetti in Annuario del R. Istituto Botanico di Roma, vi. (1896), pp. 161–176, tt. ix.–xxi.

‡ Hackel in Mémoirs de l'Herbier Boissier, No. 20 (1900), pp. 6–8.

1375 Wt 87 6/07 D & S 29 28536

His collections were made in December, 1892, on the journey from Berbera through the Habr Awal country and the Haud to Milmil, which latter place is well south of the British boundary. They belong to only three, or possibly five, species which were enumerated by Dr. Chiovenda* in 1897. If we add a species gathered by Robecchi-Bricchetti on a former journey on the western frontier of British Somaliland, the number of grasses thus made known from the Protectorate amounts to fewer than 20. The north-eastern part of the Protectorate from Lasgori to the Ahl Mountains and from Maid to Jebel Serut was explored botanically by J. M. Hildebrandt as long ago as 1871 and 1873 respectively. No list of the plants collected on those occasions was published; but from Hildebrandt's set at Kew and Prof. Engler's references in his sketch of the vegetation of the Somali Peninsula† it appears that the grasses were represented in his collections by not more than eight species. Including Hildebrandt's grasses mentioned by Engler and a new species described by Dr. Rendle from Mrs. Lort-Phillip's collection we have still less than 25 species of *Gramineae* on record from the whole of British Somaliland.

Material has, however, been accumulating at Kew during the last twelve years which allows us to form a better idea of the general character and composition of the grass vegetation of British Somaliland and to some degree also of its economic value. Some information as to the extent of grass land, all of which has to be classed as grass steppe, may also be gleaned from the reports of travellers who did not themselves collect.

It is proposed to give in this paper a general account of all that can be grasped concerning the grasses of British Somaliland, from the published as well as the unpublished evidence at our disposal. As to the latter, it consists mainly of three sets of plants at Kew. Of these I have to mention in the first place the collection of Mrs. Lort-Phillips and Miss Edith Cole. Both botanised in the country between Berbera and the upper parts of the Golis Range from February to April, 1895. In 1897 Mrs. Lort-Phillips visited the same district and the Waggar Mountains. A considerable number of new species, discovered on both occasions, was described by the botanists of Kew and the British Museum, among them being, however, only one grass, *Chloris somalensis*, Rendle. I have now to record 26 species out of the collections made by these two ladies, and mostly by Mrs. Lort-Phillips. No fewer than 21 of them were unrepresented in the earlier collections. Unfortunately many of their species were neither localised nor accompanied by notes as to the conditions of their habitats, frequency, association with other plants and other particulars which can only be supplied by the observer in the field. Another very important collection of grasses was made in Somaliland by Lieut.-Col. A. F. Appleton, Army Veterinary Department, who was attached to General Manning's Force during the operations against the Somalis from 1902 to 1904. Apart from a few specimens

---

* E. Chiovenda, Graminaceae somalenses a Dre. D. Riva in expeditione Ruspoliana lectae in Annuario del R. Istituto Botanico di Roma, vii. (1897), pp. 58–78, tt. iii.–vii.

† Engler, Über die Vegetationsverhältnisse des Somalilandes in Sitz. Ber. Preuss. Ak. Wiss. 1904, x., pp. 355–416 (reprint 1–62).

collected in Italian territory, the whole collection was made between Bohotle and Berbera and comprises 31 species, several of which are new to science. Col. Appleton, who from his special duties was naturally interested in questions of forage, paid particular attention to the grasses, and attached valuable notes to his specimens concerning their quality as fodder plants. He also added occasionally observations on their mode of growth, and carefully localised the samples. A third set of Somali grasses was received in several instalments through the Colonial Office and the Imperial Institute in 1905 and 1906. They were collected by Dr. R. E. Drake-Brockman, mostly in the Golis Range. The only notes accompanying these specimens refer to vernacular names, which ought to prove very useful for practical purposes. Dr. Drake-Brockman's collection yielded over 40 species of grasses. Of other Somali collections which have provided material for this paper I may mention those of Major D. Thomson, 128th Pioneers, and of Fleet-Paymaster W. Wykeham Perry. The former collected in the Haud in 1903 (three species), whilst the latter's grasses (two species) were gathered near Berbera in 1878.

As might be expected, the climatically favoured mountain ranges which separate the littoral zone from the Haud, the plateau land of the interior, have yielded the greatest number of species. But it is precisely in the interior that the grass steppe attains its greatest development, covering immense tracts, as in Toyo, or alternating with tree steppe and thorn bush, or passing into desert. The sketch map of Northern Somaliland by Aylmer, Parkinson and Brander Durbar in the Geographical Journal for 1898 (p. 112) characterises Toyo as an "immense open treeless grassy plain." North-east of it "a treeless grassy plain" is shown to extend as far as the Tug Der, and due east of the Toyo we find "trees, open patches and tall Durr grass" (*Andropogon cyrtocladus*). A "short grass plain with little or no jungle" is entered in the same map east of Burao and a "rich grass plain" still farther east at the foot of the Artalla Range. Further exploration will, no doubt, considerably raise the number of grass species represented in the Haud; but at the same time it is probable that gregariously growing grasses prevail there to some degree, making up by number of individuals for what they lack in variety.

The list of grasses given here comprises 82 species. This is a very considerable number, when the imperfect exploration of the Protectorate is taken into account.

For comparison it may be mentioned that the United Kingdom and Ireland, with an area almost twice as large as that of British Somaliland, possess 135 species of grasses (7·25 per cent. of their phanerogamic flora), Italy, with its immensely rich and varied flora and an area 1·6 times as large, 285 (7 per cent.) and Egypt proper, six times the size of the Protectorate, 143 (11 per cent.). In its composition this grass flora is thoroughly tropical, practically all the species belonging to tribes which are characteristic of the tropical floras and of their intrusions into the temperate zones. Thus *Paniceae* number 23, the *Sporoboleae* and *Eragrosteae* together 15, *Chlorideae* 13, *Andropogoneae* 12 species, whilst genera which could be classed as boreal types are entirely absent. The close affinity of the Somali flora to that of Eritrea and

tropical Arabia finds a striking expression in the number of grasses common to those areas. Out of the 67 non-endemic species of British Somaliland no fewer than 45 (67 per cent.) have been found in all three countries, whilst 49 (73 per cent.) occur in Eritrea and 9 more in the adjacent parts of Abyssinia and Nubia, and 48 (72 per cent.) are recorded from tropical Arabia. If we finally consider the grasses which occur in British Somaliland and at the same time appear either in Eritrea and the immediately adjoining districts or in tropical Arabia, we find that no fewer than 60 (91 per cent.) out of 67 non-endemic species come under the heading. There is therefore no doubt that, so far as the grasses are concerned, Somaliland proper and Eritrea with Eastern Nubia on the one, and tropical Arabia on the other side of the Red Sea form a natural unit. Similar conditions also prevail in other respects, marking out that area as a distinct phyto-geographical province which might appropriately be called the Erythraean Province. It would naturally include, although as a well characterised subdivision, the Island of Socotra. It is true that of the total of 50 non-endemic grasses known from Socotra only 20 have been recorded from British Somaliland, and indeed from the whole of the Somali Peninsula; but on the other hand the island has 34 (68 per cent. of the non-endemic element) in common with tropical Arabia and as many, and mostly the same species, with Eritrea. The latter, as well as tropical Arabia, are far better explored than Somaliland, and this may account sufficiently for a greater number of Socotra grasses having been found there than in the Protectorate.

If we go beyond the limits of the Erythraean Province and take a broad survey of the grass flora of Somaliland with respect to more distant affinities, we find that its character quite fits in with the position of the Erythraean Province as a division of the great steppe and desert belt, which extends from the Cape Verd Islands and Senegambia to the Indus, exhibiting a stronger leaning towards India than towards the West. The number of grasses common to British Somaliland and India is 40, 11 of which do not occur west or south of the Erythraean Province. On the other hand, 36 extend to Senegambia or the Cape Verd Islands; most of the latter are, however, species having a wide distribution, or at least ranging eastwards and southwards of the Somali Peninsula.

The relationship with India will no doubt appear still more accentuated when the species which Socotra has in common with Arabia and Eritrea but not, so far as our present records go, with British Somaliland, may have been discovered there, a contingency that is to be expected as they are practically all members of the Indian flora.

As might be expected, a considerable number (31 and 25 respectively) of the species extends southwards into East Africa and even South Africa, but here again most of them are species of a wide range, only five or six being limited to the Erythraean Province and East Africa. The isolation of the Somali Peninsula from the African Hylaea region is very strikingly shown by the small number of species which extend into it. If we except the grasses of more or less cosmopolitan character or of at least general

distribution in the tropics of the Old World, there are only four left which enter the Hylaea (*Panicum maximum*, *Tricholaena rosea*, *Sporobolus festivus* and *Eragrostis aspera*) none of them, however, peculiar to it. Of species whose areas are chiefly in the northern temperate zone *Erianthus Ravennae* is of interest in so far as its occurence in Somaliland is the only instance of its extension into the tropics. It is found throughout the Mediterranean region, in Central Asia and North-eastern India, frequently in the neighbourhood of streams, just as in Somaliland. Another more temperate type is *Aeluropus repens*, a halophilous grass which is mainly a native of the Mediterranean region, but in India has found its way into the tropics, ranging along the shores of the Deccan Peninsula as far as Ceylon.

The endemic element is represented by 15 species of which *Andropogon Kelleri* and *A. cyrtocladus* form (together with *A. Bentii* from Socotra) a marked little group not found anywhere else. All the other species peculiar to British Somaliland have their nearest allies in groups which are represented, and mostly well represented, in the Erythraean and the adjoining provinces, so that the endemism of the grasses is not of a very high order.

Physiologically the grasses of Somaliland may be considered as distinctly xerophilous types, mostly fitted for the prolonged droughts by long resting periods during which they are reduced to dry stubble or by annual habit with a very short vegetative cycle. The latter class is, however, represented by 14 species only, more than half of which are cosmopolitan. The tall rank grasses so characteristic of the steppes of tropical Africa are almost absent and are replaced by forms which rarely exceed 1 m. and in many cases are under 0·5 m. A notable exception is *Andropogon cyrtocladus*, the Durr of the Somalis, which attains a height of 2–2·5 m. and is further distinguished by its shrubby habit and copious branching. The branches are like those of *A. Kelleri*, which is, however, a prostrate grass, slender, wiry and hard. Colonel Appleton records that "in the dry season the leaves and young shoots fall off," a peculiarity which it shares, according to the same collector, with *Chrysopogon Aucheri*. The production of foliage by these grasses after the rains have set in, is very considerable, as can be seen from the herbarium specimens. Colonel Appleton describes them as "forming large feathery bunches." The internodes of the young foliage-branches are very short and the finely acuminate and by no means coarse leaf-blades are crowded into tufts. *Sporobolus fruticulosus*, another shrubby grass, seems to behave similarly. This rapid and abundant growth of rather tender foliage appears to be characteristic of many Somali grasses. Other grasses, like *Panicum turgidum* and *Pennisetum dichotomum* have persistent culms which remain green even during the dry season, and form, although stiff and tough, an important fodder supply for the hard-mouthed camel. There is no doubt that the considerable mammalian fauna of Somaliland as well as the flocks and herds of the roving nomads for their sustenance depend to a great extent on this grass vegetation, not only during the rainy season but also later on when it is reduced to stubble.

In a country with so small a rainfall and so little surface water the distribution of underground water must obviously play a great part in the distribution of the vegetation. Accordingly we see the grasses gather in the wadis and in the neighbourhood of the wells, except in the higher mountain ranges where the conditions are favourable for a more general expansion. There are also, however, grasses which are evidently specially adapted to the rigours of excessive heat and drought in a table land of so monotonous a configuration as that of the Haud. The usual arrangements for the regulation and restriction of transpiration manifest themselves sufficiently in the xerophilous facies of their overground parts; but there must be an additional apparatus in the underground system enabling them to draw from the soil the last particles of moisture. In respect to this, however, we know next to nothing.

The grass vegetation of a country like Somaliland is, of course, one of its mainstays and is a great natural asset. To know its extent and its composition is of extreme importance. One object of this article is, as already stated, to bring together all that is known or can be learned from material as yet unused. Another object, however, is to invite further exploration on more extensive lines, and in order to give the non-professional collector some help in this direction a paragraph concerning the collecting of grasses has been added. With respect to the economic value of the grasses few can be expected to have the opportunities and the experience of Colonel Appleton. Much could, however, be learned by careful observation and from the natives, who are generally good judges in such matters. I have carefully quoted Colonel Appleton's notes, and also when possible referred to Mr. Duthie's book on the fodder grasses of Northern India which contains much valuable information, and considering the great affinity of the grass floras of Somaliland and Northern India, will be found generally useful. This is about all that can be done in this direction as long as our knowledge of the nutritive value of tropical fodder plants is so imperfect and crudely empirical. A curious instance of a grass alleged to be poisonous is that of *Dactyloctenium glaucophyllum*. It deserves further investigation by a competent chemist and physiologist.

Finally I would refer to the importance of collecting the vernacular names of the grasses. I have quoted all the names given by Robecchi-Bricchetti, Appleton, and Drake-Brockman and it will be seen that there are remarkably few cases of contradiction. This points to careful discrimination and accuracy in the application of names by the native inhabitants. To make the spelling of the geographical names uniform, I have adopted the system used in the map prepared by the Intelligence Department of the War Office.

Enumeration of Somaliland Grasses.

Erianthus Ravennae, *Beauv.*, var. **purpurascens,** *Hack.*; Hook. f., Fl. Brit. Ind. vii., 121; Duthie, Fodd. Grass. N. Ind., 26; Chiovenda in Ann. Ist. Bot. Roma, vi., 164 and vii., 58.

Between Hargeisa and Berbera, *Robecchi*; plains of "Scek" (Au Bakhadle, N.E. of Hargeisa), in isolated tufts or in thickets

by the torrent, or forming extensive borders along it, *Riva*, 49; between Derra Godeli and "Lafane" (Lafarrug ?) by a stream, *Riva*, 19; without precise locality, *Drake-Brockman*, 4, 35.

VERN. *Aibarli* (Drake-Brockman).

DISTR. (of the species). Mediterranean region to the Panjab and Turkestan.

Arthraxon lanceolatus, *Hochst.*, var. **serrulatus**, *Hack.*; Hook. f., l.c. 143.

Without precise locality, *Drake-Brockman*, 12, 22.

VERN. *Horrajar* (Drake-Brockman).

DISTR. (of the species). Abyssinia to Tonkin and China.

Ischaemum laxum, *R. Br.*, var. **genuinum**, *Hack.*; Hook. f., l.c. 136; Duthie, Fodd. Grass. N. Ind. 31, Ill. t. 58.

Golis Range, *Drake-Brockman*, 133, 183.

DISTR. (of the species). Cape Verd Islands to India and tropical Australia.

Andropogon foveolatus, *Del.*; Hook. f., l.c. 168; Duthie, Fodd. Grass. N. Ind. 34, Ill. t. 21.

Berbera, *Perry*.

DISTR. Cape Verd Islands to the Panjab.

A. Kelleri, *Hack.* in Mem. Herb. Boiss. No. 20, 8.

Toyo, *Keller*.

DISTR. Endemic.

A. cyrtocladus, *Stapf*, sp. nov., sect. *Arthrolophis*; *A. Kelleri* arcte affinis, sed erectus, 2–2·5 m. altus et racemis 2-natis majoribus, spiculis hermaphroditis 7 mm. longis, valva inferiori 3-nervi, palea eciliata, spiculis masculis majoribus, antheris 4 mm. longis distinctus.

Shrub, up to over 2 m. high, much branched, many-noded; main culms and branches usually ascending in curves, glabrous, terete, hard; lower internodes more or less exserted from the persistent or slowly decaying sheaths, whitish glaucous, up to 7 cm. long, upper enclosed, much shorter to very short. *Leaves* crowded on the young branches, forming "feathery bunches," or more or less distant, glabrous; *sheaths* terete, tight, firm, smooth, finely striate, persistent; *ligule* a minute, membranous rim; *blades* attenuated from the slightly rounded base (2 mm. wide), into a long setaceous point, 2–3·5 cm. long, more or less glaucous, firm, smooth, with about 7 primary nerves alternating with very fine secondary ones. *Peduncles* slender, 5–10 cm. long, more or less exserted from the uppermost bladeless or nearly bladeless sheath, with a tuft of hairs at the upper end. *Racemes* paired, one sessile, the other on a slender peduncle (5–6 mm. long), subparallel, silky, 2·5-3 cm. long, densely hairy all over the back and edges; hairs white, very fine, the longest as long as the joint; pedicels similar to the joints, 4 mm. long. *Sessile spikelets* linear-lanceolate, acuminate, 6–7 mm. long, sometimes purplish; *glumes* thin, glabrous, *lower* minutely truncate, slightly concave on the

back, nerveless between the fine, minutely scabrid keels, *upper* boat-shaped, 3-nerved, shortly aristulate, margins minutely ciliate upwards; *lower valve* almost lanceolate, acute, 6 mm. long, hyaline, 1-nerved, minutely ciliate, *upper* lanceolate, 5 mm. long, deeply bifid, 1-nerved, awn about 15 mm. long, kneed at or below the middle, glabrous; *palea* ovate, nerveless, 1·5 mm. long, glabrous; *anthers* 4 mm. long; *stigmas* 2·5 mm. long. *Pedicelled spikelets* male, linear-lanceolate, 7 mm. long, glabrous, purplish; *glumes* thin, *lower* shortly aristulate with 3 stronger and 3–4 very fine nerves, ciliate, *upper* hyaline, 3-nerved, ciliate, 6 mm. long; *valves* hyaline, 1-nerved, 6–5 mm. long.

VERN. *Durr* (Appleton, Drake-Brockman).

Without precise locality, *Drake-Brockman*, 43, 44. "Dur: grows to 6 or 8 feet in great feathery bunches. Very plentiful in the Haud and at Bohotle. A valuable camel feed."—*Appleton.* To this species refers possibly, at least in part, another note, written by Col. Appleton against a specimen of *Sporobolus fruticulosus*, which by mistake had been mounted with his specimen of "Durr." It runs "Grows thickly in most parts of Italian Somaliland (between Obbia and Bohotle), also less freely in the Haud and British Somaliland. After rain it forms large feathery bunches of green. In the dry season the leaves and young shoots fall off, leaving the stubble on which our horses grazed until the rain came. The best grass in Somaliland." The specimen of the *Sporobolus* referred to resembles a dwarfed "Durr," but the anatomy of the leaves and the presence of a few withered inflorescences are sufficient to recognise it. "Tall Durr" is also mentioned in Aylmer's map (*see* p. 205) as occurring in patches in the Haud, east of Toyo.

Hackel placed the closely allied *A. Kelleri* in the section *Schizachyrium*, where it was supposed to occupy an isolated position. He was probably led to do so by the solitary racemes. The same condition is characteristic of *A. Bentii*, from Socotra, which I describe at the end of the paper. The close affinity of the three species *A. cyrtocladus*, *A. Kelleri* and *A. Bentii* is, however, evident from their general appearance as well as from the structure of their racemes and spikelets. The latter refers them unmistakeably to the section *Arthrolophis*, within which they form a small group of well-marked habit, approaching in their technical characters more the American *A. glaucescens*, Kunth, and *A. incanus*, Hack., than any of their African congeners. Among the latter *A. appendiculatus*, Nees, has probably most in common with them.

A. Ischaemum, *L.*, var. (?) **somalensis**, *Stapf*, var. nov.; a typo spiculis paulo minoribus (3 mm. longis), articulis 2 mm. longis, spiculis pedicellatis valva superiore destitutis neutris distinctus.

"At Burao and Upper Sheikh, grows two feet high, and is a good feed."—*Appleton.*

The specimens consist only of a few culm tops and inflorescences. The racemes are on the whole so similar to those of *A. Ischaemum* (var. *genuinum*, Hack.) that I hesitate to base a new species on the differences which I have indicated. Yet it is quite possible that it will have to be treated as specifically distinct when

complete material comes to hand. I would add that the nodes are glabrous as in typical *A. Ischaemum*. For the species see Hook. f., Fl. Brit. Ind. vii., 171, and Duthie, Fodd. Grass. N. Ind. 35, Ill. t. 22.

DISTR. The typical form from South and Central Europe to North India and China.

A. pertusus, *Willd.*; Hook. f., l.c. 173; Duthie, Fodd. Grass. N. Ind. 38, Ill. t. 25.

Golis Range, *Drake-Brockman*, 128.

DISTR. From Abyssinia to North Australia, and southwards through East Africa to Natal.

Chrysopogon Aucheri, *Stapf.*—Syn. *Andropogon Aucheri*, Boiss.; Hook. f., Fl. Brit. Ind. vii. 195.

—— var. **quinqueplumis,** *Hack.*; Chiovenda, in Ann. Ist. Bot. Roma, vi., 164.

Habr Awal country, *Robecchi*. "Grows in small feathery clumps in the plains of British Somaliland. When the hot weather comes the leaves fall off, leaving a kind of stubble from 4 to 5 inches long, on which animals feed."—*Appleton*.

DISTR. (of the species). Abyssinia to the Panjab.

Col. Appleton also collected several panicles of what seems to be a form of this variety with somewhat smaller, dark purplish spikelets. He says of it: "This grows in tufts with an abundance of green leaves, forming an excellent feed. It requires very little water, grows freely in patches round Little Bohotle, but is frequently met with on the road from Gararo to Upper Sheikh." The same form was found by Dr. Drake-Brockman in the Golis Range (153). His specimens are very complete. They consist of dense bundles of underground branches dividing, where they emerge from the soil, into short barren, densely leafy shoots, and forming, as Col. Appleton says, "tufts with an abundance of green leaves." The leaves are 1-1·5 cm. long, and the flowering culms springing from the cushion-like tufts are about 25 cm. high. Typical *C. Aucheri* var. *quinqueplumis* from Afghanistan and Beluchistan occasionally exhibits a similar mode of growth.

Heteropogon contortus, *Roem. & Schult.*; Duthie, Fodd. Grass. N. Ind. 32, Ill. t. 19.—Syn. *Andropogon contortus*, L.; Hook. f., l.c. 199; Chiovenda, l.c. vii., 61.

Berbera, *Riva*, 449; Golis Range, *Drake-Brockman*, 84, 88, and without precise locality, *Drake-Brockman*, 25. "Speargrass from Upper Sheikh; common also round Galkayo and usually found near Burao. Causes much trouble to ponies, the spears sticking in their mouths."—*Appleton*.

VERN. *Aggar* (Drake-Brockman).

DISTR. All tropical countries, also in the Mediterranean.

Cymbopogon commutatus, *Stapf.*—Syn. *Andropogon commutatus*, Steud., Chiovenda, l.c. vii. 61.

Golis Range, *Drake-Brockman*, 121, 126. "Found in small quantities round Upper Sheikh and between Upper Sheikh and Burao."—*Appleton*.

DISTR. Eritrea to Afghanistan and Sind.

Chiovenda quotes a specimen collected by Riva (315) in Ogaden under this species. Engler mentions it from the Haud. The species probably occurs throughout the peninsula. It is a very close ally of *A. Schoenanthus*, Spr., which has the reputation of being a good fodder grass. *See* Stapf in Kew Bull., 1906, p. 310.

Cymbopogon hirtus, *Nees ex Baker*.—Syn. *Andropogon hirtus*, L.

Golis Range, *Drake-Brockman*, 186; and without precise locality, *Drake-Brockman*, 34; Waggar Mountains, Gedais, in an almost dry river bed, at 1,700 m., *Lort-Phillips*.

VERN. *Dailan* (Drake-Brockman).

DISTR. In several varieties all over Africa and in the Mediterranean region.

Themeda Forskalii, *Hack.*, **var. punctata**, *Hack.*

Daraas, *Cole*.

—— var. **imberbis**, *Hack.*; cf. for the species Duthie, Fodd. Grass. N. Ind. 43 and (sub. *Anthistiria imberbis*), Hook. f., Fl. Brit. Ind. vii. 211.

Without precise locality, *Lort-Phillips*.

DISTR. (of the species). All over Africa, India, and Malaya to Australia.

Mrs. Lort-Phillips' specimen has densely bearded nodes. The lower sheaths and exserted portions of the lower internodes are also more or less hairy.

Paspalum distichum, *L.*; Hook. f., l.c. 12.

"Found round Burao and on the road to Upper Sheikh, and at Lower Sheikh and Behindula. Height 6 to 8 inches. A good grazing grass."—*Appleton*.

DISTR. Sporadically throughout the tropics, usually a shore plant.

Digitaria eriantha, *Steud.*

Wadaba, *Cole*.

DISTR. (of the species). From the Canaries to North-western India and southwards through East Africa to the Cape.

The Mediterranean and Indian forms represent slight modifications of the type. The Indian variety, originally described as *Panicum pabulare*, Aitch. & Hemsl. (Syn. *Paspalum sanguinale*, var. *pabulare*, Hook. f., l.c. 15) is described by Aitchison as the "best fodder-grass for cattle" in the Kuram District.

D. horizontalis, *Willd.*

Golis Range, *Drake-Brockman*, 157. "A free growing grass with plenty of leaf, found principally round Galkayo, but also at Burao and Upper Sheikh; considered a good feeding grass."—*Appleton*.

DISTR. Tropical Africa and Tropical America.

D. sanguinalis, *Scop.*, **var. ciliaris**.—Syn. *Paspalum sanguinale*, var. *ciliare*, Hook. f., l.c. 15; *Panicum sanguinale*, var. *ciliare*, Duthie, Fodd. Grass. N. Ind. 12, Ill. t. 9.

"Found in the valleys round Upper Sheikh; grows to 3 feet, and is a good feed."—*Appleton.*

DISTR. Almost cosmopolitan.

D. longiflora, *Pers.*—Syn. *Paspalum longiflorum*, Hook. f., Fl. Br. Ind. xiii., 17. *Panicum tenuiflorum*, Duthie, Fodd. Grass. N. Ind. 13.

Golis Range, *Drake-Brockman*, 150.

DISTR. Tropics of the Old World.

D. Rivae, *Stapf.*—Syn. *Panicum Rivae*, Chiovenda in Ann. Ist. Bot. Roma, vii. 62, t. III., fig. ii.

Ogaden Desert, *Riva*, 303. Haud, according to Engler (Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 41 of reprint).

DISTR. Endemic.

D. abyssinica, *Stapf.*—Syn. *Panicum* (*Digitaria*) *abyssinicum*, Hochst. ex A. Rich., Tent. Fl. Abyss. 11, 361.

—— var. **scalarum,** *Stapf.*—Syn. *Panicum* (*Digitaria*) *muticum*, Schimp. ex A. Rich. l.c. 362, non Forsk. *P. scalarum*, Schweinf. in Bull. Herb. Boiss. II., ii., 20. *P. scalarum*, var. *elatior*, Chiovenda in Ann. Ist. Bot. Roma, vi., 166, t. 9. *P. kafuroënse*, K. Schum. in Engl. Jahrb. xxiv., 334.

Habr Awal country, *Robecchi.*

DISTR. Abyssinia and tropical Arabia to Uganda and British East Africa.

Panicum geminatum, *Forsk.*

"Found in Upper and Lower Sheikh and Burao in small quantities."—*Appleton.*

DISTR. Somaliland to Nubia and tropical Arabia.

P. leersioides, *Hochst.*

"Found in fairly large quantities in bundles of grass brought from the valleys above Upper Sheikh; grows to 3 feet, and is a good feed."—*Appleton.*

DISTR. From Nubia and tropical Arabia southwards to Mozambique.

P. serratum, *Spreng.*, var. **gossypinum,** *Hack.*

Without precise locality, *Lort-Phillips.*

DISTR. (of the species). From Eritrea through East Africa to the Cape, westwards to Northern Nigeria.

P. maximum, *Jacq.*; Hook. f., Fl. Brit. Ind. vii., 49; Kew Bull., 1894, 382, and 1897, 210; Chiovenda, l.c. vi., 166.—Syn. *P. jumentorum*, Pers.; Duthie, Fodd. Grass. N. Ind., 9.

Between Hargeisa and Berbera, *Robecchi*; and without precise locality, *Drake-Brockman*, 7, 21. "Grows at Bohotle, near Burao, and in the valley beyond Upper Sheikh. Height about 3 feet; considered a good feed."—*Appleton.* Jebel Serrut, 1,600 m., *Hildebrandt*, 1482.

DISTR. All over tropical and South Africa, also in tropical Arabia; cultivated and naturalised in many tropical countries.

This is the so-called "Guinea grass," cultivated in many parts of the tropics as one of the most valuable fodder plants.

P. coloratum, *L.* (forma minor).

"Grows near water at Bohotle, Burao, and Upper Sheikh; height about 1 foot; a poor feed."—*Appleton.*

DISTR. From Egypt through East Africa to the Zambesi, also in tropical Arabia.

A similar small state is represented by a specimen collected by Höhnel in Pare, German East Africa, and distributed as "*Panicum Dregeanum*, Nees., var. *glabratum*, Schweinf."

P. repens, *L.*; Hook. f., Fl. Brit. Ind. vii. 49; Duthie, Fodd. Grass. N. Ind. 11.

Golis Range, *Drake-Brockman*, 98.

DISTR. Throughout the Mediterranean region and India to China and Malaya; in Africa chiefly along the West Coast to South Africa.

P. turgidum, *Forsk.*; Chiovenda, l.c. vii., 166.

Between Hargeisa and Berbera, *Robecchi*; without precise locality, *Lort-Phillips*, *Drake-Brockman*, 3, 42.

VERN. *Dungara* (Robecchi), *Dungarr* (Drake-Brockman).

DISTR. From the Senegal to tropical Arabia.

A valuable fodder for camels. It often covers large tracts.

Setaria aurea, *A. Br.*

Golis Range, near Daraas, in water-courses, 1,500 m., *Lort-Phillips.*

DISTR. Throughout tropical and South Africa.

The perennial *S. aurea*, one of the commonest grasses of the African savannas, is, perhaps, the mother plant of the annual and almost cosmopolitan *S. glauca*, Beauv. Concerning this see Hook. f., Fl. Brit. Ind. 78; Duthie, Fodd. Grass. N. Ind. 14, Ill. t. 10.

S. verticillata, *Beauv.*, subsp. **Aparine**, *A. Braun*; Chiovenda, l.c. vi., 167. Cf. *S. verticillata*, Hook. f., l.c. vii., 80; Duthie, Fodd. Grass. N. Ind. 15.

Habr Awal country, *Robecchi*; Golis Range, *Drake-Brockman*, 171.

DISTR. (of the species). Throughout Africa, India and Melapa, otherwise as a weed.

Pennisetum ciliare, *Link.*—Syn. *P. cenchroides*, Rich.; Hook. f., Fl. Brit. Ind. vii., 88; Duthie, Fodd. Grass. N. Ind. 17, Ill. t. 12, 13.

Golis Range, *Drake-Brockman*, 166; without precise locality, *Cole*, *Drake-Brockman*, 20. "Grows in the valleys round Upper Sheikh. Height from 1–1½ ft. A good feeding grass."—*Appleton.* Ahl mountains, up to 2,000 m. *Hildebrandt* (according to Engler).

VERN. *Arabjeb* (Drake-Brockman). *See* also under *P. Ruppellii.*

DISTR. From Senegambia to North-west India and through East Africa to the Cape.

Chiovenda (l.c. vii., 66) described a variety *anachoretica* from specimens collected by Riva in the Ogaden desert (in the Haud, according to Engler). It is stated to differ from the typical form in having smaller, unispiculate involucres and unequal glumes; but as Riva's specimens were diseased, the differences may very well be due to the anomalous condition of the grass.

P. dichotomum, *Del.*; Hook. f., Fl. Brit. Ind., vii., 85.

Maid, in the coast plain, *Hildebrandt*, 1481.

DISTR. From Algiers to North-western India.

P. Ruppellii, *Steud.*—Syn. *P. orientale*, Chiovenda in Ann. Ist. Bot. Roma, vii., 65, non Rich.

Golis Range, *Drake-Brockman*, 151; without precise locality, *Lort-Phillips*, *Brockman*, 50; near Hargeisa, *Riva*, 52. "Samples, found at Burao, near the river bed and at Upper Sheikh. A good grass, but not plentiful. Height about 2 feet."—*Appleton*.

DISTR. From Tripoli to tropical Arabia and Socotra.

VERN. *Arabjeb* (Drake-Brockman). See the preceding species. Chiovenda also describes a var. *altissima* from specimens collected by Riva near Hargeisa, but the differences are so slight as to suggest merely a case of individual variation.

P. villosum, *R. Br.*; Engl. Veget. Somaliland, in Sitz. Ber. Preuss. Ak. Wiss. Berlin (1904), 56 (reprint).

Jebel Serut near Maid, 1,800 m., *Hildebrandt*, 1480.

DISTR. Abyssinia, tropical Arabia

P. pachycladum, *Chiovenda*, l.c. vi., 167.

Habr Awal country, *Robecchi*.

VERN. *Garaw* (Robecchi).

DISTR. Endemic.

Tricholaena rosea, *Nees*.

Golis Range, in dry water-courses, *Lort-Phillips*, *Drake-Brockman*, 116.

DISTR. In several varieties all over tropical Africa, South Africa and tropical Arabia. The Somali specimens correspond to the form named *T. grandiflora* by Hochstetter.

T. Teneriffae, *Parl.*; Hook. f., Fl. Brit. Ind. vii., 65.

Golis Range, *Lort-Phillips*, *Drake-Brockman*, 115.

DISTR. From the Canaries to the Panjab, and southward to Usambara.

Anthephora Hochstetteri, *Nees*.

Without precise locality, *Drake-Brockman*, 47.

VERN. *Hamashleh* (Drake-Brockman).

DISTR. To Abyssinia and Nubia.

Tristachya Bricchettiana, *Chiovenda*, l.c. v., 163, t. 14.

Between Gildessa and Zeila, *Robecchi*.
DISTR. Endemic.

T. barbata, *Nees* ; Hook. f., l.c. 272.
Golis Range, *Drake-Brockman*, 250.
DISTR. To Nubia and the Panjab.

Polypogon monspeliensis, *Desf.*; Hook, f., l.c. 245 ; Duthie, Fodd. Grass. N. Ind. 50.—Syn. *P. fugax*, Duthie, Fodd. Grass. N. Ind. 51.

Without precise locality, *Lort-Phillips*.

DISTR. Throughout the Mediterranean region and continental India, southwards to East Africa. Introduced into most other warm parts of the world.

Phragmites communis, *Trin.*; Hook. f., l.c. 303 ; Duthie, Fodd. Grass. N. Ind. 60.

Without precise locality, *Lort-Phillips*.

DISTR. Almost cosmopolitan.

The specimen (barren) probably represents var. *isiacus*, which Dr. Riva collected on the Dana River in Abyssinian Somaliland (Chiovenda, l.c. vii., 77).

Aristida adscensionis, *L.*; Hook., Fl. Brit. Ind. vii., 225.—Syn. *A. adscensionis*, var. *abyssinica*, Engl., Veget. Somaliland, in Sitz. Ber. Preuss. Ak. Wiss, 1904, 50 (reprint). *A. depressa*, Retz ; Duthie, Fodd. Grass. N. Ind. 47. *A. Hystrix*, Duthie, Ill. t. 30, non Linn.

Daraas, *Cole*. Ahl Mountains, *Hildebrandt* (according to Engler).

—— var. **aethiopica,** *Stapf* in Hook. f., l.c. 226.

Golis Range, *Drake-Brockman*, 145 ; without precise locality, *Lort-Phillips*. "Grows freely at Bohotle, Burao and Upper Sheikh on good ground ; the stem is $1\frac{1}{2}$–2 ft. long. It is considered a good feeding grass."—*Appleton*.

DISTR. (of the species). All warm countries.

A. redacta, *Stapf*; Hook. f., l.c. 227.

Maritime plain of Berbera, 150 m., *Cole*.

DISTR. Through South Persia to Bengal and Central India.

A. somalensis, *Stapf*, sp. nov. ; affinis *A. vestitae*, Thunb., sed dimensionibus glumarum et arista haud cum valva articulata distincta.

Perennial, densely caespitose, light green. *Culms* up to 1 m. long, erect, simple, about 4-noded, with the uppermost internode finally by far the longest, wiry, glabrous, smooth. *Leaf-sheaths* tight, smooth, scarcely striate, glabrous, the lowest bearded at the mouth ; ligule a fringe of short hairs ; blade convolute-setaceous, up to 20 cm. long, up to 2·5 mm. broad when expanded, rigid, curved, glabrous, smooth below, scaberulous above and along the margins. *Panicle* erect, effuse or slightly contracted, 20–30 cm. long, up to 15 cm. wide ; rhachis strict ; branches 2–3-nate, up to 15 cm. long, the longest undivided for 5–6 cm., then sparingly

branched; branchlets flexuose or straight, filiform, like the branches scabrid; pedicels 1–10 mm. long. *Spikelets* yellowish or brownish, 12-14 mm. long. *Glumes* scarious, rounded at the back, linear-acute, with a long fine point, 1-nerved, the lower lanceolate, 9–12 mm. long, flattened out 3 mm. broad, upper linear, 15–18 mm. long, 2 mm. wide. *Valve* linear produced into a twisted scaberulous beak, 16–18 mm. long (of which 8–10 mm. go to the beak), smooth below the beak; callus 1 mm. long; awn continuous with the valve, bristles divaricate, the lateral 25–30 mm., the middle 35–40 mm. long. *Palea* elliptic, subtruncate, 15 mm. long. *Lodicules* obovate-oblong, 2 mm. long, finely nerved. *Anthers* purple, 6 mm. long.

Golis Range, *Drake-Brockman*, 10, 124, 127; without precise locality, *Lort-Phillips*.

VERN. *Saddeh Eli* (Drake-Brockman).

A. Kelleri, *Hack.* in Mem. Herb. Boiss, No. 20, p. 8; Engl. Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 41 (reprint).

Haud, *Thomson*, also *Riva* according to Engler.

DISTR. Somaliland (Ogaden, *Keller*).

A. papposa, *Trin. & Rupr.*

Without precise locality, *Drake-Brockman*, 37, 39; Haud, *Thomson*, 92 a.

VERN. *Mardweidleh* (Drake-Brockman).

DISTR. From Abyssinia through the Sudan to the west coast and the Cape Verd Islands; also in Gaboon and Loanda.

A. hirtigluma, *Steud.*

Golis Range, *Drake-Brockman*, 149.

DISTR. From Abyssinia and Egypt to the Panjab.

A. plumosa, *L.*, var. **brachypoda,** *Trin.*—Syn. *A. brachypoda*, Tausch.; Engl. l.c. 50. For *A. plumosa*, see Hook. f., l.c. 228; Duthie, Fodd. Grass. N. Ind., 47.

Ahl Mountains, *Hildebrandt*.

DISTR. (of the species). From North Africa and Nubia to Western Tibet.

Perotis latifolia, *Ait.*; Hook. f., Fl. Br. Ind. vii., 98; Duthie, Fodd. Grass. N. Ind., 22.

Without precise locality, *Lort-Phillips*.

DISTR. Throughout Tropical Africa and Asia; also in South Africa.

Tragus racemosus, *All.*; Hook. f., l.c. vii., 97; Duthie, Fodd. Grass. N. Ind., 22, Ill. t. 14.

Golis Range, *Drake-Brockman*, 163.

DISTR. Most warm countries.

T. paucispina, *Hack.*

Without precise locality, *Lort-Phillips*.

DISTR. Nubia, Sudan.

Latipes senegalensis, *Kunth.*, Hook. f., l.c. 97 ; Duthie, Fodd. Grass. N. Ind., 22.

Golis Range, *Drake-Brockman*, 93, 108, 206. "Found near water at Burao, but in very small quantities."—*Appleton.*

Sporobolus variegatus, *Stapf*, sp. nov. ; affinis *S. festivo*, Hochst., sed spiculis paulo majoribus, glumis tenuissimis angustis, valva tenuiter hyalina obtusissima distincta.

Culms very slender, glabrous, upper 3 internodes shortly exserted from the sheaths. *Leaf-sheaths* (only the 2 uppermost known) very tight, smooth, very finely striate ; *ligule* a fringe of very short hairs ; *blades* linear, long, tapering to a fine point, up to 2 cm. long, up to 2 mm. wide (flattened out), glaucous or pale green, with scattered very fine tubercle-based hairs in the lower part. *Panicle* ovoid, lax, 6–9 cm. long, about 3 cm. wide; rhachis very slender with long scattered very fine hairs ; branches paired or the lowest 3-nate, the upper frequently solitary, capilliform, 2·5–1·5 cm. long, the lowest divided from the base, the others from 3–6 mm. above it, ultimately like the secondary branchlets almost divaricate ; pedicels extremely fine, up to 5 mm. long. *Spikelets* lanceolate, 1·8–2 mm. long, variegated. *Glumes* linear to linear-oblong, subacute or obtuse, very narrow, the lower almost 1 mm. long, the upper slightly longer, very delicate, white, hyaline, nerveless. *Valve* elliptic-oblong, very obtuse, almost 2 mm. long, hyaline, obscurely 1-nerved, purple at the base, otherwise almost colourless or white. *Palea* as long as the valve ; keels smooth. *Anthers* over 1 mm. long, purple.

"Found occasionally in small quantities between Bohotle and Upper Sheikh. A poor feed."—*Appleton.*

S. fruticulosus, *Stapf*, sp. nov. ; *S. Ghikae*, Schwf. & Volck., affinis esse videtur, sed laminis glabris, vaginis eciliatis, paniculae ramis fere semper solitariis, plumis longioribus distincta ; a *S. somalensi*, Chiov., culmis ramosissimis, paniculis brevibus, pedicellis brevissimis, glumis inaequalibus undique asperulis differt.

Culms much branched, hard, slender, 10–15 cm. high, suffrutescent, quite glabrous. *Leaf-sheaths* tight, glabrous, smooth ; those of the persistent parts of the culms and of the innovation-buds very firm and persistent ; *ligule* a fringe of short hairs ; *blades* tapering almost from the base to a long, very fine point, 1–3 cm. long, 1–2 mm. broad at the base, pale green, minutely asperulous above, sometimes with a few extremely fine long hairs from close above the ligule, otherwise glabrous. *Panicle* oblong to ovoid, 3–4 cm. long, ultimately open and up to 2·5 cm. wide, rigid ; branches filiform, usually solitary, the longest somewhat over 1 cm. long, when mature spreading almost at right angles, divided from 2–3 mm. above the base, rough ; pedicels in dense clusters at the ends of the branches and branchlets, very short. *Spikelets* lanceolate, whitish or purple at the base, 1·5–1·75 mm. long. *Glumes* lanceolate to ovate-lanceolate, acute or subobtuse, minutely asperulous all over, lower 0·75–1 mm. long, nerveless, upper 1–1·4 mm. long, faintly 1-nerved. *Valve* oblong, subobtuse, 1 to

sub-3-nerved, minutely asperulous, at least in the upper part. *Palea* as long as the valve. *Anthers* purple.

"Found in very small quantities between Burao and Upper Sheikh."—*Appleton.*

The specimen quoted above is in the state of flowering. There are, however, others in the stubble condition, but with some over-mature panicles, against which Col. Appleton wrote the note referred to under *Andropogon cyrtocladus* (see p. 210).

S. festivus, *Hochst. ex A. Rich.*; Engl. Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 55 (reprint).

Without precise locality, *Lort-Phillips.* "Found between Garraro and Burao. A poor feed."—*Appleton.* "From Garraro, also found between Burao and Upper Sheikh. A very poor grass."—*Appleton.* Ahl Mountains, 1300 m., *Hildebrandt.*

DISTR. In several varieties throughout Tropical and South Africa.

S. longibrachiatus, *Stapf*, sp. nov.; affinis *S. pallido*, Nees, sed paniculae ramis longioribus, infimis rhachim mediam excedentibus, proportione glumarum valvaeque et vagina etiam ad margines glabra distincta.

Upper leaf-sheaths glabrous, smooth, finely striate, tight, up to 15 cm. long, *ligule* a narrow, membranous, ciliolate rim; blades linear, long attenuate to a fine point, up to 2 mm. wide at the base, pale green, or glaucous above, smooth. *Panicle* shortly exserted from the uppermost sheath, ovoid when expanded, lax, 14–18 cm. long, 12–15 cm. wide, rhachis very slender, smooth; branches filiform, the lower 10–12 cm., middle ones 6–7 cm. long, undivided for 1–2·5 cm., then remotely branched, lower branchlets 2–3 cm. long with distant short divisions, which are again divided, the ultimate ramifications bearing 3 or 4 approximate more or less secund spikelets; pedicels like the preceding divisions of the panicle slightly scaberulous, the lateral very short. *Spikelets* lanceolate, 1·7–1·8 mm. long, pale green or tinged with purple, slightly asperulous. *Glumes* hyaline, oblong, subacute or the tips minutely denticulate, lower 0·7–0·8 mm. long, nerveless, upper 1·2–1·4 mm. long, faintly 1-nerved. *Valve* oblong, subacute, 1-nerved. *Palea* slightly shorter than the valve.

"Grows freely at Bohotle, Burao and Upper Sheikh. Height from 2 to 3 feet. Considered a poor feeding grass."—*Appleton.*

S. marginatus, *Hochst. ex A. Rich.*

Without precise locality, *Lort-Phillips.*—"Grows in clumps near the river-bed at Burao and occasionally at Upper Sheikh."—*Appleton.*

DIST. From Abyssinia through East Africa to Nyasaland.

S. spicatus, *Kunth*; Hook. f., Fl. Brit. Ind. vii., 250.

"Grows near water round Upper Sheikh, Lower Sheikh and Bihendula, much resembling 'hariali' in its manner of growth. An excellent feed."—*Appleton.*

DISTR. From the Cape Verd Islands to India.

S. robustus, *Kunth.*

Without precise locality, *Drake-Brockman*, 30, 32.

VERN. *Werris* (Drake-Brockman).

DISTR. To Tropical Arabia and through the Sudan to West Africa.

S. Brockmanii, *Stapf*, sp. nov.; affinis *S. indico*, R. Br., sed foliis brevibus planis, spiculis paulo longioribus, glumis aequalibus longioribus distincta.

A densely tufted, perennial grass. *Culms* 25–40 cm. high, erect, slender, smooth, glabrous, about 3-noded, internodes enclosed with the exception of the uppermost. *Leaf-sheaths* tight, finely striate, glabrous or finely hairy along the outer edge and near the mouth, those of the barren shoots 2–3 cm. long; *ligule* a narrow, ciliate, membranous rim; *blade* tapering almost from the base to a long fine point, spreading, 5–7 cm. long, 2·5–3·5 mm. wide at the base, somewhat firm, pale green or glaucous, smooth, glabrous or with scattered, tubercle-based hairs, particularly along the thickened margin. *Panicle* very narrow, contracted, interrupted, 7–10 cm. long, about 4 mm. wide; rhachis stiff, smooth; branches solitary, often shorter than the internode (particularly the lower), adpressed to the rhachis, 2–0·5 cm. long, divided from the base or almost so, much contracted; branchlets short, asperulous; lateral pedicels short to very short. *Spikelets* lanceolate to oblong, 2·25–2·4 mm. long, silvery grey; close together. *Glumes* equal or nearly so, lanceolate to lanceolate oblong, 1·6–1·8 mm. long, hyaline, white, smooth, the lower nerveless, the upper faintly 1-nerved, the tips often minutely denticulate. *Valve* oblong, subacute, very thin, grey below, white towards the tip, finely 1-nerved. *Palea* as long as the valve. *Anthers* yellow, slightly over 1 mm. long.

Golis Range, *Drake-Brockman*, 11.

VERN. *Garra gorro* (Drake-Brockman).

S. capensis var. *altissimus*, Chiovenda in Ann. Ist. Bot. Roma, vol. vi., p. 168, tab. ii., is very likely this plant. It differs from *S. capensis*, Kunth (=*S. indicus*, R. Br.), as stated above in the short leaves which spread usually at a right angle and in the longer, narrower and equal glumes of the slightly larger spikelets. Chiovenda's plant was collected by Robecchi in the country of the Habr Awal. According to Robecchi its vernacular is "Saddaho," a name quoted by Brockman for *Dactyloctenium glaucophyllum*, Courb. (spelt "Saddehho").

Eragrostis papposa, *Steud.*; Stapf in Hook. f., Fl. Brit. Ind. vii. 322.

Hammar, *Cole.* Golis Range, *Drake-Brockman*, 89. Waggar Mountains, Gedais, in rocky river-bed, 1,600 m., *Lort-Phillips.* Without precise locality, *Drake-Brockman*, 36. "Found in the valleys between Bohotle and Upper Sheikh. A good feed." —*Appleton.*

DISTR. To North Africa and the Panjab, southwards to East Africa.

E. megastachya, *Link*; Duthie, Fodd. Grass. N. Ind. 63, Ill. t. 75.—Syn., *E. major*, Host; Stapf, l.c. 320.

Golis Range, *Drake-Brockman*, 208. Without precise locality, *Lort-Phillips*, *Drake-Brockman*, 5.

VERN. *Harfo* (Drake-Brockman.)

DISTR. All over Africa and India. Introduced as a weed into many countries.

E. Barrelieri, *Dav.*; Chiovenda in Ann. Ist. Bot. Roma, vi., 173.

VERN. *Harfo* (Robecchi). See the preceding species.

DISTR. Mediterranean Region, Nubia, tropical Arabia.

E. aspera, *Jacq.*; Stapf, l.c. 314.

Mirsa Ridge, Gollen, *Cole*. Without precise locality, *Lort-Phillips*.

DISTR. Sporadically throughout tropical and South Africa; occasionally in India (introduced).

E. ciliaris, *Link*; Stapf, l.c., Duthie. Fodd. Grass, N. Ind. 62, Ill. t. 38; Chiovenda, l.c. 172.

Ahl Mountains, 1,000 m., *Hildebrandt*, 875.

Between Hargeisa and Berbera, *Robecchi*.

DISTR. Throughout the tropics.

E. tenella, *Roem, & Schult.*, var. **plumosa**, *Stapf*; Stapf, l.c. 315.—Syn. *E. plumosa*, Link; Duthie, Fodd. Grass. N. Ind. 64, Ill. t. 77.

Ahl Mountains, Damalle, 1,000 m., *Hildebrandt*, 877.

DISTR. From Abyssinia to India.

Eragrostis plumosa, Link, corresponds to the original of Linnaeus' *Poa tenella*, the basis of *E. tenella*, Roem. & Schult., and my var. *plumosa* is therefore really what might be called typical *E. tenella*.

Harpachne Schimperi, *Hochst. ex A. Rich.*

Golis Range, *Drake-Brockman*, 181.

DISTR. Abyssinia to Usambara.

Cynodon Dactylon, *Pers*; Hook. f., Fl. Brit. Ind. vii., 288; Duthie, Fodd. Grass. N. Ind. 52, Ill. 33.—Syn. *Dactylon officinale*, Vill.; Chiovenda in Ann. Ist. Bot. Roma, vi., 169.

Habr Awal country, *Robecchi*; Golis Range, *Drake-Brockman*, 158, 159. "Grows freely at Bohotle, Burao, and Upper Sheikh. Height about 3 feet. A good feeding grass."—*Appleton*.

DISTR. Cosmopolitan.

Enteropogon somalensis, *Chiovenda*, lc. vi., 170, t. 16.

Habr Awal country, *Robecchi*.

VERN. *Harrar* or *Harar* (Robecchi).

DISTR. Endemic.

E. Ruspolianum, *Chiovenda*, l.c. vii., 72, t. III., fig. iii.

Without precise locality, *Drake-Brockman*, 19.

VERN. *Ausad* (Drake-Brockman).
DISTR. Somaliland (Ogaden, *Riva*, 303).

E. macrostachyum, *Munro*; Chiovenda, l.c. vi., 170, t. xvii.
Habr Awal country, *Robecchi*; Golis Range, *Drake-Brockman*.
VERN. *Askorof* (Robecchi).
DISTR. From Arabia and Abyssinia to British East Africa.

Chloris somalensis, *Rendle* in Journ. Bot., 1899, 66.
Waggar Mountains, *Lort-Phillips*.
DISTR. Endemic.

C. tenella, *Roxb.*; Hook. f., Fl. Brit. Ind. vii., 290; Duthie, Fodd. Grass. N. India, 54, Ill. t. 56.

"Grows plentifully in the valleys round Upper Sheikh where it is cut and brought in mixed with other grasses. Usual length 2–2½ feet. A good feed."—*Appleton*.

DISTR. Abyssinia to India.

C. myriostachya, *Hochst.*

"Grows in small quantities near the water supply at Upper Sheikh."—*Appleton*.

DISTR. From Abyssinia and Arabia to Zanzibar.

Tetrapogon villosus, *Desf.*; Duthie, Fodd. Grass. N. Ind. 55, Ill. t. 68; Chiovenda in Ann. Ist. Bot. Roma, vii., 74; Engl., Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 41 (reprint).—Syn. *Chloris villosa*, Pers.; Hook. f., l.c. 291.

Golis Range, in a deep rocky defile, *Lort-Phillips*. Without precise locality, *Drake-Brockman*, 1§. Haud (according to Engler). "A free grower in the valleys round Upper Sheikh, where it forms about a third of the grass supply brought in. It grows to 3 feet high and is highly valued as a forage. Found also in smaller quantities round Bohotle and Burao."—*Appleton*.

VERN. *Iya Makarai* (Drake-Brockman).
DISTR. From the Canaries to India.

According to Riva (Chiovenda, l.c.) this forms carpets locally in grassy places in the Ogaden Desert.

T. spathaceus, *Hack.*; Engl. l.c.

Haud (according to Engler). "Found in the rocky ground between Lower Sheikh and Bihendula, in very small quantities. Height 6 to 8 inches. Of no value."—*Appleton*.

DISTR. From the Cape Verd Islands to Tropical Arabia.

Dactyloctenium glaucophyllum, *Courb.*; Chiovenda, l.c. vi., 172, t. xviii.—*Eleusine aristata*, Hook. f., Fl. Brit. Ind. vii., 296, an Ehrenb.? *E. scindica*, Boiss.; Duthie, Fodd. Grass. N. Ind., 58, Ill. t. 36.

Habr Awal country, *Robecchi*. Without precise locality, *Drake-Brockman*, 8, *Lort-Phillips*. "This grass grows very rapidly and is found in great quantities in the Haud and occasionally in

British Somaliland. Cattle and sheep eat it greedily; but it is dangerous for horses, causing intense irritation of the bladder and kidneys if eaten in large quantities."—*Appleton.*

VERN. *Jaddoho*, *Dojo* (Robecchi); *Saddeh ho* (Drake-Brockman).

DISTR. Nubia to the Panjab.

This is the plant which was described by Boissier as *D. scindicum*, from specimens collected by Stocks in the Indus Delta, and it is probably also identical with the grass enumerated by Chiovenda (l.c. vii., 6) as *D. aristatum*, and described as forming turf in the Ogaden country. Whether it is the original *D. aristatum* of Link, Hort. Berol. i. 59, is doubtful, and can only be decided by comparison with Link's original. Of the specimens distributed by Schweinfurth as *D. aristatum*, and enumerated as such in Bull. Herb. Boiss. ii., App. ii., 35, the Shugra plant (No. 71) is *D. glaucophyllum*, while the Arkiko specimen (No. 158) belongs to another species, evidently an annual with flaccid leaves and very small anthers (0·4–0·5 mm.). We have this other species also from the Nubian Coast (at about 21° N. lat., *Bent*); the Dalak Archipelago (*Steudner*, 1050); and Socotra (*Balfour*, 42 and 69). Steudner's plant was also distributed as *D. aristatum*, and in any case it agrees well with Link's description.

Eleusine floccifolia, *Spreng.*

Without precise locality, *Drake-Brockman*, 23.

VERN. *Garrgorr* (Drake-Brockman). *See* "Garra gorro" for *Sporobolus Brockmanii.*

DISTR. Tropical Arabia to Abyssinia.

Leptochloa obtusiflora, *Hochst.*; Hook. f., l.c.

"Principally grows in the valleys above Upper Sheikh from whence it is cut and brought in. It grows to about 3 feet and is an excellent feed."—*Appleton.* Without precise locality, *Lort-Phillips.*

DISTR. Abyssinia, tropical Arabia; also in India (introduced ?).

L. Appletonii, *Stapf*, sp. nov.; affinis *L. obtusiflorae*, Hochst., sed spiculis majoribus, valvis basin versus demum induratis et hic aequaliter pubescentibus diversa.

Perennial, densely tufted, *Culms* slender, geniculate at the base, 15–25 cm. high, 3–1-noded, internodes exserted, glabrous, smooth, the uppermost by far the longest. *Leaves* glaucous; sheaths glabrous, smooth, the lower compressed, their bases persistent; ligule short, hyaline; blades convolute in the bud, at length flat, linear, long attenuated into an acute point, those of the barren shoots up to 10 cm. by 2 mm., of the culms usually much shorter and spreading, with long fine hairs near the base, otherwise glabrous, smooth, midrib broad and white on the upper side, primary nerves 5–7, prominent above, with 4–6 finer ones alternating with them. *Racemes* spiciform, compact, subdistichous, seated along a slender common axis which is straight or slightly flexuous, angular, smooth or almost so, and 5–20 cm. long; racemes up to 7, subsessile, up to 10 cm. by 6 mm., with up to 20 spikelets; rhachis slightly wavy, asperulous; pedicels extremely short, but

distinct. *Spikelets* laterally compressed, oblong, obtuse, up to 7 mm. by 2 mm., whitish green, or slightly tinged with purple; florets up to 12, very close; rhachilla-joints clavate, at length often very much thickened upwards, glabrous or minutely hairy. *Glumes* subequal, ovate, subacute, up to 3 mm. long, subscarious, 1-nerved, persistent. *Valves* imbricate, obliquely ovate in side view, obtuse, entire, muticous, 2·5–3 mm. long, membranous and whitish when young excepting the sometimes slightly purplish upper half, at length indurated and yellowish below the middle, silky pubescent all over the back in the hardening part, hairs clavate-tipped; nerves green, the lateral subpercurrent. *Pales* much shorter than the valves, membranous, 2-keeled, folded backwards, rotundate-elliptic when flattened; flaps very narrow; keels minutely serrate. *Lodicules* broad-cuneate. *Anthers* 0·75 mm. long. *Ovary* glabrous; styles long, with the top of the ovary produced between them; stigmas short, laterally exserted. *Grain* tightly enclosed by the rigid valve and pale and deciduous with them, elliptic-oblong, dorsally much compressed, concave-convex (when dry), 1 mm. long, yellowish; embryo elliptic in outline, almost half as long as the grain; hilum punctiform.

Golis Range, *Brockman*, 99, 101, 147. "Grows freely in the valleys round Upper Sheikh and sparingly at Burao. One of the principal grasses cut and brought in. An excellent feed; grows to 3 feet."—*Appleton.*

Enneapogon mollis, *Lehm.*

Without precise locality, *Drake-Brockman*, 41.

VERN. *Aggan* (Drake-Brockman).

DISTR. To the Sudan, Angola and South Africa.

E. elegans, *Stapf.*—Syn. *Pappophorum elegans*, Nees; Hook. f., Fl. Brit. Ind. vii., 301.

Golis Range, *Drake-Brockman*, 175, 180. Without precise locality, *Lort-Phillips.* "A good feeding grass found in small quantities round Bohotle and Burao, but in large quantities in a valley above Upper Sheikh."—*Appleton.* In the Haud, *Thomson*, 92 b.

DISTR. To Abyssinia, the Deccan Peninsula and Burma.

Aeluropus repens, *Parl.*—Syn. *A. villosus*, Trin. ex C. A. Mey; Hook. f., l.c. 334.

On the shore at Berbera, above high-water mark, *Lort-Phillips*, *Perry.*

I add here descriptions of two new grasses—one collected by the late Theodore Bent in Socotra and closely allied to *A. cyrtocladus* (p. 209), the other discovered in Italian Somaliland by Col. Appleton and a near ally of a peculiar Socotran species :--

Andropogon (§ **Arthrolophis**) **Bentii**, *Stapf*, sp. nov.; affinis *A. Kelleri*, Hack., et *A. cyrtoclado*, Stapf, ab utroque racemis brevius pilosis, villis spiculis minime occultantibus, spiculae sessilis valva inferiore (neutra) 3-nervi, superiore eciliata, paleis eciliatis vel subeciliatis, ab *A. cyrtoclado* praeterea racemis solitariis spiculis minoribus differt.

Suffrutescent, many-noded; branches spreading, recurved or ascending, glabrous, terete, hard; internodes of the flowering branches more or less exserted, not glaucous, those of the main culms up to 2·5 cm., of the branches 1–1·5 cm. long. *Leaves* glabrous, sheaths persistent, terete, tight, firm, smooth, finely striate in the upper part; ligule a minute, membranous rim; blades attenuated from the slightly rounded base (1–1·2 mm. wide) into a fine point 1--2 cm. long, subglaucous, firm, smooth, primary nerves about 5, alternating with much finer solitary or paired secondary ones. *Peduncles* slender, up to 3 cm. long, shortly exserted from the almost bladeless uppermost sheath, with a tuft of hairs at the apex. *Racemes* paired, solitary one sessile, the other on a slender peduncle (3–5 mm. long), subparallel, silky, 1–2 cm. long; joints 3–5, slender, slightly wider upwards, 3 mm. long, hairy along the edges only, hairs white, lower very short, uppermost as long as the joint; pedicels like the joints. *Sessile spikelets* lanceolate, acute, 5 mm. long, pale; glume glabrous, lower papery, very smooth and shining on the back, shallowly channelled along the middle, keels scaberulous upwards, rounded and smooth below, each with 3 fine, close nerves; upper glume as long as the lower, boat-shaped, acute, faintly 3-nerved, ciliate; *lower valve* lanceolate, acute, hyaline, very faintly 3-nerved, ciliate; *upper valve* lanceolate, deeply bifid, 3·5 mm. long, 1-nerved, awn about 8 mm. long, very fine, kneed at or below the middle, glabrous; palea oblong, truncate, 0·75 mm. long; anthers 2 mm. long. *Pedicelled spikelets* barren or male, lanceolate, acute, 5 mm. long, glabrous; *lower glume* 7–9-nerved, upper 3-nerved, subhyaline; *valves* hyaline, 1-nerved, 3 mm. long.

SOCOTRA.—*Bent.*

Panicum (§ **Eupanicum**) **Appletonii**, *Stapf*, sp. nov.; affinis *P. rigido*, Balf., Socotrensi, sed foliis glabris, rigidioribus, paniculа parva brevissima, spiculis submajoribus, glumis valvisque firmioribus nervis minus distinctis necnon toto habitu multo robustiore differt.

Perennial, quite glabrous; rhizome short, emitting numerous, long, fibrilliform roots and tufts of erect shoots and creeping or ascending stolons. *Shoots* and *stolons* branching (often copiously) when reaching the surface, forming dense, intricate tufts from a few to 10 cm. high, or some of them much stouter, elongated, prostrate, sending out short branches from the nodes; underground parts covered with persistent sheaths, overground branches fascicled, slender, many-noded, closely sheathed. *Sheaths* terete, smooth, those of the underground parts or prostrate branches up to 3·5 cm. long and the lowest bladeless, of the short branches above the ground under 1 cm. long and slender; *ligule* a fringe of minute stiff hairs; *blades* firm, linear-lanceolate to sublinear, tapering almost from the base, those of the long shoots up to 5 cm. by 4 mm. (when flattened out), of the short shoots from less than 1 to 3 cm. long, tightly involute, needle-shaped, stiff, spreading, crowded, all rather blunt, finely striate. *Panicle* scarcely exceeding the uppermost leaves, 1 cm. long; branches finely filiform, rigid, up to 7 mm. long; pedicels very short to 2 mm. long, tips slightly thickened. *Spikelets* ovoid, subacute, almost 2 mm. long. *Glumes* broad-ovate, subobtuse, lower almost

half as long as the spikelet, 5-nerved, upper as long as the spikelet, 5-nerved. *Lower floret* male; valve resembling the upper glume, palea almost as long as the valve. *Upper floret* hermaphrodite, 1·5 mm. long, sub-obtuse, valve and palea greenish-brown, shining, the valve faintly 5-nerved.

ITALIAN SOMALILAND: near Obbia, in sand, *Appleton.*

HINTS FOR THE COLLECTION OF GRASSES.

The following lines are intended for the traveller or resident who, without being a professional botanist, wishes to contribute to the botanical exploration of the country he travels or lives in. In a general way the conditions for collecting grasses are the same as for collecting other flowering plants, except that the merely technical part of the work is much simpler than in most other families; there are, however, certain points which will have to be considered to make the collection as useful as possible.

Two principal objects offer themselves to the collector; firstly, to gather as many different species as possible with a view, as it were, to a contribution towards a census of the flora of the district he is exploring; and, secondly, to collect information which cannot be got otherwise than in the field, that is, information regarding distribution, share in the composition of the vegetation (frequency, scattered or social occurrence, association with other plants), physiological peculiarities (such as duration, period of sprouting, flowering, fruiting, and resting, seed dispersal), dependence on external conditions (soil, altitude, water-supply, light, shade, temperature), and the place they occupy in the economy of the animal kingdom, and of man especially (usefulness or obnoxiousness). Both objects are intimately connected. It is obvious that in the end no systematic knowledge of the character indicated under the second head is possible without our being able to connect our observations with the names of the plants. Any information of that kind, particularly if coming from a collector or observer who is not a professional botanist, will therefore have to be accompanied by specimens sufficiently complete to allow their determination by the specialist. In so far the requirements will be the same as in the case of mere specimen collecting. The latter has been the aim of most of the earlier collectors and still satisfies many of the recent. This implies no derogation of the value of their work. In fact without it we should have no botany; but it does not exhaust botany or the possibilities which are within the reach even of the untrained collector. A complete set of specimens representing all the species growing in a given area, as for instance British Somaliland, would indeed be a great achievement. In itself it would be a mine of wealth for the taxonomist, morphologist and plant geographer, but after all it would be dead material. And so closely interwoven, in the light of modern science, are the problems of those doctrines with the life phenomena of the plants, that many of them would have to remain unsolved or be misinterpreted without the addition of field observation. Science is slowly adjusting itself to these

conditions by admitting even distant regions within the normal working sphere of the professional naturalist and linking them up with the old centres of research. This is the meaning of the establishment of botanical laboratories in the tropics, of enrolling the trained specialist for field work abroad, and also of initiating the home worker into the conditions of foreign vegetations by travel, the best of all object-lessons. When this has been generally accepted and has become an essential part of the organisation of our research work, a new era will also have set in for the botanical exploration of those immense districts which so far have only been skimmed. At present, however, we stand barely on the threshold of that era, and we must be thankful for any outside help we can get, however casual it may be. The shelves of our national herbaria and the pages of our colonial floras testify abundantly to the advantages which have accrued to our science from that side. So far they have been somewhat one-sided and too much in the direction of mere specimen collecting; but there is no reason why, with some guidance, our non-professional contributors should not avail themselves to the full extent of their opportunities and supply us with information which would often increase the value of their specimens, and, one might almost say, put life into them. The hints given here are conceived in the spirit of those principles and adapted to the limits within which the untrained collector may expect to do useful work, and apply at the same time more especially to the collecting of grasses.

1. Only complete specimens allowing reliable identification should be collected. This excludes specimens without flowers or fruits. The determination of such is very often quite impossible, or, when feasible, it takes more time than can conscientiously be devoted to it. An exception should only be made in rare cases, as when the grass is a very prominent feature of the vegetation or of economic importance, and cannot be had in the flowering (or fruiting) state, as is, for instance, frequently the case with bamboos. Inflorescences without leaves or, in the case of tufted perennials, flowering culms without basal leaves or barren leaf-shoots are less objectionable, but are still incomplete and the former may even be unidentifiable.

2. In the case of small grasses up to 40 cm. (16 in.) high, the whole grass should as far as possible be preserved with enough of the underground portion to show its nature. Grasses higher than 40 cm. (16 in.), but below 1 m. (3 feet), may be doubled up to go on sheets 40 cm. (16 in.) long. Still taller grasses have to be cut up, but enough of the culms and leaves should be gathered to show their conditions at different levels, and of these, too, sections of the underground stems with barren shoots attached to them should be gathered. The latter in the young state with their sheaths are particularly important in the case of bamboos.

3. The specimens should, whenever possible, be laid in before the leaves begin to fade or dry up and the inflorescences, as is often the case, contract.

4. Almost any paper will do for drying grasses. It is not necessary and not even advantageous to change the sheets on or in which the specimens are lying, as the leaves are apt to curl up

when lifted off. It is sufficient to renew the empty paper between these sheets from time to time. How often this has to be done depends mainly on the moisture of the air, if not done over fire. On the whole, grasses dry quickly and without changing colour. They may from the beginning be subjected to considerable pressure.

5. Every specimen should be accompanied by a numbered label, the numbers running on through the consecutive collections. The label should contain the name of the collector, the name and general character (wood, bush, savanna, river banks &c.) of the locality, approximate altitude, date of collecting, average height, frequency, association, or any other peculiarity of the grass which can only be made out in the field.

6. If in unexplored countries there is not sufficient time for thorough collecting, attention should be paid in the first place to the grasses which are most striking on account of their frequency, their general appearance, or their economic importance. It is better to have them well represented than to have an indiscriminate set of scraps.

7. In fairly well explored districts, the commoner and most conspicuous grasses might be treated more superficially, although they should by no means be neglected, and an eye might be kept on them with respect to their variation and physiological and economic peculiarities (*see* p. 208). On the other hand, small or rare grasses or such as flower irregularly or in unusual seasons should be the principal object of the collector. The collector should, however, always keep in mind that many grasses require close comparison to distinguish them, and that it will therefore be safer for him to err on the side of duplicating his specimens than otherwise.

The opportunities of the collector, particularly the traveller who has in the first place other objects to pursue, will of course not always permit him to carry out to the full the recommendations laid down here; but the minimum to be insisted upon is the collecting of identifiable specimens (paragraphs 1 and 2) and proper localising. Without that his time will frequently be wasted.

XXXVI.—THE FLOWERING OF CULTIVATED BAMBOOS.

W. J. Bean.

The last two decades have witnessed a great increase in the popularity of hardy bamboos. It was not, indeed, until about 1891 that any general interest was taken in them by horticulturists in this country, although their merits had been appreciated by French cultivators for some years previously. The formation of the Bamboo Garden at Kew in the winter of 1891–2 not only marked the beginning of a more general cultivation of these plants in Britain, it helped largely to bring it about. It was the first, and still remains the most important, collection open to public

inspection. The publication by Mr. A. B. Freeman-Mitford (now Lord Redesdale) of his most useful and able work "The Bamboo Garden"* has also been the means of greatly popularising these plants in gardens, and diffusing a general knowledge of their characteristics and requirements.

But during the past few years the enthusiasm of cultivators of bamboos has had a serious setback. They have been concerned to see the flowering of their bamboos one after another, followed, as that phenomenon nearly always is, by the death or serious crippling and disfigurement of the plants. Only those who have witnessed it can appreciate the grievous transformation that takes place when a bamboo, hitherto embodying the very perfection of leafy grace and vegetative vigour, breaks into flower and, in a few months, becomes a bundle of dead, leafless sticks.

The reports of botanists and travellers, especially in the Eastern tropics, had acquainted us with the phenomena attending the flowering of bamboos in their natural state: the transformation of great areas of luxuriant bamboo forest into barren, and often (by the firing of the dead stems and leaves) blackened deserts. Under cultivation in Europe, too, bamboos had been known to flower at rare intervals. The well-known *Arundinaria japonica* (Bambusa Metaké), for instance, flowered in 1872 and 1874, and *Arundinaria Falconeri* flowered in 1876; in the latter case the flowering was followed by the death of all the plants. But the likelihood that the new hardy bamboos introduced so freely into cultivation 15 to 20 years ago would flower in their due time did not enter many people's minds. The event was too uncertain and too few people had seen the results for them to be disturbed by any thought of the fate that would overtake their bamboos when the time for flowering had come.

The experiences of the last few years have considerably increased our knowledge of the behaviour of bamboos flowering under cultivation, and it seems desirable that some record should be made embodying our knowledge so far as it goes. The species enumerated in the following notes are all, so far as we know, that have flowered under cultivation within the last thirty years. The list will enable future cultivators to form some estimate of the probable duration of the lives of their plants and to judge of their value too. For it seems that we shall have to regard bamboos in much the ame light as leasehold property. Other things being equal, a p ant recently raised from seed, with pretty nearly its full term of years to run, will obviously be of more value than another with the greater portion of its "lease" expired.

Arundinaria auricoma, Mitford.—Flowers were noticed on plants growing in the Bamboo Garden at Kew as long ago as 1898, and they have been seen every year since. It is only very few of the culms, however, that flower, and except that the flowering culms die, the plants are not affected.

A. falcata, Nees.—Flowered in the Temperate House at Kew in 1884 and about the same time in several other places. It had flowered previously in Europe during the years 1866–7.

---

* London: Macmillan & Co., 1896.

A. falcata, var. *glomerata*.—This also grows in the Temperate House and flowers almost every year on a certain number of culms, but the plant as a whole does not suffer. According to Gamble this sporadic flowering is characteristic of the type in a wild state.

A. Falconeri, Gamble (A. nobilis, *Mitford*).—The first introduction of this species to Britain took place apparently in 1847. A quantity of seeds were sent that year to Kew from India by Mr. Madden, and from these no doubt most or all of the plants in Irish and Cornish gardens were derived. In the same year seeds were obtained by Van Houtte, and in 1848 young plants were offered for sale by him. Nearly all these plants flowered simultaneously in 1876 by which time the species was cultivated in most European countries and in the United States. The plants died but produced seeds freely and from them the present generation of plants was raised.

The flowering of *Arundinaria Falconeri*, however, like that of many other Bamboos, is not simultaneous in the sense that plants in various places, or even in the same place, flower during one summer. Lieut.-Colonel Prain has noted the same thing in the Bamboo forests of the East. Although the general flowering of a species may occur in one particular year, it is heralded by the flowering of a few forerunners the previous year and followed by that of laggards the next. The year 1876 was the great flowering year of *Arundinaria Falconeri* and our specimens show that plants flowered then at Kew, Mount Edgcumbe, and wild in Sikkim. But plants had flowered at Trentham in 1875, whilst others at Holland House did not flower until 1877.

We seem at the present time to be in the midst of another but more protracted flowering period. As long ago as March, 1903, Kew received flowering specimens from Mr. J. C. Hawkshaw's garden at Hollycombe, Liphook; in 1904 they were received from the late Hon. Charles Ellis of Frensham Hall, and in 1906 from Lord Lansdowne's garden at Derreen, Kenmare; but none of the plants at Kew have yet flowered generally.

It should be noted that *A. Falconeri* does not always flower over the entire plant at one time. Odd culms flowered at Kew during 1893 and 1894.

A. Hookeriana, Munro.—Flowered in the Temperate House at Kew in 1899 and bore seed. All the Kew plants died, but at Glasnevin, where it flowered at the same time, some died whilst others recovered.

A. intermedia, Munro.—Flowered in the Temperate House at the same time as the preceding, and died also.

A. japonica, Sieb. et Zucc. (Bambusa Metaké, *Sieb.*).—In Lady Dorothy Nevill's garden at Dangstein this well-known Bamboo flowered in 1874. The late Signor Fenzi also records its flowering at Florence in 1872 (Gard. Chron., 1872, p. 1228). Specimens in the Kew Herbarium show that it was flowering in Japan in 1877.

A. racemosa, Munro.—Flowered in the Temperate House at Kew in 1899.

A. Simoni, A. & C. Rivière.—As long ago as 1892, the first year of the Bamboo Garden at Kew, we noticed odd culms flowering on the plants of this species growing there. But excepting that the flowering culms died, the plants were in no way affected. Their general vigour and the number of young culms sent up were in no way diminished. They continued to flower in this way every year up to 1903, by which time we had almost come to regard *A. Simoni* as a perennial. In that year, however, the plants in the Temperate House flowered on every culm, and, after producing an abundance of seed, died. This species is, of course, quite hardy, and large clumps 18 feet high were growing at that time in the Bamboo Garden, but it was not until the two following years (1904–5) that these flowered on every culm. After that not a single trace of leaf-growth was ever visible and the plants were ultimately uprooted.

A. Simoni var. *variegata*, Hook. f.—This differs from typical *A. Simoni* only in having a proportion of its leaves striated with white. Often, so few leaves are marked, that the plants scarcely differ from ordinary *A. Simoni*. Yet, curiously enough, although every particle of the true *A. Simoni* has flowered, not one of the specimens of this variety has done so. It is figured in Bot. Mag. t. 7146 where it is said to have flowered in 1877, but whether the flowering was partial or complete cannot be inferred from the context. [Since the above was written I have seen a plant of this variety flowering in Messrs. Veitch's nursery at Coombe Wood. We may infer therefrom that the plants of *A. Simoni* var. *variegata* in this country are about to share the fate of the type. —W. J. B.]

A. Simoni var. *Chino*, Makino (A. Laydekeri, *Hook. f.*).—This is a dwarf Bamboo with mottled leaves, very distinct from the type. It flowered in the Bamboo Garden at Kew in 1896 all over the plant, and although every effort was made to save it (as it was the only one we had) it died the following year. According to a letter from Mr. A. B. Freeman-Mitford (now Lord Redesdale) dated Nov. 17, 1901, this Bamboo had flowered at Batsford during the four previous seasons and was none the worse. But this, I assume, was the partial flowering which has been alluded to as characteristic of *A. Simoni*.

Chusquea abietifolia, Griseb.—A striking example of simultaneous flowering is afforded by this West Indian Bamboo. Sir Daniel Morris records the phenomenon as seen by him in 1884–5, in Gard. Chron., Oct. 23, 1886, p. 524, where he observes that "when the seed was set, the stem began to die down and apparently every plant in the island [Jamaica] died, root and all." It is a curious fact that a plant growing in the Palm House at Kew flowered at exactly the same time and died also.

Phyllostachys aurea, A. & C. Rivière.—Flowered with Signor Fenzi at Florence in 1876, but so far as the British Isles are concerned we have but one record of its flowering. This was in Mr. S. T. Heard's garden at Rossdohan, Kerry, in 1905.

P. nigra, Munro.—Several reputed species of *Phyllostachys* have, as a consequence of their recent flowering, had to be reduced

to varieties of *P. nigra.* However much they may have differed from each other in leaf and stem characters, the bamboos here grouped under *P. nigra* have shown not the least difference in floral characters. In this respect they are absolutely identical with *P. nigra.* At Kew *P. nigra* itself has not yet flowered, although all the varieties here mentioned have done so. It has, however, flowered in other places. In 1900, it flowered with Mr. F. W. Moore at Glasnevin, Dublin; in 1901, with the late Hon. Charles Ellis at Frensham Hall near Haslemere; and, in 1902, with Lord Ventry at Burnham, co. Kerry.

P. nigra var. *Boryana* (P. Boryana, *Mitford*).—Flowered at Kew in 1904, and at Exeter the previous year. Of the original plant at Kew a small portion is still alive; this may be from a piece of rhizome which had not flowered. At any rate the entire plant died with this exception.

P. nigra var. *Castillonis* (P. Castillonis, *Mitford*).—This beautiful bamboo, with its golden-yellow stems, is very different from the ordinary black-stemmed *P. nigra.* Yet when it flowered at Kew, in 1903 and 1904, it was found to be the same species.

P. nigra var. *fulva*, (P. fulva, *Mitford*).—Flowered at Kew in 1905.

P. nigra var. *Henonis* (P. Henonis, *Mitford*).—Flowered at Tilgate, Crawley, Sussex in 1898; at Menabilly in Cornwall, Regent's Park, and Rodway House near Bristol, in 1900; and since then in very many gardens. At Kew it flowered in the Temperate House in 1902; and in the open air from 1903 to 1905. None of the plants recovered and the collection has sustained no severer loss than that of this beautiful bamboo.

P. nigra var. *punctata.*—First flowered at Kew and at Abbotsbury in 1900. During the next few years other plants flowered at Kew and in numerous other gardens.

The following cultivated species have not yet flowered in this country, but it may be of interest to give the dates when they were last known to flower in a wild state.

Arundinaria aristata, Gamble.—Now cultivated in the Temperate House at Kew and by Mr. S. T. Heard at Rossdohan, Kerry. It flowered in Sikkim in 1895.

A. macrosperma, Michx.—This is the only hardy bamboo from the New World. It flowered in the S. United States between 1872 and 1878.

A. nitida, Mitford.—Mr. E. H. Wilson collected flowering specimens of a bamboo in Western Hupeh, China, June, 1900, which were subsequently identified as this species.

Some bamboos evidently go much longer than others without flowering. *Bambusa tessellata*, Munro, has been in cultivation for probably over sixty years, yet I have seen no record of its having flowered anywhere. It is the same with *Arundinaria Fortunei*, A. & C. Rivière, which has been in cultivation for nearly, or quite, fifty years.

There is, no doubt, a good deal yet to be learnt about the flowering of bamboos. We know, however, that they have two

methods of flowering—the partial or sporadic as contrasted with the complete and simultaneous. The partial flowering, as in the case of *Arundinaria Simoni*, is sometimes merely the beginning of the end, and culminates in the flowering of the entire plant and its death. Whether there are species that will continue to flower at intervals and never break into that general flowering which is always followed by the death of the individual plant, we do not yet know. But from what is noted above with regard to cultivated species, it would appear that the production of flowers is fatal to that part of the plant affected. If the whole plant flowers then the whole of it dies. Every one of the *Phyllostachys* that has flowered hitherto at Kew has sooner or later died, with the exception of the small portion of a plant of *P. nigra* var. *Boryana* noted. Seedlings have been raised from most of them, but as the parent plants have all proved to be varieties or forms of *P. nigra*, it is doubtful whether their progeny will reproduce their peculiar characters.

Mr. E. H. Wilson, the well-known collector of Chinese plants saw *Phyllostachys nigra* in flower in the Yang-tsze valley in May, 1903, and he says "I noted that only the flowering culms die" (Gard. Chron. Aug. 12, 1905, p. 125). It would be interesting to know whether the length of life in a bamboo would be altered by deferring the sowing of the seed. Judging by one's ordinary experience it would not; one would expect plants from the seed of *Arundinaria Falconeri*, sown in 1876, to reach the flowering state, other circumstances being equal, two years earlier than plants raised from similar seed kept until 1878. Yet when we consider the various accidents which even in a wild state would help to vary the time of germination, it would seem that some general law governs the flowering of many bamboos and keeps it practically simultaneous.

Under cultivation, on the other hand, the system of simultaneous flowering of some of these species would appear to be breaking down. For instance, *Arundinaria Falconeri* in this country, so far as our records show, first flowered between 1875 and 1877; in the vast majority of cases in 1876. But the flowering of the present generation has already extended over five seasons.

XXXVII.—ACCESSION OF TROPICAL AFRICAN PLANTS FROM 1899–1906.

Otto Stapf.

The accession of tropical African plants to the herbarium during the last seven years has been particularly heavy, and as more than two-thirds were unnamed it was quite impossible to deal with them as they arrived. To avoid duplication of work only those collections which for special reasons had to be dealt with immediately were worked out separately, the bulk of them being pooled and treated as a whole. This involved a considerable but unavoidable delay in completing the determination of the earlier collections. By February last, however, all the tropical African

collections received to that date were worked up, and they are now, together with the named collections acquired during the same period, incorporated in the herbarium.

The following is a list of the collections of phanerogams and vascular cryptogams received from 1899–1906. The figures given do not include duplicates excepting such as were received under different collector's numbers.

Adamson, George, and John Buchanan: Shiré Highlands, 498 specimens (named), communicated by Prof. I. Bayley Balfour on behalf of the Royal Botanic Garden, Edinburgh.

Allen, C. E. F.: Rhodesia, neighbourhood of Victoria Falls, 392 specimens (unnamed).

Appleton, Lt. Col.: Somaliland, between Obbia and Berbera, 100 specimens (unnamed).

Bagshawe, Dr. A. G.: Uganda, 60 specimens (named), communicated by Dr. A. B. Rendle on behalf of the Trustees of the British Museum.

Balfour, Prof. I. Bayley, *see* ADAMSON.

Barthelemy, Rev. M., *see* GARDNER.

Baum, H.: Kunene to Zambesi Expedition, 330 specimens (named), purchased.

Broun, A. F. and Mrs.: Sudan, 233 specimens (named).

Brown, E.: Uganda, 369 specimens (unnamed).

Brown, H.: Sudan, 81 specimens (unnamed), communicated by Prof. Dunstan on behalf of the Imperial Institute.

Buchanan, John, *see* ADAMSON.

Bureau, Prof. L. E., *see* POBÉGUIN.

Busse, Dr. W.: German East Africa, 196 specimens (named), purchased.

Cameron, K. J.: British Central Africa, mostly from the Nyika Plateau, 275 specimens (unnamed).

Cecil, Hon. Mrs. Evelyn: Rhodesia, 147 specimens (unnamed).

Cunningham, J. F.: British Central Africa, between Lake Shirwa and Lake Chiuta, 25 specimens (unnamed).

Dalziel, Dr. J. M.: Northern Nigeria, 287 specimens (unnamed).

Dawe, M. T.: Uganda, 905 specimens (partly named).

Dawodu, T. B.: Lagos, 323 specimens, communicated by Sir W. MacGregor.

Denton, Sir G. C.: Lagos, 62 specimens (unnamed).

Dinklage, M. J.: Liberia, 15 specimens (named), purchased.

Drake-Brockman, Dr. R. E.: Somaliland, 74 specimens (unnamed), communicated by the Colonial Office; 257 specimens (unnamed), communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Dudgeon, G. C.: Gambia, 8 specimens (unnamed), communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Dunstan, Prof. W. R., *see* BROWN, H., DRAKE-BROCKMAN, DUDGEON, ELLIOTT, W.R.

Elliott, C. F.: British East Africa, mostly from Nairobi, 242 specimens (unnamed).

Elliott, W. R.: Northern Nigeria, 162 specimens (unnamed), communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Engler, Prof. A., *see* GOETZE, HEINSEN, PREUSS, SCHEFFLER, THOMAS.

Farmar, Leo: Sierra Leone and French Guinea, 434 specimens (partly named), communicated by Viscount Mountmorres on behalf of the Institute of Commercial Research in the Tropics, of the University of Liverpool.

Foster, E. W.: Lagos, 186 specimens (unnamed).

Gardner, T.: Rhodesia, mostly from the neighbourhood of Bulawayo, 97 specimens (unnamed), communicated by the Rev. M. Barthelemy.

Goetze, W.: German East Africa, "Nyasa-Sea and Kinga Expedition" (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Gosling, Capt. G. B.: Northern Nigeria, 11 specimens (unnamed).

Gossweiler, J.: Angola, 1,020 specimens (partly named), communicated by Prof. J. A. Henriques on behalf of the Coimbra Botanic Garden.

Grenfell, A. P.: British East Africa, Taita Hills, 52 specimens (unnamed).

Heinsen, Dr.: German East Africa, Usambara, 50 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Henriques, Prof. J. A., *see* GOSSWEILER.

Henry, Dr. A., *see* KESTEVEN.

Holland, J. H.: Southern Nigeria, Old Calabar Division, 140 specimens (unnamed).

James, Sir Evan: British East Africa, Aberdare Mountains, 136 specimens (unnamed); Uganda, Nandi, Kitoshi, spurs of Mount Elgon, 198 specimens (unnamed).

Johnson, W. H.: Gold Coast, 168 specimens (unnamed).

Johnson, Archdeacon: Portuguese East Africa, East Coast of Lake Nyasa, 136 specimens (unnamed).

Johnston, Sir. H. H., *see* REYNOLDS, SIM, and WHYTE.

Junod, Henri A.: Eastern Transvaal (partly south of the tropic), 240 specimens (unnamed), purchased.

Kässner, Theodor: British East Africa, 560 specimens (unnamed), purchased.

Kentish-Rankin, L.: Northern Nigeria, 40 specimens (unnamed).

Kesteven, Lord: Barotse Country, 15 specimens (unnamed), communicated by Dr. A. Henry.

Klaine, R. P.: West Africa, Gaboon, 234 specimens (named), communicated by Dr. L. Pierre.

Kolbe, Rev. F. C.: Rhodesia, mostly in the neighbourhood of the Victoria Falls, 54 specimens (unnamed), communicated by the St. Mary's Herbarium, Cape Town.

Last, J. T.: Zanzibar, 27 specimens (unnamed).

Leslie, J. C.: Southern Nigeria, Asaba Division, 13 specimens (unnamed).

Linton, A.: British East Africa, 166 specimens (unnamed).

Lort-Phillips, Mrs. E.: Somaliland, 113 specimens (unnamed).

Lugard, Capt. E. J. and Mrs.: Ngamiland, 285 specimens (unnamed).

Lyne, R. N.: Zanzibar, 164 specimens (unnamed).

MacGregor, Sir W., *see* Dawodu.

MacLeod, N.C.: Southern Nigeria, 30 specimens (unnamed).

McClounie, J.: British Central Africa, mostly from the Nyika Plateau, 358 specimens (unnamed).

Mahon, J.: Uganda, 116 specimens (unnamed).

Manning, Lt. Col. W.H., *see* PURVES.

Mountmorres, Viscount, *see* FARMAR.

Muriel, C. E.: Sudan, 289 specimens (unnamed).

Newton, F.: Cape Verd Islands, 33 specimens (unnamed), communicated by Mr. Isaac Newton.

Newton, Isaac, *see* NEWTON, F.

Pearson, Prof. H. H. W.: German South West Africa, Damaraland, 39 specimens (unnamed).

Pierre, Dr. L., *see* KLAINE.

Pobéguin, H.: French Guinea, 50 specimens (unnamed), communicated by Prof. L. E. Bureau on behalf of the Muséum d'Histoire Naturelle, Paris.

Powell, H.: British East Africa, 103 specimens (unnamed).

Preuss, Dr. P.: Cameroons, 102 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Punch, C.: Lagos, 161 specimens (unnamed).

Purves, J. M.: British Central Africa, 375 specimens (unnamed), communicated by Sir Alfred Sharpe and Lt. Col. W. H. Manning.

Rendle, Dr. A. B., *see* BAGSHAWE.

Reynolds, H.: Liberia, 16 specimens (unnamed), communicated by Sir H. H. Johnston on behalf of the Liberian Chartered Company.

Scheffler, E.: German East Africa, Usambara, 55 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Sharpe, Sir Alfred, *see* PURVES.

Sim, D.: Liberia, 36 specimens (unnamed), communicated by Sir H. H. Johnston, on behalf of the Liberian Chartered Company.

Smythe, C. W.: Sierra Leone, 49 specimens (named).

St. Mary's Herbarium, Cape Town, *see* KOLBE.

Talbot, P. A.: Northern Nigeria, 10 specimens (unnamed).

Thomas, F.: British East Africa, Witu, 108 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Thompson, H. N.: Southern Nigeria, Benin Division, 30 specimens (unnamed).

Thomson, Major D.: Somaliland, 93 specimens (unnamed).

Unwin, Dr. A. H.: Southern Nigeria, 35 specimens (unnamed).

Urban, Prof. I., *see* WARNECKE.

Warnecke,—.: West Africa, Togoland, 11 specimens (named), communicated by Prof. I. Urban on behalf of the Botanic Garden and Botanic Museum, Berlin.

Wellby, Capt. M. S.: South Abyssinia, 100 specimens (unnamed).

Wellman, Dr. F. C.: Angola, 73 specimens (unnamed).

Whyte, Alexander: Uganda, 576 specimens (unnamed); British East Africa, 286 specimens (unnamed); Liberia, 306 specimens (unnamed) (partly collected with D. Sim), communicated by Sir H. H. Johnston on behalf of the Liberian Chartered Company.

Zenker, G.: Cameroons, 1546 specimens (named), purchased.

Various Collectors :—

(*a*) A set of *Combretaceae* and *Melastomaceae*, 37 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

(*b*) A set of *Gramineae*, 24 specimens (partly named), communicated by Prof. L. E. Bureau, on behalf of the Muséum d'Histoire Naturelle, Paris.

The total number of specimens contained in these collections is 14,627, of which 11,740 were presented and 2,887 purchased. About 10,000 specimens were received unnamed and had to be identified. So far as the specimens belonged to families published in the recent volumes (1899–1906) of the Flora of Tropical Africa, they have been recorded in their places, whilst others formed the foundation of a considerable number of new species described in the *Kew Bulletin* (vols. for 1901, 1906 and 1907), and *Hooker's Icones Plantarum.*

Whyte's, Sim's and Reynold's new Liberian species formed the subject of a paper "Contributions to the Flora of Liberia" by Dr. O. Stapf (*Journ. Linn. Soc.* xxxvii., pp. 79–115); whilst the whole of their collections were taken up in the same author's

paper, "The Known Plants of Liberia," in Sir H. H. Johnston's Liberia, vol. ii., pp. 570–668 (with numerous illustrations by Miss M. Smith). A list of Dawe's Uganda collection was published in that gentleman's official "Report on a Botanical Mission through the Forest Districts of Buddu and the Western Nile Provinces of the Uganda Protectorate" (Parliamentary Blue Book, Cd. 2904), and the new species collected by him were described in "Plantae Daweanae in Uganda lectae" by Dr. O. Stapf in collaboration with T. A. Sprague, R. A. Rolfe, C. B. Clarke, M. T. Dawe, and C. H. Wright (*Journ. Linn. Soc.* xxxvii., pp. 495–544, tt. 21 and 22). Lieut.-Col. Appleton's, Dr. Drake-Brockman's and Mrs. Lort-Phillip's Somaliland collections were particularly rich in *Gramineae* and enabled Dr. Stapf to give a general account of the Grass Flora of Somaliland (*Kew Bulletin*, 1907, pp. 203–228). Finally a paper on the Flora of Northern Nigeria is in preparation, based to a great extent on the collections from that country enumerated in the above list.

The lower Cryptogams (Mosses, Liverworts, Algae, Lichens, Fungi) are not included in the figures given, for the simple reason that they have been almost completely neglected by the collectors; but it is to be hoped that attention will in the future be paid to these plants, the more so as they are, in most cases, easy to collect. It should not be forgotten that they form a very important part of the vegetation, and the flora of no country can be considered properly explored without their being included.

XXXVIII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: IV.

NEW AND ADDITIONAL SPECIES OF FUNGI: SECOND SERIES.

(With Plate.)

G. Massee.

It has already been necessary to make a first addition to the list of *Fungi* occurring in the Royal Botanic Gardens, published in the *Wild Fauna and Flora of the Royal Botanic Gardens, Kew* (*Kew Bulletin: Additional Series* V., pp. 103–187; 223). This additional list is to be found in *Kew Bulletin* for 1906, No. 2, pp. 46, 47. To that list it is now necessary to add the species enumerated below.

AGARICACEAE.

Collybia retigera, *Bresad.* On a dead beech stump, Queen's Cottage Grounds, *A. D. Cotton.*

The second record for Britain, having previously been recorded from the New Forest. The surface of the pileus is ornamented with irregularly anastomosing, raised veins or ridges.

Pleurotus atrocoeruleus, *Fries.* On a decaying beech trunk, Queen's Cottage Grounds, *G. Nicholson.*

Hypholoma peregrinum, *Massee.*

Pileus carnosus, e convexo explanatus, margine repando, demum striato, viscidulus, luteo-virescens, fibrillis fulvo-auroreis obtectis, centro squamoso hirtus, 3–4 cm. latus. *Lamellae* confertissimae, angustae, ventricosae, postice sinuato adnexae, ex albis purpureo-fuscae, acie fimbriata, alba. *Stipes* pallidus, fistulosus, fibrillosus, aequalis, 2–3 cm. longus, 2 mm. crassus. *Sporae* ovato-oblongae, basi apiculatae, episporio subtiliter punctato-scabro, 5 × 3 μ. *Basidia* clavata. *Cystidia* ampulliformia, 65–75 × 6–7 μ. Sapor mitis.

Gregarious on decaying wood in the Tropical Fern House, *W. B. Little.*

This is in all probability an introduced species, bearing some resemblance to *Hypholoma atrichum*, Berk., from India, but differing in the narrow, very closely crowded gills, flattened (not umbonate) pileus, and smaller spores.

Gomphidius viscidus, *Fries.* On the ground under conifers, Queen's Cottage Grounds, *A. D. Cotton.*

Remarkable for the tough, elastic substance of the entire fungus, and the large fusiform, olive-coloured spores.

Coprinus Spraguei, *Berk. & Curtis.* On the ground among moss, Queen's Cottage Grounds.

Differs from every other British species of *Coprinus* in having a coloured stem.

Polyporaceae.

Boletus granulatus, *L.* On the ground under conifers, Queen's Cottage Grounds, *A. D. Cotton.*

One of the best of the edible species of *Boletus*. Much appreciated as an article of food by squirrels.

Polyporus armeniacus, *Berk.* On dead wood lying on the ground, Queen's Cottage Grounds, *G. Nicholson.*

Snow-white when growing, changing to deep cinnamon when dry.

Thelephoraceae.

Cyphella Pimii, *Phil.* On dead nettle stems, Arboretum.

Hydnaceae.

Odontia Pruni, *Lasch.* On rotten wood, Queen's Cottage Grounds, *G. Nicholson.*

New to Britain. Distribution ; France, Germany, Italy.

Clavariaceae.

Pterula multifida, *Fries.* Growing in a dense cluster at the base of dead fern stipes, Herbaceous ground, *W. Irving.*

PEZIZACEAE.

Belonidium pruinosum, *Massee.* On dead branches, Queen's Cottage Grounds.

A minute white fungus growing in dense clusters. The mealy or pruinose appearance of the disc is due to the great accumulation of spores, which, on escaping from the asci, are not disturbed by currents of air as in most of the *Pezizae*, but remain on the surface of the fungus until they have germinated. The object of this exceptional arrangement is at present unknown.

Dasyscypha trichoidea, *Sacc.* On fallen pine leaves, Queen's Cottage Grounds, *G. Nicholson.*

Helotium Amenti, *Fckl.* On dead fallen alder catkins, Arboretum, *G. Nicholson.*

Ascobolus Crouani, *Boud.* On old rotten sacking, Melon ground, *C. P. Raffill.*

A beautiful little green fungus, a colour rarely met with in fungi.

SPHAERIACEAE.

Chaetomium lageniforme, *Corda.* On dead fallen alder twig, Queen's Cottage Grounds, *G. Nicholson.*

New to Britain.

Xylaria Culleniae, *Berk. & Broome.* On bamboo flower stake, *H. M. Woolley.*

This fungus is an introduced species from Ceylon. It is not uncommon in the gardens, and shows a preference for bamboo.

GYMNOASCACEAE.

Endomyces Magnusii, *Ludwig.*

This is one of the organisms always present in the "slime-flux" or glairy substance dripping from the large weeping wounds often present on the trunk or larger branches of various kinds of trees. There are several very large wounds of this nature on the horizontal branches of a horse chestnut, growing just within the north entrance to the Queen's Cottage Grounds.

SACCHAROMYCETACEAE.

Saccharomyces Ludwigii, *Hansen.*

This yeast is one of the organisms present in the disease called "slime-flux." The yeast promotes fermentation and converts the cellulose cell-walls into a soluble substance, which oozes from the wound, more especially during rainy weather, under the form of diluted, frothy gum.

MELANCONIACEAE.

Diplodia ilicicola, *Desm.* On dead holly leaves, Queen's Cottage Grounds, *G. Nicholson.*

Dilophospora Graminis, *Desm.* On the inflorescence of *Holcus mollis*, Arboretum, *G. Nicholson.*

This fungus is a true parasite, and is not uncommon on the living inflorescence of various kinds of grass. Infection occurs when the inflorescence is quite young, and enclosed within the sheath, and when it emerges it is more or less completely covered with a dense black felt of hyphae, in which the numerous minute perithecia are embedded. It sometimes proves very destructive to cereals, more especially wheat.

Pyrenochaeta Phloxidis, *Massee.*

Perithecia dense gregaria, in maculis elongatis nigricantibus atra, nidulantia, globosa, erumpentia, membranacea, ostiolo pertusa, setis nigris, rigidis, praecipue ad verticem vestitis, 130–180 μ diam. *Sporae* continuae, ellipsoideae, hyalinae, 5 × 3 μ; basidiis hyalinis bacillaribus suffultis.

On stems of *Phlox* just above the ground-line. This parasite quite destroyed a bed of *Phlox*; the foliage at first assumed a greenish-yellow sickly tinge, and afterwards wilted and fell, followed by the breaking of the stem near the base.

Most nearly allied to *Pyrenochaeta ferox*, Sacc., which differs in the hyaline spines springing from the upper portion of the perithecium, and the much larger spores.

Phoma Callunae, *Karsten.* On dead heather stem, Arboretum, *G. Nicholson.*

Pestalozzia Callunae, *Cesati.* On dead heather stem, Arboretum, *G. Nicholson.*

Pestalozzia truncata, *Lév.* On dead bark of hawthorn and oak, Arboretum, *G. Nicholson.*

Lepothyrium ilicinum, *Sacc.* On dead fallen leaves of *Quercus Ilex*, Arboretum, *G. Nicholson.*

Vermicularia corvina, *Karsten.* On chips, Queen's Cottage Grounds, *G. Nicholson.* New to Britain.

Coryneum microstictum, *Berk. & Broome.* On dead bramble stem, Queen's Cottage Grounds, *G. Nicholson.*

Coryneum pustulatum, *Peck.* On dead branches of horse chestnut, Queen's Cottage Grounds, *G. Nicholson.*

Ascochyta Cookei, *Massee.*

Perithecia dense gregaria, inordinata, in maculis elongatis lutescentibus nidulantia, subepidermica, globosa, ostiolo erumpentia, 70–80 μ lata, basi hyphis mycelialibus septatis, fuligineis praedita. *Sporae* hyalinae, medio septatae, cylindraceo-clavatae, 40 × 4–5 μ.

On living leaves of "Sweet William"—*Dianthus barbatus*, L., *M. C. Cooke.*

This species was collected in Kew Gardens by Dr. Cooke several years ago, and placed in the herbarium under the name of *Ascochyta Dianthi*, Berk., presumably on account of a very close superficial resemblance between the two species; the spores

however are quite different in size and shape, in *A. Dianthi* they are narrowly fusiform, and measure 14–16 × 4 μ, or only about one-third the length of those of *A. Cookei*.

Exosporium laricinum, *Massee*.

Sporodochia atra, erumpente-superficialia, convexo-pulvinata, dein centro depressa, dense aggregata, circa 0·5 mm. diam. *Conidia* crebra; fusiformia, 5-7-septata, hyalina, olivaceo-fuliginea, 25–30 × 6–7 μ, sporophoris brevibus, teretibus, 1-septatis, concoloribus suffulta.

On young living larch branches, Queen's Cottage Grounds.

This fungus is a true parasite, but does little or no direct damage. Indirectly, however, it is sometimes the cause of serious injury as through the minute cracks formed in the living bark, and the extrusion of sap and resin, the spores of the "Larch canker" fungus (*Dasyscypha calycina*, Fckl.) often effect an entrance into the tissues of the host, and as a rule canker follows.

The minute black conidiophores occur in dense clusters at different points on the branch. Allied to *Exosporium Tiliae*, Link, but at once distinguished from this and every other known species by the fusiform conidia.

Septoria Hippocastani, *Berk.* On dead horse-chestnut leaves, Arboretum.

Septoria Aesculi, *Westem.* On dead sweet chestnut leaves, Arboretum.

Septoria Robiniae, *Desm.* On living leaves of *Robinia*, Arboretum.

Septoria Cytisi, *Rabenh.* On living laburnum leaves, Queen's Cottage Grounds.

Septoria Wistariae, *Roumeg.* On living leaves of *Wistaria*, Arboretum.

HYPHOMYCETACEAE.

Oospora candidula, *Sacc.* On dead twigs, Queen's Cottage Grounds, *G. Nicholson*.

Arthroderma Curreyi, *Berk.* On buried beech mast, Queen's Cottage Grounds, *G. Nicholson*.

Cylindrium griseum, *Bonord.* On decaying vegetable matter. Arboretum.

Aspergillus flavus, *De Bary*. On dung of caterpillar of swallow-tail moth,—*Europteryx sambucaria*, L., *A. L. Simmons*. New to Britain.

Clonostachys Simmonsii, *Massee*.

Hyphae steriles repentes, simplices vel breve vage ramulosae, septatae, hyalinae; hyphae fertiles erectae, simplices, supra septatae, ad septos verticillato-ramosae; ramis ramulisque ternis-quinis; ramulis attenuatis, conidiis ubique tectis, spicam aemulantibus. *Conidia* ellipsoidea, hyalina, spinulosa, 6 × 4 μ.

On dung of caterpillar of swallow-tail moth,—*Europteryx sambucaria*, L., *A. L. Simmons*.

A very beautiful and distinct fungus, resembling in miniature a compact bundle of plantain spikes. Every part pure white. Approaches to *Clonostachys Araucaria*, Corda, in habit and general appearance, but differs in the longer fertile spikes and in the larger, spinulose conidia. The fungus appeared on the dung of caterpillars bred from a moth taken in the Queen's Cottage Grounds by Mr. Simmons.

Ramularia Necator, *Massee.*

Sporodochia superficialia, late effusa, filamentosa, nivea ; hyphae steriles repentes, dense intricato-ramosae, septatae, hyalinae, 7–10 μ diam. hinc inde inflatulae. *Basidia* assurgentia, parce ramulosa, ramulis ultimis attenuatis, conidiis elliptico-oblongis, utrinque obtusatis, 3-septatis, ad septa vix constrictis, 25–28 × 7–9 μ.

On the cotyledons of seedlings of *Theobroma Cacao*, L., in the propagating pits.

A batch of Cacao seeds from Jamaica was recently sown, and soon after germination the cotyledons became covered with a dense snow-white mould which eventually killed the seedlings. The fungus is a true parasite and quite distinct from any described species of *Ramularia* ; furthermore, the fungus does not conform with the usual facies of European species belonging to this genus, and it would be interesting to learn whether it has been observed as a parasite on Cacao seedlings in Jamaica.

Milowia amethystina, *Massee.*

Sporodochia pulvinata, laxe gregaria, sessilia, humetecte laete amethystina, 0·5–1 mm. diam. *Sporae* cylindraceo-ellipsoideae, utrinque obtusatae, 7-septatae, hyalinae, 40–50 × 7–8 μ, basidiis hyalinis suffultis.

On damp decorticated wood, Herbarium Grounds, *G. Nicholson.*

The pustules are of a clear amethyst colour when moist and growing, becoming pallid when dry. *Milowia nivea*, Massee, the only species previously known, differs in the snow-white colour and much larger spores.

Stilbum sphaerocephalum, *Massee.*

Sporophora capitata, usque 1 mm. diam., straminea, glabra, demum sporis albido-pruinosa. *Stipes* subteres, compressusve, laevis, in capitulum diffusus, concolor, basi incrassatus, fuscus, 2 mm. longus, 0·1 mm. crassus. *Sporae* ellipsoideae, hyalinae, 7 × 3 μ.

On wounds of living stem of *Philodendron*, growing in the Aroid house.

The plants grow singly or in small clusters. The general aspect is that of a miniature drumstick, the head or spore-bearing portion being at first obpyriform, then globose and frosted with a dense layer of spores. This appearance is probably due to the fact that the fungus was growing in a constantly damp atmosphere, and the spores, instead of being removed by wind as they matured, were held together in a damp mass by moisture.

Most nearly allied to *Stilbum connatum*, Kalchbr. & Cooke, differing in the straw-coloured head and stem, and in the smaller spores.

Graphiothecium parasiticum, *Desm.* On very much decayed hawthorn branch, Arboretum, *G. Nicholson.*

Uredinaceae.

Uromyces Dactylidis, *Otth.* The aecidial form on *Ranunculus repens*, L.; uredo- and teleutospore-forms on *Dactylis glomerata*, L., Queen's Cottage Grounds, *G. Nicholson.*

Uromyces Rumicis, *Wint.* On living leaves of *Rumex acetosa*, L., Queen's Cottage Grounds, *G. Nicholson.*

Puccinia Glechomatis, *DC.* On living leaves of *Nepeta Glechoma*, Benth., Queen's Cottage Grounds, *G. Nicholson.*

Explanation of Figures on Plate.

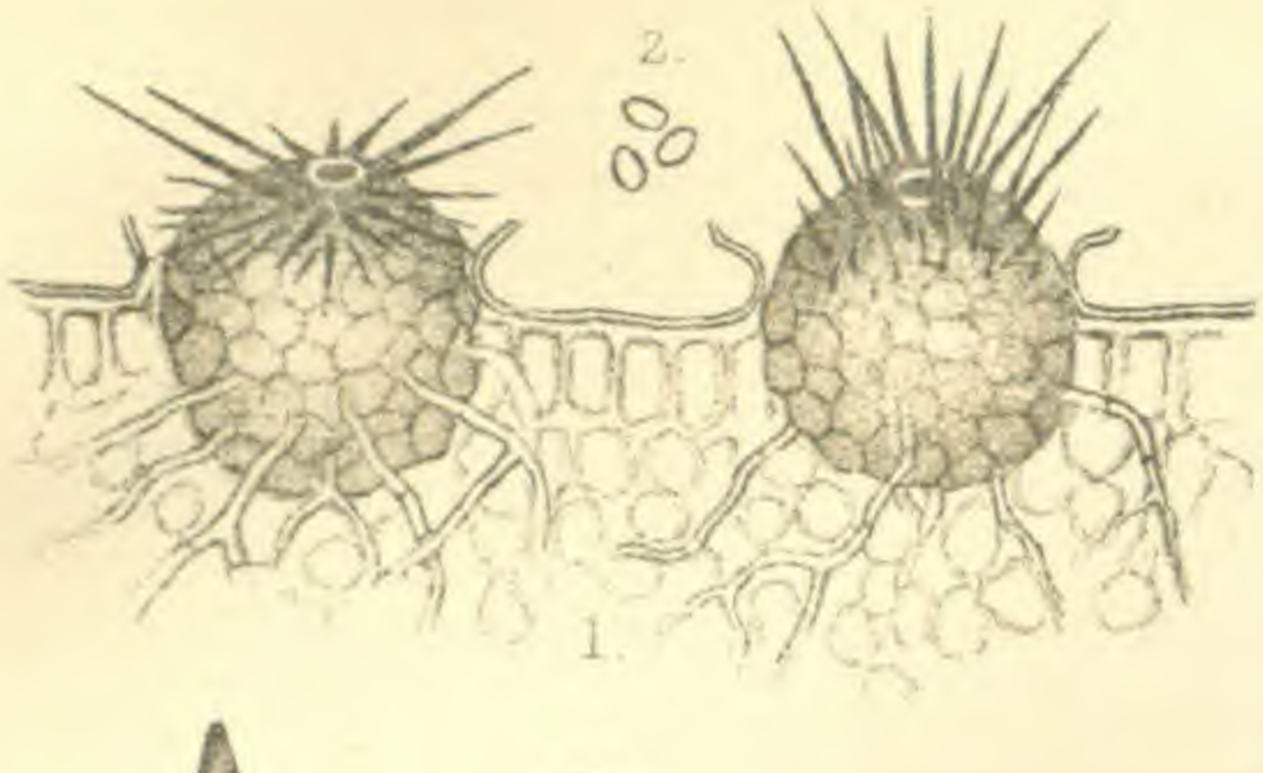
Fig. 1. *Pyrenochaeta Phloxidis*, Massee; section of *Phlox* stem showing two perithecia, mag.
„ 2. Spores of same, highly mag.
„ 3. *Milowia amethystina*, Massee; group of plants on dead wood, slightly mag.
„ 4. Spores of same, highly mag.
„ 5. *Ascochyta Cookei*, Massee; fungus on living leaf of "Sweet William," nat. size.
„ 6. Spores of same, highly mag.
„ 7. Portion of fruiting hypha of *Ramularia Necator*, Massee; highly mag.
„ 8. Spores of same, highly mag.
„ 9. *Clonostachys Simmonsii*, Massee; entire fungus, mag.
„ 10. Spores of same, highly mag.
„ 11. *Chaetomium lageniforme*, Corda; entire fungus, mag.
„ 12. Spores of same, highly mag.
„ 13. *Stilbum sphaerocephalum*, Massee; group of plants, mag.
„ 14. Spores of same supported on tips of hyphae, highly mag.
„ 15. *Exosporium laricinum*, Massee; group of plants on a larch branch, nat. size.
„ 16. A single plant of same seen from above, mag.
„ 17. Section of a plant of same, mag.
„ 18. Group of spores of same, highly mag.
„ 19. *Hypholoma peregrinum*, Massee; nat. size.

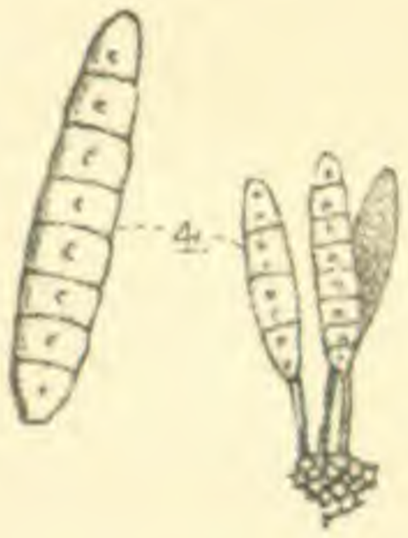
XXXIX.—A NEW CHINESE RHODODENDRON.

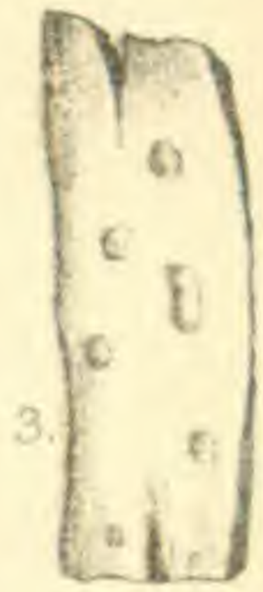
W. B. Hemsley and E. H. Wilson.

5056 **Rhododendron** (§ **Azalea**) **Mariesii**, *Hemsl. et E. H. Wils.*; species critica compluribus plus minusve arcte affinis, *R. Weyrichii*, Maxim., proxima, differt foliis in ramorum apices saepissime terna et gemmarum floriferarum squamis glabris; a *R. rhombico*, Miq., ramulis glabris, foliis lanceolatis pilis longissimis appressis subtus vestitis et squamis latioribus recedit; a *R. Farrerae*, Tate, cum qua cl. Diels haec conjungit, foliis ternis multo majoribus membranaceis minute reticulatis differt.

W. B. H.



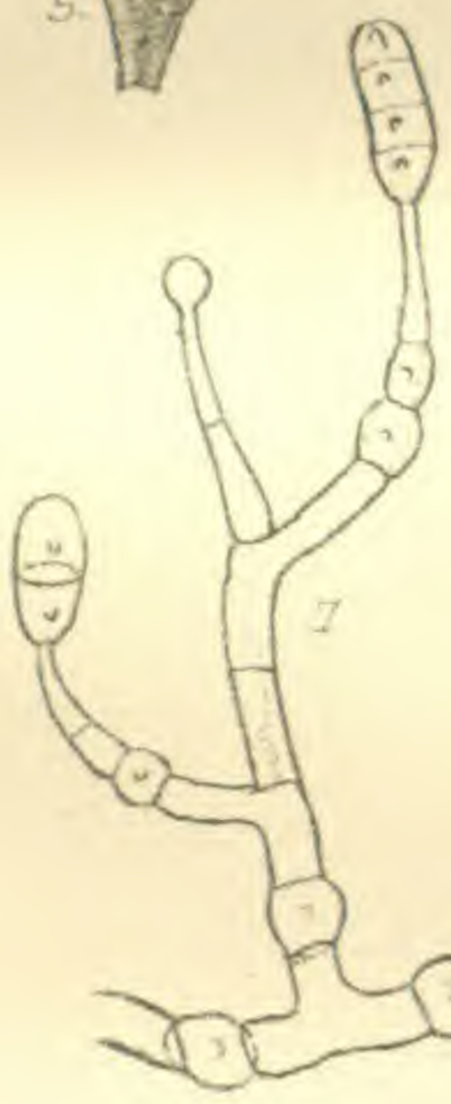


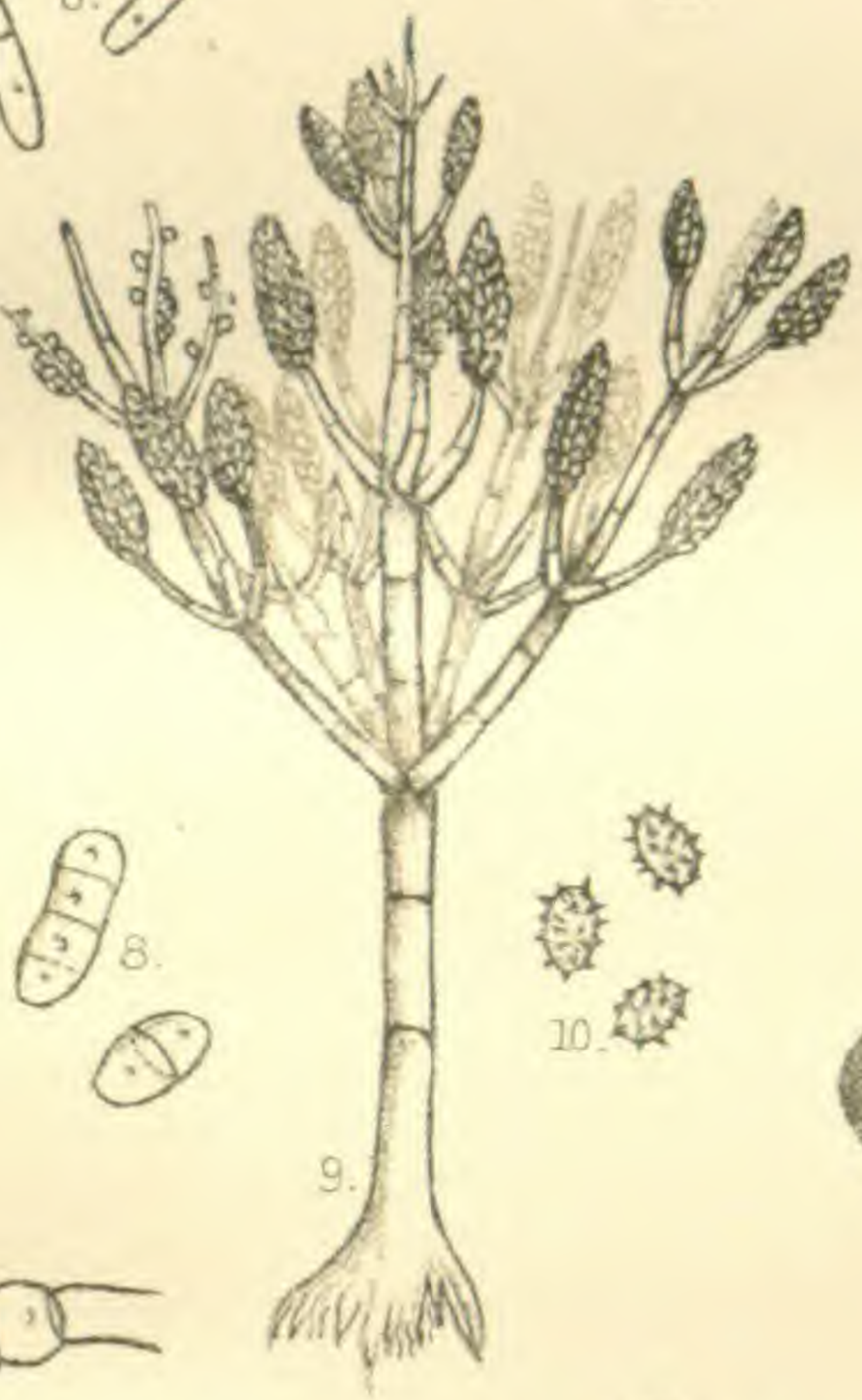


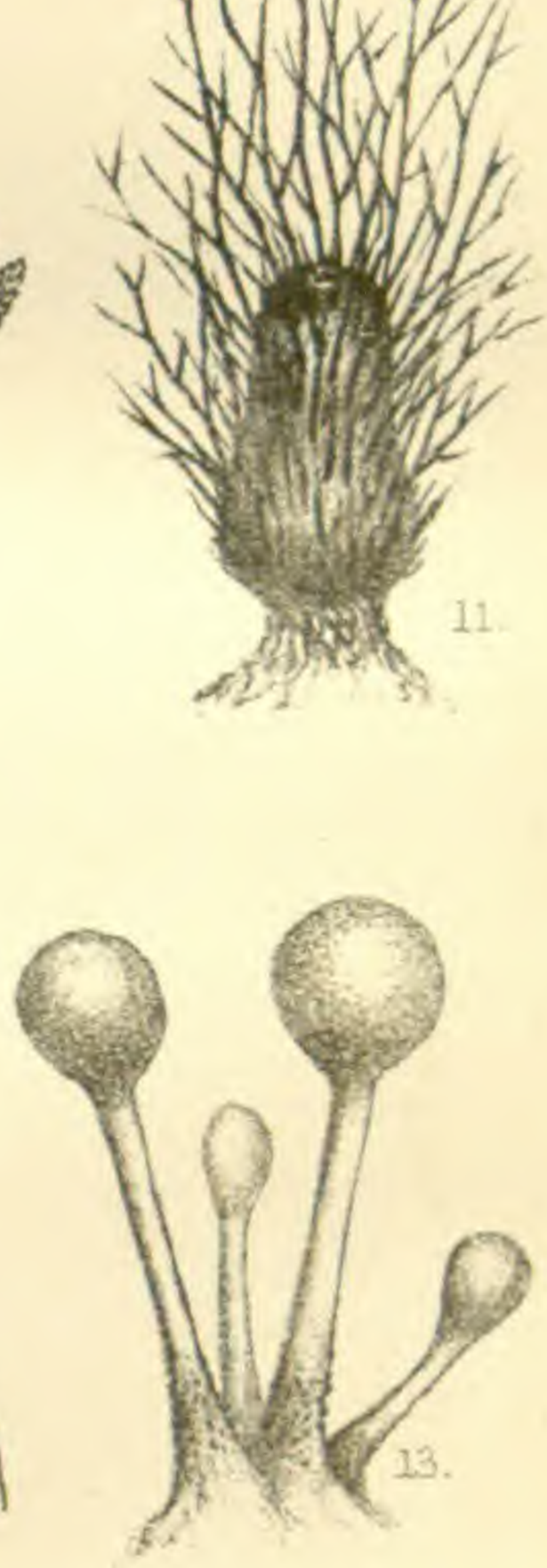












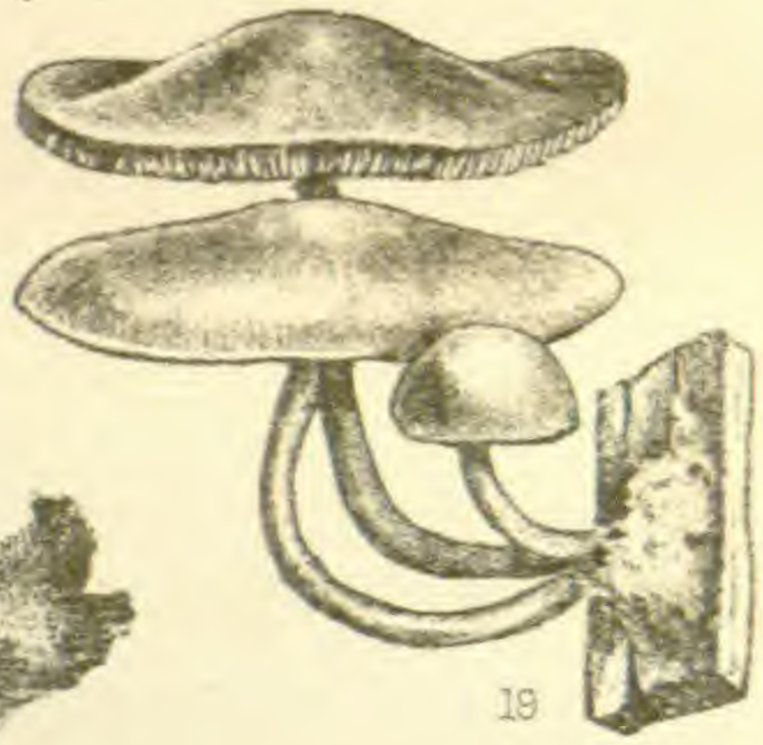












New British Fungi.

N.B.T. 6.07.

Weller & Graham, Ltd. Litho, London.

Bush 1–2 metres high; branches twiggy, grey or reddish, shining. *Leaves* clustered, deciduous, membranous, ovate, acute, excluding petioles 6–7 cm. long, 2·5–3·5 cm. broad, reticulate, base cuneate, glabrescent, clothed with yellowish, silky hairs when young; midrib and primary veins prominent, sparsely pubescent; petioles 4–8 mm. long, dark coloured, glabrescent. *Buds* ovoid; scales broadly ovate or orbicular, apiculate, ciliate, glabrescent without, pubescent within. *Flowers* usually in pairs, rarely solitary, pale purple, 4–5 cm. across; pedicels, enclosed by bud-scales, erect, stout, ·5–1 cm. long, setulose. *Calyx* annular, densely setose. *Corolla* deeply 5-lobed, glabrous; tube narrowly funnel-shaped, 5–10 mm. long; lobes twice the length of the tube, spreading, elliptic, rounded or obtuse. *Stamens* 10, shortly exserted; filaments 2–2·5 cm. long, glabrous, curved in upper half. *Pistil* much exceeding stamens; ovary 4–5 mm. long, densely setose; style 3–3·5 cm. long, curved upwards, glabrous. *Fruit* about 1·5 cm. long, 6 mm. broad, setose.—*R. Farrerae*, var. *Weyrichii*, Diels, in Engl. Jahrb. vol. xxix., p. 513.

E. H. W.

CENTRAL CHINA: Western Hupeh, at 200–600 metres, *Wilson*, 29; Changyang, *A. Henry*, 5274, 5947; Patung, *A. Henry*, 1422; Nanto and mountains to the northward, *A. Henry*, 3829; Kiukiang, Kiangsi, *Maries*.

Dr. Henry's dried specimens, and some others, were doubtfully referred by me (*Journ. Linn. Soc.* vol. xxvi., p. 32) to *R. Weyrichii*, Maxim.

Raised at Kew from seeds sent home by Dr. Henry in 1886, and flowered in the Temperate House in April, 1907.

Dr. L. Diels, in the place cited above, reduces *R. Weyrichii*, Maxim., *R. leucotrichum*, Franch., the specimens here referred to *R. Mariesii*, Hemsl. and E. H. Wils., and some others, to *R. Farrerae*, Tate. This treatment leads me to suspect that he may not have had specimens of genuine *R. Farrerae* before him, because this, in my opinion, is one of the most distinct and least variable of the species of the section *Azalea*; and Maximowicz, in contrasting his *R. Weyrichii*, a Japanese species, with the Hongkong *R. Farrerae* says:—"A praecedente optime differt." *R. Farrerae*, Tate (Sweet's Brit. Fl. Gard. 1831, series 2, t. 95), is a low, very densely branched bush with thick, stiff leaves strongly reticulated on the under surface, with usually solitary flowers and more hairy flower-buds.

The investigation of this group of species has led to the discovery of some facts in the history of *R. Farrerae* that seem worth recording. It is a native of the mountains of Hongkong and the neighbouring part of the mainland, as stated in the *Journal of the Linnean Society*, vol. xxvi., p. 23. Among the collectors of the species is one named Tate, who collected both on the mainland and in the island, in 1862–3. This was G. R. Tate, M.D., an army surgeon, who was stationed at Hongkong during the years named. The Tate to whom Sweet attributes the authorship of the name *Farrerae* was not, however, Dr. Tate, but a nurseryman in Lowndes Street, as we learn from Loudon's

Gardener's Magazine, vol. vii. (1831), p. 474, for whom Captain Farrer, of the East Indiaman "Orwell," brought home several living plants; this Mr. Tate proposed the name in compliment to Mrs. Farrer. But the species was made known to the Horticultural Society of London in the first instance by John Reeves, who presented the Society with drawings and specimens. This was the Reeves who, in 1858, introduced the plant of *Wistaria chinensis* which until recently was one of the notable features of the Chiswick Garden. Fortune re-introduced *R. Farrerae* about 1846 and Lindley, overlooking its previous publication, described it under the name of *Azalea squamata* in the *Journal of the Horticultural Society*, vol. i., p. 152, and in 1847 a coloured figure of it appeared in the *Botanical Register*, t. 3.

W. B. H.

XL.—MISCELLANEOUS NOTES.

Mr. Frank Henry Butcher and Mr. Edmund George Stroud, members of the Gardening Staff of the Royal Botanic Gardens, have been appointed by the Secretary of State for India in Council, on the recommendation of Kew, probationer gardeners for service in India.

Abraham Dixon.—The death of this gentleman, an old correspondent of Kew, is announced as having taken place on April 30, at the great age of 92 years. He was an enthusiastic horticulturist with sufficient means to gratify his taste for the pursuit, and he was specially interested in tropical plants of economic value. His first letter in the Kew archives is dated from Birches Green, Birmingham, February 23, 1867, advising the despatch of seeds of Coca* and seeds and fibre of 'Bimba Cotton,' and requesting an interview to discuss the cultivation of tropical fruits, concerning which he wrote: "I and my gardener have unfortunately much more zeal than knowledge." In spite of their want of knowledge, he must have had various tropical fruit-trees under cultivation for some years at that date, because in a communication of the following year he says: "I now write to say that I have a valuable and, I believe, an unusually well selected collection of tropical fruit-trees which I have imported myself during the last few years from the East and West Indies and South America, but which I have now some intention of placing elsewhere, because I am preparing to change my residence from here to a small estate which I have purchased near Dorking." He was prepared to present the collection, on which he had spent much money, to Kew, on the condition that if in the future he should be able to resume "the interesting and attractive attempts

---

* This was the *Erythroxylon Coca*, var. *novo-granatense* (*Kew Bulletin*, 1889, p. 5); hundreds of plants were raised and distributed to numerous correspondents in various parts of the world.

to fruit these plants," he would receive such assistance as Kew could afford him. But in consequence of Mr. Dixon going abroad, the plants were not sent to Kew till August, 1869. There was a railway truck load of them, made up as follows :—*Garcinia Mangostana*, 7 plants; *G. cochinchinensis*, 1; *Anona squamosa*, 9; *A. palustris*, 2; *A. Cherimolia*, 5; *Persea gratissima*, 4; *Averrhoa Carambola*, 2; *Achras Sapota*, 4; *Baccaurea dulcis*, 1; *Artocarpus integrifolia*, 1; *Erythroxylon Coca*, 12; *Mangifera indica*, 1; and *Nephelium lappaceum*, 1.

In 1871 Mr. Dixon wrote from Cherkley Court, his new estate near Leatherhead, where he had built himself a residence and begun laying out his garden, which soon became famous. He particularly mentions his "wood of 60 to 80 acres of dense and fine old yews," and adds : "I hope that some day you will allow me the pleasure of showing you this old druidical grove. I think it must be one of the largest extant." Lowe, in his *Yew-trees of Great Britain and Ireland*, 1897, describes it as perhaps the finest collection of yews in existence.

Mr. Dixon again took up the cultivation of tropical economic plants. He had also a very fine collection of aquatic plants, for which he constructed a special house, and he was particularly successful with the *Victoria regia*.

For many years he continued in correspondence with Kew, and exchanged seeds and plants to the mutual benefit of both parties.

In September, 1893, his residence was burnt down in the night, and much was destroyed, but he rebuilt it and returned to enjoy many years among his favourite plants.

His last letter to Kew is dated May 19, 1899, and in this he agrees to the Director's suggestion that a plant of the 'Gordon Lily,' which he had presented to Kew, should be sent to the Queen's garden at Frogmore.

W. B. H.

Portrait of Mr. Gustav Mann.—A medallion portrait of this gentleman has recently been presented to Kew. There are few persons alive now who can remember that he was the pioneer in the botanical exploration of the mountains of Western Tropical Africa. He succeeded the unfortunate Charles Barter as Botanical Collector for Kew, on Dr. Baikie's Niger Expedition in 1859, with remarkable and valuable results, mainly published in the *Journal* and *Transactions of the Linnean Society*. In the sixth volume of the *Journal* will be found Mann's highly interesting narrative of the ascent of Clarence Peak (10,700 ft.), Fernando Po, and Sir Joseph Hooker's enumeration of the plants; and in the seventh volume of the same publication Mr. Mann describes his expedition to the Cameroons, on which he was equally successful. He reached the summit, which he estimated, from the boiling point of the thermometer, to be 12,271 feet, and he made a very full collection of the plants of the temperate region, which afforded Sir Joseph Hooker materials for a most interesting comparison with the flora of the mountains of

Abyssinia. Mr. Mann also made large collections in the tropical region, including many remarkable new genera. The Palms of the expedition were published by him, jointly with H. Wendland, in the twenty-fourth volume of the *Transactions of the Linnean Society*. Mr. Mann subsequently served with distinction in the Indian Forest Department, from which he retired a few years ago, and now lives near Munich.

W. B. H.

Botanical Magazine for June.—The plants figured are: *Rhododendron Delavayi*, Franch.; *Tamarix pentandra*, Pall.; *Eupatorium glandulosum*, H. B. K.; *Gentiana ornata*, Wall.; and *Dendrobium Ashworthiae*, O'Brien; all, excluding the *Dendrobium*, being in cultivation at Kew. The *Rhododendron* is a native of South-western China, and is very closely allied to the well-known *R. arboreum*, Smith, but may be distinguished by the intense red of its flowers with black blotches on the inside. The drawing was prepared from a specimen obtained from the garden of Mr. Thomas Acton, of Kilmacurragh, Wicklow, and sent to Kew by Mr. F. W. Moore, of Glasnevin. *Tamarix pentandra* is found in a wild state from the Balkan Peninsula, through Southern Russia, to Turkestan, and from Asia Minor to Persia. It is a very ornamental plant allied to *T. gallica*, L., with which it has been confused. The Kew plants were purchased from a Belgian nurseryman. *Eupatorium glandulosum*, a fine white-flowered Mexican species, is an old garden plant, having been introduced in 1826. The drawing was made from a plant which flowered at Kew in March, 1906. *Gentiana ornata* is a native of Alpine Central and Eastern Himalaya. It is a small herb about 6 inches high, with usually narrow leaves and solitary terminal blue flowers about $1\frac{3}{4}$ inch long. It is pointed out that the plant figured at t. 6514 under the same name is evidently a different species, resembling *G. nipponica*, Maxim. The plant of *G. ornata* was presented to Kew in 1905 by Mr. Max Leichtlin, of Baden-Baden. The *Dendrobium* belongs to the section *Dendrocoryne*, which includes, amongst others, *D. atroviolaceum*, Rolfe, and *D. Madonnae*, Rolfe, figured at tt. 7371 and 7900 of the Magazine. It was introduced from New Guinea by Messrs. F. Sander & Sons about seven years ago. The plant figured, probably the only one now in Europe, was kindly lent to Kew by Sir Trevor Lawrence, Bart.

Notes from Northern Nigeria.—The following information, contained in a letter to Kew, dated May 11, 1907, from Mr. W. R. Elliott, Conservator of Forests, Northern Nigeria, in reply to enquiries regarding the experimental station established at Lokoja in that province, seems so interesting as to deserve publication :—

"With regard to your question referring to the Botanic Station formed at Lokoja, I would point out that it can hardly be termed a Botanic Station. A piece of forest situated near Lokoja was

declared a forest reserve, and our main efforts have been directed, so far, to the propagation and planting of the different rubbers, especially *Funtumia elastica*.

"At the beginning of 1906, large nurseries of *Funtumia* were formed, and later on over 100 acres of the Lokoja reserve—which is about 250 acres in extent—were planted up, and the remainder will be done this year.

"In addition to this, 40 acres of forest were planted up on the Gurane River, where we have a reserve of over 400 square miles, and a further 40 acres at Dakini in the Basse Province.

"The idea we are working on is to get the natives to plant up the forest surrounding their towns and villages with *Funtumia*.

"Para rubber is also being grown experimentally in the Lokoja reserve, and I have no doubt will be a success in the southern parts of the Protectorate. The different Landolphias have also been planted in the reserve with a view of experimenting with them as to what extent the roots can be tapped without injuring the plants and to discover improved methods of tapping the vines and coagulating the latex.

"At present the country is being rapidly denuded of Landolphias owing to the destructive methods of collecting the root rubber, the whole of the roots being dug up and pounded.

"There are no planting operations of a private nature in Northern Nigeria, if one excepts the work of the British Cotton-growing Association Model Farm near Lokoja.

"There is no doubt that the cultivation of Para rubber and *Funtumia* could be successfully undertaken in the southern parts of the Protectorate, but the question of European supervision is a somewhat serious one, and unless the thing was taken up on a large scale it would not pay. European supervision means large pay, payment leave, and passages home and out; and to ensure continuity in the work, the European staff would have to be double what it is in other places.

"Our forest reserve on the Gurane River is full of splendid Mahogany—*Khaya senegalensis*—and Ebony—*Diospyros mespiliformis* ?—as well as many other valuable timber trees. By the new Forestry Proclamation the cutting of these trees is forbidden excepting under the supervision of the Forestry Department, and it is hoped that a stop will be put to the cutting of young trees for firewood.

"There is no doubt that there is a great future for Northern Nigeria in cotton. Every village grows its own cotton, and in many cases manufactures its own cloth, and I think every effort should be made to select the best variety of native cotton and distribute the seeds throughout the country. During 1906 the British Cotton-growing Association got as much cotton as they could deal with in their ginnery at Lokoja, and they are making arrangements to deal with a much larger quantity this season. Tobacco is also largely grown in the Protectorate, some of it of very good quality."

Bitter Pit in Cape Apples.—Since the publication of previous notes on this subject (*K.B.* for 1906, pp. 193–5, and *K.B.* for 1907, pp. 142–4), it has transpired that prior to the official reference of this interesting question to Kew for report, on 26th March, 1906, the subject had already been placed in the very competent hands of Professor J. B. Farmer, F.R.S., Royal College of Science, South Kensington, for investigation. Knowing the great interest taken in the matter at Kew, and sharing our feeling that it is desirable to place at the disposal of all who are, or are likely to become, interested in the subject the whole of the information as yet available, Professor Farmer has very kindly supplied the subjoined note for the information of readers of the *Kew Bulletin* :—

"With reference to the note on Bitter Pit in Cape Apples which appeared in the *Kew Bulletin*, No. 4, 1907, I should like to say that my own attention was called to the disease about 18 months ago by Dr. Horace Brown, who showed me some specimens preserved in spirit. I was introduced by him to the Cape Orchard Company, who were good enough to send me several consignments of various sorts of apples for investigation. In the badly attacked sorts (*e.g.*, Northern Spy) the disease was not confined to any special region of the apple. All attempts to establish a fungal or bacterial origin for the disease failed. No trace of either could be seen in sections of the fruit, either fresh or preserved in the fixations commonly employed in microscopic technique. This is of itself not conclusive, for it is well known how easily the parasite may escape detection under these conditions. But cultural experiments carried on on a rather large scale also failed to reveal the slightest trace of any existing parasite.

"Furthermore, the disease seems, as Mr. Davis states, always to develop *within* the flesh of the apple, and to extend outwards to the skin. Several of the samples I received showed no traces of the disease till they were cut open, and then the characteristic brown spot was easily enough identified. Thus it seems clear that the disease is connected with—at present—obscure physiological causes which can only be investigated on the spot, unless it should turn out that some plant louse or other animal starts the mischief by boring into the fruit when very young. There is, however, one peculiarity connected with the affected tissue which seems to me to be of great interest, and which will have to be borne in mind in seeking for the explanation of the origin of the malady. The cells of the affected area are always full of starch, and stand out in this respect in marked contrast to the surrounding healthy tissue. Either the pathological condition tends to effect the formation of the starch, or, as I think is more probable, the action of diastase is locally inhibited. This might arise from the inability of sugar to pass out of the infected cell, and so by increasing its concentration, to maintain a high starch content, or it might be due to a more directly prejudicial action on the diastase itself. The cell walls undergo a kind of pectic degeneration, and react in a marked degree to Ruthenium Red. The whole disease bristles with points of physiological interest, but they can only be hopefully attacked on the spot."

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1907.

XLI.—THE LINNEAN BICENTENARY.

The two-hundredth anniversary of the birth of Linnaeus was celebrated in Sweden with much enthusiasm between May 21st and May 25th last. The central ceremony took place at Upsala on May 23rd, Linnaeus having been born on May 23rd in 1707; the actual Linnéfest at Upsala was, however, preceded by celebrations at Lund on May 21st and followed by celebrations at Stockholm on May 25th.

The University of Upsala and the Royal Academy of Sciences of Stockholm invited, as their guests, delegates representing certain selected Universities, delegates representing those societies and institutions of which Linnaeus had been a member, delegates from all societies that bear the name "Linnean" as well as from all those that comprise a natural history section and that at the same time belong to the International Association of Academies, and finally, delegates from a few other Institutions. Among these was the Royal Botanic Gardens, Kew, represented by the Director.

The University of Lund thereafter kindly invited the delegates proceeding to Upsala for the celebrations of May 23rd to break journey at Lund and participate in the ceremonies organised for May 21st at Råshult, the birth place of Linnaeus. A considerable number of the delegates were able to avail themselves of this subsidiary invitation and were afforded an opportunity in the forenoon of inspecting a collection of Linnean relics and portraits and thereafter of examining the particular sections of University activity in which each was most interested. Under the kindly guidance of Professor Norstedt, himself a lineal descendant of Linnaeus' brother, we were able to pay a profitable visit to the Botanic Garden which, if small, is well laid out and well furnished, the Botanical Museum in which there are a number of interesting specimens, the Herbarium and the Laboratory, before joining the other guests at a luncheon, hospitably offered by Rector Ribbing, preparatory to leaving for Råshult.

1375 Wt 87 7/07 D & S 29 29041 A

The house at Råshult which occupies the site of the one in which Linnaeus' father, who was then pastor of the parish, lived in 1707, is situated quite near the railway line from Lund to Stockholm. On the slope in front of the house stands a commemorative obelisk erected in 1866, surrounded by an open space which formed the meeting ground for those attending the celebration. At the foot of this slope a temporary platform was provided where the various trains drew up and disembarked their passengers. The local celebrations had been arranged for in the forenoon so that the afternoon was available for the academic ceremonies organised by the University of Lund.

The majority of the delegates who broke journey for the Råshult celebrations were taken back when these were over by special train to Elmhult, the nearest station in the direction of Lund. Here they dined as the guests of the University of Lund, and some time after midnight joined the night train from Malmö to Stockholm, which was reached next forenoon. Some, however, preferring to forego the Elmhult banquet and the four hours subsequent wait which this entailed, took an afternoon train and travelled direct to Stockholm, which was reached in the early morning on May 22nd. Those who adopted this course were able to breakfast comfortably before joining the forenoon train for Upsala, which was reached about noon.

Arrangements had been made beforehand by Mr. W. Carruthers, the delegate appointed to represent the Linnean Society, that a carriage should be in waiting when the train reached Upsala to take him to Hammarby, the country seat in which Linnaeus spent his summers when he was Professor at Upsala. Mr. Carruthers having kindly invited us to join his party we were thus enabled to spend a pleasant afternoon in a quiet and leisurely inspection of this place, so intimately associated with the great man whose memory we were there to celebrate.

Hammarby, which lies some miles south-west from Upsala, is preserved in much the state in which it was when Linnaeus resided there. In the house itself and in the small museum erected by Linnaeus on the little hill behind the house, are preserved relics of their illustrious owner which, if not very numerous, are at least exceedingly interesting. Perhaps more interesting, at least to our mind, than the house and the museum, were the garden, which is maintained as nearly as may be in the condition in which Linnaeus left it, and the grounds full of plants originally placed there by Linnaeus himself. The most striking of these at the time of our visit was *Corydalis nobilis*, great patches of which were in full bloom and made a memorable show.

The early morning of the 23rd brought by special train from Stockholm the greater number of the guests of the University to Upsala. Such of us as had arrived the previous day were requested to attend at the railway station when this train arrived and participate in the formal reception accorded by the University to its guests. Very cordial and striking this reception was and very manifest was the enthusiasm and interest evoked by the celebration not only in the students but in the people of the city. This reception over we were able to devote a considerable part of

the forenoon to visiting the formally arranged Botanic Garden, formerly the garden of the Royal Castle. The one sad feature of the celebrations to the botanical guests of the University was the fact that owing to the recent death of the lamented Professor Kjellman, this garden, for the moment, was without a Director and the Chair once filled by Linnaeus without an occupant.

The great central Fête, commemorative of the birth of Linnaeus, took place at 2 p.m. on May 23rd in the Aula of the University; this noble hall forms a magnificent semi-circular theatre facing a smaller apse, also semi-circular, which provides an ample stage, occupied for the time being by an orchestra and chorus. The various delegates, who had assembled beforehand and taken the places assigned them by the University authorities, marched into the hall in procession and filed off to their appointed seats. When this had been done a Royal party, headed by H.R.H. the Prince Regent of Sweden, entered; the audience rose and joined the orchestra and chorus in singing the Swedish National Anthem. The formal ceremonial at once began, with at intervals very beautiful music from the orchestra and the choir. After an address, delivered by Rector Schück, the delegates, introduced by a single representative for each country, presented their addresses; those for the United Kingdom were introduced by Sir Archibald Geikie, the delegate representing the Royal Society of London. The Swedish delegates, in two groups, were introduced after the foreign delegates. The whole ceremony occupied more than three hours; when it was over the foreign delegates were graciously received in the Chancellor's room by H.R.H. the Prince Regent; a few of the delegates were subsequently recalled individually in order to receive, at the hands of the Prince, the insignia of the order of the Polar Star, the decoration bestowed when he lived on Linnaeus himself.

The afternoon was devoted to various social gatherings, the most striking of which was a students' concert, given at the Botanical Garden, where the guests had an opportunity of understanding how magnificent the singing of the undergraduates of Upsala really can be. In the evening the guests, divided roughly into those whose pursuits are literary and those whose pursuits are scientific, were entertained at dinner by His Grace the Archbishop of Upsala, and by the Rector of the University and Madame Schück. The latter banquet, to which we were invited, was given in the handsome hall of the Norrland Nation, one of the largest of the twelve nations in which the students of Upsala are grouped. The toasts in addition to Royal toasts were few—the foreign guests, for whom Professor Haeckel replied; the Swedish guests, for whom Count Mörner, President of the Royal Swedish Academy of Sciences, responded; finally the Linnean Society of London, for whom Mr. Carruthers answered. The feast ended at 9 p.m. and the guests adjourned to attend a reception in the University Palace which ended what had been a well filled and interesting day.

The morning of May 24th was enlivened at 7 a.m. by the firing of 21 guns from the Castle Battery. To make quite certain that none of their guests should oversleep themselves after the arduous festivities of the previous day the authorities who had arranged

the ceremonies thoughtfully supplemented this salute by causing the great bell of the Cathedral to be rung at 8 a.m. and to go on ringing for a quarter of an hour. The great ceremony of the day was fixed for noon, guests being desired to assemble half an hour in advance, so that time was found to visit the old Botanic Garden attached to what in the eighteenth century was the town residence of Linnaeus, which is still kept as it was in his time. During this visit we were accompanied by Mr. C. de Candolle and by Professor and Mrs. Farlow. The season of our visit was too early to see the garden to advantage. After having seen Linnaeus' garden a visit was paid to the Botanical Museum and the Herbarium where it was desirable if possible to settle a crucial point connected with a species described by Thunberg. The University of Upsala had very kindly permitted the study at Kew, in connection with the preparation of the *Flora Capensis*, of the *Labiatae* belonging to Herb. Thunberg. When the other genera were sent the genus *Salvia*, being among the *Diandria*—for the Thunberg collection is kept apart and is still arranged according to the sexual system—was not forwarded; subsequently when the species of *Salvia* were transmitted for study it was found that the covers contained no example of *Salvia aurita*, Thunbg.

In spite of the heavy calls on their attention, Dr. Juel, Lecturer on Botany, and Dr. Sernander, Lecturer on Plant Geography, most kindly spared the time required, and the absence of *Salvia aurita* from the Cape covers was, when the type specimen was found, at once explained. The specimen, though the basis of a South African species, was not collected at the Cape but was raised in the Botanic Garden at Upsala from seed received from the Cape. The opportunity which has now occurred of examining the specimen disposes finally of what was a subject of considerable dubiety.

Assembling at 11.30 a.m. at the University Hall, the delegates had places assigned to them by the marshal of ceremonies and marched at noon in procession to the Cathedral of Upsala, which stands on the hillside below the University, there to witness the conferring of degrees in the four faculties of Theology, Law, Medicine and Philosophy. In addition to the Swedish graduates in all four faculties, in two of the faculties various strangers were selected for this honour. The system of selection adopted was officially explained as follows :—Les Facultés de Médecine et de Philosophie, pour lesquelles cette fête a naturellement une importance toute particulière, ont décidé de créer aussi, *honoris causa*, des docteurs étrangers, par une derogation à l'usage établi chez nous, laquelle paraîtra saus doute justifiée, en égard aux nombreuses relations étrangères de Linné. Ces facultes n'auraient pas désiré mieux que de pouvoir conférer, *honoris causa*, leurs différents grades à tous les illustres invités qu'elles auront, daus cette occasion, l'honneur d'accueillir au nom de la vieille Université de Linné. Toutefois, cela ne leur ayant pas, pour plusieurs raisons, paru possible, il a été décidé que seront reçus docteurs honoraires : un représentant pour les sociétés portant le nom de Linné, un autre représentant pour les savants étrangers, délégués des Universités et institutions dont Linné a été membre, et, enfin un représentant pour chaque pays ayant envoyé des délégués aux fêtes du bicentenaire.

The only three British Societies and Institutions of which Linnaeus was a member are :—

The Royal College of Physicians of Edinburgh ;
The Royal Society ;
The Society for the Encouragement of Arts, Commerce and Manufactures ;

the only British Society bearing his name is the Linnean Society of London.

Five honorary graduates were, in accordance with the system above described, selected from among the British delegates ; one, representing the Royal College of Physicians of Edinburgh receiving a degree in the Faculty of Medicine ; the other four, representing the three London Societies and representing the United Kingdom, receiving degrees in the Faculty of Philosophy.

As the procession filed into the Cathedral a solemn march was played, and when all were seated and the Prince Regent with the Royal Party had arrived, the first part of the University Cantata was sung. This cantata was written by Rydberg and set to music by Josephson for the historic graduation ceremony of 1877, when the University of Upsala celebrated its quatercentenary. The singing of special parts of the cantata preceded the promotions in the different faculties. The first faculty to be called was that of Theology ; the dean of the faculty and promoter of the thirty doctors being the Archbishop. At an appointed passage in his allocution he placed on his head the hat which in this University doctors may wear, and three cannon shots fired in quick succession from the Castle platform, greeted the faculty which he represented. One by one the *doctores electi* came forward and as each passed the promoter a doctor's hat was placed on his head, a single cannon shot being fired to mark his assumption of the degree ; in the case of Jubilee doctor two cannon shots were fired. Having passed the promoter each doctor received his diploma from another official, paid his respects to the Chancellor, made obeisance to the Prince Regent and returned to his seat. The procedure for the faculties of Law and Medicine, whose respective deans acted as promoters, was the same as for that of Theology ; in the case of the faculty of Philosophy it only differed in that the doctors received crowns of bay instead of hats and in addition to diplomas received gold finger-rings.

As the various doctors filed past the Chancellor and the Royal Party on their way to resume their seats the orchestra played a march which changed for each faculty. The doctors of theology were encouraged by the martial notes of the "War-march of the Priests," those of Law by the stirring strains of a triumphal march. The doctors of medicine went thoughtfully past to the accompaniment of a *marche funèbre* ; those of Philosophy walked gaily to a "Wedding March."

The graduation ceremony occupied rather more than two hours ; at its close the delegates left the Cathedral in the order in which they had arrived, most of the new doctors returning to the University to assemble on the perron and there receive the congratulations of the students. This, which was for us the most striking ceremony of these two wonderful days, was seen perhaps

to greatest advantage from the balcony windows that overhang the main entrance of the University Palace. Far off and faint, one heard the sweet singing of the previous afternoon; then the banners of the University and of the nations came in sight and the sound grew in intensity as the students in a solid and orderly phalanx came slowly up the hill towards the steps of their noble hall. As the procession drew near it was seen that in its foremost ranks there were not a few of the young new doctors of philosophy—proud of their laurel crowns, loth to break with student associations. At the base of the perron the phalanx below us slowly melted into a wide girdle of white capped students, singing in unison round the new doctors. The song ended, the students uncovered, and their eager faces glowed as one stood forward and greeted the graduates on behalf of his fellows; one of the new doctors, Prince Eugene of Sweden, came forward and replied and the most beautiful and impressive of the ceremonies of the Linnéfest, where everything had been beautiful and impressive, was at an end.

The reason for the transference of the graduation ceremony from the University Hall to the Cathedral now dawned on one. A banquet to all the guests of the University had been arranged for in this hall at 6.30 p.m. Like everything else provided by the University of Upsala this was perfect; it broke up early to admit of the hall being cleared for a students' ball at 10.30 p.m., and thereby allowed those of the guests whose dancing days are done to take, if they chose, a late train for Stockholm which reached its destination at midnight.

Next morning it was therefore possible to visit the famous Hortus Bergianus at Albano near Stockholm and, guided by Professor Wittrock in person, to see the many interesting things that this garden contains and to make the acquaintance of the almost unique collection of portraits of botanists which it has been one of his pleasures to accumulate.

The great event of May 25th was the meeting, at 2 p.m., not in their own rooms but in the great hall of the Musical Academy, of the Royal Swedish Academy of Sciences. At this meeting the procedure adopted at Upsala as regards the reception of the delegates and of their addresses, was repeated, save that the Swedish delegates in this case were received before the foreign guests.

During the séance of the Academy two addresses were delivered by the President, Count Mörner, the formal proceedings being varied by the singing of a cantata commemorative of the life and work of Linnaeus. The culminating feature of the ceremony was the award by the President of the great Linnean medal struck especially for the occasion. The destination of this medal had not been allowed to transpire, and the announcement that the recipient of this unique and signal award was Sir Joseph Dalton Hooker, formerly Director of the Royal Botanic Gardens, Kew, caused the liveliest satisfaction to every one of the delegates present, Swedish and foreign alike. The enthusiasm with which the announcement of this happy decision was received was indeed only equalled by the regret which was expressed that our veteran chief had found himself unequal to the fatigue of being present in person to receive this crowning honour.

To the courtesy of Sir Joseph we owe an opportunity of examining the medal, which is a most beautiful example of the medallist's art, and we are further indebted to him for permission to publish here copies of the correspondence connected with one of the most interesting events in the history of Kew.

Correspondence relating to the Award of the Gold Medal Commemorative of the Bicentenary of Linnaeus.

Foreign Office to Sir Joseph Hooker.

Foreign Office,
June 10th, 1907.

Sir,

I am directed by the Secretary of State to forward to you, herewith, the Gold Medal, commemorative of the Bicentenary of Linnaeus, struck for award to the most illustrious living exponent of botanical science, which the Swedish Academy has conferred upon you, and which, in your absence, was presented to Sir R. Rodd, His Majesty's Minister at Stockholm, by the Crown Prince of Sweden with the request that he would cause it to be forwarded to you.

Sir R. Rodd reports that at the Memorial Meeting held on May 27th, which was attended by delegates from many foreign countries, the President of the Academy, Count Mörner, passing from Swedish to English, referred to your great services to science in a speech of which copy is enclosed, at the conclusion of which the Crown Prince handed the Medal to Sir R. Rodd with cordial expressions of the gratification which the Award had given him.

Sir E. Grey wishes to associate himself with these sentiments and desires me to express his pleasure in giving effect to the wishes of the Crown Prince.

I am, etc.,
(Signed) Eric Barrington.

Sir Joseph Hooker, G.C.S.I., C.B.,
The Camp,
Sunningdale.

(Enclosure.)

Your Royal Highnesses,
Ladies and Gentlemen,

Having reminded you of the works of Linné I will add that in the eighteenth century he was King in the realm of Flora.

In the nineteenth he has been followed by worthy successors.

The Swedish Academy of Sciences has the honour of reckoning among its members one of these, Sir Joseph Dalton Hooker, who by his age stands near to Linné.

By his works he does so too.

By scientific expeditions to many parts of the world he has revealed the secrets of their vegetation. His extraordinary experience embraces both the nature of tropical India as also of sub-tropical and temperate climates as well as of the cold antarctic regions. The contents of his floristic works are therefore exceedingly rich. He has furthermore enriched botany by splendid works in other departments of this science, on the geographical distribution of plants, their classification and other matters.

On account of these merits the Academy wishes to show him especial honour on the day of Linné's Bicentenary by awarding him the Linnean Medal, which has been struck in commemoration of this day.

Unfortunately Sir Joseph Hooker is not present.

I must therefore beg the representative of His Britannic Majesty to receive the mark of honour that the Academy has awarded his illustrious countryman.

Sir JOSEPH HOOKER to FOREIGN OFFICE.

The Camp, Sunningdale,
June 12, 1907.

SIR,

I HAVE the honour of acknowledging the receipt of your letter of June 10, 1907, No. 18036, written under direction of the Secretary of State for Foreign Affairs, together with the Medal, struck in commemoration of Linnaeus, awarded to me by the Swedish Academy, and the copy of the speech delivered by Count Mörner, the President of the Academy, on the occasion of the Crown Prince of Sweden handing the Medal to the British Minister at the Court of Sweden for transmission to me.

I have now to request that you will convey to Sir E. Grey my grateful thanks for the aforesaid communications and most especially for the expression of his pleasure in giving effect to the wishes of the Crown Prince of Sweden; and I can most truly say that the gratification with which I have received this unique award is immeasurably enhanced by its being transmitted with the approval of my own Government, so cordially expressed by Sir E. Grey.

My thanks to Sir R. Rodd are enclosed in a separate envelope addressed to him at the Foreign Office for transmission.

I am, etc.,

(Signed) JOS. D. HOOKER.

Hon. Sir Eric Barrington, K.C.B.,
Foreign Office.

The Camp, Sunningdale,
June 19, 1907.

SIR,

I HAVE the honour of informing you that I have received from His Britannic Majesty's Minister for Foreign Affairs, Sir Edward Grey, the magnificent Gold Medal struck in commemoration of the Bicentenary of Linnaeus by the Royal Academy of Sciences of Sweden, awarded to me by that Society through the hands of H.R.H. the Crown Prince of Sweden.

Also that Sir Edward Grey did me the honour of accompanying the Medal with a copy of the Proceedings of the Academy on the occasion of the award, and with a letter informing me of his desire to associate himself with the sentiments of His Royal Highness and of the President of the Academy.

It remains for me to attempt to express my sense of the unique value of this award and of all it conveys to the scientific world as voiced by the President. It is the crowning honour of my long life, as inestimable as unexpected, and both on this account and in consideration of the gracious interposition of His Royal Highness the Crown Prince, I feel profoundly grateful.

Requesting you to convey to the President and my fellow members of the Academy my deep sense of the appreciation of my services to science and my wishes for its continued welfare and renown,

I am, etc.,

(Signed) JOS. D. HOOKER.

The Count Mörner,
President,
Royal Swedish Academy of Sciences.

The Camp, Sunningdale,
June 20, 1907.

SIR,

I HAVE to request that the enclosed letter addressed to Count Mörner, respecting the award to me of the Gold Medal struck in commemoration of the Linnaean Bicentenary may be forwarded by favour of the Foreign Office.

* * * * *

I have, etc.,

(Signed) Jos. D. HOOKER.

Hon. Sir Eric Barrington, K.C.B.

XLII.—NEW OR LITTLE-KNOWN MARINE ALGAE FROM THE EAST.

(With Plate.)

A. D. Cotton.

Amongst the marine Algae named in the Herbarium specimens of rarity and interest are frequently noted of which a permanent record is desirable.

In the present communication, which concerns only plants occurring east of India, descriptions are given of two new species, together with notes on some of the rare or critical species lately observed. Some of these specimens have been newly added, others have been in the Herbarium for many years. In the case of those examined from the Herbarium of Mr. E. M. Holmes, duplicate specimens or portions of specimens, have been kindly presented by him to Kew.

Endarachne Binghamiae, *J. Ag.;* Anal. Alg., Cont. iii., p. 27, tab. i., fig. 5; Okam., Alg. Jap. Exsicc. No. 86; *Phyllitis Fascia*, Kütz. in Okam. Illustr. Mar. Alg. Jap., vol. i., tab. 10.

The genus *Endarachne*, with one species *E. Binghamiae*, was described by J. Agardh in 1896 from California. Since then it has been recorded from Japan (Okamura), and in the Kew Herbarium a specimen exists from Hong Kong (Hong Kong Botanic Garden, No. 194). Its remarkable resemblance in external appearance to *Phyllitis Fascia*, Kütz., doubtless accounts for its being, until recently, entirely overlooked. In vegetative structure however the two species are very distinct, *Endarachne* being partly filamentous, whilst *Phyllitis* is entirely cellular; a further difference is found in the epidermal cells of the former being smaller than those of the latter.

The discovery of the genus *Endarachne* makes it doubtful whether *Phyllitis* is as widely distributed in the Northern Hemisphere as has been hitherto supposed. Though previously thought to be common in Eastern Asia we may now question its occurrence there at all: no specimens have been found in the Kew or British Museum Herbaria.

Halisèris undulata, *Okam.;* Syn. List, p. 10; Alg. Jap. Exsicc., No. 41. *Dictyopteris undulata*, Holmes; Journ. Linn. Soc., vol. xxxi., p. 251, tab. 8, fig. 1.

The plants collected by Wright in Japan, named and sent out by Harvey as *H. polypodioides*, var. *crispata*, Harv., prove on examination to be *H. undulata*, Okam. Recognised as a distinct species by Holmes in 1895, *H. undulata* differs from *H. polypodioides*, Ag., in the stout strongly stupose rachis, and the densely frilled lamina, which is blackish olive and of firm texture. The plant is also shorter, and much more robust, though it is now known to attain a greater length than that mentioned by Holmes.

Scinaia complanata, *Cotton*, sp. nov.

S. furcellata, Biv., forma *complanata*, Collins ms. in Phyc. Bor. Amer., No. 836.

A *S. furcellata*, Biv., fronde complanata avenia distincta.

Species complanata, membranacea, mediocris magnitudinis. *Frons* stratis duabus, interiore filis angustis laxe intextis, exteriore cellulis rotundato-angulatis in membranam unistratosam acte concretis. *Venae* nullae. *Rami* breves, decomposito dichotomi divergentes, 5–10 mm. lati, apicibus subacutis non attenuatis. *Cystocarpia* minuta, plerumque secus margines disposita. *Tetrasporangia* ignota. *Color* roseus.

JAPAN. Enoura, *Saido*, 9. In Herb. E. M. Holmes.

The present plant though resembling certain forms of *S. furcellata*, Biv., is evidently distinct from it. The very thin flattened fronds, their bright colour, and diverging branching, mark external differences, whilst in structure the entire absence of veins is a distinctive feature. Judging from the two specimens which have been examined (that of Collins and that of Saido) the plant is also decidedly smaller.

The note by Collins on Phyc. Bor. Amer., No. 836, stating that "the frond is flattened throughout, even when quite fresh," is of value in confirming the claim of this plant to specific rank. Although in Herbaria forms of *S. furcellata* often appear flattened, in the living state the fronds are found to be invariably cylindrical.

Scinaia complanata is at present known from two localities, Indian River Inlet, Florida, and Enoura, Japan.

The identity of Okamura's Alg. Jap. Exsicc. No. 2, and similar Japanese specimens, with *S. furcellata* of Europe, is, in the opinion of the writer, very doubtful. Dried material of the plant is so difficult to deal with, that a description of the structure, from living or carefully preserved material, is highly desirable.

Gigartina prolifera, *Hariot;* Alg. de Yokoska, p. 220; De Toni Syll. Alg., vol. iv., p. 211.

COREA. Port Hamilton, *Wilfred*, No. 732. In Herb. Hooker.

The only record of this species appears to be that by Hariot in 1891. In general habit the plant resembles *G. mamillosa*, J. Ag., young specimens of which might be confounded with it. The surface of the frond however remains entirely free from papillae, and the cystocarps, which do not appear to have been observed by Hariot, are embedded in more or less regularly arranged marginal proliferations. In some specimens these proliferations give the frond an almost pectinate appearance.

Callophyllis crispata, *Okam.;* Contrib. Mar. Alg. Jap., ii. p. 21, tab. 3, fig. 1–2; De Toni Syll. Alg., vol. iv., p. 286.

JAPAN. Shimoda, *Saido*, No. 47. In Herb. E. M. Holmes.

Though only known in Britain by the original reference this species is readily recognised. It approaches *C. laciniata*, Kütz., of Europe, and if Saido's specimens may be considered typical, it has, in addition to the differences mentioned by Okamura, a decidedly thicker frond.

Rhodymenia palmata, *Grev.*, var. **flabellata,** *Rosenv.;* Groenlands Havalger, p. 810; De Toni Syll. Alg., vol. iv., p. 513.

JAPAN. Shimoda, *Saido*, No. 48. In Herb. E. M. Holmes.

Rhodymenia palmata, Grev., though not occurring abundantly in the East, has often been reported from Japan. The present Japanese specimen is very distinct in form from all the well known varieties, being almost semicircular in outline, formed of short dichotomising branches and possessing a typical *Rhodymenia* structure. It agrees so well with the description of the variety *flabellata*, Rosenv., as to justify its being identified with that plant, notwithstanding the fact that up to the present the latter is only known from Greenland.

Gracilaria eucheumoides, *Harv.;* Proc. Amer. Acad., vol. iv., p. 331.

ANDAMAN ISLANDS. Termoklee Island, *S. Kurz.*

First discovered by Harvey in the Friendly Islands and later recorded by him from Japan, the distribution of this plant does not seem to have been otherwise extended. From its remarkable likeness to *Eucheuma*, it was thought to be not improbable that specimens under that name might be found in the Herbarium; this did not however prove to be the case. Though only known in a sterile state the *Gracilaria* structure marks it off as very distinct from *Eucheuma*.

Harvey's specimens (Friendly Island Algae, No. 35) are apparently young, and consequently the exact character of the mature frond, and the arrangement of the tubercles are difficult to determine. It seems likely that the plant remains decumbent, and that the young growing apices alone have an upward tendency. The tubercles, which are more or less pointed, appear to be almost entirely confined to the margins.

The Andaman specimens have somewhat more robust and flattened fronds, the margins of which are frequently densely set with spine-like tubercles.

Polysiphonia japonica, *Harv.;* in Perry's Narrative, vol. ii., p. 331.

COREA. Fusan, *Brand*, Jan. 1905.

Both J. Agardh and De Toni omitted to include this species in their respective works; hence the plant is little known and has been almost lost sight of. At the same time it does not appear to have been redescribed under another name, which suggests that it is not of common occurrence. The plants received from Corea were in fine condition, exhibiting both kinds of fruit.

In Journ. Bot. 1904, Mrs. Gepp transcribed Harvey's diagnosis of *P. japonica*, and at the same time recorded the plant from Wei-hai-wei, having compared it with a portion of the type specimen. The Corean examples are less corticated than those from China, in which respect they agree more closely with the original material.

Euptilota Fergusonii, *Cotton*, sp. nov.

Species distinctissima, dispositione pinnularum ab omnibus differt.

Planta tenue filamentosa, decomposite pinnata, usque 15 cm. longa. *Rami* filamentosi, primo nudi, demum rhizoidibus corticati, alterne pinnati. *Pinnae* nudae, breves, vix 1 mm. longae. *Pinnulae* insigniter dispositae, duae infimae facie superiore, ceterae facie inferiore pinnarum ortae. *Cystocarpia* in pinnis brevibus fertilibus terminalia. *Tetrasporangia* in pinnulis duabus infimis sparsa, terminalia aut lateraliter adfixa, sessilia.

CEYLON. Pantura, *Ferguson*, No. 20.

An exceedingly beautiful and delicate species having the habit of a *Plumaria* or a *Dasya*. The arrangement of the pinnae and pinnulae is remarkable and very constant. The lowest articulations of the pinna remain at first unbranched, whilst from the remaining articulations pinnulae are given off but always from the lower side. After some time, the two lowest articulations also give rise to pinnulae, but on the upper side only; these last-formed pinnulae become branched and bear tetraspores. The tetraspores appear to be confined to this position and the number produced is consequently small. The poorness of the tetraspore production is in marked contrast to many allied species, but is in agreement with such a plant as *Plumaria pellucida*, Schmitz. The arrangement of the pinnae and pinnulae shown in fig. 1 is characteristic, though for the sake of clearness, a somewhat slender and elongated shoot was selected. As a rule the shoots are more densely set with pinnae, the branches of which overlap thickly; at the same time the frond does not lose its delicate and wavy character.*

Another point in the structure of this species which demands attention is the method of cortication. The cortex is not composed of a dense cellular tissue as is common in the *Ptilotae*, but of a system of filaments resembling those found in *Callithamnion*, which give it a loose spongy texture. The origin of the filaments has not been made out with certainty, but there is little doubt that they arise from an outgrowth of the basal cell of a lateral branch (pinna) as in *Callithamnion* and as do the cells of the true cortex in *Ptilota*.

The systematic position of the species remains to be considered. The delicate fronds with fine main filaments remaining uncorticated for some distance from the apex, and the method of thickening, are characters more in common with *Plumaria* (especially such species as *P. Harveyi*, Schmitz, and *P. pellucida*, Schmitz) than with *Euptilota*. Though approaching *Plumaria* in the points just mentioned there is one important feature in which it differs, viz., the oblique apical cell, and resultant alternate branching; on account of this character the writer has been led to place the plant in *Euptilota*. This genus though usually

---

* In one specimen (a cystocarpic plant) the constancy of this arrangement was not maintained. The pinnae instead of producing pinnulae in the manner above described were frequently found to show alternate branching much as is seen in the extreme apex of a main branch. Cortical filaments however were not present as in the main shoots, and the pinnae remained short. These modified pinnae are intermediate in form between the normal pinnae and the long shoots; they appear to be of the same order as those that produce cystocarps, and may possibly represent branches the procarps of which were not fertilized.

more robust is characterised by alternate pinnae. The cystocarps of *E. Fergusonii* are borne at the apices of special short branches (modified pinnae), and by this character the plant is separated from *Rhodocallis*, Kütz.

Grateloupia affinis, *Okam.;* Bot. Mag. Tok., vol. vii., 1893, p. 100, tab. 5, fig. 3–5. *Gigartina affinis*, Harv.; Proc. Amer. Acad., vol. iv., p. 332.

One of Wright's original specimens exists at Kew, given by Harvey to Hooker. An examination of this specimen was thought to be advisable with the object of verifying the supposition of Okamura, as to the genus in which the plant should be placed. The examination proves Okamura to be right, the structure of the frond being that of *Grateloupia* and not that of *Gigartina*.

Explanation of the Plate.

All the figures refer to *Euptilota Fergusonii*, Cotton.

Fig. 1. Apex of a main branch showing arrangement of pinnae and pinnulae. The pinnae (*p.*) are alternate and bear pinnulae (*pl.*) on both their upper and lower surfaces. Those pinnulae from the lower surface arise first (*pl.* 1), those from the upper surface appear later (*pl.* 2); the pinnulae from the upper surface arise only from the two lowermost cells of the pinnae. The corticating filaments (*c.f.*) are also shown. × 180.

Fig. 2. Portion of an older branch showing tetraspore-bearing pinnulae (*t.*) on the upper surface of the pinnae. (The pinnulae from the lower surface of the two upper pinnae are omitted from the drawing for the sake of clearness.) × 90.

Fig. 3. A pinnula bearing tetraspores. × 180.

Fig. 4. A short branch (modified pinna) bearing cystocarps; the latter are surrounded by a number of pinnulae. × 80.

Fig. 5. Transverse section of a young stem showing commencement of thickening due to corticating filaments. × 90.

Fig. 6. Transverse section of older stem, showing spongy cortex. × 80.

XLIII.—REDUCTIONS OF THE WALLICHIAN HERBARIUM.—III. CYPERACEAE.

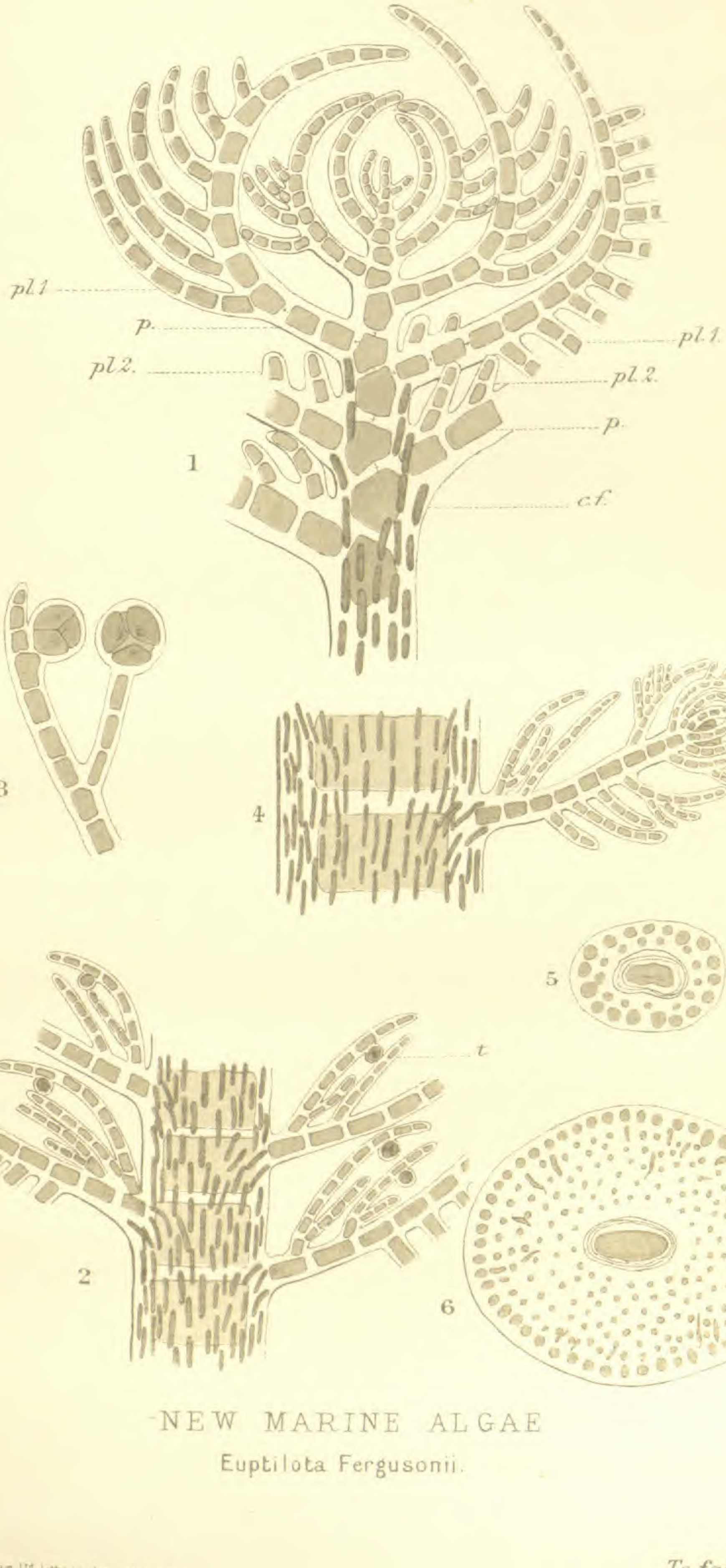
C. B. Clarke.

Cyperaceae.

3308. *Cyperus:* A. *C. viridis*, Hb. Roxb.; B. Bengal Inferior; C. *C. compressus*, Hb. Madras; D. *C. compressus*, Hb. Wight; E. *C. compressus*, Hb. Heyne; F. Ripa Irrawady = Cyperus compressus, Linn.

3309. *Cyperus:* A. and C. *C. brevifolius*, Hb. Madras; B. Hb. Heyne = Cyperus stoloniferus, Retz, and Fimbristylis spathacea, Roth, mixed.

3310. *Cyperus*: *C. semiteres*, Hb. Heyne = Pycreus capillaris, Nees, *var.* nilagiricus, C. B. Clarke (*Cyperus globosus*, Allioni, var. *livida*, Heyne; *C. atro-ferrugineus*, Steud.).



NEW MARINE ALGAE

Euptilota Fergusonii.

A.D.C. del

Waller & Graham, Ltd. Litho. London. 4809.307

To face page 264.

3311. *Cyperus*: *C. mucronatus* et *C. niveus*, Hb. Heyne = JUNCELLUS LAEVIGATUS, C. B. Clarke.

3312. *Cyperus*; A. *C. punctatus*, Hb. Roxb. = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). B. Bengal Inferior = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.). C. Bengal Inferior = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). D. Hb. Wight = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.), and MARISCUS SQUARROSUS, C. B. Clarke (*Cyperus squarrosus*, Roxb.), mixed. E. *C. pumilus*, Hb. Ham. Monghir = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). F. *C. pulchellus*, Hb. Ham. Nathpur = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.). G. *C. divaricatus*, Hb. Ham. Nathpur = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.), and PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B. Clarke, mixed. H. Rangoon = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn., var. *punctata*). I. Ava; K. var. *pumila*, Wall., *C. pollicaris*; L. *C. nitens*, Hb. Heyne; M. Segain; one sheet "3312" unlettered = PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.).

3313. *Cyperus*: A. *C. hyalinus*, Hb. Heyne = MARISCUS SQUARROSUS, C. B. Clarke (*Cyperus squarrosus*, Rottb.). B. Hb. Wight = MARISCUS SQUARROSUS, C. B. Clarke (*Cyperus squarrosus*, Rottb.), and PYCREUS NITENS, Nees (*Cyperus pumilus*, Linn.), mixed. "3313" unlettered = CYPERUS FLAVIDUS, Retz.

3314. *Cyperus*: A. *C. arenarius*, Hb. Heyne = CYPERUS ARENARIUS, Retz, and CYPERUS TENERIFFAE, Poir., mixed. B. *C. nitens*, Hb. Madras = CYPERUS TENERIFFAE, Poir. C. *C. compressus*, Hb. Ham. Nathpur = CYPERUS COMPRESSUS, Linn.

3315. *Cyperus*: A. *C. juncifolius*, Hb. Madras; B. *C. Jeminicus*, Hb. Heyne; C. *C. rotundus*, Hb. Wight = CYPERUS STOLONIFERUS, Retz.

3316. *Cyperus*: Hb. Wight (one plant) = CYPERUS SUBCAPITATUS, C. B. Clarke.

3317. *Cyperus*: A. *C. geminatus*, *stoloniferus* aut *bulbosus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn., and CYPERUS BULBOSUS, Vahl, mixed. B. *C. geminatus*, Hb. Madras; C. Hb. Wight = CYPERUS BULBOSUS, Vahl.

3318. *Cyperus*: A. *C. lividus* et *C. fuscus*, Vahl, Hb. Heyne = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni), and PYCREUS CAPILLARIS, Nees, *var.* NILAGIRICUS, C. B. Clarke (*Cyperus globosus*, Allioni, var. *livida*), mixed. B. *C. capillaris*, Roxb., et *C. strictus*, Hb. Wight a Cannanore = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni). C. Kamaon = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni), and PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B.

Clarke, mixed. D. Napalia = PYCREUS CAPILLARIS, Nees (*Cyperus globosus*, Allioni). E. Bengal Inferior = PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B. Clarke.—Put with 3318 and marked "3318" but not by Wallich, is Wallich n. 209 Tavoy = PYCREUS STRAMINEUS, C. B. Clarke (*Cyperus stramineus*, Nees).

3319. *Cyperus:* A. *C. cruentus*, Hb. Roxb. = PYCREUS SANGUINOLENTUS, Nees. B. *C. grossarius*, Ham., Hb. Heyne = PYCREUS SANGUINOLENTUS, Nees, and PYCREUS CAPILLARIS, Nees, *var.* STRICTA, C. B. Clarke, mixed. C. *C. foveatus*, Hb. Ham. Nathpur; D. *C. cruentus*, Hb. Wight, Cannanore; E. Bengal Inferior; F. Sylhet; G. Kumaon; H. Napalia = PYCREUS SANGUINOLENTUS, Nees. [G. is the type of *Cyperus atratus*, Boeck.]

3320. *Cyperus:* A. *C. filiformis*, Hb. Heyne = PYCREUS STRAMINEUS, C. B. Clarke (*Cyperus stramineus*, Nees), and PYCREUS POLYSTACHYUS, Beauv., mixed. B. Sillet = PYCREUS STRAMINEUS, C. B. Clarke.

3321. *Cyperus:* Napalia = CYPERUS ZOLLINGERI, Steud.

3322. *Cyperus:* A. *C. rotundus*, Hb. Ham. Nathpur; B. Hb. Finlayson; C. Bengal Inferior; D. Nepal; E. Kamaon = CYPERUS ROTUNDUS, Linn.

3323. *Cyperus: C. pusillus*, Hb. Wight = CYPERUS CASTANEUS, Willd.

3324. *Cyperus:* A. Napalia; B. Ava = PYCREUS ANGULATUS, Nees.

3325. *Cyperus:* A. *C. musarius*, Hb. Ham. Patna = SCIRPUS MICHELIANUS, Linn. B. Bengal Inferior; C. Hb. Wight; a sheet "3325" unlettered = JUNCELLUS PYGMAEUS, C. B. Clarke (*Cyperus pygmaeus*, Rottb.).

3326. *Cyperus:* A. *C. dubius*, Roxb., Hb. Wight; B. *C. dubius*, Roxb., Hb. Heyne; C. Bengal Inferior = MARISCUS DREGEANUS, Kunth.

3327. *Cyperus:* A. *C. racemosus*, Hb. Heyne; B. Hb. Wight; C. Bengal Inferior = CYPERUS EXALTATUS, Retz. [All this n. 3327 is the young state; figured by Roxburgh as *Cyperus umbellatus*.]

3328. *Cyperus:* A. Rajmahl; B. Bengal Inferior; C. *C. canescens*, Hb. Ham. Monghir = CYPERUS EXALTATUS, Retz.

3329. *Cyperus:* A. *C. procerus*, Hb. Roxb. = CYPERUS TUBEROSUS, Rottb. B. *C. alopecuroides*, Hb. Wight = CYPERUS TUBEROSUS, Rottb., and CYPERUS EXALTATUS, Retz, mixed. C. Hb. Wight; D. *C. Carmotha*, Ham. a Patna; E. *C. rotundus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn. F. Hb. Heyne = CYPERUS STENOSTACHYUS, Benth., *var.* INDICA, C. B. Clarke [this is

Cyperus longus var. *gracilis*, Boeck., but has long stolons quite unlike *longus*] ; in Herb. Kew, 3329 F = CYPERUS TEGETUM, Roxb., *var.* AMBIGUA, C. B. Clarke. G. *C. laxus*, Hb. Heyne ; H. *C. rotundus*, Hb. Madras ; I. Ripa Irrawadi = CYPERUS ROTUNDUS, Linn. K. Mauritius, Telfair = PYCREUS FERRUGINEUS, C. B. Clarke. L. *C. Tesira*, Ham. Soondreebun = CYPERUS TUBEROSUS, Rottb. M. *C. Pangorei*, Hb. Ham. ; N. *C. Panimotha*, Ham. Gongachora = CYPERUS MALACCENSIS, Linn. [L. and M. are a little mixed—on one sheet.]

3330. *Cyperus : C. Pangorei*, Hb. Heyne ; etiam *C. subulatus*, ibid.= CYPERUS TEGETUM, Roxb. (one of two specimens), and CYPERUS TEGETUM, Roxb., *var.* AMBIGUA, C. B. Clarke (the other specimen).

3331. *Cyperus : C. strictus*, Hb. Heyne = PYCREUS FERRUGINEUS, C. B. Clarke.

3332. *Cyperus :* A. *C. tegetum*, Hb. Roxb. = CYPERUS TEGETUM, Roxb. B. *C. plenus*, Hb. Heyne = PYCREUS POLYSTACHYUS, Beauv., and PYCREUS FERRUGINEUS, C. B. Clarke. C. *C. geminatus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn.

3333. *Cyperus : C. bicarinatus*, Hb. Heyne = PYCREUS POLYSTACHYUS, Beauv.

3334. *Cyperus:* A. Hb. Heyne = CYPERUS PILOSUS, Vahl, and CYPERUS PILOSUS, Vahl, *var.* OBLIQUA, C. B. Clarke, mixed. B. Napalia ; C. Kamaon ; D. Bengal Inferior = CYPERUS PILOSUS, Vahl.

3335. *Cyperus :* Ava = PYCREUS SANGUINOLENTUS, Nees (forma *khasiana*).

3336. *Cyperus : C. flavidus*, Hb. Heyne = PYCREUS PUNCTICULATUS, Nees. B. *C. lonyus*, Hb. Heyne = PYCREUS PUNCTICULATUS, Nees, *var.* QUINQUAGINTIFLORA, C. B. Clarke. C. *C. strictus*, Hb. Wight = PYCREUS PUNCTICULATUS, Nees, and PYCREUS PUMILUS, Nees (*Cyperus hyalinus*, Vahl), mixed. D. *C. elatus*, Hb. Wight = PYCREUS PUNCTICULATUS, Nees. E. *C. Bacha*, Hb. Ham. Nathpur = CYPERUS PILOSUS, Vahl, and CYPERUS BABAKENSIS, Steud., mixed. F. *C. procerus*, Hb. Madras = PYCREUS PUNCTICULATUS, Nees.

3337. *Cyperus :* A. *C. canescens*, Hb. Heyne ; B. Hb. Wight ; C. *C. fluitans*, Hb. Ham. a Pirgunj = CYPERUS PLATYSTYLIS, R. Br.

3338. *Cyperus :* Mauritius, Telfair = CYPERUS AEQUALIS, Vahl.

3339. *Cyperus : C. tortuosus*, Hb. Roxb. = PYCREUS NITENS, Nees.

3340. *Cyperus*: A. *C. polystachyus*, Hb. Wight; B. *C. polystachyus* et *C. strigosus*, Hb. Madras; C. *C. polystachyus*, Hb. Heyne; D. Bengal Inferior = PYCREUS POLYSTACHYUS, Beauv.

3341. *Cyperus*: A. Penang = CYPERUS ELATUS, Linn. B. Hb. Wight = CYPERUS PLATYPHYLLUS, Roem. & Schult.

3342. *Cyperus*: A. *C. inundatus*, Hb. Roxb.; B. *C. inundatus*, Hb. Ham. = JUNCELLUS INUNDATUS, C. B. Clarke. C. Bengal Inferior = JUNCELLUS INUNDATUS, C. B. Clarke, CYPERUS MALACCENSIS, Lam., and CYPERUS PILORUS, Vahl, *var.* MARGINELLA (*C. marginellus* Nees), mixed.

3343. *Cyperus*: A. *C. maximus* et *C. elatus*, Hb. Heyne; B. *C. parviflorus*, Hb. Heyne; C. *C. extensus*, Hb. Heyne; D. *C. spicatus*, Hb. Heyne; E. *C. acerosus*, Hb. Roxb.; F. *C. fastigiatus*, Hb. Madras; G. Hb. Wight a Ceylon; H. *C. verticillatus*, Roxb., Hb. Wight, Gingee; I. *C. verticillatus*, Hb. Ham.; K. Bengal Inferior = CYPERUS EXALTATUS, Retz.

3344. *Cyperus*: A. *C. verticillatus*, Hb. Roxb., is missing. B. *C. speciosus*. Hb. Wight; C. *C. speciosus*, *C. congestus* et *C. alopecuroides*, Hb. Heyne = JUNCELLUS ALOPECUROIDES, C. B. Clarke.

3345. *Cyperus*: Sillet = CYPERUS RADIATUS, Vahl.

3346. *Cyperus*; A. *C. racemosus*, Hb. Heyne; B. *C. fastigiatus* et *C. mysorensis*, Hb. Heyne = CYPERUS ELEUSINOIDES, Kunth.

3347. *Cyperus*: A. *C. complanatus*, Hb. Wight; B. Monghir = CYPERUS ELEUSINOIDES, Kunth.

3348. *Cyperus*: Bengal Inferior = CYPERUS PILOSUS, Vahl.

3349. *Cyperus*: *C. denudatus*, Hb. Heyne = CYPERUS STENOSTACHYUS, Benth., *var.* INDICA, C. B. Clarke.

3350. *Cyprus*: Attran = CYPERUS DISTANS, Linn. f.

3351. *Cyperus*: A. *C. gangeticus*, Hb. Roxb. = CYPERUS MALACCENSIS, Lam., and *C. tegetiformis*, Hb. Roxb. = CYPERUS TEGETIFORMIS, Roxb. B. *C. corymbosus*, Hb. Madras = CYPERUS TEGETIFORMIS, Roxb. C. *C. Koenigii*, Spreng., et *C. corymbosus*, Hb. Wight; D. Bengal Inferior; E. Kamaon; F. Sylhet; G. Ripa Irrawadi; H. *C. racemosus*, Ham. Gongachora, et *C. Nagarmotha*, Ham. Monghir = CYPERUS CORYMBOSUS, Rottb. [3351 E. is the type of *Cyperus enodis*, Boeck.]

3352. *Cyperus*: A. *C. corymbosus*, Hb. Heyne: B. *C. tenuiflorus*, Hb. Madras = CYPERUS TEGETUM, Roxb. C. Napalia = CYPERUS MALACCENSIS, Lam., and CYPERUS TEGETUM, Roxb., mixed. D. Kamaon = CYPERUS TEGETUM, Roxb.

3353. *Cyperus :* A. *C. Mothi*, Hb. Ham. Patna ; B. Hb. Wight = CYPERUS ROTUNDUS, Linn.

3354. *Cyperus :* A. *C. pumilus* et *C. Jeminicus*, Hb. Heyne = CYPERUS ESCULENTUS, Linn. (forma = *C. Tenorii*, Presl.). B. Bengal Inferior = PYCREUS SANGUINOLENTUS, Nees.

3355. *Cyperus :* A. *C. carnosus* et *C. spadiceus*, Hb. Heyne = CYPERUS PROCERUS, Rottb. B. *C. tegetum*, Roxb., Hb. Wight = PYCREUS PUNCTICULATUS, Nees. C. Bengal Inferior = JUNCELLUS INUNDATUS, C. B. Clarke. D. Kamaon ; E. Sillet ; F. *C. Barungia*, Hb. Ham. Nathpur ; G. Hb. Finlayson ; H. Napalia = CYPERUS PILOSUS, Vahl. I. Irrawadi Ripa = CYPERUS PILOSUS, Vahl, with a root of C. ROTUNDUS, Linn., mixed. [E. is the type of *Cyperus honestus*, Kunth.]

3356. *Cyperus : C. albidus*, Hb. Heyne = CYPERUS ROTUNDUS, Linn.

3357. *Cyperus* : Bengal Inferior = CYPERUS PULCHERRIMUS, Willd.

3358. *Cyperus :* A. Hb. Finlayson ; B. Bengal Inferior = CYPERUS DIFFUSUS, Vahl.

3359. *Cyperus :* A. *C. pallidus*, Hb. Heyne ; B. *C. racemosus*, Hb. Wight ; C. Hb. Finlayson = MARISCUS ALBESCENS, Gaud. D. Penang = CYPERUS PLATYSTYLIS, R. Br., and MARISCUS ALBESCENS, Gaud., mixed. E. Moalmayne = MARISCUS ALBESCENS, Gaud. F. *C. Gonus*, Ham. Nathpur = JUNCELLUS INUNDATUS, C. B. Clarke.

3360. *Cyperus :* A. *C. Iria*, Hb. Roxb. ; B. *C. Iria*, Hb. Madras ; C. *C. Iria*, Hb. Wight ; D. *C. Iria*, Hb. Heyne ; E. Sillet ; F. Bengal Inferior ; G. Napalia ; H. Irrawadi Ripa ; I. Hb. Ham.—*C. luteus* e Monghir, *C. Canconia* e Patna, *C. Santorii* e Nathpur, *C. Trinasori* e Monghir, *C. Marmotha* e Patna ; K. Hb. Ham.—*C. Jalmotha* e Patna, *C. agrestis* e Govindgunj = CYPERUS IRIA, Linn.

3361. *Cyperus : C. Iria*, pygmaeus, Hb. Wight e Mysore = CYPERUS IRIA, Linn.

3362. *Cyperus :* A. Rangoon ; B. Hb. Heyne = CYPERUS DIFFUSUS, Vahl.

3363. *Cyperus :* A. *C. difformis*, Hb. Roxb. ; B. *C. difformis*, Hb. Madras ; C. *C. difformis*, Hb. Heyne ; D. *C. difformis*, Hb. Wight ; E. *C. Haspan*, Hb. Ham. Monghir et Nathpur = CYPERUS DIFFORMIS, Linn. F. Sillet, F. D. = CYPERUS SILLETENSIS, Nees. G. Kamaon ; H. Napalia ; I. Bengal Inferior ; K. Ripa Irrawadi = CYPERUS DIFFORMIS, Linn.

3364. *Cyperus* : A. *C. nitidus*, Roxb., Hb. Wight ; B. *C. articulatus*, Hb. Heyne = CYPERUS ARTICULATUS, Linn.

3365. *Cyperus:* A. *C. strictus*, Hb. Heyne; B. Napalia; C. Sillet = CYPERUS FLAVIDUS, Retz.

3366. *Cyperus:* A. *C. distans*, Hb. Roxb.; B. *C. distans*, Hb. Heyne; C. *C. distans*, Hb. Wight; D. *C. distans*, Hb. Madras; E. Monghyr; F. Penang; G. Rangoon = CYPERUS DISTANS, Linn. f.

3367. *Cyperus:* Napalia = CYPERUS ZOLLINGERI, Steud.

3368. *Cyperus:* Sillet = CYPERUS HASPAN, Linn.

3369. *Cyperus:* A. *C. Haspan* et *C. hexangularis*, Hb. Wight; B. *C. Haspan*, Hb. Madras; C. Bengal Inferior = CYPERUS FLAVIDUS, Retz. D. *C. gracilis*, Hb. Heyne; E. Tavoy; F. Attran fl. Ripa = CYPERUS HASPAN, Linn. G. *C. graminifolius*, Hb. Ham. Nathpur = CYPERUS HASPAN, Linn., and *C. Trinchatra*, Hb. Ham. Monghir = CYPERUS FLAVIDUS, Retz.

3370. *Cyperus:* A. Penang = CYPERUS DIFFUSUS, Vahl. B. Amherst = CYPERUS PUBISQUAMA, Steud.

3371. *Cyperus:* A. Hb. Wight = RYNCHOSPORA AUREA, Vahl. B. Singapore = CYPERUS RADIANS, Nees & Meyen, and THORASTACHYUM BANCANUM, Kurz, mixed.

3372. *Cyperus:* Sillet = CYPERUS HASPAN, Linn.

3373. *Cyperus:* Monghyr = CYPERUS ROTUNDUS, Linn., and CYPERUS ROTUNDUS, Linn., *var.* CENTIFLORA, C. B. Clarke (the right hand example), mixed.

3374. *Cyperus:* *C. arenarius*, Spreng., Hb. Wight = CYPERUS ARISTATUS, Rottb., *forma* versicolor (*C. versicolor*, Nees).

3375. *Cyperus:* A. *C. aristatus*, Hb. Heyne; B. Hb. Wight = CYPERUS ARISTATUS, Rottb.

3376. *Cyperus:* A. Hb. Ham.—*C. angustifolius*, e Monghir et *C. cositicus*, e Nathpur = CYPERUS CUSPIDATUS, H. B. & K., *var.* ANGUSTIFOLIA (*C. angustifolius*, Nees): *C. Jalmothi* e Monghir = CYPERUS ARISTATUS, Rottb. B. Bengal Inferior = CYPERUS CUSPIDATUS, H. B. & K. One sheet "3376" unlettered = CYPERUS CUSPIDATUS, H. B. & K., and PYCREUS PUMILUS, Nees, mixed.

3377. *Cyperus:* A. *C. niveus*, Hb. Ham. Monghir; B. Napalia; C. Monghyr; D. Ripa Irrawadi; E. Sirmoor, Gerard; F. Kamaon = CYPERUS NIVEUS, Retz.

3378. *Remirea Wightiana*, Wall., Hb. Wight = REMIREA MARITIMA, Aubl.

3379. *Carex lachnosperma*, Wall., Napalia = CAREX HEBECARPA, C. A. Meyer.

var. β major, Napalia = CAREX LIGULATA, Nees.

3380. *Carex Wallichiana*, Prescott, is good.

3381. *Carex :* Napalia = CAREX LEHMANNI, Drejer.

3382. *Carex :* Napalia = CAREX MYOSURUS, Nees, *var.* EMINENS (*C. eminens*, Nees).

3383. *Carex :* Penang = CAREX CYRTOSTACHYS, Brogn.

3384. *Carex :* A. Nepal = CAREX MYOSURUS, Nees, *var.* EMINENS (*C. eminens*, Nees). B. Hb. Wight, Dindygul, alt. 2600 ft. = CAREX MYOSURUS, Nees.

3385. *Carex :* Napalia = CAREX SETIGERA, Don.

3386. *Carex :* Napalia = CAREX PRESCOTTIANA, Boott.

3387. *Carex :* Napalia = CAREX MURICATA, Linn., *var.* FOLIOSA (*C. foliosa*, D. Don).

3388. *Carex :* Napalia (one sheet, 4 or 5 plants) = CAREX LONGIPES, D. Don, and CAREX LONGIPES, D. Don, *var.* NEPALENSIS, Boott, mixed.

3389. *Carex :* A. Gossain Than = CAREX USTULATA, Wahl. B. Kamaon = CAREX CRUENTA, Nees.

3390. *Carex :* Hb. Ham. — *C. hortulana* et *C. fluviatilis* = CAREX WALLICHIANA, Prescott.

3391. *Carex :* Rajmahl = CAREX SPECIOSA, Kunth.

3392. *Carex :* Sillet, F. D. = CAREX CAESPITITIA, Nees.

3393. *Carex :* Nepal. Two plants mixed ; the main plant with terminal spike male at base, spikes short-peduncled, approximate, glumes deep brown, may possibly be CAREX OBSCURA, Nees ; the very slender plant with long slender distant peduncles and with all the spikes slender, male at top, glumes pale, may be CAREX STRACHEYI, Boott.

3394. *Carex :* Kamaon, R. B. ; type sheet = CAREX PHACOTA, Spreng. : second sheet = CAREX LIGULATA, Nees.

3395. *Carex :* A. Napalia = CAREX PHACOTA, Spreng., and CAREX JAPONICA, Thunb., *var.* ALOPECUROIDES (*C. alopecuroides*, D. Don), mixed, probably in pasting down. B. Sillet, F. D. = CAREX JAPONICA, Thunb., *var.* ALOPECUROIDES (*C. alopecuroides*, D. Don).

3396. *Carex :* Nepal = CAREX NUBIGENA, D. Don.

3397. *Carex :* Gossain Than = CAREX MYOSURUS, Nees, *var.* EMINENS (*C. eminens*, Nees).

3398. *Carex :* Nepaul = CAREX STRAMENTITIA, Boott.

3399. *Carex ? :* Taong Dong, Ava = CAREX FILICINA, Nees, *var. ?* MICROGYNA, C. B. Clarke.

3400. *Carex :* A. Napalia = CAREX CONDENSATA, Nees. B. Kamaon, R. B. = CAREX CRUCIATA, Wahl. [doubtful if the locality be correct]. C. Hb. Wight = CAREX

WIGHTIANA, Nees, and CAREX FILICINA, Nees, mixed. D. Hb. Heyne, marked *Scirpus paniculatus*, Koen., or *S. Eriophorum*, Vahl, is very doubtfully young CAREX FILICINA, Nees.

3400β. *Carex :* Gossain Than = CAREX VESICULOSA, Boott.

3401. *Hypolytrum :* Singapore = THORACOSTACHYUM BANCANUM, Kurz.

3402. *Hypolytrum :* A. Penang ; B. *Hypolytrum zeylanicum*, Hb. Heyne = HYPOLYTRUM LATIFOLIUM, L. C. Rich.

3403. *Hypolytrum :* Penang = HYPOLYTRUM LATIFOLIUM, L. C. Rich.

3404. *Hypolytrum :* A. Martaban ; B. Chappedong, Tenasserim ; C. Sillet = HYPOLYTRUM LATIFOLIUM, L. C. Rich. D. Hb. Wight e Ceylona = HYPOLYTRUM LATIFOLIUM, L. C. Rich. : Hb. Finlayson = SCIRPUS CHINENSIS, Munro. E. Origo incerta : no sheet so marked, but an extra sheet marked "3404 Singapore" = THORACOSTACHYUM BANCANUM, Kurz.

3405. *Scleria :* A. Nepaul = SCLERIA TESSELLATA, Willd. B. Bengal Inferior = SCLERIA BIFLORA, Roxb.

3406. *Scleria :* Sillet = SCLERIA PERGRACILIS, Kunth.

3407. *Scleria :* Penang = two plants, SCLERIA SUMATRENSIS, Retz, and SCLERIA MULTIFOLIATA, Boeck., mixed.

3408. *Scleria :* A. Napalia = SCLERIA ELATA, Thwaites. B. Hb. Madras e Travancore = SCLERIA SUMATRENSIS, Retz. C. *Scleria trialata*, Hb. Ham., Gongachora = SCLERIA ELATA, Thwaites.

3409. *Scleria :* Singapore = SCLERIA BANCANA, Miq.

3410. *Scleria :* Penang = SCLERIA MULTIFOLIATA, Boeck., and SCLERIA LEVIS, Retz, mixed

3411. *Scleria :* Rangoon = two sheets ; one sheet = SCLERIA LEVIS, Retz; the other = SCLERIA MULTIFOLIATA, Boeck.

3412. *Scleria : S. strigosa*, Hb. Heyne = SCLERIA CORYMBOSA, Roxb.

3413. *Scleria :* Hb. Wight = SCLERIA SUMATRENSIS, Retz.

3414. *Scleria villosula*, Wall. : Taongdong = SCLERIA HEBECARPA, Nees, *var.* PUBESCENS (*Scleria pubescens*, Steud.).

3415. *Scleria :* A. Moalmyne ; B. Chappedong = SCLERIA HEBECARPA, Nees.

3416. *Scleria :* A. Penang ; B. Hb. Wight ; C. Hb. Heyne ; D. *Olyra orientalis*, Hb. Madras e Courtallum = SCLERIA LITHOSPERMA, Sw.

3417. *Scleria :* Rajmahl = SCLERIA LITHOSPERMA, Sw.

3418. *Scleria :* Hb. Heyne = SCLERIA LITHOSPERMA, Sw.

3419. *Scleria : S. sessilis*, Hb. Heyne = SCLERIA LITHOSPERMA, Sw.

3420. *Scleria ? :* Mont. Sillet = CAREX sp., possibly C. cruciata, *Wahl.*, and SCLERIA sp., possibly S. sumatrensis, *Retz*, mixed.

3421. *Rynchospora :* Napalia = RYNCHOSPORA GLAUCA, Vahl.

3422. *Rynchospora :* A. Napalia ; B. Taongdong ; C. *Dichromena diandra*, Hb. Ham. Sukanuggur = RYNCHOSPORA WALLICHIANA, Kunth.

3423. *Rynchospora Prescottiana*, Wall. : Montes Prome, Ripa Irrawadi = RYNCHOSPORA LONGISETIS, R. Br.

3424. *Rynchospora :* A. Penang ; B. *Rynchospora aurea*, *Schoenus corymbosus*, et *Schoenus surinamensis*, Hb. Heyne = RYNCHOSPORA AUREA, Vahl.

3425. *Rynchospora : Schoenus articulatus*, Hb. Ham. e Nathpur = RYNCHOSPORA HOOKERI, Boeck.

3426. *Rynchospora : Cyperus melicoides*, Petit-Thouars, Mauritius, Telfair = RYNCHOSPORA AUREA, Vahl.

3427. *Rynchospora :* Singapore = CYPERUS RADIANS, Nees & Meyen.

3428. *Rynchospora : Scirpus retusus*, Koen., Hb. Wight e Ceylona = RYNCHOSPORA WALLICHIANA, Kunth.

3429. *Mariscus :* Penang = CYPERUS DIGITATUS, Roxb.

3430. *Mariscus :* Donabue, Ripa Irrawady = MARISCUS MICROCEPHALUS, Presl.

3431. *Mariscus* : Hb. Heyne = MARISCUS CYPERINUS, Vahl.

3432. *Mariscus :* A. Hb. Heyne ; B. Monghyr = MARISCUS TENUIFOLIUS, Schrad.

3433. *Mariscus :* Hb. Heyne = MARISCUS PANICEUS, Vahl.

3434. *Mariscus :* Hb. Madras = MARISCUS PANICEUS, Vahl, *var.* ROXBURGHIANA, C. B. Clarke.

3435. *Mariscus :* A. *Mariscus* et *Kyllinga*, Hb. Heyne = MARISCUS PANICEUS, Vahl, MARISCUS PICTUS, Nees, and MARISCUS CYPERINUS, Vahl, mixed. B. *M. sumatrensis*, Hb. Ham. Monghir = MARISCUS PANICEUS, Vahl, *var.* ROXBURGHIANA, C. B. Clarke. C. *Tunga*, Hb. Wight e Palaverum = MARISCUS BULBOSUS, C. B. Clarke, and MARISCUS PANICEUS, Vahl, mixed.

3436. *Mariscus :* Hb. Heyne = MARISCUS CYPERINUS, Vahl.

3437. *Mariscus :* A. Nipal = MARISCUS SIEBERIANUS, Nees. B. Bengal Inferior = MARISCUS PANICEUS, Nees, and

MARISCUS SIEBERIANUS, Nees, mixed. C. Prome; D. Hb. Finlayson = MARISCUS SIEBERIANUS, Nees. E. Hb. Russell = MARISCUS SIEBERIANUS, Nees, *var.* SUBCOMPOSITA, C. B. Clarke. F. Hb. Ham. Sunyashilkata = MARISCUS CYPERINUS, Vahl, *var.* BENGALENSIS, C. B. Clarke.

3438. *Mariscus:* A. *Cyperus digitatus*, Hb. Roxb.; B. *C. involucellatus*, Hb. Ham.; C. Penang; D. Ripa Irrawady; E. Ripa fl. Attran, all = CYPERUS DIGITATUS, Roxb.

3439. *Mariscus:* A. Rangoon; B. Penang; C. Singapore; D. *Cyperus spinulosus*, Hb. Wight; E. *Scirpus Luzulae*, Hb. Madras; F. *Cyperus Acsa*, Hb. Ham. Nathpur; G. Hb. Finlayson, all = MARISCUS MICROCEPHALUS, Presl.

3440. *Kyllinga:* Hb. Wight = KYLLINGA MELANOSPERMA, Nees.

3441. *Kyllinga:* A. *Schoenus triceps*, Hb. Heyne = MARISCUS BULBOSUS, Koen., and CYPERUS CEPHALOTES, Vahl, mixed. B. *Kyllinga triceps*, Hb. Russell, one sheet—this is a remarkable CYPERUS which I cannot at present name. C. Bengal Inferior; D. Sylhet = CYPERUS CEPHALOTES, Vahl.

3442. *Kyllinga*: Nepal, one sheet = KYLLINGA CYLINDRICA, Nees, and KYLLINGA BREVIFOLIA, Rottb., mixed.

3443. *Kyllinga:* A. *K. monocephala*, Hb. Roxb.; B. Hb. Wight= KYLLINGA MONOCEPHALA, Rottb. C. Hb. Madras = KYLLINGA BREVIFOLIA, Rottb. D. Hb. Heyne, Nundydroog = KYLLINGA CYLINDRICA, Nees, and KYLLINGA BREVIFOLIA, Rottb., mixed. [A and D are mixed on one sheet; B and C are mixed on another.] E. Hb. Russell [I can find no plant marked E, it was perhaps one of the two plants mixed in F, which is one sheet containing two things.]. F. Hb. Ham. Monghyr and North Bengal = KYLLINGA BREVIFOLIA, Rottb., and KYLLINGA MONOCEPHALA, Rottb., mixed. G. Singapore = KYLLINGA MONOCEPHALA, Rottb. H. Bengal Inferior = KYLLINGA MONOCEPHALA, Rottb., and KYLLINGA BREVIFOLIA, Rottb., mixed. I. Ripa Attran = KYLLINGA TRICEPS, Rottb.

3444. *Lipocarpha:* A. *Tunga triceps*, Roxb.; B. Prome; C. *Hypaelyptrum sphacelatum* et *Scirpus filiformis*, Hb. Heyne, all = LIPOCARPHA SPHACELATA, Kunth.

3445. *Lipocarpha:* A. *Kyllinga triceps*, Hb. Wight; B. Hb. Madras; C. Hb. Ham. Monghir, all = KYLLINGA TRICEPS, Rottb. D. *Cyperus capitatus*, Hb. Ham. Monghir = CYPERUS LEUCOCEPHALUS, Retz. E. *Kyllinga brevifolia?* Hb. Heyne = KYLLINGA TRICEPS, Rottb. F. Nepal; G. Kamaon; H. Sylhet, all = LIPOCARPHA ARGENTEA, R. Br.

3446. *Eriophorum comosum*, Wall. : Nepal, is good.

3447. *Eriophorum :* Patria dubia—one sheet = ERIOPHORUM COMOSUM, Wall., but mixed with leaves of SPODIOPOGON ANGUSTIFOLIUS, Trin.

3448. *Eriophorum arundinaceum*, Wall. : A. Paghamew, Ripa Irrawadi ; B. Penang ? both = ERIOPHORUM COMOSUM, Wall.

3449. *Eleocharis :* Kamaon = ELEOCHARIS PALUSTRIS, R. Br.

3450. *Eleocharis : Scirpus palustris*, Hb. Ham. Nawabgung = ELEOCHARIS PALUSTRIS, R. Br.

3451. *Eleocharis :* Montes Silhet = ELEOCHARIS PALUSTRIS, R. Br.

3452. *Eleocharis :* Nepal = ELEOCHARIS TETRAQUETRA, Nees.

3453. *Eleocharis :* A. *Scirpus spiralis*, Hb. Wight ; B. *S. plantagineus*, Hb. Heyne ; C. *S. spiralis*, Hb. Madras ; D. Hb. Ham. Nathpur ; E. Nepal, all = ELEOCHARIS FISTULOSA, Schult.

3454. *Eleocharis :* A. *Scirpus plantagineus*, Hb. Wight = ELEOCHARIS PLANTAGINEA, R. Br. B. *S. spiralis*, Hb. Madras = ELEOCHARIS SPIRALIS, R. Br., and ELEOCHARIS VARIEGATA, Kunth, mixed. C. Hb. Ham. — *S. seminudus*, Sukanuggur, et *S. plantagineus*, Monghir ; D. Bengal Inferior = ELEOCHARIS PLANTAGINEA, R. Br.

3455. *Eleocharis :* Oude = ELEOCHARIS PALUSTRIS, R. Br.

3456. *Scirpus :* Moolmyne = SCIRPUS ARTICULATUS, Linn.

3457. *Scirpus :* A. *S. subarticulatus*, Hb. Roxb. ; B. Hb. Wight ; C. *S. articulatus*, Hb. Ham. ; D. *S. praelongatus*, Hb. Ham. Birnoghur ; E. Nepal ; F. Sylhet ; G. Segain, Ripa Irrawaddi ; H. Kamaon ?, all = SCIRPUS ARTICULATUS, Linn.

3458. *Scirpus : S. fistulosus*, Hb. Heyne = SCIRPUS ARTICULATUS, Linn.

3459. *Scirpus :* A. *S. articulatus*, Hb. Wight ; B. *S. articulatus*, Hb. Heyne = SCIRPUS ARTICULATUS, Linn.

3460. *Scirpus : S. glomeratus*, Hb. Heyne = CYPERUS ARENARIUS, Retz.

3461. *Scirpus :* A. *S. supinus*, Hb. Wight ; B. *S. supinus*, Hb. Heyne ; C. *S. triqueter*, Hb. Heyne ; D. Hb. Ham. — *S. ensiformis*, Gujpur, et *S. lateralis*, Nathpur ; E. Bengal Inferior, all = SCIRPUS SUPINUS, Linn.

3462. *Scirpus : S. ternatus*, Hb. Ham. Nathpur = SCIRPUS ERECTUS, Poir.

3463. *Scirpus :* A. *S. Balna*, Hb. Ham. Monghir ; Asseerghur = SCIRPUS MARITIMUS, Linn., *var.* AFFINIS (*S. affinis*, Roth.).

3464. *Scirpus: S. bangalorensis*, Hb. Heyne = SCIRPUS CORYMBOSUS, Heyne.

3465. *Scirpus: S. quinquefarius*, Hb. Ham. Nawabgung = SCIRPUS QUINQUEFARIUS, Ham.

3466. *Abildgaardia:* Lungee, Irrawaddi, 1826. [A blank sheet with only the ticket.]

3467. *Scirpus:* A. *S. mysurensis*, Hb. Heyne; B. *S. biceps*, Hb. Ham. Amorha; C. *S. pungens*, Hb. Ham. Sunyasikata; D. Nepal; E. Monghir; F. Sillet; G. *S. triangulatus*, Hb. Telfair, Mauritius, all = SCIRPUS MUCRONATUS, Linn.

3468. *Scirpus:* Sillet = SCIRPUS ERECTUS, Poir.

3469. *Scirpus:* A. *S. lateralis*, Hb. Heyne; B. Hb. Wight; C. Nepal; D. Sillet; E. Bengal Inferior, all = SCIRPUS ERECTUS, Poir.

3470. *Isolepis:* A. *Scirpus grossus*, Hb. Roxb.; B. Hb. Ham. — *S. grossus*, Gungachora, *S. Kysur*, Nathpur; C. *S. Kysur*, Hb. Wight, Wallajabad; D. Nepal, all = SCIRPUS GROSSUS, Linn. f.

3471. *Isolepis: Scirpus flavus*, Hb. Heyne = SCIRPUS CORYMBOSUS, Heyne.

3472. *Isolepis: Scirpus Gonda*, Hb. Ham. Patna = SCIRPUS CORYMBOSUS, Heyne.

3473. *Isolepis:* Penang; Tavoy, n. 165, both = CYPERUS TURGIDULUS, C. B. Clarke (*Scirpus trialatus*, Boeck.).

3474. *Isolepis?:* Rangoon, n. 45 = CYPERUS [one of the *elegantes*, very young].

3475. *Isolepis: Scirpus acifolius*, Hb. Ham. Julpighuri = FIMBRISTYLIS AESTIVALIS, Vahl.

3476. *Isolepis:* Montes Sillet = BULBOSTYLIS CAPILLARIS, Kunth, *var.* TRIFIDA (*B. trifida*, Kunth).

3477. *Isolepis:* A. *Scirpus squarrosus*, Hb. Heyne; B. *S. squarrosus*, Hb. Madras; C. *S. capillaris*, Hb. Ham. = SCIRPUS SQUARROSUS, Linn.

3478. *Isolepis:* A. *Scirpus globulosus*, Hb. Ham. Govindgung = FIMBRISTYLIS DIPSACEA, Benth. B. Hb. Wight = SCIRPUS SQUARROSUS, Linn. C. Yenanghem et Segaen = FIMBRISTYLIS SQUARROSA, Vahl, and FIMBRISTYLIS DIPSACEA, Benth., mixed.

3479. *Isolepis:* A. *Scirpus aristatus*, Hb. Ham. Julpigori = FIMBRISTYLIS SQUARROSA, Vahl, and FIMBRISTYLIS AESTIVALIS, Vahl, mixed. B. *Scirpus aristatus* β, Hb. Ham. Patna; C. Bengal Inferior; D. Nepal; E. Silhet, all = FIMBRISTYLIS SQUARROSA, Vahl.

3480. *Isolepis:* A. Bengal Inferior = JUNCUS BENGHALENSIS, Kunth. B. Hb. Wight = BULBOSTYLIS BARBATA, Kunth, *var.* PULCHELLA (*Isolepis pulchella*, Thw.).

3481. *Isolepis :* A. *Scirpus antarcticus*, Hb. Wight ; B. *S. cyperoides*, Hb. Ham. Gungachora = BULBOSTYLIS BARBATA, Kunth. C. *Scirpus antarcticus*, Hb. Heyne = BULBOSTYLIS BARBATA, Kunth, *var.* PULCHELLA (*Isolepis pulchella*, Thw.). D. Napalia ; E. Melloon et Ava et Taongdong = BULBOSTYLIS BARBATA, Kunth.

3482. *Isolepis :* Hb. Wight — one sheet = FIMBRISTYLIS ALBICANS, Nees.

3483. *Isolepis :* A. *Scirpus argenteus*, Hb. Heyne ; B. Hb. Wight ; C. *Scirpus argenteus ?*, Hb. Madras, all = FIMBRISTYLIS ARGENTEA, Vahl.

3484. *Isolepis :* A. *Scirpus nanus*, Hb. Ham. Govindgunge ; B. Sillet = SCIRPUS MICHELIANUS, Linn. D. Ripa Irrawaddy = SCIRPUS MICHELIANUS, Linn., and JUNCELLUS PYGMAEUS, C. B. Clarke, mixed. [There is no sheet "3484 C".]

3485. *Isolepis :* *Scirpus gracilis*, Hb. Heyne = ELEOCHARIS CHAETARIA, Roem. & Schult.

3486. *Isolepis ?* : A. *Scirpus capitatus*, Hb. Wight ; B. *S. polytrichoides*, Hb. Heyne ; C. Bengal Inferior, all = ELEOCHARIS CAPITATA, R. Br.

3487. *Isolepis ? :* A. Hb. Wight = ELEOCHARIS CAPITATA, R. Br. B. *Scirpus capitatus* et *S. polytrichoides*, Hb. Heyne = FIMBRISTYLIS ACUMINATA, Vahl, FIMBRISTYLIS SCHOENOIDES, Vahl, and FIMBRISTYLIS POLYTRICHOIDES, Vahl, mixed. C. Bengal Inferior = FIMBRISTYLIS POLYTRICHOIDES, Vahl.

3488. *Isolepis ? :* A. Hb. Finlayson ; B. Singapore = FIMBRISTYLIS PAUCIFLORA, R. Br.

3489. *Isolepis :* A. *Scirpus ovatus*, Hb. Ham. Govindgunge ; B. *S. atropurpureus*, Hb. Heyne = ELEOCHARIS ATROPURPUREA, Kunth.

3490. *Isolepis ? :* A. *Scirpus bispicatus*, Hb. Roxb. ; B. *S. schoenoides*, Hb. Madras ; C. *S. schoenoides*, Hb. Wight ; D. Bengal Inferior ; E. Nepal = FIMBRISTYLIS SCHOENOIDES, Vahl. F. Rangoon = FIMBRISTYLIS TETRAGONA, R. Br.

3491. *Abildgaardia :* A. *Scirpus schoenoides*, Hb. Roxb. ; B. *Cyperus indicus*, Hb. Ham. Nathpur ; C. *Cyperus monostachyus*, Hb. Madras ; D. Hb. Wight ; E. *Cyperus monostachyus*, Hb. Heyne ; F. *Scirpus polytischoides*, Hb. Heyne ; G. Monghyr ; H. Bengal Inferior ; I, Lunggee, Ripa Irrawaddi = FIMBRISTYLIS MONOSTACHYA, Hassk.

3492. *Isolepis ? :* Hb. Wight — one sheet = FIMBRISTYLIS TRISTACHYA, Thwaites.

3493. *Isolepis ? :* Hb. Wight — one sheet = ELEOCHARIS CAPITATA, R. Br.

3494. *Isolepis ? :* Kamaon, R. B. — one sheet = FIMBRISTYLIS ACUMINATA, Vahl.

3495. *Isolepis ? :* Ava — one sheet = JUNCELLUS PYGMAEUS, C. B. Clarke.

3496. *Isolepis : Scirpus fastigiatus*, Hb. Heyne — one sheet = SCIRPUS NODOSUS, Rottb.

3497. *Isolepis :* A. *Scirpus tristachyus*, Hb. Ham. Monghyr ; B. *S. dipsaceus*, Hb. Heyne ; C. Napalia, all = BULBOSTYLIS BARBATA, Kunth.

3498. *Fimbristylis :* Hb. Wight — one sheet = FIMBRISTYLIS JUNCIFORMIS, Kunth, *var.* LATIFOLIA (*F. latifolia*, Kunth.)

3499. *Fimbristylis :* A. *Scirpus salbundius*, Hb. Ham. Burrisaul ; B. Taongdong ; C. Napalia, all = FIMBRISTYLIS QUINQUEANGULARIS, Kunth. [In Herb. Berol., 3499 C is = FIMBRISTYLIS SALBUNDIA, Kunth.]

3500. *Fimbristylis :* A. *F. emarginata*, Hb. Heyne ; B. *Scirpus miliaceus*, Hb. Heyne ; C. *S. miliaceus*, Hb. Madras ; D. *S. tetragonus*, Hb. Ham. Gongachora ; E. Sillet ; F. Napalia ; G. Ava, all = FIMBRISTYLIS MILIACEA, Vahl.

3501. *Fimbristylis : Scirpus arvensis*, Hb. Roxb. — one sheet = FIMBRISTYLIS DIPHYLLA, Vahl.

3502. *Fimbristylis :* A. Attran = FIMBRISTYLIS COMPLANATA, Link. B. Tavoy, W. Gomez = FIMBRISTYLIS ASPERRINA, Boeck., with one small piece of FIMBRISTYLIS COMPLANATA, Link, mixed.

3503. *Fimbristylis :* A. Napalia ; B. Bengal, both = FIMBRISTYLIS STOLONIFERA, C. B. Clarke. C. Sillet = FIMBRISTYLIS STOLONIFERA, C. B. Clarke, and FIMBRISTYLIS DIPHYLLA, Vahl, mixed.

3504. *Fimbristylis :* A. *Scirpus maritimus*, Hb. Ham. Nawabgunge ; B. Hb. Wight ; C. Oude, all = SCIRPUS MARITIMUS, Linn.

3505. *Fimbristylis : Scirpus atelius*, Hb. Ham. Magahar = SCIRPUS MARITIMUS, Linn.

3506. *Fimbristylis :* A. *Scirpus dipsaceus*, Hb. Heyne = FIMBRISTYLIS FERRUGINEA, Vahl. B. *Scirpus juncifolius*, Hb. Heyne = FIMBRISTYLIS FERRUGINEA, Vahl, and SCIRPUS LITTORALIS, Schrad., mixed. C. Hb. Finlayson = FIMBRISTYLIS DIPHYLLA, Vahl, and FIMBRISTYLIS FERRUGINEA, Vahl, mixed. D. Hb. Wight = FIMBRISTYLIS FERRUGINEA, Vahl.

3507. *Fimbristylis :* A. *F. glauca*, Telfair, Mauritius ; B. *Scirpus sylvaticus*, Hb. Heyne = FIMBRISTYLIS DIPHYLLA, Vahl. C. Sillet, F. D. = FIMBRISTYLIS SCABERRIMA, Nees.

3508. *Fimbristylis : Scirpus quadrifarius*, Hb. Ham. Sukanugger = FIMBRISTYLIS DIPHYLLA, Vahl.

3509. *Fimbristylis :* A. *Scirpus uniformis*, Rottb., Hb. Heyne ; B. *S. dichotomus*, Hb. Heyne ; C. Hb. Wight ; D. *Scirpus dichotomus*, Hb. Roxb., all = FIMBRISTYLIS DIPHYLLA, Vahl. E. *Scirpus dichotomus*, Hb. Madras = FIMBRISTYLIS DICHOTOMA, Vahl, and a very young state of another species of FIMBRISTYLIS, mixed. F. Bengal Inferior = FIMBRISTYLIS DIPHYLLA, Vahl.

3510. *Fimbristylis :* A. *Scirpus tuberosus*, Hb. Heyne, Courtallum ; B. Hb. Wight = FIMBRISTYLIS COMPLANATA, Link.

3511. *Fimbristylis :* A. *Scirpus dichotomus*, Hb. Heyne ; B. *S. Nildurba*, Hb. Ham. Monghir ; C. Hb. Wight ; D. Asseerghur ; E. Napalia, all = FIMBRISTYLIS DICHOTOMA, Vahl.

3512. *Fimbristylis :* A. *Scirpus plantagineus*, Hb. Roxb. = FIMBRISTYLIS QUINQUEANGULARIS, Kunth. B. Hb. Wight = FIMBRISTYLIS DIPHYLLA, Vahl. C. *Scirpus quinquesulcus*, Hb. Ham. ; D. Bengal Inferior = FIMBRISTYLIS QUINQUEANGULARIS, Kunth.

3513. *Fimbristylis :* Ava — one sheet = FIMBRISTYLIS DIPHYLLA, Vahl.

3514. *Fimbristylis :* A. Hb. Wight = FIMBRISTYLIS MONTICOLA, Steud. B. *Scirpus Sarada*, Hb. Ham. Monghir = FIMBRISTYLIS TENERA, Roem. & Schult., *var.* OXYLEPIS (*F. oxylepis*, Steud.). C. Napalia ; D. Kamaon, R. B. = BULBOSTYLIS CAPILLARIS, Kunth, *var.* TRIFIDA (*B. trifida*, Kunth). E. Bengal Inferior = BULBOSTYLIS CAPILLARIS, Kunth, *var.* TRIFIDA (*B. trifida*, Kunth), and FIMBRISTYLIS TENERA, Roem. & Schult., *var.* OXYLEPIS (*F. oxylepis*, Steud.), mixed.

3515. *Fimbristylis :* A. Attran ; B. Bengal Inferior = FIMBRISTYLIS DICHOTOMA, Vahl.

3516. *Fimbristylis :* A. Napalia = FIMBRISTYLIS AESTIVALIS, Vahl. B. Bengal Inferior = FIMBRISTYLIS DICHOTOMA, Vahl.

3517. *Fimbristylis :* A. *Scirpus brevifolius*, Hb. Ham. = FIMBRISTYLIS DICHOTOMA, Vahl. B. *Scirpus Saparmotha* et *S. Tivarsar*, Hb. Ham. Patna = FIMBRISTYLIS AESTIVALIS, Vahl. C. Ripa Irrawaddy = FIMBRISTYLIS SQUARROSA, Vahl, and FIMBRISTYLIS AESTIVALIS, Vahl, mixed. D. Attran ; E. Tavoy = FIMBRISTYLIS AESTIVALIS, Vahl.

3518. *Fimbristylis :* Penang — one sheet = FIMBRISTYLIS GLOBULOSA, Kunth.

3519. *Fimbristylis :* Napalia — one sheet = FIMBRISTYLIS RIGIDULA, Nees, and FIMBRISTYLIS JUNCIFORMIS, Kunth, mixed.

3520. *Fimbristylis:* A. *Scirpus obtusifolius* et *S. brevifolius*, Hb. Heyne = FIMBRISTYLIS JUNCIFORMIS, Kunth, and FIMBRISTYLIS JUNCIFORMIS, Kunth, *var.* ABBREVIATA (*F. abbreviata*, Boeck.), mixed. B. *Scirpus obtusifolius*, Hb. Ham. Monghyr; C. *S. brevifolius*, Hb. Wight; D. Napalia; E. Irrawadi = FIMBRISTYLIS JUNCIFORMIS, Kunth.

3521. *Fimbristylis:* A. *Scirpus miliaceus*, Hb. Roxb. = FIMBRISTYLIS DIPHYLLA, Vahl. B. *Scirpus diphyllus*, Hb. Heyne = FIMBRISTYLIS PODOCARPA, Nees & Meyen.

3522. *Fimbristylis:* A. *Scirpus diphyllus*, Hb. Heyne; B. Hb. Wight = FIMBRISTYLIS FERRUGINEA, Vahl.

3523. *Fimbristylis:* Mont. Sillet, F. D. = FIMBRISTYLIS NIGROBRUNNEA, Thw., *forma* subtetrastachya (*F. subtetrastachya*, Boeck.).

3524. *Fimbristylis:* *Scirpus tetragonus*, Hb. Wight = FIMBRISTYLIS MILIACEA, Vahl.

3525. *Fimbristylis:* A. *Scirpus membranaceus*, *marginalis* et *inaequalis*, Hb. Heyne = FIMBRISTYLIS DIPHYLLA, Vahl, and FIMBRISTYLIS COMPLANATA, Link, mixed. B. *Scirpus striatus*, Hb. Wight; C. *S. complanatus*, Hb. Roxb.; D. *S. complanatus*, Hb. Ham. Soondreebun = FIMBRISTYLIS COMPLANATA, Link. E. Napalia = FIMBRISTYLIS COMPLANATA, Link, FIMBRISTYLIS ASPERRIMA, Boeck., and CYPERUS CORYMBOSUS, Rottb., mixed. F. Sillet = FIMBRISTYLIS COMPLANATA, Link. G. Ava, is missing.

3526. *Fimbristylis:* Sillet = FIMBRISTYLIS SALBUNDIA, Kunth. [This is the type of Kunth's species *F. salbundia* but is not = Scirpus salbundius, *Ham.* (n. 3499A).]

3527. *Fimbristylis:* Amherst — one sheet = FIMBRISTYLIS FERRUGINEA, Vahl. [In Herb. DC., n. 3527 is = FIMBRISTYLIS SALBUNDIA, Kunth.]

3528. *Fimbristylis:* Chappedong fl., in Tenasserim = CYPERUS HELFERI, Boeck.

3529. *Fimbristylis:* Rangoon = FIMBRISTYLIS GLOBULOSA, Kunth.

3530. *Fimbristylis:* Nepal = FIMBRISTYLIS FUSCA, Benth. (*Abildgaardia fusca*, Nees.).

3531. *Isolepis?:* Bengal = FIMBRISTYLIS TENERA, Roem. & Schult., *var.* OXYLEPIS (*F. oxylepis*, Steud.).

3532. *Isolepis?:* Penang = FIMBRISTYLIS POLYTRICHOIDES, Vahl.

3533. *Carex?:* Saluen ad Neergye = CAREX INDICA, Linn., *var.* MILNEI (*C. Milnei*, Boott).

3534. *Carex psilochloa*, Wall.: cacumen Mont. Taongdaong = CAREX sp. [over-ripe and every utricle gone. Looks the same as some Assam-Manipur specimens of *Carex brunnea*].

3535. *Cyperus: C. arenarius?*, Hb. Wight = CYPERUS ARENARIUS, Retz.

3536. *Cyperus: C. fasciculatus*, Hb. Ham. Sukanuggur = CYPERUS SILLETENSIS, Nees. *Cyperus*, Amherst [field-ticket n. 25] = CYPERUS LEUCOCEPHALUS, Retz.

3537. —— : Sillet, F. da S. = COURTOISIA CYPEROIDES, Nees.

3538. *Scleria macrocarpa*, Wall. (Ptychocarya, *R. Br.*): Singapore = SCIRPODENDRON COSTATUM, Kurz.

3539. —— : Sillet, F. D. = SCLERIA ORYZOIDES, Presl.

3540. —— : A. *Olyra malaccensis*, Koen., Hb. Heyne; B. Sillet, F. D. = SCLERIA CARICINA, Benth.

3541. —— : Singapore = MAPANIA WALLICHII, C. B. Clarke.

3542. *Fuirena:* A. Sillet; B. Hb. Finlayson; C. *Fuirena pentagona*, Hb. Wight = FUIRENA UMBELLATA, Rottb.

3543. *Fuirena: Scirpus arvensis*, Hb. Heyne = FUIRENA UMBELLATA, Rottb.

3544. *Fuirena:* A. *Fuirena ciliaris*, Hb. Wight = FUIRENA GLOMERATA, Lamk, and FUIRENA UNCINATA, Kunth, mixed. B. Sillet; C. Prome = FUIRENA GLOMERATA, Lamk. D. [not taken up].

3545. *Fuirena:* Hurdwar — one sheet = FUIRENA WALLICHIANA, Kunth.

4470. *Holostemma fragrans*, Wall.: Ripa Irrawadi ad Prome et Taongdong, 1826, is missing from the collection. [At Kew one sheet numbered "4470" = MAPANIA SILHETENSIS, C. B. Clarke.]

4471. *Scirpus:* Ava = SCIRPUS ERECTUS, Poir. (*S. debilis*, Pursh).

4474. *Cyperacea?:* Sylhet, F. D. — one sheet = MAPANIA SILHETENSIS, C. B. Clarke. [This bears the MS. note :— Confer Chrysitricem (R. Br. monit) et etiam genus istud americanum.]

——. *Isolepis?:* Tavoy, n. 509, is very young; may be Eleocharis afflata, *Steud.*

——. *Isolepis:* Silhet = ELEOCHARIS CHAETARIA, Roem. & Schult.

——. —— : —— = FIMBRISTYLIS JUNCIFORMIS, Kunth.

XLIV.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: V.

MOLLUSCA.

ALFRED SICH.

During the last few years a renewed interest has been taken in the study of our native *Mollusca*, especially of those families which include the slugs. Though several species of slugs and snails only too commonly make their presence known, there are many others which will probably escape observation in any particular area, unless special search is made for them. Doubtless there are several species inhabiting the Royal Gardens at Kew which have not yet been recorded.

GASTEROPODA.

LIMACIDAE.

Limax flavus, *Linn.* In the vicinity of the dwelling-houses.

When adult this slug may be known by its large size, yellow colour and beautiful bluish tentacles. It commonly occurs around the walls of houses, hiding in damp corners and even finding its way into cellars. It is active at night, but the slimy tracks it leaves on the walls may frequently be observed in the day time.

Agriolimax laevis, *Müll.* Close to the water along the Strip.

This is a small red-brown slug. When in motion the mantle appears situated almost in the centre of the animal on account of its remarkably long neck. In most of the other slugs the mantle lies much nearer the head. This species inhabits very damp places and may be found on plants growing at the water's edge.

ZONITIDAE.

Vitrea crystallina, *Müll.* Common along the Strip.

This small snail with its exquisite pearly white shell in which the umbilicus is minute, occurs, usually two or three together, under stones, bits of wood, &c., in damp places.

Zonitoides nitidus, *Müll.* Not rare along the Strip.

A rather small, almost black snail with a glossy red-brown shell having a deep suture. This species and the above-mentioned slug, *A. laevis*, so frequently occur in the same spot that if one of them be observed, the discovery of the other may confidently be anticipated.

ARIONIDAE.

Arion circumscriptus, *Johnston* (= *fasciatus*, var. γ, Nilsson). Occurs along the Strip and also in P.

This distinct species of slug, about an inch long, has sometimes been confused with *A. hortensis*, Fér., but in its typical form may easily be distinguished by the under surface being clear white, while *A. hortensis* is yellowish orange beneath.

AURICULIDAE.

Carychium minimum, *Müll.* Along the Strip.

One of our smallest land snails. Under a lens, the eyes, which are very black, may be seen even through the transparent shell. Not scarce in damp places but easily overlooked on account of its minute size.

LAMELLIBRANCHIATA.

UNIONIDAE.

Unio pictorum, *Linn.* The Lake.

The somewhat pearly shells of this species were formerly used by Dutch painters to contain their colours, hence the name bestowed by Linné. Though not the Pearl Mussel, this occasionally contains small pearls of inferior quality.

XLV.—MGOA RUBBER IN BRITISH EAST AFRICA.

(*Mascarenhasia elastica*, K. Sch.)

OTTO STAPF.

Mr. E. Battiscombe, Acting Conservator of Forests at Nairobi, B.E.A., communicated recently specimens of flowers and fruits of a rubber tree found by him in the Shimba Hills, near Mombasa. On comparison they proved to belong to *Mascarenhasia elastica*, K. Sch., a species previously known only from the neighbourhood of Dar-es-Salam, German East Africa, where it is worked occasionally by the natives for a kind of ball rubber called Mgoa rubber in the Zanzibar trade.

Mascarenhasia elastica was discovered by Dr. Stuhlmann in 1898 near Dar-es-Salam, and described and figured by the late Dr. Schumann in the *Notizblatt* of the Berlin Botanic Garden and Museum, vol. I. (1899), pp. 268–270. This is what the author says of it as a rubber tree: "Between the villages of Vikindo and Mbaffu there grows in moist places a robust tree which contains rubber latex and yields a superior kind of caoutchouc. The trunk branches usually low down and attains a height of 10 m. The pale grey bark is covered with scars from the knives of the rubber collectors, who produce from it large balls of rubber known as Mgoa in the Zanzibar trade. It is not particularly pure, containing fragments of bark, etc." Samples of this rubber received at the Botanic Museum, Berlin, are described by Dr. Warburg (*Der Tropenflanzer*, III., p. 220) as consisting of pale brown drawn-out caoutchouc threads intermixed with small particles of caoutchouc. In 1899 Herr Hedde, Government gardener at Dar-es-Salam, was commissioned to explore the neighbourhood of Dar-es-Salam and to study the distribution and properties of the tree. Dr. Schumann published an abstract from Hedde's official report in the *Notizblatt* of the Botanic Garden and Museum at Berlin, vol. III., p. 43. According to it *Mascarenhasia elastica* is fairly common in the

district visited by Hedde along streams as well as over underground water. It makes fine smooth and straight trunks which are much sought for by the natives, who use them in building their shambas. On the other hand Hedde found the flow of latex too slow to make collecting profitable. He further adds that the rubber produced does not sell well, possibly, as he says, on account of the crude mode of preparation. Attempts to take *Mascarenhasia elastica* into cultivation have been so far successful, as the plants grew fast even in dry soil, and flowered and fruited in their fifth year; but the flow of latex at that age was far too scanty (*Der Tropenflanzer*, X., p. 44).

As other species of *Mascarenhasia*, natives of Madagascar, are said to produce fairly good rubber, known as "Black Madagascar (Madagascar noir)," it was desirable to have an exact analysis of Mgoa rubber. This was made at the Imperial Institute from a sample communicated by Mr. Battiscombe last February to that establishment. Thanks to the courtesy of the Director of the Imperial Institute, we are able to publish the results of the examination of the sample mentioned.

Report on the composition of the rubber from the Shimba Hills, by the Director of the Imperial Institute.

Mark and weight of sample.—"Rubber from Shimba Hills, East Africa Protectorate," 104 grams.

Description.—Single ball of rubber, about $2\frac{1}{4}$ inches in diameter, evidently formed by winding threads of rubber upon a central mass; it was light brown, and contained a considerable quantity of vegetable impurity. The rubber was fairly strong.

Results of examination.—

—	Sample as received.	Composition of dry rubber.
	per cent.	per cent.
Moisture	10·0	—
Caoutchouc	69·0	76·6
Resin	6·1	6·8
Proteids	3·5	3·9
Insoluble matter	11·4	12·7
Ash	2·29	2·54

Commercial value.—3*s.* 6*d.* per pound in London; the current price of fine hard Para from South America was 5*s.* 2*d.* per pound.

Remarks.—The sample has the usual appearance of Landolphia rubber; it is of very fair quality though the amount of insoluble matter is rather high. This defect could be remedied by careful collection so as to exclude, as far as possible, fragments of bark from the rubber.

Consignments of this rubber, if well prepared, would be readily saleable at satisfactory prices.

Since the above was written a specimen of *Mascarenhasia elastica* has been received from the Uganda and British East Africa Exploration Syndicate, accompanied by a short note by Mr. Henry Dalziel, who reports: "The enclosed specimens of leaves, fruits, and wood are from a new kind of rubber tree, lately discovered by the natives in Wanga District, British East Africa, and called by them 'Goa.' This tree is generally found on the banks or near the sides of running streams where its roots can get easy access to the water. The stems are from a few to 18 inches in diameter, and form a bole 20 feet high to where it branches out. In old trees the bole has generally a great number of hollows, with a rough scaly bark which can easily be rubbed off; the inner bark is a quarter of an inch thick, and easy to cut. When the tree is cut the latex oozes out very slowly."

A specimen of the wood of *Mascarenhasia elastica* from the Wanga District, collected by Mr. H. Dalziel, is exhibited in Case 78, Museum No. I.

XLVI.—GUAYULE RUBBER.

(*Parthenium argentatum*, A. Gray.)

J. M. Hillier.

Among the plants of economic value belonging to the natural order *Compositae* none are more interesting than those known to contain rubber or a substance analogous to rubber. During the last decade considerable attention has been directed to two such plants of this order, viz:—the Colorado Rubber Plant (*Hymenoxys* sp.), a note on which appeared in *Kew Bulletin*, 1906, No. 6, pp. 218, 219, and the Guayule of Mexico, the subject of the present note.

The first communication received at Kew on the subject of Guayule was from the Mexican Land and Colonization Co., Ltd., 4, Moorgate Street, E.C., dated 29th December, 1902, requesting information regarding the following extract from Circular No. 28 issued by the United States Department of Agriculture:—

"An illustrative instance of the dangers likely to beset investments in rubber comes to hand as this Circular is being sent to the printer. A well-known journal* notices a new substitute for rubber, describing it as a gum obtained by grinding up the bark and 'comparatively hard wood' of a 'small scrubby bush' and then macerating in gasoline or other hydrocarbon solvent. 'By this process the gum that comes out is chemically pure and suitable at once for manufacture, and it forms a new composition consisting of resin of the plant combined with a residual portion of the hydrocarbon solvent.' The shrub, which has no milky

---

* *Scientific American.*

juice, is said to grow in abundance on the 'rolling land of Central Mexico, is readily propagated, may be cut two or three times a year, may be treated when fresh, or dried for export, and yields by weight 40 per cent. of a gum 'superior to most india-rubber,' and having the additional advantages of abundance, cheapness and ease of manipulation.

"The Indian name is said to be 'yule,' already known in application to *Castilloa*, while the scientific designation 'Synathereoeas Mexicanus' seems to have been unfortunately chosen, since the genus *Synantherias*, which has the only similar name known to botanists, is a member of the Aroid family.

"Moreover it is by no means clear how the 'comminuted shrub' without other provision than straining through a canvas bag, for the separation of the 60 per cent. of waste matter, can be expected to issue in the 'chemically pure' condition, since the oils, fats, resins, and many other vegetable substances would be incorporated by the solvent. Neither could such a process be carried out on fresh material, the water of which would prevent the action of the solvent. Similar inaccuracies are frequent in claims and applications for patents for artificial rubber substitutes, the published accounts of which are sometimes intended to draw public attention without unduly enlightening trade competitors. Naturally the knowledge of any such new source of wealth, or of a process by which a hitherto worthless natural product may be exploited, generally results in the greatest secrecy on the part of the first possessors of the information."

This passage doubtless refers to the Guayule, the name "Synathereoeas Mexicanus" being probably intended for "Sinantéreas mexicanas," *i.e.*, Mexican Compositae.

In January, 1905, a correspondent forwarded for identification a small section of a stem to which in a subsequent letter he gave the name "guala guayala," stating that he had found that 5 per cent. of the bark consisted of rubber of fair quality, but that he could get nothing from the wood, and that after a further examination of the so-called rubber, he believed that it was useless for any commercial purpose. This stem was determined as being that of *Parthenium argentatum*, A. Gray, a full account of which appeared in *Der Tropenpflanzer*, for May, 1905, and again in the *Bulletin of the Imperial Institute* for 1906, p. 114. The first identification of Guayule with *Parthenium argentatum* appeared in *Bull. du Jard. Colon.*, No. 1, July–August, 1901, p. 105. In the course of the present year further information with regard to Guayule has become available and is summarized in the paragraphs that follow.

On January 3rd, 1907, the following memorandum on Guayule, prepared by Mr. W. G. Max Müller, His Majesty's Chargé d'Affaires in Mexico, dated December 3rd, 1906, was transmitted to Kew from the Colonial Office for observation on the question of introducing the plant into the Colonies:—

"In my Report on the Mexican Budget for the current fiscal year (Annual Series. No. 3693, p. 9) I referred to the imposition of an export duty on 'Guayule.'

"Guayule is a form of rubber extracted from the Guayule plant, which grows in enormous quantities in certain of the Northern States of Mexico, especially San Luis Potosi, Zacatecas, Durango and Coahuila.

"The name appears to be a local term and is found in none of the Spanish Dictionaries. It may be a compound formed from 'hule,' *i.e.*, rubber.

"The Guayule industry has now passed from the experimental to the practical stage and is destined to attain considerable importance in Northern Mexico, and under these circumstances I feel that the following information which I have collected regarding this new industry may be of interest.

"Little more than two years ago the Guayule shrub was not only regarded as worthless, but was looked on as a veritable scourge by the Mexican land-owners. In fact, lands thick with this bush were considered worse than useless and could have been had for a merely nominal sum, while now many sales of Guayule on the ground have been reported at over five times the price at which the land itself was valued two or three years ago. Holders of tracts of these lands, who had to expend money on them for taxes and other purposes, found them burdensome in the extreme. Now many of these people have reaped fortunes from those same waste lands. For some years 'Guayule' had been known to contain rubber, but it is only within quite a short time that a process has been invented for the extraction of the gum for commercial use. As long ago as 1897, a German named Henry Lemcke, employed under the Mexican Ministry of Fomento, acquired a knowledge of the value of the Guayule plant, known then only to the Indians and a few others who discovered an elastic substance in the plant when chewing it. Mr. Lemcke informed the Mexican Government of his discovery and also offered it to various Companies interested in the rubber industry, with a view to ascertaining whether it was possible to extract a good quality of rubber from the shrub. Chemists and inventors began experimenting with the plant, but it was not really till towards the end of the year 1904 that the buying of the shrub began, at about $15 Mexican per ton. Speculation immediately began, and such was the number of persons anxious to secure quantities of Guayule large enough to justify them in erecting factories for applying the recently discovered processes of the extraction of the gum, that buyers have found it very difficult to purchase the plant, and recently contracts for large lots have been reported as high as $100 Mexican per ton.

"It is not to be expected that the gum extracted from the 'Guayule' will ever take the place of rubber, but it can be used as a substitute in many forms of manufacture, especially in a vulcanized form, and can be mixed in large proportions with rubber. In itself, it is inferior to real rubber, it has very little elasticity and will not bound as true rubber does, and is easily broken. It contains a great deal of soft, sticky matter. Fresh Guayule looks very much like old rubber which has been exposed to the air for years until it has lost its elasticity and strength. It requires therefore a considerable admixture of ordinary rubber to

give it strength enough for common commercial purposes. It has the further disadvantage that it deteriorates more rapidly than real rubber.

"Various extraction processes have been and are still being registered at the Mexican Patent Office, but none of these processes have as yet attained to any degree of perfection, as the known results vary from 10 to 12 per cent., whereas the quantity of gum contained in the shrub is known to be approximately 18 per cent. The quality obtained can better be judged by the price realized for the product of the various processes, which varies from 25 to 50 cents gold per pound on the New York market. There is still considerable difficulty in removing certain foreign substances and producing a pure rubber free from resin. However, a better finished product is gradually being produced, and I am informed that a sample lot of such excellent quality has been extracted by a new process still in the experimental stage, and not yet patented, that it fetched $1 gold per pound.

"Numerous companies for the extraction of the gum from the Guayule plant have been formed and many of them are so flourishing that big Corporations are active in securing control of the product. Factories have sprung up all over the north of Mexico, and already represent an outlay of many millions of dollars in buildings and machinery alone. The Continental Rubber Co. of America has large holdings of Guayule lands in Mexico. It is estimated that it has $9,000,000 Mexican invested in Guayule lands and factories in the country, and the output from its three factories at Torreon, Ocampo, and Saltillo, is said to be in the neighbourhood of 500,000 pounds per month. In addition to this there are, I am informed, twelve other large firms engaged in the trade, not to mention smaller factories.

"There are various processes of extracting the gum already patented, the best known being the Pablo Bergner, the Garza, the Delafond, the Lawrence, and the Hunieke processes, but none of them seem to be satisfactory so far.

"As I before said, the shrub is known to contain as much as 18 per cent. of rubber, but none of the present processes seem to furnish better results than 10 or 12 per cent., *i.e.*, a ton of the plant produces about 240 pounds of rubber. The cost of extraction is said to be about 10 cents Mexican a pound, and the price of a ton of the plant has never yet exceeded $100 Mexican, and is generally less. Then there is the cost of freight to the factory, which is in some cases very heavy, and certain other incidental expenses to be deducted.

"The price of Guayule rubber in New York has been as high as 75 cents gold, and in the summer went as low as 25 cents gold, owing to the action of the Continental Rubber Co. of America, but it has now attained again to 47 cents gold, so that even at the lowest price there is a handsome profit to be reaped in Guayule.

"The actual cultivation of the Guayule plant is still a problem, but it will be some time before the existing supply of Guayule is exhausted from the prairies of Northern Mexico, where it grows in such abundance. I have, in fact, seen it stated, that the value of the Guayule lands in Mexico is not less than $300,000,000

Mexican, and that the Guayule lands of one man, Salvador Madero, in the State of Coahuila, are worth over $40,000,000 Mexican.

"These valuations may be, and probably are, exaggerated, due to the mad speculation that has been taking place in Guayule, and which sent up the price per ton from $15 to $100 Mexican. That these prices will continue appears improbable, but in the opinion of those best qualified to judge, the Guayule industry in Mexico will have a great future if the landowners are sensible and do not ask exorbitant prices, and above all if they discover the secret of the planting and cultivation of the shrub.

"At present no one knows exactly how long it will take to raise Guayule shrubs, though the Department of Fomento is actively pursuing experiments to discover the best method of cultivating them.

"The price of Guayule actually depends on the price of rubber, and if there were no other considerations to be taken into account but the world's demand for rubber, the future of the Guayule interests would be assured. The rubber market, however, is controlled by the great American Companies, the Consolidated Rubber Co., and the United States Rubber Co. The former Company, which was organized last January, is supposed to control the stock of various subsidiary Companies interested in Guayule.

"Experiments are being conducted with the Guayule plant with a view to utilizing as fuel the refuse left over after the rubber has been extracted. If these experiments are successful, there will be a considerable reduction in the cost of manufacture.

"The Northern part of Mexico is not the only country where Guayule grows. There are millions of acres in Texas covered with the shrub, which has lately also been discovered in the Philippines.

"Extreme caution is necessary in dealing with this subject as the supplanting of the usual rubber of commerce by the gum of various herbs, vines, &c., has often led to rather wild speculations, not borne out by later practical results."

In the Foreign Office Report referred to by Mr. Max Müller, it is stated under the heading of "Export Duties" that "the total increase of about £7,000 under this heading is almost entirely due to the duty which, in the present Budget Bill, is for the first time to be imposed on Guayule, a form of Cactus extract which is now used and exported in considerable quantities for mixing with rubber."

A memorandum on the Guayule prepared at the instance of H.M. Envoy Extraordinary and Minister Plenipotentiary, Mexico, by Mr. Vice-Consul Kennedy, on information furnished to him by Mr. Adolph Marx, the manager of a Mexican company for the export of this rubber, was forwarded to Kew from the Foreign Office, March 22nd, 1907, together with specimens of the plants of Guayule, determined as *Parthenium argentatum*, and of the Mariola, *P. incanum*, a species apt to be confused with Guayule.

From this memorandum it appears that "the first shipments of Guayule rubber to Europe (1902) were received with scant favour, and the shippers were extremely glad to at last get an offer from a London firm of 6*d.* per lb.

"A few months later a German manufacturer offered 1*s.* per lb. for the rubber, whilst an American offered 25 cents gold per lb. At the beginning of 1903 the same American offered to take the whole output of the factory at 40 cents per lb.

"Since that date, as manufacturers have become accustomed to this rubber, the price has steadily advanced until 1906, when the highest price was reached, viz., 2*s.* 9*d.* per lb.

"Guayule, or the *Parthenium argentatum*, is a shrub growing to about 3 feet high at maturity. It is of very slow growth, and the samples accompanying this memorandum are probably at least 30 years old.

"From the first year, when only about 6 inches high, and with a very thin stem, it gives both flowers and seed, and so on every year, and as it cannot be used for extracting rubber until the eighth year, this gives the plant ample time to reproduce, the seed being blown about by the wind.

"Up to the third year the plant contains no rubber whatever, and from the third to the eighth year the percentage of rubber is small.

"A good well-matured plant will contain as much as 10 per cent. of its weight in rubber.

"The best process for extraction is that originally employed by the Anglo-Mexicana Co., viz., maceration of the plant, and extraction of the rubber by steaming in an alkaline solution.

"Unless the shrub is recently taken from the ground, the quality and quantity of rubber obtained is inferior.

"From several factories in operation, and one in course of construction, the estimated total production from all sources will not be less than 300 tons per month.

"At present there is sufficient raw material in sight to supply all these factories for several years, say three or four, but there is no plantation of Guayule to make good the plants used up; it is only a question of time when this source of rubber will be almost entirely exhausted.

"The Guayule shrub is only found in the colder parts of the Republic, and is not met with south of the Tropic of Cancer. It is principally obtained from the States of Zacatecas and San Luis Potosi.

"Mariola is another shrub which can easily be mistaken for Guayule from the similarity of the colour of its leaves, &c., especially in the wet season. It grows in the same region as the Guayule. The Mariola also contains rubber, but in such small quantities that it is not worth while to extract it."

According to "The Mexican Investor" of March 23rd, 1907, it appears that during the year 1905 a factory in Germany, backed by large financial interests, for the extraction of rubber from Guayule, experienced its most profitable run. The shrub was bought, baled, and shipped by Mr. Oton Katterfeld, who traversed most of the territory where Guayule was known to grow, and who secured many thousand tons at prices that look ridiculously low at the present time. This German enterprise was kept very quiet, and must have made much money until in September the Mexican Government put an export duty of 15 pesos a ton on the shrub which, with the freight rates, made further shipments unprofitable.

The following article, from the pen of Dr. P. Olsson-Seffer, Director of the Zacualpa Botanical Station and Rubber Laboratory in the Republic of Mexico, which appeared in a recent number of "The Mexican Investor," sums up the present position and prospects of the Guayule industry.

"The supply of Guayule has been greatly over-estimated, principally because of the confusing of Guayule with another species of the same genus, *Parthenium incanum*, H. B. K., which is far more abundant and grows all through the Guayule territory. This has been estimated to as much as 28,000 square miles, but it must be remembered that the patches of Guayule are far apart and one can travel over miles in the Guayule country without seeing a single specimen. The general estimates of Guayule on the acre is from 400 to 700 pounds, taking an average for large areas. This is undoubtedly too high an average. By actual count in very favourable localities I have become convinced that even under the best conditions not more than 1,500 pounds can be obtained per acre from the Guayule patches, and these constitute less than one-tenth of the total area of the territory, where the plant occurs. That my estimate in this regard is upheld by others who have investigated the matter and expressed an unbiased opinion is shown by the following lines, translated from an article by Dr. R. Endlich, in *Der Tropenpflanzer*, 1905, pp. 233–247. The author says in part :—

"'The supply of the Guayule is very unevenly distributed in the territory the plant occupies. In most places the plants are isolated, growing sometimes in large and often in small numbers among the other plants. At rare intervals small patches are found where it is predominating in the chaparral flora.

"'It is very difficult to make an estimate of the average supply per hectare, both on account of the uneven distribution of the plant and because of the difference in size of individual specimens. In favourable territory I have on several occasions counted thirty to forty plants on an area of 100 square meters, which would mean a total supply of 3,000 to 4,000 Guayule plants per hectare (=1,215 per acre). The differences in size and weight are so great that in places where the plants are small and grow close together ten plants have a weight of only one kilogram (=$2\frac{1}{5}$ lbs.), while in the best territories some of the trees weigh as much as 3 kilograms each. The average weight will probably not exceed 500 grams ($1\frac{1}{10}$ lb.) per plant.

"'Estimates of the Guayule supply in large areas vary from 500 to 800 kilograms per hectare, but the distance between the different places where the plants are found is often considerable, and must be taken into consideration.'

"The Guayule shrub is about two feet high, with knotted, spreading branches and sparse, greyish leaves. The whole plant contains rubber, with the exception of shoots bearing leaves and flowers. Consequently the whole plant is gathered and the supply is rapidly exhausted on the area where gathering is done. Even the roots are in most cases pulled up by the collector, and the opportunity for re-growth is reduced to a minimum.

"The rate of growth is very slow, so that a plant 20 inches high is three to four years old, while plants five years old are not more than 30 inches high. Such a plant would weigh about four pounds. In view of these facts it seems more than illusionary to speak of growing the Guayule plant for commercial purposes. Brought under domestication the plant could naturally be made to grow much faster, but there are still other factors to be taken into consideration. The dry country in which the Guayule plant grows, has a very scanty and irregular rainfall. For an agricultural crop that kind of land can hardly be expected to supply the necessary requirements, and the uncertainty about the germination of the seed brings in such an element of chance, that indeed very much faith in Providence must be present to undertake the growing of Guayule without any provision for occasional artificial irrigation. The price paid has been as high as $43 per ton of dry plants, pressed into bales, and delivered at railroad station. With that price, and the slow growth of the plant, it is difficult to see how anyone can in earnest consider the cultivation of Guayule. Factories operating a large area should naturally take some steps for re-covering the ground with Guayule, but beyond sowing the seeds and taking the chance of their germinating and growing in a few years to a size that can be utilized, it is hardly possible to do anything.

"As for the fear of Guayule filling the market to the exclusion of crude rubber from previous sources of wild tropical rubber and from present and future plantations, such an idea is hardly worth refuting. If we remember that the requirements at present of the United States alone amount to more than . . . . . 60,000,000 lbs. annually, a simple mathematical calculation, based on the most exaggerated expectations of the output of Guayule rubber from the entire territory where it is growing, will show the role this product could have in the world's market, even supposing that the supply was inexhaustible and as large as claimed by Guayule enthusiasts.

"It may be added that the quality of Guayule rubber is very inferior, the rubber being very sticky and rapidly deteriorating. The market value is very low in comparison with that of first class rubbers, but it still leaves a wide margin for profit, and the supply of rubber plants is apparently enough for a few factories, not too closely situated. As a special product the Guayule has a market of its own, and if cultivation of this plant can be accomplished on a profitable basis, it will prove a great boon to the sterile parts of Northern Mexico.

"Another rubber plant of Mexico, *Euphorbia elastica*, has been spoken of. I have seen the plant, but have not been able to obtain a sample of the product, which I understand, however, somewhat resembles the Guayule rubber."

In addition to this article, another communication on the same subject by Dr. R. Endlich appeared in *Der Tropenpflanzer* (July, 1907, under the title "Uber den gegenwärtigen Stand und die Aussichten der Guayuleindustrie (on the present conditions and the prospects of the Guayule industry"). From it the following observations may be added to what has been said above.

Dr. Endlich recognises a central area of 75,000 square Rm. (28,950 square miles) of Guayule land, comprising the northern parts of Zacatecas and San Luis Potosi, the eastern part of Durango and the south of Coahuila. Then there are smaller areas in Nueva Leon, Chihuahua, New Mexico, Arizona, and Texas. About one-tenth of the central area may be said to be stocked with Guayule, yielding on the average $\frac{1}{2}$-ton per hectare ($\frac{1}{5}$-ton per acre). The total supply of Guayule available is estimated at from 400,000 to 500,000 tons, but Mr. Hexly C. Pearson, the American expert of the "India Rubber World" (New York), allows only 300,000 tons. Investigations into the yield of rubber made by a competent chemist at Jimulco gave a result of 7–12 per cent., which agrees well with Pearson's figures of 6–11 per cent. Dr. Endlich, quoting from Pearson (in "El Financiero mexicano," 15 de Avril de 1907) states that the export of Guayule rubber up to the end of January, 1907, was 6,100,000 lbs., of which 2,700,000 lbs. go to the second half of 1906 and 700,000 to January of the current year. The last prices quoted were 65 cts. gold per lb. per New York, and 5·50–5·75 M. per Kg. per Hamburg.

The extent to which Guayule land is restocked spontaneously is satisfactory, as there are plenty of seeds and the seeds germinate readily; but growth is slow, ten years being about the time required for a Guayule plant to become fit for profitable working. By that time the stem should have a diameter of $\frac{3}{4}$-in. at the base. As to cultivating the plant Dr. Endlich is more hopeful now. Although the experiments made in that direction were on a small scale, he considers the fitness of the Guayule for plantation proved. Wherever soil and climate correspond to the physical conditions prevailing in the Mexican Guayule region, waste land might be profitably stocked with Guayule, particularly along with cattle-rearing as the primary industry. So far as soil is concerned the presence of a certain amount of lime seems to be essential, and as to climate it should be kept in mind that the occurrence of the Guayule shrub in the central area is limited to altitudes between 900 and 1,700 m. Sloping or undulating ground would answer best the situations of its natural habitats.

Owing to the fact that Mariola (*Parthenium incanum*) has been mistaken for the Guayule (*P. argentatum*) it seems desirable to provide, if possible, against a repetition of the mistake. The following diagnostic comparison of the two plants, prepared by Dr. O. Stapf, may it is hoped, serve this purpose.

Although the structure of the flowers and flowerheads of *Parthenium argentatum*, A. Gray, and *P. incanum*, H. B. K., is very

similar, there ought to be no difficulty in distinguishing the two plants, particularly when they grow, as is frequently the case, side by side. To facilitate comparison the more salient characters are set out here in parallel columns.

Parthenium argentatum.	Parthenium incanum.
A small *shrub* with a short stem and very numerous, much divided branches, from less than 1 to over 3 feet high; woody persistent branches short, more or less gnarled, covered with a rather smooth, dark grey bark; young shoots silvery grey all over.	A small *shrub*, 1–2 feet high, much branched; woody persistent branches, elongate, slender, covered with a somewhat rough bark, cracking longitudinally; young shoots finely whitish or greyish woolly.
Leaves lanceolate, acute, entire or more often with 1–3 coarse acute teeth or lobes, 1–2 in. long, 2–6 lin. wide, densely covered with a fine, silvery grey tomentum, gradually narrowed into an often long and slender petiole.	*Leaves* obovate to obovate-oblong in outline, crenate (the smaller) to deeply pinnatilobed, ½–1 in. long (rarely more), ⅓–¾ lin. wide, lobes 1–2 on each side, entire or the terminal crenate, all very obtuse, the whole leaf densely covered with a white woolly tomentum when young, then greyish; petiole very short.
Flower heads subsessile, subglobose, 2 lin. in diam., 3–7 in a cluster; clusters at the ends of 2 or 3, rarely more, slender branches, collected into a very imperfect corymb, rarely solitary.	*Flower heads* shortly peduncled, or subsessile, 2 lin. in diam., in terminal, often much branched corymbs, 1–4 in. in diam.; branches slender.
Involucre silky pubescent; outer bracts broadly herbaceous on the back.	*Involucre* finely villous; outer bracts slightly herbaceous on the back above the middle.

Specimens of the Guayule plant (*P. argentatum*) and of Mariola (*P. incanum*), presented by the Foreign Office, also a sample of Guayule rubber, presented by the Compania Explotadora Coahuilense, are exhibited at Kew in Case 68, Museum No. I.

XLVII.—A NEW RUBBER TREE: PALO AMARILLO.

(*Euphorbia fulva*, Stapf; syn. *E. elastica*, Altamirano and Rose, not of Jumelle.)

OTTO STAPF.

In July, 1905, Dr. Altamirano, Director of the Instituto Medico Nacional, Mexico, and Dr. J. N. Rose, Assistant Curator of the National Museum, Washington, published a description and illustrations* of a new species of *Euphorbia* (*E. elastica*) known in Mexico as El Palo Amarillo. From the name, a footnote, and the description of the plates, it could be gathered that the plant was used and recommended for the production of rubber. A fuller memoir on the subject by Dr. Altamirano† appeared in the

---

* Dr. F. Altamirano, El Palo Amarillo (*Euphorbia elastica*, Altamirano and Rose, sp. nov.) pp. 1–3, tt. I–IV. (Secretaria de Fomento, Colonizacion e Industria. Instituto Medico Nacional, Mexico, 1905).

† Dr. F. Altamirano, El Palo Amarillo como productor de caucho. Primera memoria (Mexico: imprenta y fototipia de la Secretaria de Fomento, 1905).—Not seen.

same year. An abstract of this was published by Dr. R. Endlich* of Mexico, and the notes given below on the tree and the rubber production from it are taken from this article.

Unfortunately the name *Euphorbia elastica* was, a few months previously, viz., in April of the same year, given by Professor Jumelle to a totally different species of *Euphorbia*, a native of Madagascar. The Mexican plant had therefore to receive a new name and, as "Amarillo" corresponds to the Latin "fulvus," I propose for it the name *Euphorbia fulva*.

Euphorbia fulva is a tree 8–10 metres high, with a yellow, smooth, shining bark; hence the name Palo Amarillo†, that is "yellow tree." It occurs in the States of Michoacán, Guanajuato, Jalisco, and in the western parts of the State of Mexico, usually at an altitude of 1500–1900 m. The annual rainfall of that area is between 550 and 750 mm., and the mean annual temperature between 17° and 20° C. (62·5°–68°F). The tree thrives well also on stony or rocky soil. Attempts to produce rubber from its latex were made in Michoacán some time ago, but given up as no process was known to separate the rubber from the resin, which occur in the proportion of 18–20 per cent. and 40 per cent. respectively. Recently, however, Professor Lozano succeeded in separating completely the two substances and producing very good rubber, according to some, even better than "caucho negro" (Central American rubber), and, from the resin, an excellent varnish. The process of separation has, however, so far not been made public, and at the time when the article was written the whole matter was still in the experimental stage, although plans for working the Palo Amarillo in Michoacán were under consideration. Since then an application for a concession to establish and work factories for the extraction of rubber from the tree in the States of Guerrero, Jalisco, Michoacán, Guanajuato, Oaxaca, Puebla, Lower California, Colima, and the Territory of Tepic has been made by Senor Carlos Llaguna y del Hoyo, of Michoacán.‡

The latex of Palo Amarillo is yellowish white, thin, and does not coagulate readily. To effect this it is exposed to the sun. If not subjected to Lozano's process the product is dark yellow, dough-like and neither resilient nor viscous. If boiled the latex turns very sticky and whitish grey. Experimental tapping in Guanajuato and Michoacán resulted in an average yield of 1 lit. (1·75 pint) of latex per tree. It is recommended to proceed with the tapping from the branches downwards, and to use sharp tools. If the tapping is done judiciously the tree may be ready for another yield after three months, and it is expected that it will stand three tappings per annum for 10 years. In Atecucario hatchets or "machetes" (large knives) are used, and the incisions are made in an oblique direction parallel to each other, or in spirals. The latex is collected in petroleum cans or small pots. A certain portion coagulates on the tree and is removed with knives. It

---

* Der Tropenpflanzer, 1906, pp. 525-531.

† The name Palo Amarillo is also applied to *Berberis pinnata*, Lag. (Mahonia pinnata, *Fedde*), and to two species of *Bocconia*, viz :—*B. arborea*, Wats., and *B. frutescens*, Linn.—See Ramirez, Sinon. Plant. Mex. p. 52.

‡ Diario Oficial, dated March 8th, 1907, according to an official despatch to the Foreign Office by Mr. R. Tower, Envoy Extraordinary and Minister Plenipotentiary, Mexico, dated March 12th, 1907.

has been calculated that 100,000 trees would yield 300,000 Kg. (about 294 tons) latex per annum, from which 54,000–60,000 Kg. (53–58 tons) rubber and 120,000 Kg. (116 tons) resin might be obtained. The price of the rubber is estimated at 2 pesos (about 4*s.*), and that of the resin at 75 cms. (1*s.* 6*d.*). The scattered occurrence of the tree, however, and the great distance of the areas where the tree is fairly common are a considerable drawback. It has therefore been proposed to lay out plantations of the tree, the more so as it is easily propagated by cuttings and grows fast. Large tracts of waste land might in this way be made productive.

A valuable by-product of the Palo Amarillo is the oil (about 30 per cent.) extracted from the seeds. It is a good drying oil for varnish, and, like the oils of other *Euphorbiaceae*, a purgative.

Considering the favourable nature of Dr. Altamirano's and Dr. Endlich's accounts, it may be useful to point out that Mr. George Kennedy, H.M. Vice-Consul at Mexico, reports as late as February 28th, 1907, that no satisfactory process has yet been discovered to separate these two substances at a sufficiently low cost to give the "Palo Amarillo" a commercial value as a rubber producer. He also gives the proportion of rubber and resin (desiccated ?) contained in the latex of *Euphorbia fulva* as 40 and 60 respectively.*

Finally it may be added that *Euphorbia fulva* belongs to a small group (*Laurifoliae*, Boiss.) of arborescent Euphorbias extending from Mexico to Peru and the West Indies. One of these species, *E. calyculata*, H. B. K., locally known as Chupire or Tencuante, in some parts of Mexico, occurs with *E. fulva*. Its latex is very inferior and Dr. Altamirano suggests that the unsatisfactory result of the examination of certain samples of "Palo Amarillo" rubber may be due to a confusion of the two species. *E. fulva* can be easily distinguished from *E. calyculata* by its smaller leaves (3–6 cm. by 1–2 cm.) which are woolly beneath, its short, stout, leafless flowering branches, dividing into 4–5-rayed umbels, of which, however, only one ray is properly developed bearing a flower or fruit. The West Indian species is *E. punicea*, Sw., a native of Jamaica, Cuba, and the Bahamas. Nothing is known as to its economic value.

XLVIII.—MISCELLANEOUS NOTES.

Sir J. D. Hooker.—His Majesty the King has been graciously pleased to confer the Order of Merit on Sir J. D. Hooker, G.C.S.I., C.B., F.R.S., formerly Director of the Royal Botanic Gardens, Kew.

Mr. A. W. Hill, M.A., Fellow and Dean of King's College, Cambridge, and University Lecturer in Botany, has been appointed Assistant Director of the Royal Botanic Gardens, Kew.

---

* Report, enclosed in Mr. Tower's despatch, Commercial No. 13, of the 1st of March, 1907.

Lilium tigrinum.—Kew received in January of this year some bulbs of a *Lilium* from Messrs. Watson & Scull, 90, Lower Thames Street, E.C., who stated that they had been sent by a nurseryman in Shanghai with the information that they were of an unknown lily from the interior of China, where they were cultivated for some medicinal property contained in the bulbs and that they had stems four to six feet high and flowers "white with a little yellow." The bulbs on comparison with cultivated examples of species of *Lilium* were most like those of *L. auratum*, and the description of the flowers also pointed to that species, which however is known only from Japan, although it has been suggested that it may be of Chinese origin. Bulbs of an "unknown lily from China, with white and yellow flowers" were soon afterwards offered for sale by English and other dealers, and a dozen, were purchased for Kew. Some of the plants, from both sources, are now in flower and they prove to be nothing more than *L. tigrinum*, Ker-Gawl., one of the most widely cultivated of Chinese Liliums, which was first introduced into England in 1804, where it is now in almost every garden, and is represented by several well-marked varieties, including one with double flowers. It has been collected wild in Peking (*David*); Hupeh; Ichang and Patung (*Henry*); Szechuen; Tchenkeoutin (*Farges*); Corea (*Perry*); Chemulpo (*Carles*); the Corean Archipelago (*Oldham*). It is also wild in Japan. Dr. Henry states that in Ichang this species is cultivated and the bulbs eaten, and that dry lily flowers are used by the Chinese for flavouring soups and as a remedy for pulmonary diseases (see also *K.B.*, 1889, p. 116). It is therefore not impossible that the particular form of *L. tigrinum* now in question, with bulbs unlike those of the forms usually known in gardens, may be one of those cultivated in China as a vegetable.

W. W.

The Treatment of Cacao and other Seeds for Export.—The distribution of *Theobroma Cacao* by Kew has hitherto been by means of young plants packed in Wardian Cases, as seeds, whenever tried, had proved a failure. A method of packing the seeds, recorded in the *U.S. Monthly Consular Reports* for March, 1906, and noticed in the *West Indian Agricultural News* of October 20, 1906, was stated to have been successful when tried in Samoa, and it was decided to put it to the test at Kew.

The account of the method is as follows:—

"Consul-General Heimrod submits a method of packing cacao seeds for export which has been practically tried in Samoa with excellent results and which he believes will be of special value to planters in the Philippine Islands.

"The seeds should be selected from ripe pods and well washed in water, then placed on a rough towel and gently rubbed in order to remove most of the pulp, taking care not to damage the skin. The seeds are next placed in a current of cool air for twenty-four hours. The packing material is composed of equal parts of vegetable mould and finely ground or pounded charcoal, moistened just enough to resemble earth taken out of a shaded place. If the packing material is too wet, the seeds will rot; and if not

moist enough, the seeds will absorb all the water and perish. A tin box, 8 × 4 × 4, will hold about 200 seeds if packed as follows: place a layer of earth and charcoal about ¾ inch deep on the bottom of the tin box, and lay the seeds in rows, leaving a little space between each. Spread another layer of the charcoal and earth, then another layer of rows of seeds, and so on until the box is full. Packing a slip of material across when the lid fits will help to keep the moisture in. When wetting the charcoal and earth it is a wise precaution to do it twelve hours before being wanted, as this gives the water time to permeate the whole mass evenly."

Application was therefore made to Sir Daniel Morris, Imperial Commissioner of Agriculture in the West Indies, for a small consignment of seeds to be prepared and packed as recommended above, and he gave instructions to Mr. A. Brooks at Dominica to forward 100 seeds as desired. They arrived by parcel post on January 31st last, apparently in good condition, every one of them having germinated on the way. They were planted in pots and placed in a tropical pit, where in a few days a fungus disease developed on the cotyledons and destroyed all except six of the plants. Mr. Massee finds the disease to be due to a new species of *Ramularia* (*R. Necator*, Massee, *K.B.* for 1907, p. 243), which must have been either on the seeds or in the packing material before they left Dominica. This was an unfortunate mishap as the method of packing itself was a success.

A second supply of seeds, packed as prescribed above, was received from Sir Daniel Morris on May 14th. They also arrived in good condition, all of them having germinated, but some of them showed unmistakable evidence of the presence of the same fungus, whose West Indian origin is undoubted, as its presence was noted in the two different consignments of seeds immediately after their arrival. Owing to its presence Mr. Massee prepared two solutions of formalin of different strengths and in these some of the seeds were soaked before they were sown. The result was as follows:—

10 germinating seeds soaked for half an hour in a 1 per cent. solution of formalin: 4 grew, 6 failed.
10 germinating seeds soaked for one hour in a 1 per cent. solution of formalin: 3 grew, 7 failed.
5 germinating seeds dipped in a 4 per cent. solution of formalin: all failed.
75 germinating seeds planted as received: 54 grew, 21 failed.

The outcome of this packing experiment is that seeds of Cacao selected, prepared, and packed as above described, can be sent from the West Indies to England and probably much farther, and that about 70 per cent. of them are likely to produce healthy plants.

In forming this estimate, the 25 seeds treated with formalin need not be taken into account, for the experimental use of this substance shows, as was to be anticipated, that when used as a "steep" for Cacao seeds it is not only ineffective but actually injurious. The object to be attained was, in this case, the destruction of a parasitic fungus present *in the cotyledons*. The impervious testa prevented the action of the fungicide, whereas the latter injured the tender root.

On the other hand batches of Coffee seeds were soaked, before germination commenced, for one hour, two hours, and three hours respectively, in a 1 per cent. solution of commercial formalin, without sustaining the slightest injury. In fact the batch of seeds soaked for three hours was the first to germinate, owing to the consequent softening of the testa. This amount of soaking, immediately before sowing, is calculated to destroy any fungus spores present *on the surface of the seed* without producing any untoward effect.

The following account of a similar method of disinfecting Cotton seeds carried out by the officer of the Imperial Department of Agriculture, West Indies, is reprinted from the *Agricultural News*, vol. VI., No. 134, for June 15, 1907, p. 183 :—

"Experiments have been carried out by officers of the Imperial Department during the past year in Antigua, Barbados, and St. Vincent, with a view to finding out what method of disinfection should be recommended to planters of cotton. The experiments in Barbados and St. Vincent have been carried out on a field scale, and therefore the results may be taken as a guide to practice.

"A wooden tub should be carefully washed out, and a solution of 1 in 1,000 corrosive sublimate made up in it. This should then be covered down and allowed to stand. After a few days (say a week), when the reaction between the wood and the corrosive sublimate has finished, this solution should be run away, and a fresh supply made up by dissolving 1 oz. of corrosive sublimate to every 7 gallons of water. It is estimated that 1 gallon of the solution should be sufficient to disinfect 12 lb. of seed at a cost of a little more than 1c. The cotton seed is soaked in this solution for twenty minutes, then removed and spread in a thin layer, on a clean floor, or a clean canvas, to dry, either in the shade or in the sun. While drying, the seed should be turned several times, and when thoroughly dry it will be ready for planting, or may be put into bags and stored for some time. No seed should be planted without first being thoroughly dried. It is advisable to use a new solution for each new batch of seed.

"It has been shown that it is unnecessary to wash in pure water after soaking in corrosive sublimate if the seed is not to be kept for more than a few days before planting. If the seed is to be stored for any considerable length of time, it might be advisable to wash in pure water for ten minutes after taking from the disinfectant solution.

"The germination of the seeds, after disinfection for twenty minutes, would appear to be in no way affected, and, in some instances, germination has been somewhat hastened by the soaking."

Calabash Tobacco Pipes.—Among the exhibits from Cape Colony at the South African Exhibition held in London during the early part of this year was an interesting series of specimens illustrating the Calabash Pipe industry.

As it was impossible at the time to obtain a selection from these for the Museum the good offices of Prof. H. H. Pearson, M.A., F.L.S., Hon. Curator of the Government Herbarium, Cape Colony, were requisitioned, and he very kindly undertook to obtain the necessary material, which has recently come to hand and has been placed in Case 57, Museum No I.

The identification of the plant furnishing the fruit from which these pipes are manufactured is not quite clear, but they are certainly not made from the common Calabash (*Crescentia Cujete*), a tree of the West Indies and South America. Judging, however, from an illustration and from some seeds kindly forwarded by Prof. Pearson, it appears almost certain that they are made from the fruits of one of the forms of the Bottle Gourd (*Lagenaria vulgaris*) which is employed in various parts of the world for a great variety of purposes, well illustrated by examples in the Museum Case mentioned above.

The following note on this industry appeared in "Industries of Cape Colony," compiled by the Dept. of Agriculture, 1907, p. 69:—

"The making of Calabash pipes is entirely a South African industry which has only grown to considerable proportions within the last couple of years or so. The Calabash is grown in certain districts in the south of Cape Colony, and in every town of importance there are several factories. The pipe has become a favourite with tobacco smokers for various reasons, and appears to have won the place in public estimation for years held by the meerschaum. The price of the article varies according as it is mounted in gold, silver or a base metal and whether the mouth-piece is either vulcanite or amber. Employment is afforded a fair number of practical pipe makers. The Calabash pipe has not yet appeared as an article of export, but still a great many are bought by tourists and other visitors, while residents send them as presents to their friends.

"The Calabash pipe gives every promise of becoming as fashionable with smokers in South Africa as the corn cob is in America, with the additional recommendation that the Calabash is a pipe that lasts, and which smokers take as much delight in colouring as used to be the case with the meerschaum."

J. M. H.

Guide to Museum I.—A third edition of the "Official Guide to the Museums of Economic Botany, No. I." has recently been published. During the twenty years that have elapsed since the issue of the second edition the accessions to the Museum have been very numerous, requiring much additional space for their display. This was provided in 1904 by the transfer of the entire collection of Gymnosperms to a new gallery attached to Museum No. III. (*K. B.*, 1904, p. 14). The consequent rearrangement, and the incorporation of new exhibits have necessitated a thorough revision of the Guide. The system of grouping the exhibits under the Natural Orders of the plants producing them has been retained. In the Guide, under each Natural Order is given a brief

note of the general properties of the Order, followed by detailed numbered references to the more noteworthy objects. The information contained in the Guide has been carefully revised in accordance with the knowledge we now possess of the sources, areas of production and improved processes of manufacture of the extensive series of vegetable products exhibited.

Davidia.—The genus *Davidia*, Baill., has been fully and repeatedly described and figured; but as some time ago a question arose as to whether the dried specimens in herbaria and the living plants in Europe represent one or two species, it seems desirable that something be said on this point, and in its elucidation the history of the discovery of the genus, its introduction into European gardens, and the conditions under which it grows in its native country, may be briefly recapitulated. *Davidia involucrata* was discovered near Moupine, Western China, by the Abbé David in 1869, growing at an elevation of between 6,000 and 7,000 feet. A specimen was transmitted to Paris and Baillon described it (*Adansonia*, vol. x., p. 115) in 1871, and a coloured figure of it appeared in the *Nouvelles Archives du Museum d'Hist. Nat. de Paris*, série, 2, 1885, vol. viii., p. 242 t. 10. Previously, in vol. v. (1882) of the same publication, p. 161, David, in a general description of the position, climate and vegetation of Moupine, mentions: "L'arbre curieux que M. Baillon a bien voulu appeler de mon nom, *Davidia tibetana*, croit aussi vers 2,000 mètres d'altitude." Now, there is no doubt, as we shall presently demonstrate, that David was writing of the very same tree that Baillon described, and not of a second species, as assumed by André (*Revue Horticole*, 1902, p. 378) and others.

In December, 1871, the same year that Baillon published his description, Prof. J. Decaisne sent to Kew a leaf and a bract and a sketch of the material described by the former, with the remark: "Le Muséum ne possède que le seul exemplaîre dont voici le calque . . . . On m'avait assuré que le *Davidia* se trouvait dans les pepinières d'A. Leroy à Angers." We have found no confirmation of the latter statement; but E. André, in the place cited above, gives the history of the successful introduction of a *Davidia* by Messrs. de Vilmorin, through Père Farges, a missionary. There were two consignments; one from Szechuen, in 1897, and the other from "Eastern Tibet," in 1898. Moupine it should be explained, was regarded by the missionaries as being in Tibet, but we follow Bretschneider's map, where it is placed in Western Szechuen, though the boundaries of China Proper and the adjoining tributary States are not well defined. It is important, however, to note this geographical fact, because there are two varieties, or closely allied species, of *Davidia*: the one from Moupine, otherwise "Eastern Tibet," and the other from more eastern localities. Out of the two lots of seed received by Messrs. de Vilmorin, only one seed germinated, and that after lying in the ground two years! It was one of those received in 1897, and the seedling flourished so well that in 1901 four cuttings were taken off and one branch was layered. Two of the cuttings grew and eventually one of the resulting plants was presented to

the Jardin des Plantes, Paris, and the other to Kew. The layer was intended for Prof. Sargent. In May of last year the original plant flowered, and figures appeared in the *Revue Horticole*, p. 297, and in the *Gardeners' Chronicle*, vol. xxxix., p. 346, and Mr. M. de Vilmorin presented Kew with a good herbarium specimen. In 1889, twenty years after David's discovery, Dr. A. Henry sent good flowering and fruiting specimens to Kew, and Prof. D. Oliver described and figured the fruit in *Hooker's Icones Plantarum* t. 1961. Henry's specimens were taken from "the only tree observed during a six months excursion." It grew in South Wushan on the Yangstze-kiang, just within the eastern boundary of Szechuen.

Ten years later Mr. E. H. Wilson went to China to collect for Messrs. James Veitch & Sons, one of the principal objects of the mission being to procure seeds of *Davidia*, in which he was highly successful. He was fortunate in discovering a considerable grove of trees to the south-east of Wushan between Patung and Nanto, Hupeh, in about 110° 45′ longitude. There he found abundance of seed, which he transmitted to Messrs. Veitch, who raised a large number of plants; and the writer described and illustrated the germination and early condition of the seedlings in the *Journal of the Linnean Society*, vol. xxxv., pp. 556–559, t. 19. On his second journey, in 1903, Mr. Wilson collected specimens of *Davidia* in the mountains south of Moupine and west of Yachan, Szechuen, in about 102° 40′ long. and 30° 20′ lat.; and in 1904 he collected further specimens on Mount Omei, in about 103° 40′ long. and 29° 30′ lat.

Previous to Mr. Wilson's departure on his third journey to China, he called my attention to certain differences exhibited by the specimens of *Davidia* from different localities, and I have since examined the rich material at Kew.

Wilson's specimens, collected near Moupine, are exactly like Baillon's original of *D. involucrata*, which differs from all the other specimens collected by Wilson, as well as from those collected by Henry, in having the under surface of the leaves, even of the mature ones, clothed with a white tomentum. All the other specimens have glabrous or early glabrescent leaves. But there are no other obvious differences, and I think they can only be classed as varieties of one species. So far as I have seen, all the plants in cultivation have glabrescent leaves. The largest leaves of the Moupine variety, including the petiole, are nearly 30 cm. long and the largest bracts 15 cm. long and 11 cm. broad. None of the more numerous specimens of the other have leaves or bracts quite so large; but that, of course, counts for nothing.

Some of the Abbé David's notes respecting the climate of Moupine and the plants with which *Davidia* is associated, are worth repeating for the information of the cultivator.

Moupine itself is at an elevation of 7,100 feet, and to reach it from the east it is necessary to cross a pass rising to 10,000 feet. It is surrounded by loftier peaks, the highest being nearly 17,000 feet, and wooded up to 11,600, with beautiful pastures above, without perpetual snows. From the summit, much higher, snow-clad peaks can be seen in the distance. A curious fact in the climate

is that the snows and fogs of winter usually cease lower down in the forest zone, leaving the upper zone dry and serene. The climate of Moupine is very rigorous and unpleasant; the winter cold, with much snow, which lies in the sheltered valleys till May or June. During the rest of the year there is almost daily rain, and the atmosphere is always fully charged with moisture. *Davidia* grows in the partial shade of larger trees, such as a *Cerasus* with small red fruits; a gigantic *Corylus*; a *Quercus* having a corky bark; numerous *Lauraceae* and *Ficus*, both erect and of great stature, and climbing.

W. B. H.

The Forests and Forest Flora of the Colony of the Cape of Good Hope.—Mr. T. R. Sim, F.L.S., well known, by his writings at least, to all students of the vegetation of South Africa, has presented to Kew a copy of his *magnum opus*, bearing the above title, and the date, 1906. It is a quarto, with 361 pages of letterpress, illustrated by 160 plates drawn by the author, and representing 312 species. We are so apt to consider Cape Colony as almost devoid of forest, that a large book on Cape forests comes almost as a surprise. It is true, however, that the forest area is relatively very, very small; a fact confirmed by the opening words of the author's preface. He says: "The Colony of the Cape of Good Hope has during many centuries suffered, and it still continues to suffer, climatically, as well as economically, through the absence of a fair proportion of forest-covered surface. In both these respects the position went rapidly from bad to worse during the first three-quarters of the last century, mostly through the malign influence of man, and it is only in more recent years, and more particularly since the passing of the Forest Act in 1888 that a serious endeavour, on scientific lines, to maintain and improve the quality of the Crown forests has been made, or even became possible." It is satisfactory to note that a beginning has been made in establishing a well organised and effectively administered Forest Department, and, not least among the means to success is the excellent book compiled by Mr. Sim, who was formerly District Forest Officer at King William's Town, Cape Colony, and who now holds the position of Conservator of Forests in Natal. Mr. Sim has had the advantage of the co-operation of all the leading botanists and forest officers in South Africa, and the Governments of Cape Colony, Transvaal, Orange River Colony, and Rhodesia have united in defraying the cost of publication.

The subject matter is set forth and discussed in chapters, of which it may be useful to give the headings:—I. The Forests of Cape Colony Described; II. Area and Value of Cape Forests; III. Economic Composition of the Forests; IV. Factors affecting the Forests; V. Gradual Reduction of Forest Areas in the Past, and the Retrogressive Nature of the Forests; VI. Factors affecting the Distribution of Species; VII. Economic Value of Cape Timbers; VIII. The Protection and Exploitation of the Forests; IX. Artificial Afforesting; X. Epitome of the History of Cape Forestry; XI. Species reserved under the Forest Act; XII. Synoptical Index of the Classification; XIII. Artificial Key to the

Genera; XIV. Systematic Descriptions; XV. Index. Chapters I. to XII. occupy rather less than a hundred pages, but they are full of interesting information, so arranged that it is quite easy to find what one is in search of.

The author states that in consequence of the requirements of other industries, and especially the mining industry, the forests were left out of sight in the construction of railways. He continues :—"Thus they remain difficult of access and little known, and of the hundreds of thousands of visitors from abroad who took part in the recent war, probably 90 per cent. neither saw nor heard of any Cape forest, and would agree with Max O'Rell when he says, 'In South Africa the land is scarcely more clothed than the natives who inhabit it. When you have travelled north for a few hours all vegetation disappears; no more trees, no more shrubs. The grass grows on the earth and on the sides of the mountains as the hair grows on the heads of the Kaffirs, in little tufts here and there.' Or they might even feel inclined to apply to many parts his description of what was the Orange Free State when he visited it—'It is desolation, isolation, immensity!'

"Nevertheless, actual forests do exist, and, though they form only 0·21 per cent. of the whole area of the Colony, there are 613 square miles of them, besides twice that area of less closely forested reserves, the estimated total value being £4,000,000." One can better realise the very small proportion of real forest by the fact that it is only about $\frac{1}{500}$th of the area of the Colony; in other words, about 25 miles square, or less than half the size of the county of Sussex! But the fact that the Colony has produced such a practical "Forest Flora" raises strong hopes of future extensions.

W. B. H.

Rubber cultivation in the British Empire.—The Library at Kew is indebted to the publishers for a copy of *Rubber Cultivation in the British Empire*. The work is a reprint of a lecture recently delivered before the Society of Arts by Mr. H. Wright, who is known as an authority on rubber. The book, which is well printed, is issued by Messrs. Maclaren & Sons. It consists of 108 pp., 8vo.; in it the writer has brought together in a concise form much useful information on the subject.

Bromeliaceae Andreanae.—To Mr. W. E. Gumbleton, of Belgrove, Queenstown, Co. Cork, who has already presented several rare and valuable books to Kew, the library is now further indebted for the gift of a handsomely bound and beautifully hand-coloured copy of the *Bromeliaceae Andreanae*. This copy is, we understand, the only coloured copy of this work in existence with the exception of that belonging to the author, from which the colouring of the copy now received was taken. The continuation of the title runs: "Description et Histoire des Bromeliacées recoltées dans la Colombie, l'Ecuador et Venezuela, par Ed. André. Ouvrage illustré de 39 Planches lithographiées et d'une carte partielle de

l'Amérique du Sud." Mr. André, who is an old and valued correspondent of Kew, visited South America, under the auspices of the French Government, for the botanical exploration of the countries named, where he collected assiduously in 1875 and 1876. Of the *Bromeliaceae* alone he collected 129 species and 14 varieties belonging to 14 genera. No less than 91 of the species are described as new, and seven others, of which only imperfect material was collected, were almost certainly undescribed. The collection also yielded two new genera, namely, *Sodiroa* and *Thecophyllum*. Upwards of 70 of the species are more or less fully illustrated; some only by analyses of the flowers. It may be added that the plain copy, previously possessed by Kew, was presented by Mr. André.

The Cyperaceae of the Philippines.—The Philippine *Journal of Science* for April, 1907, contains an enumeration of the Philippine *Cyperaceae* in the Kew Herbarium by the late Mr. C. B. Clarke. It comprises 127 species belonging to 22 genera, and is not put forward "as complete in any respect." The more important synonymy relating to the Philippines and adjacent lands is given, and there are short notes on the genera and species, which are "not given as sufficient diagnoses, but are intended to be useful to assist collectors in the field." The general distribution of each species follows its distribution in the Philippine Islands. One new species, *Mariscus Merrillii*, is described. This little contribution to cyperology has a melancholy interest as being the last prepared for the press by the author, whose exhaustive monograph of the order still lies in manuscript.

London Botanic Gardens.—A small volume under this title has recently been published by the Wellcome Chemical Research Laboratory. It consists of a reprint of a series of articles contributed to the *American Journal of Pharmacy* by Mr. P. E. F. Perrédès in 1905 and 1906. These articles give descriptions of the Chelsea Physic Garden, the Royal Botanic Society's Garden, the Royal Horticultural Society's Garden, and the Royal Botanic Gardens, Kew, regard being had to their scientific and economic functions rather than to any recreative features they may possess. A short but well-informed history of each institution is given, attention being called to the direction in which its influence has been most markedly exerted. Thus the Chelsea Physic Garden and the Royal Botanic Society's Garden are shown to have had the teaching of Botany, particularly in relation to medicine and pharmacy, as their dominant feature, while Kew is said to "stand out prominently as a centre of botanical research, and as the cradle of botanical enterprise in India and the Colonies."

Mikania scandens in Fiji.—The following letter has been received from Mr. C. H. Knowles, Superintendent of Agriculture, Fiji :—

"Fiji, 17th May, 1907.

"I have the honour to inform you that I am forwarding specimens of root, stem, leaves and flowers of a vine that is a serious nuisance as a weed in the wet districts of Fiji. The Fijian name is *Wa Butako*, which means 'Thief' or 'Pirate,' having reference to the rapid way in which it spreads and makes itself at home in the native and other cultivations.

"In the bush on the sides of the road from Suva to Rewa it is to be seen climbing on the trees and posts, and when the bush is cleared this vine makes its appearance climbing up all stumps and often forming a thick carpet on the land. In cane fields it climbs around cane and does much damage if unchecked. It is easily removed by the laborious method of hand-picking, but horse cultivation does not appear to kill it.

"I should be much obliged if you would have it examined and inform me of its botanical name and where it is a native of. I regret that I am unable to obtain any information as to the history of its arrival and spread in the Colony."

The specimens show that the weed in question is *Mikania scandens*, Willd. This species is common in most hot countries. In Lower Bengal it sometimes gives much trouble, and the description of its behaviour in Fiji given by Mr. Knowles tallies exactly with what has been observed in the neighbourhood of Calcutta. In India, as in Fiji, the only method of checking the pest that has been of any use has been that of carefully removing the plant by hand and destroying it.

Seedling sugar-canes in the West Indies.—From the *Agricultural News* we learn that the cultivation of new seedling sugar canes, as compared with the Bourbon and other varieties hitherto grown in British Guiana and elsewhere in the West Indies shows considerable progress in recent years. From returns to hand it appears that 28,801 acres were planted in British Guiana in seedling canes in 1906–7. The area in 1905–6 was 14,743 acres and 1904–5, 9,518 acres. Amongst the more important seedling varieties are the Demerara seedlings D. 109 and D. 625; while two Barbados seedlings, B. 208 and B. 147 are also largely cultivated. An Editorial note which appeared in the *International Sugar Journal*, in May last (pp. 219-220) discussing the "Identity of Seedling Canes in Demerara" asserts that it was "an ascertained fact" that the seedling Cane B. 208 cultivated on the well known Diamond Plantation in Demerara "was not the original seedling of that variety." Samples of B. 208 from Diamond Plantation have, however, since been submitted to a critical examination by the Imperial Department of Agriculture for the West Indies, and it is stated that they are identical with the original seedlings of that variety raised at Barbados.



DEGENERATION IN POTATOES.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1907.

XLIX.—PLANT DISEASES.—VIII. DEGENERATION IN POTATOES.

(With Plate.)

G. MASSEE.

During the past few years many inquiries have been addressed to Kew as to the reason why potato tubers fail to form sprouts at the proper season, even when placed under the most favourable conditions for doing so. Last spring one correspondent stated that out of 70 tons of potatoes of high grade, especially intended for "seed," only five tons showed signs of sprouting, the remainder being disposed of, at a serious loss, for culinary purposes. This condition of things is not confined to this country. In Germany (*a*) serious losses have been sustained owing to the sterility of potato "sets," more especially of the kind known as Magnum Bonum. Very few of the eyes produced sprouts, and the "sets" at the time of lifting were not shrivelled and dried up as is the case under normal conditions, but on the other hand were solid and quite firm and in many cases had actually increased in size. In one instance where the "sets" were graded by a machine before planting, an increase in size of from one-half to three-quarters had taken place. This proves that the "sets" after planting had commenced growth a second season, and had accumulated the starch formed by the scanty amount of foliage produced. The new tubers formed by such plants were small and few in number. In many instances sprouts were not formed, and the "sets" remained intact in the soil throughout the season. The loss on the potato crop varied from about 5 per cent. to total loss, and averaged from 50 to 60 per cent. Investigations made by Dr. Schleh and Dr. Speikermann proved the absence of any specific disease, and the failure was in part attributed to the practice of growing the same kind of potato from sets produced on the spot for a long period of time.

In France Dr. Delacroix (*b*) has described the occurrence, on a large scale, of a similar sterility of potato tubers, which he calls

1375 Wt 87 8/07 D & S 29 29357

"filosité." In this case the few sprouts produced become considerably elongated, remain very slender, and usually do not appear above ground, and when they do so, produce only a few small stunted leaves. Here again there was an absence of disease, and the author considers that "filosité" is due to decadence and loss of vitality, brought about by the employment of the vegetative method of reproduction invariably followed. In those countries where attention is paid to the production of improved varieties of potatoes, certain points have been constantly kept in view. Amongst such may be enumerated: increase of crop; improved flavour; smooth and even surface; immunity from disease. With the first three points cultivators have surpassed their most sanguine expectations, and it is hoped that by a strict application of Mendelian laws, a strain of potatoes immune to all ills will shortly be forthcoming.

Unfortunately the method of selection and the lines followed in producing these much desired improvements in potatoes have in some instances also favoured other unexpected modifications, which have resulted in sterility or the failure to form sprouts by the tubers. This failure has been shown, by a series of experiments conducted at Kew and extending over three years, to be accompanied by a combination of two distinct specific conditions: i., more or less arrest of the development of the vascular system of the tuber; ii., comparative absence of the ferment or enzyme called diastase from the tuber.

A tuber, as is well-known, is the very much swollen terminal portion of an underground branch specialised for the purpose of a vegetative method of reproduction. Such tubers retain, under normal conditions, those structures present in the above-ground stem of a potato plant. The main bulk of a tuber consists of a mass of tissue crowded with starch, which is used up in the formation of new shoots or sprouts. This starch is conveyed to the growing shoots through certain portions of the fibro-vascular system, which appears to the naked eye, when a tuber is cut across, as a thin line forming a ring situated some little distance from the surface of the tuber. Branches from this ring pass outwards to the 'eyes' or sunken points from which the sprouts originate. Now the improvement in the tubers, from the culinary standpoint, which has resulted from these methods of selection and interbreeding has at the same time been accompanied by a serious degeneration of the fibro-vascular system; in fact, in many examples that have been examined microscopically, this system is found to be so much reduced, especially in the branches connecting the main ring with the 'eyes,' as to be rendered incapable of conveying the necessary amount of food from the tuber to the growing shoots. Consequently the growing shoots are either not developed at all, or only developed as weakly branches devoid of vigour and soon perishing. It is a well-known fact that a quarter of a century ago stored potatoes (even the varieties most renowned for their 'mealy' or 'floury' qualities) were apt to become sweet in flavour, watery, and unsuitable for table purposes during the early spring months. Various methods of treatment were devised for preventing this deterioration from a culinary standpoint, more especially in the case of potatoes stored on board ship for use

during the prolonged voyages of that period. This defect is not apparent at the present day, and many of the best kinds remain unchanged in composition until midsummer or even for a longer period of time.

The primary object of the mass of starch stored up in a tuber is that of supplying formative material for the shoots during their early period of growth until leaves are developed. Before the starch can be utilised, however, it has to be converted into a liquid condition, when it is conducted through the elements of the fibro-vascular bundles to the growing-points. The solution of the starch is effected by means of a soluble ferment called diastase, which is produced in the tuber when the normal season for growth or sprouting arrives. Now in many high grade potatoes at the present day, diastase is produced in such small quantity that it is incapable of converting more than a very small proportion of the starch present into liquid sugar, hence the absence of sprouting is due to a lack of the food material necessary for the work. For the same reason many tubers remain almost unchanged as to starch contents when the crop is lifted in the autumn. These are illustrations of somewhat extreme cases, but the fact that potatoes in general remain 'floury' for a longer period of time than formerly, indicates a gradual and general loss of power on the part of potatoes to produce the necessary quantity of diastase.

Prunet's method (*c*) of determining the relative amount of diastase present in potatoes is as follows. Absolute alcohol is added to a definite amount of liquid pressed from crushed potatoes. The precipitate thus formed is collected on a filter and dissolved in a definite quantity of water. This solution, when added to a known quantity of water containing starch paste in solution, admits of the relative proportion of diastase present being determined by the rapidity with which the liquor ceases to be coloured by a solution of iodine.

By adopting the above method a total absence of diastase was proved in the case of tubers that had failed to sprout. In other examples the relative amount of diastase present was ascertained to be in proportion to the number of sprouts formed. Diastase is first formed, and in greatest abundance, at the apical or free end of a tuber, and for this reason the earliest and most vigorous sprouts are produced in this region in a normal tuber. When the presence of diastase is on the wane it also lingers longest in the apical region ; hence, in a large percentage of deteriorating tubers, sprouts from a single apical 'eye' are alone produced, as in Fig. 1 ; and in many instances, where the supply of food is very scanty owing to the absence of diastase, these sprouts perish at a very early age, as shown in Fig. 2. In Fig. 3, which illustrates the grower's ideal even surface—a factor of undoubted value when the loss resulting from paring is the object in view—the power of growing or sprouting has been completely lost, owing to deterioration of the fibro-vascular system and the comparative absence of diastase.

During the past three years a series of experiments have been conducted with the object of imparting new vigour to potatoes

intended for 'seed.' It must be admitted that the results obtained up to the present have not been very encouraging, the time being too short to remove the deterioration which has been established by a prolonged period of more or less intensive cultivation; nevertheless certain points have been noted which may prove to be of value to future experimenters.

Degeneration appears to be due mainly to the vegetative method of reproduction commonly followed. Even in the case of seedlings, the parents of these must, at least, be closely related.

Imperfect development of the fibro-vascular system is mainly due to the desire to obtain a potato with an even surface, that is, to abolish the sunken 'eyes' of the older type of potato. Selection has accomplished this point, but at the expense of germinating power. In the old type of tuber the 'eyes' were depressed to the level of the fibro-vascular ring, which supplied food directly to the sprouts springing from it. In the modern potato, resembling the surface and contour of an egg, the 'eyes' have dwindled to a mere suggestion of such, in other words the cortical portion of the tuber, or the portion outside the vascular ring, has increased in thickness, but the branches that connect the 'eyes' with the vascular ring from which they have been raised, are too often merely rudimentary, and fail to convey food to the sprouts.

On the whole, the failure of many otherwise excellent varieties of potatoes to grow vigorously is due rather to a lack of diastase than to morphological imperfections. This, as already explained, is manifested in the persistence of the starch in a solid form.

The nearest approach to a return to normal conditions has been met with in the case of potatoes grown for three years in succession on the same patch of sandy ground and without a trace of manure of any kind. The original 'sets' of a highly prized modern type were each reduced to the condition of being able to produce only one sprout at the apical end. The product of the third generation formed vigorous sprouts from every part of the tuber, thus proving that abandonment of all forcing or selective tactics enables the plants to regain their power of producing diastase. This result, however, was at the expense of all those points that have cost the cultivator so much time and labour to secure; the crop was small, the tubers few in number and only of average size and the 'eyes' were considerably depressed.

Superphosphate increased the amount of diastase to a much greater extent than a liberal dressing of farmyard manure.

Light favours the production of diastase much more than darkness, also a greater amount is produced in a high than in a low temperature.

A very interesting discovery on this point was made by Mr. Watson, Curator of the Royal Botanic Gardens. Some tubers that had refused to produce sprouts when placed under the most favourable conditions available to the ordinary grower, were placed in one of the forcing pits having a temperature averaging about 70° F. and were not covered. In due course sprouts

were formed freely at the apical end of the tubers in all the 'eyes.' The tubers were then planted in Mr. Watson's kitchen garden and duly yielded an ample crop of quite normal potatoes.

Literature quoted.

a. Deutsche Landwirtsch. Presse, Nos. 91, 94, 95, & 97 (1905).
b. Comp. Rend., Dec. 1903, p. 1006.
c. Comp. Rend., Dec. 1892, p. 241.

L.—THE CRICKET BAT WILLOW.

(With Plates.)

W. J. Bean.

No question in connection with profitable tree-planting has aroused greater interest in recent years than that as to the kind of Willow best adapted for the manufacture of cricket bats. It has only attained importance in recent times because it is only lately that the supplies of the best "Bat Willow" have become seriously limited and that prices have risen in proportion. At a sale of Willow trees on Sir Walter Gilbey's estate at Sawbridgeworth, in February, 1906, the best "Bat Willow" realised prices estimated to be equivalent to about seven shillings per cubic foot. I have recently been informed by the agent of a large estate in Essex that he had declined the offer of £1,500 for the best 100 Willows on the estate; and Mr. John Shaw, of the well-known firm of Shaw and Shrewsbury of Nottingham, last winter offered £40 for a single tree. When it is remembered that trees have been known in favourable situations to reach a saleable size in twelve years (having in that period attained a girth of about 50 inches) these prices show that there is no timber so profitable at the present time as that of the Cricket Bat Willow. It is not surprising, therefore, that the attention of owners of land suitable for the growth of Willows should have been attracted by this tree. As a matter of fact a large number of Willows have been planted during the last few years with a view to meeting the future demand. But we have it on the authority of Mr. Shaw, one of the largest buyers as well as a leading expert, that not more than one-fourth of the trees that are being planted are the best Cricket Bat Willow.

The identity of the true "Bat Willow" has always been obscure. The cricket bat maker recognises the tree best suited to his purpose with infallible certainty, but the characters on which he relies are not characters on which the botanist bases his distinctions. It is with a view to helping the planter to recognise the Willow best suited for cricket bats, and to avoid the unsuitable ones, that the matter is now being taken up in the *Kew Bulletin*.

It has for some time been evident to us at Kew that there is more than one Willow valuable for bat-making, although, perhaps,

not equally valuable. It has also been evident that whatever the best "Bat Willow" might be it was not so much a species in its entirety as a variety, or, perhaps, merely a local form. With a view to settling the identity of the true kind the Copped Hall estate near Epping, the property of Mr. Wythes, was visited in company with Mr. Shaw. Here a large quantity of "Bat Willows" are growing, and specimens were collected of the different sorts whose respective values for bat-making were certified by Mr. Shaw. They have since been botanically identified, and for assistance in this work we have to express our obligations to the Rev. E. F. Linton, M.A., the well-known authority on British Willows. The expert knowledge of the cricket bat manufacturer has, therefore, been joined to that of the botanist and it now remains to put on record the conclusions at which we have arrived.

The "Open-Bark" Willow.

(*Salix fragilis*, L.)

The two commonest terms used in describing Willows from the bat-maker's standpoint are "open-bark" and "close-bark." There is no difficulty or mystery about the "open-bark." It is the Crack Willow—the *Salix fragilis* of Linnaeus—a common tree on the banks of the Thames near Kew. Although a useful timber in other respects, it is of very inferior merit for the making of cricket bats. It is, in fact, used only for the manufacture of cheap bats for children, such as are sold in toy shops rather than by the genuine athletic outfitter. They are of a reddish colour. In connection with the present question, the "open-bark" or Crack Willow should only be known in order to be avoided.

Botanical characters of *Salix fragilis*.—A *tree* 80 to 90 feet high with spreading branches; *branches* growing at angles of 60° to 90°. *Leaves* coarsely serrate, usually somewhat pubescent at first; *pubescence* deciduous. *Stamens* silky at extreme base only. *Ovaries*, in the commonest (probably unfertilised) state, almost subulate, but ovate-lanceolate in the fertilised condition, gradually narrowing to a distinct style; their *pedicels* ultimately three to four times the length of the nectary.

The Best "Close-Bark" Willow.

(*Salix alba*, L., var. *caerulea*, Syme [S. caerulea, *Smith*].)

The Willow selected by Mr. Shaw as the very best one for bat-making is a tree of markedly pyramidal habit; it is female or seed-bearing; and it belongs to the bluish-leaved variety of the White Willow. It is, therefore, a pyramidal form of *Salix alba*, var. *caerulea* ♀. The bark is less rough than in *S. fragilis*, and the corrugations are less prominent, straighter and more continuous up and down the trunk of the tree. The wood is white, and when it is being split does not part so easily as the "open-bark" does, but splinters a good deal. This splintering, or tearing, down the cleft is regarded as an evidence of good quality.



THE "OPEN-BARK" WILLOW.

Salix fragilis, L.

To face page 312.



THE BEST "CLOSE-BARK" WILLOW.

Salix alba, L., var. *caerulea*, Syme.

According to Mr. Shaw this particular tree is only to be found at the present time in the counties of Essex, Hertford and Suffolk. A few trees were at one time growing in Kent and Surrey, but it is his belief that the true "Bat-Willow" is no longer to be obtained there. Neither Cambridgeshire nor Lincolnshire has it, nor does it exist (except for recent plantings) north of the Trent. This all goes to show that this Willow is a local form, and that only those "sets" can be relied on which have been obtained from the right district. *Salix alba*, var. *caerulea* ? is grown at Kew, where there are two fine specimens on the banks of the Lake. But although in character of leaf and fruit they are identical with the trees on the Copped Hall Estate, in habit they are quite different. The trunks have forked low, and the habit is more spreading. Although some of the Copped Hall trees are growing in hedgerows and have ample room for lateral development, their tapering pyramidal form is a most noticeable characteristic. This is well shown in the illustration.

The pyramidal shape of the tree is associated with, and may in some measure be due to, a great vigour of growth. And it is reasonable to conclude that it is this vigorous growth which gives to the timber those peculiar qualities which render it better adapted for cricket bat-making than any other variety of White Willow. It is a remarkable fact that of all the hundreds of timbers now available from the tropical and temperate parts of the globe the only tree yet known to produce a timber of the right quality is found in a few counties in England.

In regard to quality of timber for cricket bats, the typical *S. alba* appears to be intermediate between *S. alba* var. *caerulea* and *S. viridis* (v. below). A tree at Copped Hall was considered by Mr. Shaw to be of second rate though of fairly good quality.

Botanical characters of *Salix alba*.—A *tree* 70 to 80 feet high with ascending or erect *branches* growing at angles of from 30° to 45°. *Leaves* finely serrate, silky pubescent, *pubescence* permanent. *Stamens* more silky in the lower half than those of *S. fragilis*. *Ovaries* ovate-conic, abruptly obtuse, sessile or with the pedicels shorter than the nectary ; *style* very short or absent.

S. alba, var. *caerulea* differs from ordinary *S. alba* in the leaf being glabrescent and of a bluish green tint. The ovaries are identical.

Botanically there is no well-marked dividing line between *S. alba* and *S. alba* var. *caerulea*, the two being united by intermediate forms. It is possible that the quality of timber improves as the tree approaches the latter.

Salix viridis, Fries.

There is another Willow recognised by Mr. Shaw as a "close-bark" and of a useful quality, but still inferior to that of *Salix alba*, var. *caerulea*. Although it is not easy to put on paper the differences between the "open" bark of *S. fragilis* and the "close" bark of the true "Bat Willow" in such a way that they

can be indubitably recognised, they are appreciated easily enough when seen in the field. But the differences between the two "close" barks, although perfectly evident to the expert eye of Mr. Shaw, are by no means obvious to the uninitiated. Nor was it possible after careful "coaching" to fix on any distinctive features in the bark as a help for future occasions. This, however, is only one more of those instances, common to pretty nearly every walk in life, where distinctions clear enough to the trained eye are quite hidden from the outsider.

But although the bark afforded no help in the differentiation of the two "close-barks," the trees were distinct enough in other respects. The habit of this second tree was more spreading than that of *S. alba*, var. *caerulea*; the leaf was smaller and not so blue; and the trees, being devoid of fruit, were presumably male. Mr. Linton considers this tree to be *Salix viridis* of Fries.

Salix viridis is a hybrid between *S. alba* and *S. fragilis* and as these species frequently grow together they have no doubt cross-bred very many times. It is quite probable also that the progeny have interbred with the parent species again. At any rate *Salix viridis* is a very variable tree, showing numerous intermediate gradations between the two parents—sometimes approaching *S. alba* and *S. alba*, var. *caerulea* so closely in leaf as to be indistinguishable from them, and sometimes showing very distinctly the influence of *S. fragilis*. Its advent into the Cricket Bat Willow question has created a good deal of confusion. A specimen approaching *S. alba*, var. *caerulea* may be described as good by the bat-making expert, whereas another approaching *S. fragilis* will be accounted inferior. Yet to the botanist both are *S. viridis*.

From the bat-maker's point of view the timber of *Salix viridis* is not so good as that of *S. alba*, var. *caerulea* because the wood is coarser and heavier. A bat made of good *S. viridis* timber would weigh about 2 lb. 7 oz. to the 2 lb. 4 oz. of *S. alba*, var. *caerulea*. The difference in market value is also so considerable as to be important to intending planters. Mr. Shaw stated that, for trees of equal size, buyers would give £10 for the *S. alba*, var. *caerulea*, but only £6 for the *S. viridis*.

With regard to the botanical characters of *Salix viridis*, it is difficult to give a concise description. It has already been explained that it is a hybrid between *S. alba* and *S. fragilis*, with which it has bred and interbred till it now forms an almost complete series of links between those two species. Therefore *S. viridis* in its various characters is more or less intermediate between the other two; this refers more especially to the angles at which the branches grow; the serration and pubescence of the leaf; the density of the flowers on the male catkins; the size of the ovaries, the length of their pedicels and the distinctness of their styles. In some states, again, *S. viridis* has one set of organs, say leaves and twigs, resembling one parent, whilst the ovaries are almost identical with those of the other. In practice, as the late Dr. Buchanan White observed, it requires the trained eye of the salicologist to detect and balance up the various characters that go to make *Sulix viridis*.

Salix Russelliana, Smith.

In connection with the "Bat-Willow" question the name of *Salix Russelliana* frequently crops up, and is a source of considerable confusion. A correspondent of Kew complains that whilst one person tells him that *Salix Russelliana* is an excellent Willow for bat-making, another says that it is quite worthless. The probable explanation of this is that "Russelliana" is a name that has been given to two different Willows. Most commonly it has been applied to the "Crack Willow" (*S. fragilis*); in that connection, therefore, it indicates the very inferior Willow for bat-making. But the name has also been given to the hybrid between *Salix alba* and *S. fragilis* which, as has already been explained, is itself a variable plant, but is often of good, although not the best, quality. The name "Russelliana" is now no longer used by the leading authorities on British Willows, so that those interested in the Cricket Bat Willows would do well to discontinue its use.

Popular and Local Names.

Another source of confusion arises from the use of local names. So misleading are they, that they should be dispensed with altogether in connection with the present question, since it is hopeless now to find one popular name restricted to one particular Willow. A name given to a particular species or variety may be in general use in one district, but it may be given to quite a different tree in another. In the course of consulting various works in connection with the Cricket Bat Willows the curious fact has been noticed that the terms "Huntingdon Willow" and "Leicestershire Willow" have both been applied to *Salix alba*, to *Salix alba*, var. *caerulea*, and to *Salix fragilis*.

Propagation and Cultivation.

It will have been gathered from what has been said that there is at the present time a brisk demand for young trees or "sets" of the true "Bat-willow." Enquiries are being continually addressed to Kew as to where they can be obtained, but we know of no one at the present time who is able and willing to supply them in quantity. It is of little use applying to the ordinary trade firms. With the best will and the most honest intentions they may supply the wrong tree, because, as has already been pointed out, it is not *Salix alba* var. *caerulea* merely that is wanted.

So far as our present knowledge takes us it is the erect-growing form alone that can be relied on, and then possibly the female plant only, and it is only safe to plant stock which has come originally from the counties of Essex, Suffolk, or Herts.

The usual method of propagating this Willow is by means of "sets." These "sets" are branches cut as thick as or thicker than a broom-handle, with the minor branches and twigs removed; they are thus transformed into bare rods which when planted are 8 to 10 feet or even more in length. "Sets" of about this length are preferred so that the young growths may be out of reach of cattle, &c., and the young trees away from the various dangers

that beset them when they are near the ground. They are also suitable for thrusting in hedgerows and such-like situations. Care should be taken to prevent cattle from injuring the stems. In some places Willows are being pollarded for the especial purpose of producing "sets" of the desired size. But with the present demand for this Willow this seems a slow and cumbersome means of propagation; slow, that is, to produce a large quantity; no doubt for the individual tree it may be the quickest. This Willow is one of the most easily propagated of all trees, for every twig will grow. I would recommend the use of cuttings which can be made of any shoots as thick as a goose-quill and, say, 1 foot long. Cuttings of this character, planted in the Arboretum nursery at Kew last spring, are already (in August) 6 feet high. For thicker wood the cuttings may be proportionately longer. These can be put in the ground in autumn or early spring. As they grow it would be necessary to keep them each to a single leader and to prune back the side branches and remove the lower ones as the plants grow in height. In well-kept nursery ground fine healthy plants could be produced in two or three seasons, and they could be grown to planting-out size at the rate of 8,000 or more to the acre.

Whilst these Willows like abundant moisture, a position by the side of water is not necessary. The fine specimen here illustrated is, with several others, growing in a deep, rather heavy clay, with only an ordinary hedge-row ditch on one side. Mr. Shaw told me he preferred timber grown in such a position to that of trees growing close to the edge of ponds, &c.

Young trees should be watched to see that they are kept to a single leading shoot. This will obviate the forking of the trunk low down, which, of course, detracts from the value of the tree by reducing the amount of good timber. Trees, however, are more liable to fork when growing in isolated positions than they are when close together in plantations.

LI.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECAS XLIV.

1045 431. **Meconopsis (Eumeconopsis) Forrestii**, *Prain* [Papaveraceae-Eupapavereae]; e grege *Primulinarum*, foliis caulibusque setosis, floribus pedicellis ebracteis in cymas racemiformes dispositis, petalisque 4 ad *M. lancifoliam* accedit, sed *Primulinis* caeteris floribus pallide coeruleis stigmateque sessili statim differt.

Herba setis retrorso-patentibus pallide stramineis valde induta. *Rhizoma* fusiforme, 10 cm. longum, 1·5 cm. crassum. *Folia* radicalia pauca, lanceolata vel anguste subspathulata, obtusa vel subacuta, sensim versus basin caulem vaginantem attenuata, 12–16 cm. longa, 1·5–1·75 cm. lata, margine integra, supra pallide

viridia, subtus glaucescentia, utrinque sparse setosa. *Caulis* ad 25 cm. usque altus, simplex, nudus, setis retrorsis obsitus, quadrante, summo tantum floriferus ibique subito versus apicem attenuatus, ceterum cylindricus ·75 cm. crassus. *Flores* in cymas racemiformes 3–5-floras dispositi, flos terminalis erectus, caeteri pedicellis gracilibus subrigidulis ebracteis circa 1 cm. longis patentes vel subreflexi. *Sepala* oblongo-ovata, extra parum setosa. *Petala* 4, oblonga, pallide coerulea, glabra. *Stamina* indefinita, pluriseriata, filamentis coeruleis discretis glabris; antherae (ex sicco) aureae. *Ovarium* e carpellis 4 compositum, glabrum; stylus 0; stigma oblongum, 4-sulcatum; placentae intrusae; ovula plurima. *Capsula* adhuc ignota.

CHINA. Yunnan; open mountain pasture-land among rocks and on the margins of cane-brakes, on the eastern flank of the Likiang range, Lat. 27° 12′ N., alt. 10–11,000 ft.; in flower in June, *Forrest*.

A very distinct species of the group *Primulinae* in the section *Eumeconopsis*, but with flowers of a much paler blue than in any of the other species of that group. With *M. lancifolia* it agrees in having 4-petalled flowers and raceme-like cymes, the other three species of the group normally having simple scapes. From all the other species of the group *M. Forrestii* differs in having no style. But while this is the case the stigma is oblong and the stigmatic rays are decurrent; in the other species with sessile stigmas so far known (*M. integrifolia* and *M. punicea*; group *Grandes*; *M. Oliveriana*; group *Chelidonifoliae*) the stigma is depressed and the stigmatic rays are radiating.

7309 432. **Rosa Willmottiae**, *Hemsl.* [Rosaceae]; species ex affiinitate *R. Webbianae*, Wall., a qua aculeis aequalibus, calyce eglanduloso, sepalis quam petalis multo brevioribus et petalorum colore differt.

Frutex dense ramosus, 1·5–3 m. altus, praeter stipulas glanduloso-ciliatas fere glaber, ramis brunneo-rubris. *Aculei* in ramis floriferis geminati, recti, 8–10 mm. longi, pallidi, setis nullis. *Folia* conferta, 2–3 cm. longa; rhachis gracillima, minutissime setulosa; stipulae minutae, supra medium liberae, apice obtusae, margine eximie glanduloso-ciliatae. *Foliola* saepissime 9, brevissime petiolulata, oblonga, obovata vel interdum fere orbicularia, 4–8 mm. longa, praecipue supra medium subduplicato-denticulata. *Flores* roseo-lilacini vel roseo-purpurei, (alabastris saturate rubris) 3·5–4 cm. diametro, in ramulorum lateralium brevium apicibus solitarii, brevissime pedunculati. *Sepala* lanceolata, caudato-acuminata, circiter 1 cm. longa, integra, intus albo-tomentosa. *Petala* subintegra. *Filamenta* brevissima, antheris aureis. *Styli* hirsuti, liberi. *Achaenia* dorso villosa. *Fructus* maturus ignotus.

CHINA. Cultivated by Messrs. James Veitch & Sons from seeds collected by Mr. E. H. Wilson in the mountains of Sangpan, at elevations of 2,800 to 3,300 metres.

It is named in compliment to Miss Willmott, F.L.S., V.M.H., of Great Warley, whose interest and work on roses is well known. A drawing has been made of this novelty for the *Botanical Magazine*.

433. **Erodiophyllum acanthocephalum,** *Stapf* [Compositae-Asteroideae-Bellideae]; ab *E. Elderi*, F. Muell., foliis tenuius dissectis, involucri phyllis triangulari-ovatis, paleis longuiscule spinescentibus angustis, radiis brevioribus latioribus distinctum.

Herba e basi ramosa, circiter 12 cm. alta, undique pilis longis multicellularibus cateniformibus mollibus obsita. *Caules* pallidi, leviter sulcati. *Folia* infima oblanceolata, dentata, caetera (plurima) ambitu obovato-lanceolata, basi longe in petiolum anguste alatum attenuata, pinnatipartita, segmentis utrinque 3–4 haud contiguis anguste oblongis vel obovato-oblongis acute dentatis, cum petiolo 5–7 cm. longa, ad 2–5 cm. lata. *Pedunculi* pallidi, 4–6 cm. longi. *Capitula* subglobosa, cum ligulis ad 2 cm. lata. *Involucri* bracteae triangulari-ovatae, acutae, 8–9 mm. longae, 5 exteriores ad sinus in cornua deflexa apice spinuloso-dentata productae, pilosae. *Receptaculum* demum cylindrico-conicum, ad 1 cm. longum, 5 mm. latum, durum. *Paleae* flores fertiles subtendentes lanceolatae, in spinam longuisculam abeuntes, inferiores ad 8 mm. longae, demum recurvae, caeterae rectae, inferne pubescentes et ad margines ciliatae; interiores membranaceae, inter se magis minusve in cupulas ovaria efoeta cingentes et aequantes connatae. *Corollae* tubus glandulosus, florum radii 3 mm. longus, florum disci masculorum 5 mm. longus; radii ligulae oblongae, obtusae, circiter 12 mm. longae, 4 mm. latae, albae. *Achaenia* matura ad 2 mm. longa, pappi coronula dimidio breviore.

West Australia. Laverton, scarce, *F. A Rodway*.

This genus was hitherto very imperfectly known. It was described by F. von Mueller from very scanty material, collected by Young between Elizabeth River (west of Torrens Lake) and Youldah Water (30° 23′ S.L. 131° 47′ E.L.) in South Australia. As the genus was represented at Kew only by a single leaf, a branch of Mr. Rodway's plant was sent to Professor Ewart at Melbourne, to be compared with von Mueller's type. He confirmed the determination so far as the genus was concerned, but suggested that it was a distinct species. His notes and a few fragments he was good enough to send prove this to be the case. Mr. Rodway's specimen being so much more complete than F. von Mueller's original, an amended description of the genus is here added.

Erodiophyllum, F. Muell. (descr. emend.).

Capitula multiflora, heterogama, radiata, floribus radii discique exterioribus ♀ fertilibus, centralibus numerosis ♂ cum pistillo efoeto. *Involucri* bracteae herbaceae, basi connatae, 5–8. *Receptaculum* convexum, paleaceum, paleis flores fertiles subtendentibus rigidis spinescentibus, caeteris (interioribus) membranaceis et basi inter se magis minusve connatis. *Corollae* radii ligulatae, conspicuae, florum disci ♀ ad tubum brevissimum vel subnullum redactae, florum ♂ tubulosae, 5-dentatae. *Antherae* ecaudatae, apice appendiculatae, basi filamentis impositae. *Stylus* filiformis, profunde bifidus; crura lineari-filiformia, florum ♀ secundum margines et ad apice minute denseque papillosa, florum ♂ magis applanata papillis minus densis longioribus rigidulis. *Achaenia* matura obpyramidata, triangulata, laevia; pappus florum ♀ e squamis magis minusve in cupulam connatis demum crassis suberosis formatus.— Herbae perennes, hispidae. *Folia* alterna,

numerosa, pinnati-lobata, lobis dentatis vel infima indivisa, dentata. *Capitula* solitaria, pedunculata, matura multispinosa. *Ligulae* albae ; discus luteus.

4673 434. **Rhododendron Benthamianum,** *Hemsl.* [Ericaceae-Rhodoreae] ; species *R. yunnanensi* proxima, a qua foliis crebrius lepidotis non setulosis et florum colore differt.

Frutex usque ad 3 m. altus, sed plantae cultae tantum 30 cm. altae jam florentes, glaber, dense ramosus, ramis crassiusculis rufo-brunneis. *Folia* ad ramorum apices conferta, saepe terna, coriacea, persistentia, oblongo-lanceolata, cum petiolo circiter 1 cm. longo 3–6 cm. longa, apiculata, basi rotundata, supra reticulata et lepidibus atris obscuris parce instructa, subtus lepidibus orbicularibus elegantibus radiatim multistriatis aureis et brunneis intermixtis densissime vestita. *Flores* saepius terni, breviter pedicellati, purpureo-violacei, circiter 6 cm. diametro ; pedicelli circiter 1 cm. longi, ut calyx brevissimus lepidoti. *Calycis dentes* rotundati. *Corolla* extus praesertim dorso lepidota, intus basi puberula ; lobi rotundati, recurvi, postico intus maculis deltoideis atro-brunneis instructo. *Stamina* 10, inaequalia, longiora corollam vix excedentia ; filamenta infra medium dense villosa, ima basi et supra medium nuda. *Ovarium* densissime lepidotum, stylo glabro breviter exserto.

China. Szechuen ; in woods near Tatsienlu, 2400–3300 m., *Wilson*, 3940, 3942 ; *Pratt.*

Described from a living specimen communicated by Messrs. James Veitch & Sons, raised from seeds collected by Mr. Wilson.

Wilson, 197, in Herb. Kew from Western Hupeh is perhaps the same species though some of the leaves are as much as 8 cm. long and the flowers are larger.

1748 435. **Primula muscarioides,** *Hemsl.* [Primulaceae] ; ex affinitate *P. cernuae*, Franchet et *P. deflexae*, Duthie, a priore foliis distincte crenatis, a posteriore foliis majoribus crenatis calyce efarinoso et corollae lobis vix emarginatis differt.

Folia subcarnosa laete viridia, obovato-spathulata, 10–12 cm. longa, rotundata, deorsum attenuata sed haud vere petiolata, crenato-dentata, ciliolata, supra pilis mollibus obscuris parce vestita, subtus glabra vel cito glabrescentia, costa carnosa crassa, inter venas primarias leviter bullata. *Scapi* erecti, quam folia fere duplo longiores. *Bracteolae* lineares, calyce breviores. *Flores* numerosi, subcarnosi, densissime capitato-spicati, deflexi ; spicae 2·5–3·5 cm. longae. *Calyx* campanulatus ; lobi erecti, inaequales, ovato-oblongi, minute ciliato-glandulosi, posteriore latiore emarginato florum superiorum atro-purpureo. *Corolla* anguste infundibularis, vix 1 cm. longa, saturate purpureo-coerulea ; lobi quam tubus cylindricus dimidio breviores, subtruncati, suberecti, leviter emarginati, circiter 3 mm. lati. *Antherae* subsessiles, tubo infra medium affixae. *Stylus* tubum paullo excedens. *Capsula* ignota.

China. Without special locality. Described from a specimen received from the ‘ Bees,’ Ltd., Neston, Cheshire.

This species, *P. cernua*, Franchet, *P. deflexa*, Duthie and *P. pinnatifida*, Franchet, are very closely allied and perhaps not all deserving of specific rank, but at present we prefer to keep them separate.

Wilson's 4036 is very similar in aspect, but the leaves are very much more hairy and the calyx is farinose.

P. muscarioides has, so far as the Kew material goes, almost sessile anthers near the base of the corolla-tube, and the stigma projects slightly from the mouth of the tube. *P. cernua*, in the specimen examined, has the anthers attached near the top of the tube, and the style is only about 1 mm. long. In Wilson's 4036, which has been referred to *P. deflexa*, Duthie, the anthers are attached a little above the middle of the corolla-tube and are overtopped by the slightly exserted style. Thus we have trimorphism of the genitalia in this very distinct little group of *Primula*.

2047 436. **Incarvillea Younghusbandi** *Sprague* [Bignoniaceae-Tecomeae]; habitu *I. compactae*, Maxim. similis, capsula brevi lata arcuata ab ea recedit.

Herba subacaulis, foliis cataphyllaribus anguste triangularibus, superioribus lanceolatis. *Folia* sub anthesi 3–7, pinnati-partita, 1·5–6 cm. longa; petiolus ·5–2·5 cm. longus, plano-convexus, ut rhachis venaeque minutissime pubescens; lamina rugosa, venis supra impressis subtus valde prominentibus, margine minutissime ciliata, ceterum venis exceptis glabrata; segmenta lateralia utrinque 4–7, opposita vel subopposita, oblonga vel ovato-oblonga, obtusa, interdum subapiculata, irregulariter crenato-crispata, foliorum maximorum usque ad 13 mm. longa, 6 mm. lata, terminale suborbiculare, irregulariter crenatum, usque ad 2 cm. diametro. *Flores* 1–5-fasciculati; bracteolae lineari-subulatae; pedicelli 4–12 mm. longi. *Calyx* campanulatus, extra minutissime puberulus, inconspicue 5-nervis; tubus 5–8 mm. longus; lobi lanceolati, recurvato-acuminati, minute ciliolati, 2–4·5 mm. longi. *Corolla* purpurea, infundibuliformis, nigro-punctata (praesertim lobi), extra glabra, intus infra insertionem staminum glanduloso-pilosa; tubus 3·5–5·5 cm. longus; lobi elliptici, 10–15 mm. longi, 15–23 mm. lati. *Stamina* supra medium tubi inserta, antherarum lobis oblique ovatis, 2–2·5 mm. longis. *Discus* circa ·3 mm. altus. *Ovarium* 5–6 mm. longum, lepidotum; stigmatis lobi flabelliformes, ciliati; ovula pro loculo irregulariter 2-seriata, circa 14 pro serie. *Capsula* lignosa, arcuata, apicem versus angustata, 2·5–3 cm. longa, 8–9 mm. lata; valvae costis media et lateralibus conspicuis. *Semina* anguste lacerato-alata, 5–6 mm. longa, 3–4 mm. lata, utrinque papillis crassis dense induta.

TIBET. Khamba Jong, 4,500 m., July 5, 1903, *F. E. Younghusband*, 21; Sept., 1903, *F. E. Younghusband*, 316; *D. Prain*; Giri, 4,650 m., July, 1903, *F. E. Younghusband*. Between Phari and Gyangtse, 3,000–4,500 m., June, 1904, *H. J. Walton*; Gyangtse, 3,960 m., July–September, 1904, *H. J. Walton*, 103. Between Phari and Shigatze, *King's Collection* (1882). Near Tuna, 4,500 m., collected by an officer of the Transport Department, Indian Army, name unknown.

2048 437. **Incarvillea longiracemosa**, *Sprague* [Bignoniaceae-Tecomeae]; ab affini *I. Principis*, Bur. et Franch., foliolorum forma, ramis inflorescentiae aphyllis, floribus majoribus recedit.

Herba caulescens, 38–41 cm alta, minute puberula. *Folia* sub anthesi 2–5, alterna, pinnata, 12–21 cm. longa; foliola 7–8, sessilia, ovata vel ovato-oblonga, obtusa, interdum minute apiculata, basi rotundata vel truncata, margine ± crenato-serrata, lateralia 2–4 cm. longa, 1–2·5 cm. lata, terminale 6–6·5 cm. longum, 2·5–3·5 cm. latum, interdum cum supremo vel 2 superioribus lateralium conjunctum, venis lateralibus utrinque 4–6. *Inflorescentia* racemosa, terminalis et axillaris; rachis usque ad 16-flora; rami axillares 1–4–flori, aphylli; pedicelli 3–8 mm. longi, infra medium 2–bracteolati, bracteolis lineari-lanceolatis vel lanceolatis. *Calyx* tubuloso-campanulatus, 5-nervis, minute puberulus; tubus 1·5–1·7 cm. longus; lobi ascendentes ovato-deltoidei, acute acuminati, 5–6 mm. longi, apice recurvi. *Corolla* anguste campanulato-infundibuliformis, extra glabra, intus (praesertim lobis) pilis minutis capitatis densiuscule induta; tubus 4–4·5 cm. longus; pars basalis cylindrica, 8–9 mm. longa; lobi suborbiculares, circa 1 cm. longi. *Stamina* 14–15 mm. supra basin corollae inserta, antherarum lobis ellipticis, 4–5 mm. longis, connectivo supra lobos 1 mm. producto. *Discus* annularis, ab ovario remotus, vix ultra 1 mm. altus. *Ovarium* circa 1 cm. longum, ovulis medio placentarum imbricatim 4-seriatis, apice 1-seriatis, basi 2-seriatis.

TIBET. Between Phari and Shigatze, *King's Collector* (1882); Yam Dok Cho, 4,500 m., Aug., 1904,. *H. J. Walton.*

3592 438. **Iris Wilsoni**, *C. H. Wright* [Iridaceae-Moraeeae]; *I. sibiricae*, Linn., affinis, floribus luteis differt.

Rhizoma breviter repens 8 cm. diam. *Folia* linearia, acuminata, 60 cm. longa, 8 mm. lata, flaccida, minute scabridula. *Scapus* 20 cm. altus, cylindricus; spathae herbaceae, late lanceolatae, acuminatae, 9 cm. longae; pedicelli 7–10 cm. longi, cylindrici, virides. *Perianthii* tubus viridis, trigonus, 8 mm. longus; segmenta exteriora oblanceolata, 5 cm. longa, 1·6 cm. lata, dilute lutea, nervis purpureis dimidio inferiore notata, callis duobus parvis erectis oblique triangularibus prope basin instructa; segmenta interiora erecta, oblanceolata, 4 cm. longa, 8 mm. lata, lutea. *Filamenta* complanata, dilute lutea; antherae albae. *Ovarium* triquetrum, 12 mm. longum, 7 mm. latum; styli rami lutei; cristae bifidae obtusae, eroso-denticulatae.

WESTERN CHINA. *E. H. Wilson.*

3688 Var. **major** *C. H. Wright. Pedicelli* vix 4 cm. longi. *Perianthii* tubus 12 mm. longus; segmenta exteriora oblanceolato-spathulata, lutea, 6·5 cm. longa, limbo 2·5 cm. lato; segmenta interiora 4 cm. longa, 2·5 mm. lata. *Filamenta* lutea, purpureo-striata. *Ovarium* triquetrum, 18 mm. longum, 7 mm. latum; styli rami 1·6 cm. lati, lutei, ad costam et prope apicem dilute castanei; cristae ut in typo.

WESTERN CHINA. *E. H. Wilson.*

3490 439. **Herbertia Amatorum**, *C. H. Wright* [Iridaceae-Moraeeae]; *H. amoenae*, Griseb., affinis, styli ramis acutis differt.

Cormus globosus, tunicis brunneis. *Folia* lanceolata, plicata, acuminata, basi attenuata, 20 cm. longa, 8 mm. lata. *Scapus* 45 cm. altus, vix 2 mm. diam., cylindricus, glaber; rami 14 cm.

longi, tenues. *Spathae* herbaceae, exterior 2·5 cm. longa, interior fere duplo longior. *Perianthium* 5 cm. diam.; segmenta exteriora interioribus triplo longiora, obovato-cuneata, obtusa, 3 cm. lata, violacea, intus ad mediam albo-costata, unguis maculo cordato albo coeruleo-marginato instructa; interiora e basi oblonga lanceolata, acuta, violacea, basi brunneo-maculata. *Antherae* obscure virides. *Stylus* carneus, ramis acutis.

URUGUAY. Monte Video, *Cantera*.

Described from a plant which flowered at Kew in May, 1907, having been raised from seeds collected and sent by Dr. Cantera in 1903. The three heart-shaped areas edged with blue at the base of the outer perianth-segments are very characteristic.

440. **Agave** (**Littaea**) **Watsoni**, *J. R. Drummond et C. H. Wright* [Amaryllidaceae-Agaveae]; ab *A. horrida*, Lemaire, et ei affinibus propter foliorum vittam marginalem attenuatam infrâ prope obsoletam primo visu distinguitur; ab *A densiflora*, Hook., foliorum aculeis marginalibus remotis facile dignoscenda est; differt vero ab *A. expatriata*, J. N. Rose in Rep. Miss. Bot. Gard. xi. (1900), 82, cui omnino vicina, scapo breviore spicâ minus elongatâ, latiore, foliis rigidis, versus basin facie superiore convexâ, aculeis marginalibus parum uncinatis.

Folia 15–20, rigida, exteriora patentia, paullum recurvata, anguste oblongo-lanceolata, circâ 50 cm. longa, e basi ad 9·5 cm. dilatatâ, 8 mm. densâ, in collum 5·5 cm. latum mox constricta, inde ad circâ 22 cm. suprâ basin, quo 7·5 cm. latitudinis attingunt, gradatim expansa, facie superiore versus basin convexâ; sursum explanatâ, denique leviter concavatâ; interiora autem erecta, angusta, in bracteas sensim abcedentia. *Foliorum margines* vitta tenuissimâ castaneâ, in senectis cinerascente, ornati, aculeis e basi compressâ deltoideâ argute acuminatis, rectis vel parum uncinatis, circiter 5 mm. longis, inter se circâ 2 cm. distantibus, minuti, at sub folii apicem nonnihil involuti, cornei, in spinam terminalem, e cervice arctâ subito exortam, argutissime canaliculatam circâ 1·8 cm. longam, confluentes. *Scapus* ad basin 3·5 cm., sub spicam inflorescentem 2 cm. diametro, altitudine vix 3-orgyalis, cylindricus, bracteis, praeter infimas, patentibus, subtiliter sulcatis, albidis, instructus; *bracteae* inter alabastra inconspicuae, vix 1 cm. longae, infrâ pedetentim ampliatae, e basi deltoideâ herbaceâ, circa 4 mm. latâ, arcte constrictae, et in setam firmam, subulatam, scariosam mox conduplicatae, circum imam basin, tamen, pedunculi multo majores, ad 30 cm. longae, subfoliaceae, marcescentes, erectae. *Flores* in fasciculis bini, rarius terni, et tunc uno flore, saltem, saepius duobus abortivis, in pedicellos valde abbreviatos, incrassatos, doliiformes, binis bracteolis minutis, infrâ dilatatis herbaceis, sursum scariosis argute acuminatis, amplexos, insidentes, spicam fusiformem, diametro circâ 9·5 cm. staminibus prominentibus quasi crinitam formantes. *Germen* longitudine 13–14 mm., latitudine 5 mm. attingens, laeve vel (oculo armato) obscure puberulum, viridescens, subtriquetrum; *tubus* diametro circâ 4 mm. subito constrictus, manifeste 6-sulcatus; *lobi* perianthii (flore maturo) carnosiusculi, dorso subherbaceo, oris minus incrassatis albido-pellucidis, apice cucullato penicillato, germen longitudine subaequantes. *Antherae* 1 cm. longae, cum filamentis,

demum 28 mm. longis, summâ parte subulatis, infrâ dilatato-complanatis post excussum pollinem flaccescentibus, plus minusve purpureo-notatae. *Stylus* subcylindricus robustus, longitudine 3·5 cm., diametro 5·2 mm., albido-pellucidus, sursum et ad oras papillosi stigmatis purpureo suffusus.

This fine *Littaea* was acquired during 1906 from the collection of Mr. Justus Corderoy at Didcot, and has 'poled' this spring in the Succulent House at Kew; the native country is not known with certainty, but it is believed to have been obtained originally from Central America. From Mr. Baker's group of 'Marginatae' it is at once distinguished by the extremely narrow border of the leaf, and from all the 'Sub-marginatae' except *A. pumila*, which is otherwise a very different type, by the structure of the inflorescence, which rather approaches that of *A. densiflora*, Hook. in *Bot. Mag.* t. 5006. From *A. densiflora* however it is very certainly marked off by the margin-prickles, which in that are far closer together.

The nearest known form seems, by the description, to be the *Littaea* described as *A. expatriata* by J. N. Rose in the Eleventh Report of the Botanic Garden at St. Louis, but in Rose's plant the flower spike, from the illustration (processed from a photograph), is much longer and narrower, and the stamens are less conspicuous; the margin-prickles also in *A. expatriata* appear to be larger and more hooked than in the present species, and the surface of the leaf is more concave. In the Kew plant the leaves approach those of *A. decipiens*, Baker (a *Euagave*), in a tendency to be convex above the base on the upper side, also in the colour, and this seems to be the case with *A. densiflora* also.

LII.—THE GENUS PERGULARIA.

N. E. Brown.

1767

The genus *Pergularia* as established by Linnaeus (*Mantissa* i, p. 8), has hitherto been misunderstood. The writer, when elaborating the tropical African Asclepiads did not examine the characters of the genus as given by Linnaeus. Now that this has been done it transpires that, as *Pergularia*, Linnaeus has very accurately and unmistakably described the generic structure of the plants on which Robert Brown afterwards founded the genus *Doemia* (usually but incorrectly written *Daemia*). The chief points in Linnaeus's description of the genus *Pergularia* are as follows:—"Corolla monopetala, hypocrateriformis. Tubus cylindricus, calyce longior. Limbus quinquepartitus, planus: Laciniis oblongis. Nectaria quinque, semisagittata, erecta, compressa, attenuata in mucronem, incurva, basi exteriore dente nutante. Filamenta vix ulla. Antherae quinque, corpusculo truncato stigmatis immersae." The above characters correctly apply to those plants now placed in the genus *Doemia*, but do not at all accord with those at present considered to belong to the genus

Pergularia, nor to any other plants at present known in the whole of the *Asclepiadaceae*, since the structure of *Doemia* is peculiar and not to be mistaken for that of any other genus. Under *Pergularia*, Linnaeus (*Mantissa* i., p. 53) has described only two species, viz., *P. glabra* and *P. tomentosa*. On referring to the Linnean Herbarium it is found that the two species are represented as follows :—*P. glabra* consists of a very good flowering specimen of *Vallaris pergulanus*, Burm. fil., which is a native of Java and the Malay Peninsula, and belongs to the order *Apocynaceae*, having a floral structure totally different from Linnaeus's generic characters, so that this plant is certainly not the one on which he established the genus *Pergularia*.

P. tomentosa consists of a piece of stem with two pairs of leaves, without flowers or buds. This specimen has a label on which is written in somewhat large handwriting "No. 19," and the word "Chin" (intended for China) in the small writing of Linnaeus, and on the back of the sheet Linnaeus has written as follows :—"Macao China Theologi catholici ex hujus succo lacteo p̄parant medicinum pro dysenterica." But Linnaeus states under *P. tomentosa*, first, that it is a native of Arabia, collected by Forsköhl, secondly, by the letters "H. U." at the end of the description, that it was cultivated in the Botanic Garden at Upsala. From this, therefore, as well as from the fact that there are no flowers from which he could have constructed his generic characters, it is quite clear that the Chinese specimen (which may possibly have been collected by Osbeck) is not the type of the description of *P. tomentosa*. Therefore, so far as generic identification is concerned, there is no specimen, named *Pegularia* by Linnaeus himself, in his Herbarium, to represent this genus as he has defined it. The error of generic identification was commenced by Sir James Edward Smith, who, in his *Icones Pictae*, under t. 16, has identified the Chinese specimen named *Pergularia tomentosa* in the Linnean Herbarium with that which he figures on t. 16 (also from China) as *P. odoratissima ;* in this identification he is doubtless correct, but as stated above, it is a totally different plant from that on which Linnaeus's description of *P. tomentosa* is based, and Smith was quite wrong in referring *P. tomentosa*, Linn., as a synonym, to *P. odoratissima*, Sm. Afterwards, Robert Brown (in *Mem. Wern. Soc.* i., p. 50) added to the confusion by repeating the error made by Smith, and by establishing the genus *Doemia* (with characters by which alone, without reference to the specimens quoted, the genus could not possibly be recognised) upon the very plants Linnaeus must have seen or had before him when he described the genus *Pergularia*, since there are none in any other genus that will accord with his very careful and clear description. This is a case where the description by Linnaeus is based upon one plant, whilst the specimen in his Herbarium, supposed to represent the description, is a totally different plant. Such cases, unfortunately, are of not infrequent occurrence, and this is emphasised, with regard to *Pergularia tomentosa*, by the fact that the specimen in the Linnean Herbarium named by Linnaeus "*Cynanchum monspeliacum*" is not that well-known European plant, but is a good flowering specimen of *Doemia extensa*, R. Br. Indeed, I suspect that this

may be the very specimen on which Linnaeus based his description of the genus *Pergularia*, mentioned under *P. tomentosa* as cultivated at Upsala, and that it has been wrongly named by Linnaeus. With regard to Linnaeus's description of *P. tomentosa*, in the diagnosis of the plant, he states that the leaves are tomentose, whilst in the description under the diagnosis they are stated to be glabrous. This would seem to imply that he saw a specimen collected by Forsköhl which has tomentose leaves and was referable to *Doemia cordata*, R. Br., whilst the cultivated plant with glabrous leaves, from which the body of this description was doubtless made, perhaps raised from seed sent by Forsköhl, was evidently *D. extensa*, R. Br. Both of these species grow in Arabia; they differ chiefly by their leaves and indumentum, their flowers being very much alike.

The above being the facts as regards *Pergularia*, I propose to re-establish the genus in the sense that Linnaeus intended. But as it seems clear that Linnaeus combined two species under the name *P. tomentosa*, I propose to retain that name for the tomentose-leaved plant only.

For the plants which have hitherto been known by the generic name *Pergularia*, the name *Prageluria* may be substituted; this being an anagram of the former name will make the smallest change possible.

LIII.—MISCELLANEOUS NOTES.

M. T. Masters.—The late Dr. Maxwell Tylden Masters, whose death, on May 30th, was quite unexpected, although he had been ill for about a month, was from early life a correspondent of Kew, a worker at Kew, and a contributor from time to time of seeds, dried specimens and museum objects. He was the son of William Masters, a nurseryman, of Canterbury, and was born on April 15th, 1833. His father was a remarkable man in many ways, and one of the few, in those days, of his calling who possessed scientific attainments associated with practical knowledge. Apart from his business, he was very active, politically, socially and industrially. He was an alderman of the City of Canterbury, and served as Mayor, and was the Founder and Honorary Curator for many years of the Museum. He was also much interested in Kew Gardens, and corresponded with the late Sir William Hooker from 1846 to 1862, chiefly in relation to offers of donations from his exceedingly rich collection of living plants, which he cultivated as much for pleasure as profit. Under the title of *Hortus Duroverni* he published an excellent catalogue of plants and seeds which he offered for sale. We have only seen the third edition of this now very rare, little known and highly interesting horticultural publication, compiled on the model of Loudon's *Hortus Britannicus*. It appeared in 1831, and a copy of it was presented to Kew by the late Dr. Masters in 1898. We find no record of the other editions.

Dr. Masters was educated at King's College, and qualified for the medical profession, which he practised for some years. His first

post after leaving college was that of Sub-Curator of the Fielding Herbarium at Oxford, to which he refers in an undated letter, written from King's College, to Sir William Hooker, whose herbarium he was to examine in order to get some insight into its arrangement before going to Oxford. In another undated letter, written from the Oxford Botanic Gardens, he informs Sir W. Hooker that he had been induced to offer himself as a candidate for the Chair of Botany at King's College, vacant by the resignation of his former teacher, Professor Edward Forbes, and asks for a testimonial; adding that he had already delivered one course of lectures on botany at the London Institution, and was then engaged in delivering a similar course at the Royal Institution. Although there are no dates to these letters, we know that they were written when he was quite a young man, for in 1855 he was chosen Lecturer on Botany at St. George's Hospital, a post which he held until 1868. He was also for some years Examiner in Botany in the University of London, for the Society of Apothecaries, and for the Civil Service. On the death of Dr. J. Lindley in 1865, Masters was appointed his successor as editor of the *Gardeners' Chronicle*, in conjunction for many years with the late Thomas Moore; the duties of this post he performed up to within just a month of his death. Apart from his editorial work, Masters was a prolific writer, as may be learnt from the appended bibliography, and most of his descriptive botany was done at Kew. As early as 1865 his name appears two or three days a week in the visitors' book, when he was occupied on his first contributions to the *Flora of Tropical Africa* and the *Flora of British India*. To a certain extent he was a specialist; the Malvales, Passiflorales, Aristolochiaceae, Nepenthaceae, Restiaceae, and Coniferae being his favourite groups.

Masters became a Fellow of the Linnean Society in 1860, and in 1870 he was elected into the Royal Society. He was an M.D. and a M.R.C.S., and he was also an Honorary or Corresponding member of numerous societies, both English and Foreign. Foremost among his foreign distinctions was that of Corresponding Member of the Institute of France, to which he was elected in 1888. In the same year he was decorated with the insignia of Chevalier of the Belgian Order of Leopold.

He was an indefatigable worker; a strong supporter of Kew, the Royal Horticultural Society and the Gardeners' Societies and Institutions. How much he was esteemed and admired may be gathered from the numerous highly sympathetic and eulogistic sketches of his life and work which have appeared in the horticultural and botanical press of the world; and many of us have lost a good kind friend.

Mrs. Masters has presented most of her husband's Botanical Collections to Kew, with permission to select what is required and to send the remainder to Oxford. There has not yet been time to examine them, but the Coniferae evidently form the greater and the most valuable part. We are informed that his Herbarium of British Plants, in accordance with the deceased's wish, has been presented to his native city Canterbury.

Bibliography.

The following enumeration does not include contributions to the *Gardeners' Chronicle* and it is probably otherwise incomplete, as Masters was a contributor to many publications, sometimes anonymously. For example, he edited and contributed to the *Report of the International Horticultural Exhibition and Botanical Congress*, held in London in 1866, though his name does not appear on the title page; and he was also a contributor to the *Encyclopaedia Britannica.*

On the Arrangement of the Air-cells in Aquatic Plants The Ashmolean Society's Proceedings, 1853, vol. iii. pp. 16–19. Report of the British Association, 1854, part 2, p. 102.

Notes on some Kentish Plants. The Phytologist, vol. i. p. 189. 1855.

Note on a Monstrosity of the Flowers of Saponaria officinalis. Journal of the Linnean Society, vol. i. pp. 159–162. 1857.

On the Flowering Plants and Ferns of Oxfordshire and the contiguous counties. The Ashmolean Society's Transactions, vol. iii. (Reprint, pp. 15). 1857.

Contributions to Vegetable Teratology. The Phytologist, vol. ii. p. 449, 1857–58.

On the Relation between the Abnormal and Normal Formations in Plants. Proceedings of the Royal Institution, vol. iii. pp. 223–227; Pharmaceutical Journal, vol. ii. pp. 34–37. 1858–62.

Remarks on Vegetable Morphology and the Theory of the Metamorphosis of Plants. Report of the British Association, 1859, part 2, pp. 136–138. 1859.

On a new species of Bellevalia (B. muscarioides) from Mount Ida. Journal of the Linnean Society, vol. iii. pp. 113–114. 1859.

Notes on Muscari latifolium, Kirk. Transactions of the Botanical Society of Edinburgh, vol. vi. pp. 114–116. 1860.

On the Relation between Pinnate and Palmate Leaves. Report of the British Association, 1861, part 2, pp. 148–149. 1861.

Vegetable Morphology: Its History and Present Condition. British and Foreign Medico-Chirurgical Review, vol. xxix. pp. 202–218. 1862.

Note on an Unusual Mode of Germination in the Mango (Mangifera indica). Journal of the Linnean Society, vol. vi. pp. 24–26, ff. 1–3. 1862.

On Prolification in Flowers, and especially on that form termed Median Prolification. Transactions of the Linnean Society, vol. xxiii. pp. 359–370, t. 34. 1862.

On Prolification in Flowers, and especially on that kind termed Axillary Prolification. Transactions of the Linnean Society, vol. xxiii. pp. 481–493, t. 54. 1862.

A Description of some remarkable Malformations affecting the genus Lolium. Journal of the Linnean Society, vol. vii. pp. 121–122, ff. 1–2a. 1863.

On the Existence of two forms of Peloria. Natural History Review, 1863, pp. 258–262. 1863.

Remarks on the Theory of the Metamorphosis of Plants. Transactions of the Botanical Society of Edinburgh, vol. vii. pp. 54–55. 1863.

On Certain Forms of the Common Rye-grass (Lolium perenne, Linn.). Journal of Botany, vol. i. pp. 6–9. 1863.

On the Morphology and Anatomy of Philydrum lanuginosum, Br. Journal of Botany, vol. i. pp. 105–106. 1863.

On the Anatomy of the Leafstalk in Thalia dealbata. Journal of Botany, vol. i. p. 107. 1863.

Double Orchids. Journal of Botany, vol. ii. pp. 344–346. 1864.

Remarks on some Malformed Flowers observed by Mr. W. G. Smith. Journal of Botany, vol. iii. pp. 109–110, t. 28, ff. 9–12. 1865.

Observations on the Morphology and Anatomy of the genus Restio, Linn., together with an Enumeration of the South African Species. Journal of the Linnean Society, vol. viii. pp. 211–254, tt. 14 & 15. 1865.

On a Peloria and Semidouble Flower of Ophrys aranifera, Huds. Journal of the Linnean Society, vol. viii. pp. 207–211. 1865.

On the Corona of Narcissus. Journal of Botany, vol. iii. pp. 105–109; vol. iv. pp. 265–267, t. 28, ff. 1–8. 1865–66.

Lindley, J., & T. Moore. The Treasury of Botany, edited by J. L. and T. M. London, 1866. 2 vols. 800. (Other editions or issues in 1870, 1874, 1876, 1884, and 1889.) Numerous articles by M. T. Masters, signed M. T. M. 1866.

On some Double Flowers of Primula sinensis. Journal of the Royal Horticultural Society, new series, vol i. pp. 202–204. 1866.

Notes on Double Flowers. Proceedings of the Botanical Congress, London, 1866, pp. 127–142. 1866.

Dombeya angulata, Cav. Journal of Botany, vol. v. pp. 78–81. 1867.

Note on Double Flowers of Ranunculus Ficaria, etc. Journal of Botany, vol. v. pp. 158–159. 1867.

On Polliniferous Ovules in a Rose (Rosa arvensis). Journal of Botany, vol. v. pp. 318–322, t. 72 B. 1867.

Note on the Presence of Stamens within the Ovarium of Baeckea diosmaefolia, Rudge. Journal of the Linnean Society, vol. ix. pp. 334–335, t. 7. 1867.

On a Double-flowered Variety of Orchis mascula. Journal of the Linnean Society, vol. ix. pp. 349–355, tt. 10 & 11. 1867.

Harvey, W. H., The Genera of South African Plants. Ed. 2, by J. D. Hooker. Cape Town and London, 1868. 8vo. pp. 411–416. Restiaceae. 1868.

On the early Spring-flowering species of Scilla. Journal of Botany, vol. vi. pp. 335–339. 1868.

Sensitive Plants. Popular Science Review, vol. vii. pp. 22–33. 1868.

Oliver, D. Flora of Tropical Africa (continued by Sir W. T. Thiselton-Dyer).

vol. i. pp. 175–214. Malvaceae (1868).
„ i. pp. 214–239. Sterculiaceae (1868).
„ i. pp. 240–268. Tiliaceae (1868).
„ ii. pp. 492–500. Samydaceae (1871).
„ ii. pp. 500–501. Loasaceae (1871).
„ ii. pp. 501–503. Turneraceae (1871).
„ ii. pp. 503–520. Passifloraceae (1871).

Monographie du Codiaeum variegatum et de ses variétés horticoles. Belgique Horticole, xix. pp. 65–76. 1869.

On the relative value of the Characters employed in the Classification of Plants. Report of the British Association, 1869, part 2, pp. 114–115; Journal of Botany, vol. vii. pp. 292–293. 1869.

Vegetable Teratology. An Account of the Principal Deviations from the Usual Construction of Plants. London, 1869. 8vo. pp. xxxviii. + 534.

(German Edition by U. Dammer. Leipzig, 1886. 8vo. pp. xvi. + 610. t. 1).

On the genus Fremontia. Journal of Botany, vol. vii. pp. 297–298. 1869.

On some points in the Morphology of the Malvales, together with a description of a new genus of Buettnerieae, Scaphopetalum. Journal of the Linnean Society, vol. x. pp. 18–30, tt. 2 & 3. 1869.

Synopsis of the South African Restiaceae. Journal of the Linnean Society, vol. x. pp. 209–279, tt. 7 & 8. 1869.

On the Structure of the Flower in the genus Napoleona, etc. Journal of the Linnean Society, vol. x. pp. 492–504. 1869.

The Peculiar Cut-growths of Bridgesia spicata. Monthly Microscopical Journal, vol. iii. p. 203. 1870.

Contributions to the Natural History of the Passifloraceae. Transactions of the Linnean Society, vol. xxvii. pp. 593-646, tt. 64 & 65. 1871.

Grafting: its Consequences and Effects. Popular Science Review, vol. x. pp. 141–154. 1871.

The Passifloraceae. Flora Braxiliensis, vol. xiii. pars 1, pp. 529-628, tt. 106–128. 1872.

Bud-variation. Popular Science Review, vol. xi. pp. 244–256. 1872.

Reports of Experiments made in the Gardens of the Royal Horticultural Society in 1869 and 1870 on the Influence of various

Manures on different Species of Plants. Journal of the Royal Horticultural Society, new series, vol. iii. pp. 19–79, 124–158. 1872.

Botany for beginners. London, [1872]. 8vo. pp. xiii. + 185. (Russian Translation. St. Petersburg, 1873.) 1872.

Note on the genus Byrsanthus, Guill., and its Floral Conformation. Journal of the Linnean Society, vol. xiii. pp. 15–20. 1873.

On the Development of the Andraecium in Cochliostema, Lem. Journal of the Linnean Society, vol. xiii. pp. 204–209, t. 4. 1873.

The Battle of Life among Plants. Popular Science Review, vol. xii. pp. 35–45. 1873.

Sexuality in Plants. Popular Science Review, vol. xiii. pp. 363–374. 1873.

Hooker, J. D., Flora of British India.

vol. i. pp. 317–353. Malvaceae (1874).
„ i. pp. 353–379. Sterculiaceae (1874).
„ i. pp. 379–409. Tiliaceae (1874).
„ i. pp. 572–598. Olacaceae (1875).
„ ii. pp. 598–603. Passifloraceae (1879).

Monographic Sketch of the Durioneae. Journal of the Linnean Society, xiv. pp. 495–507, tt. 14–16. 1875.

Remarks on the Structure, Affinities, and Distribution of the genus Aristolochia, with descriptions of some hitherto unpublished species : [A. Pearcei, A. pannosa, A. imbricata, A. unguli-folia]. Journal of the Linnean Society, vol. xiv. pp. 487–495. 1875.

Note on the Bracts of Crucifers. Journal of the Linnean Society, xiv. pp. 391–399, ff. A & B. 1875.

On the Restiaceae of Thunberg's Herbarium. Journal of the Linnean Society, vol. xiv. pp. 413-421. 1875.

On Monstrous Flowers of Daucus Carota and Scrophularia aquatica. Journal of Botany, vol. xiii. 1875, pp. 79–80. 1875.

The Bitter Cola (Garciniae, sp.). Journal of Botany, vol. iv. 1875, pp. 65–67, t. 160. 1875.

On Deidamia Thompsoniana, DC. Journal of Botany, vol. iv. 1875, pp. 161–163, t. 163. 1875.

The Aristolochiaceae. Flora Brasiliensis, vol. iv. pars. 2, pp. 77–114, tt. 17–26. 1875.

On the Hungarian Oak (Quercus conferta of Kitaibel) as cultivated in the Royal Botanic Garden, Edinburgh. Transactions of the Botanical Society of Edinburgh, vol. xii. pp. 436–441. 1876.

On Certain Small-fruited Pears. Journal of Botany, vol. v. 1876, pp. 225–229, 297–298, t. 180. 1876.

Remarks on the Superposed Arrangement of the parts of the Flower. Journal of the Linnean Society, vol. xv. pp. 456–478. 1877.

Classified Synonymic List of all the Species of Passifloraceae Cultivated in European Gardens, with references to the Works in which they are figured. Journal of the Royal Horticultural Society, vol. iv. pp. 125–148, tt. 6–8. 1877.

The Restiaceae. De Candolle, Monographiae Phanerogamarum, vol. i. pp. 218–398, tt. 1–5. 1878.

Note on the Dimorphism of Restiaceae. Journal of Botany, vol. vii. pp. 36–37, t. 194 II. 1878.

Side-lights on the Structure of Composites. Journal of Botany, vol. vii. 1878, pp. 33–36; t. 194 I. vol. viii. 1879, pp. 6–7, t. 200 B; vol. xi. 1882, pp. 39–41. 1878–82.

On the Nomenclature of Garden Plants. Journal of the Royal Horticultural Society, new series, vol. v. pp. 126–135. 1879.

Notes on Root-hairs and Root Growth. Journal of the Royal Horticultural Society, new series, vol. v. pp. 173–186. 1879.

On some points in the Morphology of the Primulaceae. Transactions of the Linnean Society, series 2, vol. i. pp. 285–300, tt. 39–41. 1880.

Note on the occurrence of a Restiaceous Plant [Leptocarpus disjunctus, n. sp.] in Cochin China. Journal of the Linnean Society, vol. xvii. pp. 343–345. 1880.

Notes on the Relations between the Morphology and Physiology in the leaves of Certain Species of Conifers. Journal of the Linnean Society, vol. xvii. pp. 547–552. 1880.

The Conifers of Japan. Journal of the Linnean Society, vol. xviii. pp. 473–524, tt. 19 & 20. 1881.

Dimorphic Leaves of Conifers. Nature, vol. xxiii. p. 267. 1881.

Moore, T. Epitome of Gardening, with an introduction by M. T. Masters. Edinburgh, 1881. 8vo. pp. xii. + 444. 1881.

Note on the Foliation and Ramification of Buddleia auriculata. Journal of the Linnean Society, vol. xix. pp. 201–204. 1882.

On a new species of Gossypium from East Tropical Africa [G. Kirkii]. Journal of the Linnean Society, vol. xix. pp. 212–214. 1882.

Fruit of Opuntia. Nature, vol. xxvii. p. 126. 1882.

Results of Experiments on the Mixed Herbage of Permanent Meadows, Conducted for more than Twenty Years in succession on the Same Land. Part 2, Botanical Results (in conjunction with Sir John Lawes, and Sir Henry Gilbert). Philosophical Transactions of the Royal Society, vol. clxxiii. pp. 1181–1433. 1883.

Life on the Farm.—Plant Life. (Handb. Farm Series, ed. J. C. Morton.) London, 1883. 8vo. pp. viii. + 142. 1883.

New Passifloraceae. Journal of Botany, vol xxi. 1883, pp. 33–36. 1883.

Double Flowers. Nature, vol. xxvii. p. 126. 1883.

On the Passifloraceae collected by M. Édouard André in Ecuador and New Grenada. Journal of the Linnean Society, vol. xx. pp. 25–44, tt. 19 & 20. 1884.

Henfrey, A. An elementary course of Botany. Ed. 4, by M. T. Masters, assisted by A. W. Bennett. London, 1884. 8vo. pp. xii. + 724. 1884.

On the Comparative Morphology of Sciadopitys. Journal of Botany, vol. xxii. 1884, pp. 97–105, ff. 1–5. 1884.

Flowers out of Season. Nature, vol. xxxi. pp. 13–15. 1884.

Pinetum Britannicum. A descriptive account of hardy Coniferous Trees cultivated in Great Britain (edited by A. Murray and E. Ravenscroft). Edinburgh and London, [1863]–84. 3 vols. fol. The botanical descriptions in parts 30 to 51 were contributed by M. T. Masters. 1884.

Notes on certain Passifloraceae from Western Tropical America. Journal of Botany, xxiii. 1885, pp. 113–116. 1885.

On Petalody of the Ovules and other changes in a double-flowered form of "Dianella caerulea." Nature, vol. xxxi. pp. 487–488. 1885.

Supplementary Notes on Restiaceae. Journal of the Linnean Society, vol. xxi. pp. 574–594. 1885.

Autumnal Flowering. Nature, vol. xxxv. pp. 11–12. 1886.

On the Root-Structure and Mode of Growth of Primulaceae in Relation to Cultivation. Journal of the Royal Horticultural Society, new series, vol. vii. pp. 236–254, ff. 8–26. 1886.

Contributions to the History of Certain Conifers. Journal of the Linnean Society, vol. xxii. pp. 169–212, tt. 2–10. 1886.

Plantae Lehmannianae in Guatemala, Costarica et Columbia collectae. Passifloraceae et Aristolochiaceae. Engler's Botanische Jahrbücher, vol. viii. pp. 216–221. 1887.

On the Floral Conformation of the genus Cypripedium. Journal of the Linnean Society, vol. xxii. pp. 402–422, ff. 1–10, t. 20. 1887.

Pinus monophylla. Annals of Botany, vol. ii. pp. 124–126. 1888.

A Heterodox Onion. Journal of Botany, vol. xxvi. 1888, p. 219. 1888.

Les Skimmia. Revue de l'Horticulteur Belge, vol. xv. pp. 123–124. 1889.

Double-flowered Ceanothus. Annals of Botany, vol. iv. pp. 164–165. 1889.

Abies lasiocarpa Hook. and its allies. Journal of Botany, vol. xxvii. 1889, pp. 129–138. 1889.

An Erratic Ivy. Journal of Botany, vol. xxvii. 1889, pp. 172–176, ff. 1 & 2. 1889.

National Rose Conference. Rose Construction—Normal and Abnormal. Journal of the Royal Horticultural Society, new series, vol. xi. p. 228. 1889.

Review of some Points in the Comparative Morphology, Anatomy, and Life-History of the Coniferae. Journal of the Linnean Society, vol. xxvii. pp. 226–332, ff. 1–29. 1890.

Remarks on the Morphology of Rosa berberifolia, Pallas. Bulletin de la Société Royale de Botanique de Belgique, xxviii pp. 135–142. 1890.

Sports. Garden and Forest, vol. iii. pp. 162–164; Nature, vol, xlii. pp. 154–157. 1890.

Trees and Shrubs for large towns. Journal of the Royal Horticultural Society, new series, vol. xiii. pp. 71–98, ff. 9–16. 1891.

The Germination of Cyclamen. Journal of the Royal Horticultural Society, new series, vol. xiii. pp. 169–172, f. 21. 1891.

Some Features of Interest in the Order of Conifers. Journal of the Royal Horticultural Society, new series, vol. xiv. pp. 1–18. 1892.

A List of the Conifers and Taxads in Cultivation in the Open Air in Great Britain and Ireland. Journal of the Royal Horticultural Society, new series, vol. xiv. pp. 179–256. 1892.

Notes on the Genera of Taxaceae and Coniferae. Journal of the Linnean Society, vol xxx. pp. 1–42. 1893.

On some cases of Inversion. Journal of Botany, vol. xxxi. 1893, pp. 35–40, ff. 1–5. 1893.

Synanthy in Bellis. Annals of Botany, vol. vii. pp. 381–383, ff. 1–6. 1893.

The Cypresses of Monterey. Garden and Forest, vol. vii. p. 298. 1894.

The Cedar of Goa. Journal of the Royal Horticultural Society, new series, vol. xvii. pp. 1–11. 1895.

A General View of the genus Cupressus. Journal of the Linnean Society, vol. xxxi. pp. 312–363, with numerous figures in the text. 1896.

Substitutes for Larch. Journal of the Royal Horticultural Society, new series, vol. xix. pp. 430–436. 1896.

Thiselton-Dyer, Sir W. T., Flora Capensis, vol. vii. pp. 59–149. Restiaceae. 1897.

Suggestions for the better Utilisation of Chiswick Gardens. Journal of the Royal Horticultural Society, new series, vol. xxi. pp. 161–173. 1897.

Campanula Balchiniana ×. Journal of the Royal Horticultural Society, new series, vol. xxi. pp. 271–273, f. 63. 1897.

De Coniferis quibusdam sinicis vel japonicis Adnotationes quaedam. Bulletin de l'Herbier Boissier, vol. vi. pp. 269–274. 1898.

The Bermuda Juniper and its Allies. Journal of Botany, vol. xxxvii. 1899, pp. 1–11. 1899.

Conference on Hybridisation and Cross-Breeding. Introductory Address. Journal of the Royal Horticultural Society, new series, vol. xxiv. pp. 55–58. 1899.

Restionaceae novae capenses herbarii Berolinensis, imprimis Schlechterianae. Engler's Botanische Jahrbücher, vol. xxix. Beiblatt n. 66, pp. 1–20. 1900.

Taxodium & Glyptostrobus. Journal of Botany, vol. xxxviii. pp. 37–40. 1900.

New Plant. Erigeron neomexicanus. Journal of the Royal Horticultural Society, new series, vol. xxvi. p. 281. 1901.

Hybrid Conifers. Journal of the Royal Horticultural Society, new series, vol. xxvi. pp. 97–110, ff. 25–33. 1901.

Beiträge zur Kenntnis der Afrikanischen Flora, Neue Folge, xiii. herausg. von H. Schinz. Restionaceae (Restio praefixus, Mast.). Bulletin de l'Herbier Boissier, 2me série, vol. i. pp. 778–779. 1901.

The Coniferae in Forbes and Hemsley's Enumeration of the Plants of China. Journal of the Linnean Society, vol. xxvi. pp. 540–559. 1902.

The Arrangement of the Air-Canals in the Stalks of Nymphaeas. Journal of the Royal Horticultural Society, new series, vol. xxvi. pp. 840–843, f. 343. 1902.

Chinese Conifers collected by E. H. Wilson. Journal of Botany, vol. xli. pp. 267–270. 1903.

Hand-List of Coniferae grown in the Royal Botanic Gardens, Kew. Ed. 2 (revised by M. T. Masters). London, 1903. 8 vo. pp. i.–xxiii. + 1–145. 1903.

A General View of the Genus Pinus. Journal of the Linnean Society, vol. xxxv. pp. 560–659, tt. 20–23. 1904.

The Juniper Cedar of Jamaica. Bulletin of the Department of Agriculture, Jamaica, vol. ii. pp. 83–84. 1904.

Notes on the Genus Widdringtonia. Journal of the Linnean Society, vol. xxxvii. pp. 267–274. 1905.

On the Conifers of China. Journal of the Linnean Society, vol. xxxvii. pp. 410–424. 1906.

Correction of Widdringtonia equisetiformis to Callitris robusta. Journal of the Linnean Society, vol. xxxvii. p. 332. 1906.

On the Distribution of Conifers in China and Neighbouring Countries. Journal of the Linnean Society, vol. xxxviii. (posthumous). 1907.

W. B. H.

The Transport of Para Rubber Seeds.—One of the earliest recommendations with regard to this subject is that made by Dr. (now Sir) George King, Superintendent of the Royal Botanic Garden, Calcutta, in 1876. One of the most recent is to be found in the Report of the Department of Public Gardens and Plantations,

Jamaica, for 1905–6. A comparison of the two is of interest historically, and may be of use. The two are accordingly here reproduced.

"No. 11G, dated Howrah, the 22nd February, 1876.

"From Dr. G. KING, M.D., Superintendent, Royal Botanical Gardens,
to the ACTING ASSISTANT SECRETARY to the Government of
Bengal.

"With reference to your endorsement, No. 350 (Financial Department—Forests), dated 4th instant, I have the honour to submit herewith my suggestions as to the collection of seeds of *Hevea brasiliensis* in South America for transmission to the India Office, and from thence to Ceylon—

"I would suggest that—

* * * *

"They should not be all packed in one way. Some should be packed as recommeded by Dr. Thwaites, in slightly moist moss; others should be packed with dry moss in simple canvas bags; others should be tried in similar bags, but without moss or any other packing material; others should be sent in small boxes made of seasoned wood, and with a few small air-holes drilled in them to allow of ventilation; some should also be packed in boxes with perfectly dry soil as packing material, and others in similar boxes in finely pounded dry charcoal; finally, a quantity of the seeds should be tried in the following mode suggested by an experienced collector: 'Mix clay and water into a good stiff paste, and put a coat of this on each seed; dry these coated seeds gently in a shady place, and pack in small boxes.' In no case should any of the packages, except those packed in damp moss, be enclosed in india-rubber or other waterproof covering. Such covering effectually prevents ventilation, and is most prejudicial."

The Report of the Department of Public Gardens and Plantations of Jamaica for 1905–6 contains an account of the results of importations into Jamaica during the year. The report says:—

"A consignment of 7,500 seeds, packed with incinerator earth and sawdust, in biscuit tins, was forwarded from Singapore by parcel post on 31st August, and arrived in Jamaica on 25th October, 1905. Forty-five seeds were rotten when received; 7,455 seeds were sown, and of these 6,506 germinated, or 87 per cent. Of the 6,506 plants potted, 1,435 were constitutionally weak, and died soon after potting. There were thus obtained 5,071 plants, or about 68 per cent. of the number of seeds sown.

"On 30th January, 1906, 725 seeds were received from Para. They were packed in powdered charcoal, and only 15 were bad on arrival. From the 710 seeds sown, 656 plants were raised, or about 90 per cent.

"It does not appear to make any difference what the packing material may be, so long as it is dry. Sifted dry earth is, perhaps, the best material to recommend, as it is always possible to obtain it."

Presentations to Museums.—FORESTRY EXHIBITS.—Miss Talbot, Margam Park, Glamorgan, has presented to the Museum the following specimens of home-grown timbers :—

I. Section of young Sycamore (*Acer Pseudo-platanus*) showing effect of pruning.

II. *Sequoia gigantea* to illustrate branch formation.

III. Plank of Larch (*Larix europaea*).

The Right Hon. the Earl Bathurst, C.M.G., Cirencester Park, Gloucester, has presented a plank of Scotch Fir (*Pinus sylvestris*).

Col. Sir Ivor Herbert, Bart., C.B., M.P., Llanarth Court, Raglan, Monmouth, has presented an interesting and valuable series of timbers grown on the Llanarth Estate, Monmouth.

J. M. H.

Botanical Magazine for July.—The plants figured are : *Odontoglossum Leeanum*, Reichb. f., *Montanoa mollissima*, Brongn., *Kennedya retrorsa*, Hemsl, *Stewartia Malachodendron*, Linn., and *Phyllodoce Breweri*, Maxim. The *Odontoglossum* is a natural hybrid, of which the parents are supposed to be *O. gloriosum*, Lind. et Reichb. f. and *O. triumphans*, Reichb. f. The figure was prepared from an inflorescence sent to Kew by Baron Schröder, The Dell, Egham. *Montanoa mollissima* is a white-flowered Mexican Composite, not unlike a small-flowered *Dahlia*. The Kew plants were raised from seed received in 1902 from the late Sir Thomas Hanbury, and are grown in a greenhouse. *Kennedya retrorsa* is a new species from Eastern Australia, very distinct in its densely retrorse-pilose pods. The seeds from which the Kew plants were raised were received from the Sydney Botanic Gardens under the name of *K. procurrens*, Benth. Its flowers are rose-purple, with a white spot on the standard. *Stewartia* (often written *Stuartia*) *Malachodendron* is a white-flowered shrub or small tree, native of Eastern North America, and allied to the genus *Camellia*. Though an old inhabitant of English gardens it is not in general cultivation. The specimen figured came from a plant in Sir J D. Hooker's garden at Sunningdale. It is hardy at Kew. *Phyllodoce Breweri* is a pretty Ericaceous plant from the Alpine zone of the Californian Sierras. It flowers at Kew in May and is quite hardy, but a slow grower. Seeds of this plant were presented to Kew in 1896 by the late Baron von Saint Paul-Illaire, of Fischbach, Silesia, the founder and President of the German Dendrological Society, who died on October 21, 1902. He was a frequent correspondent of Kew, having first written to the Director in 1881, asking for assistance in his endeavour to introduce foreign plants, especially trees, into Germany, an object which he had very much at heart. He sent in exchange seeds and plants to the Gardens, and contributed to the library the *Mitteilungen der Deutschen Dendrologischen Gesellschaft* from their first appearance in 1893 to the time of his death.

Botanical Magazine for August.—*Aloe nitens*, Baker, *Bruckenthalia spiculifolia*, Reichb., *Calathea angustifolia*, Koern., *Streptocarpus Holstii*, Engler, and *Delphinium macrocentron*, Oliver, are figured and described. The *Aloe* is a South African species which has been in cultivation at Kew since the year 1877, when it was received from the late Sir Henry Barkly, at that time Governor at the Cape. It is a handsome plant, the stem reaching a height of 12 ft., and bearing a panicle of about six branches, each terminated by a dense spike of rich crimson flowers. These are produced in midwinter. *Bruckenthalia* is a monotypic genus of *Ericaceae* closely resembling a small-flowered *Erica*, but differs in having a campanulate calyx, and in the almost complete absence of a disc. It is a native of Transylvania, the Balkan Peninsula, and Northern Asia Minor. The Central American *Calathea angustifolia* has been in cultivation at Kew for many years. Like many of its congeners this species has ornamental foliage. Its leaves reach a height of about 4 ft.; the blade is about 2 ft. long, green above and purple beneath, borne on a petiole 2 ft. long. The scape is much shorter than the petiole, and bears a dense spike of pale yellow flowers. *Streptocarpus Holstii*, from East Tropical Africa, is an elegant branching herb about 18 in. high, with small stalked leaves and small mauve-purple flowers, having a white throat. The Kew plants were raised from seeds received from the Berlin Botanic Garden in 1905. The *Delphinium* is a native of the mountains of East Tropical Africa, and was introduced into cultivation by the Hon. Walter Rothschild, who received it from Mount Elgon in the Uganda Protectorate. The specimen figured was grown in a pot in the garden of Mr. James O'Brien at Harrow-on-the-Hill. It is a hairy perennial herb, growing 5 ft. high or more, with large blue and green or yellow and green flowers, whitish at the apex. Mr. O'Brien thinks it may prove hardy in this country.

Seedling Sugar-Canes in the West Indies.—In the last number of this *Bulletin* (No. 7, 1907, p. 306), reference was made to the question of the identity of the Barbados seedling, B. 208, cultivated on the well-known Diamond Plantation in Demerara, and the result of a critical examination of samples by the Imperial Department of Agriculture was given. We now learn that the subject has been also submitted for investigation and report to a Departmental Committee appointed by the Governor of British Guiana.

The report of this Committee, which is dated June 6, 1907, is as follows:—

"With reference to your letter No. 3428 of the 3rd instant,
"appointing a Committee to inquire into the identity of the cane
"grown at Plantation 'Diamond' as B. 208, we have the honour
"to report that after an examination of the seedling in cultivation
"at Plantation 'Diamond' under the name of B. 208, we are of
"opinion that there has been no mistake as to its identity as
"such."

Canhamo Braziliensis Perini.—The *Board of Trade Journal* for 7th September, 1905, records the receipt by the Board of a pamphlet describing, under this name, a Brazilian fibre plant, together with a sample of its fibre, forwarded by H.B.M. Consul at Rio de Janeiro. Subsequently, Messrs. Knight, Harrison & Co., of Rio de Janeiro, kindly forwarded to Kew copies of this pamphlet which was written by Dr. V. A. de Perini for the *Brazilian Review* in 1905, and is entitled "Canhamo Braziliensis Perini or Brazilian Linen"; with these were sent samples of the fibre and of cloth woven from it in Italy.

The pamphlet states that the plant was discovered by Dr. de Perini in the northern part of the province of Minas Geraes at about 1,000 feet above sea-level. The writer of the pamphlet claims that the plant possesses the qualities of European Hemp or Flax; that it is quite hardy both in the dry and in the rainy season; that it thrives alike in dry and in wet soil, and that it does not suffer from insect attacks or from mildew. No care or special cultivation is needed; a crop can be gathered three months after sowing, and three crops can be harvested in one year. The fibre possesses the desirable qualities of strength, fineness, flexibility, and adaptability for bleaching or dyeing. From it a fabric can be prepared which is equal to European linen; this so far has not been possible in America.

From the illustrations given in the pamphlet referred to and from a comparison of the fibre with the material in the museum at Kew it was clear that the plant under discussion is a *Hibiscus* (*Malvaceae*), nearly allied to *H. cannabinus*, Linn., which is widely grown in most warm countries, and is best known as the source of Deccan or Ambari Hemp, the fibre of which has been exported to England from India for over a century. The differences, however, were such as to indicate that the Brazilian plant is probably not exactly *H. cannabinus*.

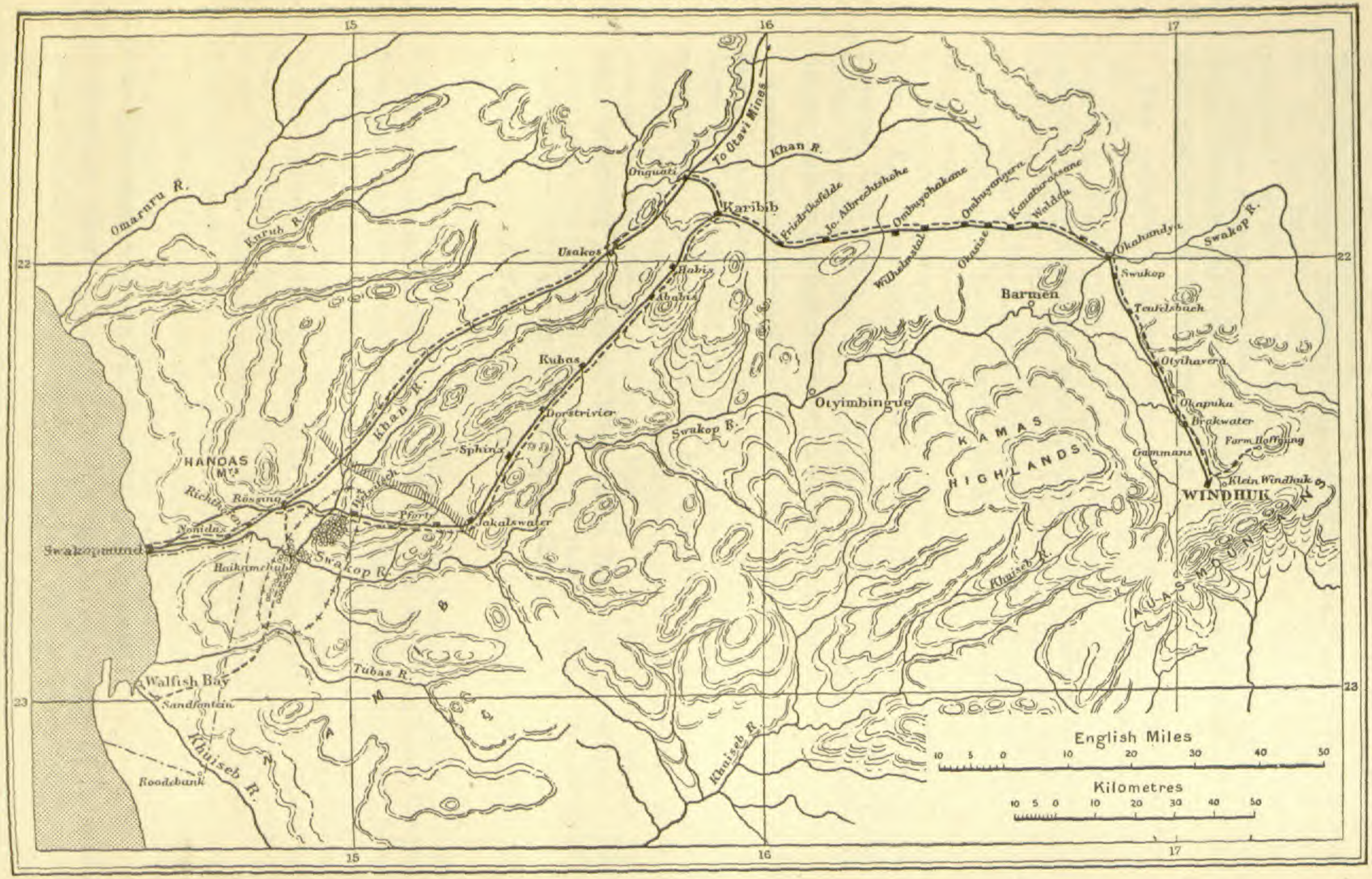
The *Board of Trade Journal* for 28th February, 1907, had the following note on the subject :—

"With reference to the Brazilian Linen plant the acting British "Consul-General at Rio de Janeiro (Mr. D. R. O'Sullivan Beare), "reports that the Brazilian Legislature have voted the grant of an "annual subsidy of thirty contos of reis (about £1,875) during a "period of five years to Dr. Perini, the discoverer and the holder "of the patent rights for Brazil in connection with the utilisation "of the plant in question. The subsidy will be paid as soon as "Dr. Perini has inaugurated the manufacture in Brazil of "articles made from the plant. Dr. Perini proposes to form "a limited liability company to exploit his plant, and has issued "a prospectus. The capital is to be 1,200 contos of reis (£75,000) "in 6,000 shares of the value of 200 milreis each."

In April, 1907, specimens of the dried plant and of its seeds were received from the Board of Trade. Plants have been raised from the seeds, and from these it has been possible to ascertain that the species is *Hibiscus radiatus*, Sims, not of Benth., doubtfully of Cav.

J. M. H.

MAP OF THE CENTRAL PART OF
GERMAN SOUTH WEST AFRICA



Route followed ---------

Where Welwitschia was seen

Transition from the Namib to Acacia forest

Supposed boundary of Welwitschia

To face p. 339.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] [1907.

LIV.—SOME NOTES ON A JOURNEY FROM WALFISH BAY TO WINDHUK.

(With Map and Plates.)

H. H. W. Pearson.

Introduction.

Railway and other communication.—Three lines of railway at present provide means of communication between the coast of German South-West Africa and the interior. The oldest of these, completed in 1902, is the Government line between Swakopmund and Windhuk, the seat of the Administration. Windhuk lies about 260 km., as the crow flies, almost due east of Swakopmund; the railway route, however, is 380 km. long owing to a considerable detour to the north between Jakalswater and Karibib and a compensating southerly deviation from Okahandya to Windhuk. The rails are very light, and are set at a gauge of about 24 inches. The steepest gradient is 1 in 25 in the 5 km. of the ascent from the Khan river-bed to Welwitsch. Elsewhere the rise is nowhere greater than 1 in 80, while over most of the journey the ascent is much more gentle. The highest point reached is 1,630 m. at Windhuk itself. The average speed of the trains over the whole journey from the coast is little more than 10 miles an hour, and this does not include a halt of about 30 minutes at each station. Travel on this line therefore affords good opportunities for observation. The engines are small, and their water and coal capacity very limited; consequently the economy of the railway is seriously impaired by the necessity of depositing reserve supplies of Hamburg coal at every station and of carrying water-tanks to all the halting places in the desert belt.

A second line completed last year by the Otavi Mine and Railway Company connects the Otavi copper mines with Swakopmund. Its length between the port and Tsumeb near the Ovamboland border, its present terminus, is 570 km. Its importance is not confined to the mines, for it passes through

1375 Wt 87 10/07 D & S 29 29709

Omarura, tapping a rich stock-raising region, and Nageib, the terminus of a short branch to the east of Otavi, is less than 50 km. from Grootfontein, which is described as a district of great promise agriculturally. The further extension of the main line north-westwards from Otjikoto into Ovamboland is suggested on Dr. Georg Hartmann's map (1904), and when it is effected this will be the most important economic railway route in the country. As on the Swakopmund-Windhuk route, the line is single and of a 24 in. gauge. The metals are much heavier and the permanent way more solidly built than that of the Government line. For the first 35 km. from the coast, *i.e.*, as far as Rössing, these two tracks run side by side; but while the Government line crosses the Khan River almost due east of Swakopmund, the Otavi track runs up its west bank for a distance of 100 km., crossing its bed at Usakos. From the station Onguati, 28 km. north-east of Usakos, a branch to Karibib effects a junction with the Government railway. This is of considerable advantage to passengers from Swakopmund to Windhuk, for by following the Otavi route as far as Karibib the journey from the coast to the capital is accomplished in two days—one day less than by travelling entirely in the Government train.

From the port Angra Pequena (Lüderitzbucht), 450 km. south of Swakopmund, the Government has just completed a line of the same gauge as the Cape railways (3 ft. 6 in.) across the desert belt to Kubub, a distance of about 90 km. Its extension eastwards to Keetmanshoep, 300 km. from the coast, is in progress.

The system of telegraph and telephone communications is very extensive. Telegraphic communication exists between (*a*) Windhuk and Swakopmund, (*b*) Windhuk and Keetmanshoep, (*c*) Keetmanshoep and Rahmann's Drift on the Orange river, (*d*) Keetmanshoep and Lüderitzbucht. In addition, telephonic communication is already established between (*a*) Windhuk and Swakopmund, (*b*) Windhuk and Keetmanshoep, (*c*) Warmbad and Rahmann's Drift. An extension of the Cape telegraph line from Steinkopf to Rahmann's Drift—a distance of about 50 miles—would thus link up the two capitals, Windhuk and Cape Town, and would be for the mutual advantage of the two Colonies.

In districts not penetrated by railways the ox-wagon is the standard means of transport, as it was in the days of Galton and other pioneer travellers in these regions. Its slow rate of travel—where the surface is good not more than three miles an hour—and the frequent "outspans" render this form of conveyance very suitable to the requirements of one who would study the country.

In the British territory of Walfish Bay there is a single railway line, of the same gauge as the German Government line, between the settlement on the coast and Roodebank (Rooibank or Scheppmansdorf) on the frontier. This was put down about eight years ago when Walfish Bay was still the port for the trade of the Hinterland. It carried goods across the belt of sand-dunes, and the wagons from up-country were able to end their journey where the surface was still hard and travelling easy. The trade has now gone to Swakopmund and Lüderitzbucht, and the Walfish Bay line has ceased to possess an economic value and is sanded up and impassable in many places.

Route followed.—The observations recorded in this paper were made in January and February last. The first section of the journey I made in the company of my friend Mr. E. E. Galpin, F.L.S. It consisted of a walk from Walfish Bay to Haikamchab, a distance of 60 km. traversed in 26 hours; our impedimenta were carried in a cape-cart, part of the Walfish Bay equipment, drawn by 10 oxen (hired from Rooibank), which accomplished the whole distance without water. After spending some days at Haikamchab I made a second ox-cart journey of 20 km. to Rössing, and thence travelled by the Otavi railway through Usakos to Karibib, and from there to Windhuk. The return journey was broken at Okahandya where I enjoyed the hospitality of Mr. K. Dinter who has contributed much to the knowledge of the flora of Hereroland, and from whom I obtained valuable information regarding the natural history of the country. From Karibib I returned to Swakopmund by the Government railway, visiting Welwitsch, a well-known locality for *Welwitschia*, and crossing the Khan River 100 km. south of Usakos. By the courtesy of the Woermann Line, to whose local manager, Captain Ihrke, I am greatly indebted for much kind assistance, I was able to make a speedy return to Walfish Bay from Swakopmund by sea.

Walfish Bay.

The British settlement at Walfish Bay, consisting of the magistrate's residence and offices, five or six houses for the members of the staff, two stores, the missionary's house, the native church, and sheds containing the condensing plant and water-reservoirs, is situated just above the normal high-water mark at the present mouth of the Khuiseb river. During exceptionally high tides the greater part of it is completely isolated from the mainland. Behind the settlement there is at present a flat stretch, 2 or 3 miles in extent, overlaid by a thin crust of dried mud, and destitute of vegetation. Beyond are the sand-dunes. The advance of the sand over this mud-flat is apparently prevented in part by the frequent incursions of the sea, and to some extent also by the occasional flow of fresh water down the Khuiseb river-bed.

At present there is a fortnightly service of steamers of the Woermann Line (Hamburg) between Cape Town and the Bay, *viâ* Swakopmund. Three years ago there was only one steamer each way per month—a condition which is likely to be reverted to in the near future. The mails are carried by land from Swakopmund (about 20 miles), where also is the nearest station of the Eastern Telegraph Company which provides the only cable communication with the Cape and Europe. There is no road between the Bay and Swakopmund, but at low water the wet sand provides a fairly satisfactory "bridle-path," and, on occasion, has served for wheeled traffic. Occasionally ships of the South African squadron visit the Bay for shooting practice, and a small reserve supply of naval coal is kept there. Tugs, dredgers, and other craft from Swakopmund take advantage of its quieter waters and sandy beach to effect minor repairs. From the landward side visitors are of the rarest. Baines tells us that in 1861 he saw at one time as many as ten or a dozen newly arrived wagons out-spanned near

the shore. Now the arrival of a wagon is an event. Apart from the internal resources of the small white community composing the settlement there is little to lessen the severity of their separation from the rest of the world. While the positions of the higher government officers entail a considerable degree of responsibility, their official occupations are only occasionally sufficiently engrossing and continuous to compensate for the monotony and isolation of their situation. One feels very strongly that if the degree of isolation of this rarely visited settlement were generally realised the practice of keeping men there for indefinite, and often prolonged periods would, as far as possible, be discontinued. A system of short-period services would as surely promote the efficiency of the administration as it would be conducive, in the great majority of cases, to the comfort of those officers and their families who are called upon to reside there.

The wagon-track from Walfish Bay to the interior lies, for the first 3 or 4 miles, in the bed of the Khuiseb river which, like all the South-West African rivers lying between the Cunene and the Orange rivers, is, in normal seasons, dry in the lower part of its course. The surface of the river-bed is indicated by a thin crust of desiccated mud left by the last flow of water which occurred in 1904. Above a point at present situated about 3 miles from the coast the bed is blocked by sand-dunes between which are seen here and there patches of dried mud from a square foot to one or more square miles in area, still uncovered by the moving sand. The sand-dunes within 3 or 4 miles of the sea, like the mud-flats, are for the most part without vegetation. Their average height is probably about 60 or 70 feet, but in some localities they can hardly be less than 200 feet high. In general they present a long gently inclined, ripple-marked slope to the south-west, and a precipitous, crescent-shaped front to the north-east. When the south-west wind is blowing—which usually occurs in the after part of the day—a constant stream of sand is blown up the slope and over the crest. In this way the dune steadily progresses, and the buried railway-line and wagon-tracks are unmistakable signs of its advancement. The goal of the sand is the sea and day after day, as soon as the south-west wind springs up, streams of dry sand commence hurtling over the wet beach; the quantity entering the harbour in the course of the year must be enormous. Mr. Gale who has made some observations on the movements of the dunes informs me, that while in general they travel towards the north-east there are local variations from this direction.

Flora.—Further inland vegetation occurs on both the mud-flats and the dunes. The flats here and there support a luxuriant growth of that most successful South African colonist the Argentine *Nicotiana glauca*, R. Grah., and the native *Tamarix articulata*, Vahl, the latter occurring also to some extent on the dunes. *Nicotiana glauca*, according to Baines, was introduced into the Swakop valley at Haikamchab, some 25 miles in a direct line from the coast, about 1854. It is now one of the commonest plants in Damaraland occurring constantly between the coast and Windhuk. In the river-beds towards the coast in

the region of the night-fogs, where it is normally a tree of 15–20 ft., it seems to be even more successful than in British South Africa. Its spread was rapid from the first for Baines states that in 1861 it had become "quite a feature in the landscape at Haikamchab." The numerous minute seeds are very well adapted to wind-distribution. Its leaves are dried and used as tobacco by the native when he can obtain nothing better.

The Tamarisk, in some places a graceful tree but more commonly deformed by the wind, sometimes reaches a height of about 20 ft. but at Walfish Bay it is usually of lower growth. In favourable times and places its natural reproduction by seed is profuse; this year in the river-bed east of Sandfontein, about 3 miles from the coast, almost a square mile is covered with a dense carpet of seedlings with very deep slender tap-roots. The sparse and decadent Hottentot population of Walfish Bay use the wood of both tamarisk and tobacco in the construction of their huts as well as for firewood. Owing to the influx of a small body of Hereros from German territory a few huts were in course of erection at Sandfontein at the time of my visit. The skeleton of the structure consists of a number of uprights arranged in a circle their free ends being bent towards the centre and fastened together, thus giving the familiar beehive form. The stouter of these are *Tamarix*, the rest *Nicotiana*. They are strengthened by three or four horizontal series of flexible *Nicotiana* stems to which they are securely tied. In this stage the erection is more rigid than would be expected from the nature of the materials. It is then rendered hideous but perhaps sufficiently proof against the penetration of the copious night-fogs by a heterogeneous outer covering of scraps of corrugated iron and of kerosene tins, skins, and old sacking. This marks an advance in civilization for 50 years ago the huts in this same hamlet were described by Baines as "of the very rudest description being in fact mere boughs thrown over a rough framewook without the slightest pretence of being either wind or water-tight." The natives obtain their water from holes, a few feet deep, excavated in the river-bed. The supply is meagre and, within a few miles of the sea, always brackish. Part of the water-supply of the British Settlement is derived from the same source. It is conveyed to the coast in large barrels drawn by donkeys. Two metal-shod wheel-rims are attached to the circumference at equal distances from the ends and the barrel is wheeled along, as Baines described it more than 40 years ago, "in the fashion of a garden roller." For drinking purposes the white population now relies entirely upon condensed water, for the preparation of which from sea-water the Cape Government maintains a condensing plant under the charge of Mr. Gale. The house of each Government officer is supplied free of charge, but to the private residents the condensed water is sold at 10*s.* 6*d.* per 100 gallons.

The most interesting and economically the most important member of the Walfish Bay flora is the "Naras," *Acanthosicyos horrida*, Welw. This highly specialised relative of the Cucumbers is an important dune-former (Fig. 1). Its root system no doubt penetrates to a considerable depth, tapping the underground water and securing such a supply that drops exude and fall from

the cut ends of the assimilating stems. The plant continues to grow with the increasing height of the dune, so that its younger shoots remain at the surface forming a dense thorny shrub. The leaves are minute, and the cucurbitaceous tendrils are replaced by thorns. The old stems when buried in the accumulating sand become as stout as one's arm and ensheathed in a thick layer of corrugated cork (Fig. 1); they obviously function in part as water-storers. The plant is dioecious. Each dune apparently contains a single individual, for the two sexes are never found together. Flowering commences in November, and this year by the middle of February all the female plants were in fruit, and only a few male flowers were open. For about four months in the year the fruits and seeds render the Hottentots independent of other sources of food, and to a large extent of water also. The spheroidal fruit, whose ripeness is indicated by the pale yellow colour of its thorn-beset, leathery pericarp, is about 9 in. in diameter, and is borne in great profusion (Fig. 2). The seeds, which are of the usual cucurbitaceous type, are very nutritious. They were formerly exported to Cape Town in small quantity and sold under the name of "Butter-nuts." They found a market among the native population, by whom they were used in the same way as are the seeds of *Arachis hypogaea*; in more refined circles they were substituted for sweet almonds. The juicy yellow flesh of the fruit is much relished by the Hottentots, who consume it in large quantities while fresh and lay by a store for winter use in the form of hard, flat cakes obtained by evaporation. It is said that the contrast between the emaciated, half-starved native at the beginning of the fruiting season and the sleek, well-fed product of a month or two on the "Naras-veld" is most remarkable. The faculty of enjoying the taste of the Naras juice is undoubtedly one which must be acquired; to the uninitiated it has a sweet, sickly flavour, and it contains an acid principle which produces very unpleasant effects upon the tongue and palate, lasting for several hours. I am told that at the end of the season the lips of even the habitual consumers are swollen and inflamed. Each family resident in the Naras region claims the fruit produced on one or more dunes, the land itself, in British territory at least, being owned by the Government. These rights of property in the fruit are tacitly allowed by the Government and are strictly respected among the natives themselves. Mr. Eadie, the magistrate at present in charge of the territory, tells me that during his two years' administration he has not had to deal with a single case of disputed possession. The owners are for the most part Hottentots, but about seven miles from the coast I was hospitably regaled with fruit by the Berg-Damara proprietor of a number of hills which he had inherited from his father, an immigrant from the upper reaches of the Khuiseb river.

Of the remaining phanerogamic flora of Walfish Bay there is not much to be said for, except in the Khuiseb bed near the frontier, the flora consists of probably less than a dozen species of flowering plants in addition to those already named. *Acacia giraffae*, Willd., comes down to within about 5 miles of the coast; the *Vernonia* mentioned later is represented by a few specimens; dead plants of a *Lycium* now overgrown by a gelatinous lichen



FIG. 1.



FIG. 2.

[*To face p.* 344.

29709

are common; *Eragrostis spinosa*, Trin., occurs frequently. Besides these the only plants seen were *Pollichia* sp., *Caroxylon* sp., *Salsola Zeyheri*, Bth. et. Hook., a *Tetragonia*, and a dead *Mesembryanthemum*.

Transition from Sand-dunes to Namib.—The sand-dune belt is not of uniform breadth. In its narrowest part it is about 7 miles broad from west to east. The eastern limit of the dunes is not indicated by any marked diminution in their height. They are suddenly replaced by a gentle slope of ripple-marked sand destitute of vegetation and free from pebbles. At the top, the slope, which is perhaps three-quarters of a mile long, merges in a tableland—the 'Namib'—gently rising to the east. To the north is seen a range of enormous sand-dunes and above the horizon to the north-east appear the tops of the Hanoas mountains, 40 miles away beyond the Swakop river. In the nearer distance domes and peaks of granitic and gneissic rock protrude abruptly from the general flat surface which, as far as the eye can see, is without a trace of vegetation. For about 4 miles after leaving the sand-dunes no plants were seen except a small orange-coloured, crustaceous lichen. Further on three phanerogams appear but for several miles they are strictly confined to hollows in the surface which perhaps receive a more copious deposit from the night-fogs than the higher land and in which running water would accumulate on those very rare occasions when rain falls. These, the most characteristic of the Namib plants, are *Zygophyllum Stapfii*, Schinz; *Aerua desertorum*, Engl.; and the *Tetragonia* already met with among the sand-dunes.

The Namib.

Further east there are many extensive areas on the Namib where the plant population is not more dense than 3 or 4 individuals to the acre; it may be even less. This is nowhere realised more forcibly than towards its eastern boundary along the 15 miles separating the railway stations Pforte and Welwitsch. The country here rises very gradually to the east and one passes mile after mile in the train without seeing a single flowering plant. A few dwarfed specimens of *Zygophyllum*, some dried-up plants of a small *Blepharis* and a few minute grasses, all confined to the very shallow, dry, sandy channels, composed the entire phanerogamic flora that was visible on both sides of the railway. *Acanthosicyos* is absent from the Namib proper save here and there in the sandy river-beds; in such localities it occurs as far inland as Haikamchab.

The Namib is crossed in various directions by numerous wagon-tracks; that from Walfish Bay to Haikamchab is half a mile or more wide, and is scored by hundreds of wheel-marks. In former times this was the main-road from the coast to the hinterland, but since the construction of the German railway it has been almost deserted. Many of the wheel-impressions seen to-day must therefore be of considerable age. Galton also records that "impressions made on this crisp gravelly soil take years to efface; they seem to be almost stereotyped." Their persistence must be due to the

extreme rarity of rainfall and to the absence of a sufficient quantity of loose sand to obliterate the clean fracture made in the thin surface-crust.

A conspicuous feature of the Western side of the Namib is the great abundance of rounded pebbles, which begin to diminish in quantity about five miles from the Eastern edge of the "Naras" belt. The majority of these must certainly be water-worn; some have been ground down to their present form by wind-blown sand. Marine shells were not found, though they are not absent from the Namib. It is easy to imagine that one is mounting an ancient sea-beach now lying from 200–400 feet above the sea. Evidence which may probably be interpreted in favour of the view that the maritime belt has risen during recent times is not wanting. Riding along the coast from Swakopmund to the Bay, one passes a large number of disintegrated whale skeletons. Many of these are several feet above high-water mark, and some are already covered by drifted sand. Baines does not say whether the "part of the skeleton of a whale covered with barnacles," which he found south of the Walfish Bay settlement, was above the level of high water.

The Namib is a plain with a gradual and fairly uniform rise to the east to a height of about 2,000 feet. Away from the numerous, broad, shallow and sandy river-beds the surface is hard and often stony and frequently of a yellowish-red colour. Rounded knobs of granite protruding a few feet above the level are a characteristic feature. Locally sheets of dark mica (Welwitsch), more or less extensive formations of a light-brown calc-spar (Welwitsch) and a coarse-grained marble (Welwitsch, Kubas, &c.) are found. Iron pyrites, often with copper ore (Haikamchab), tourmaline, and garnets occur. Deposits of fibrous gypsum are common and saltpetre was seen at Welwitsch. Narrow dykes of black dolerite, like cinder-covered railway tracks, can be followed for miles; they are especially well seen among the tributary valleys of the Swakop. The disintegration of the granite appears to proceed with great rapidity; it usually presents a more or less porous surface, which crumbles underfoot.

The number of shallow, dry river-beds crossed by the wagon-track is very remarkable; for a considerable part of the journey they occur almost every mile. According to native report they are quite without surface water for periods of ten years or longer. Most of them debouch into the Swakop or the Khuiseb; a few strike an independent course towards the sea, which they never reach, but lose themselves in the sand belt. Except for the occasional presence of *Acanthosicyos*, their flora is limited to species which occur also, though more sparsely, on the desert plateau itself. Taking into consideration the comparatively hard surface of the Namib, its gentle slope to the west and the absence of mountains or high hills from the greater part of it, it is impossible to believe that these channels can have been eroded to a depth of from 4 to 20 feet under the prevailing climatic conditions. There seems no alternative but to regard them as relics of a past time, in which rain fell much more frequently and abundantly than it does now.



FIG. 3.

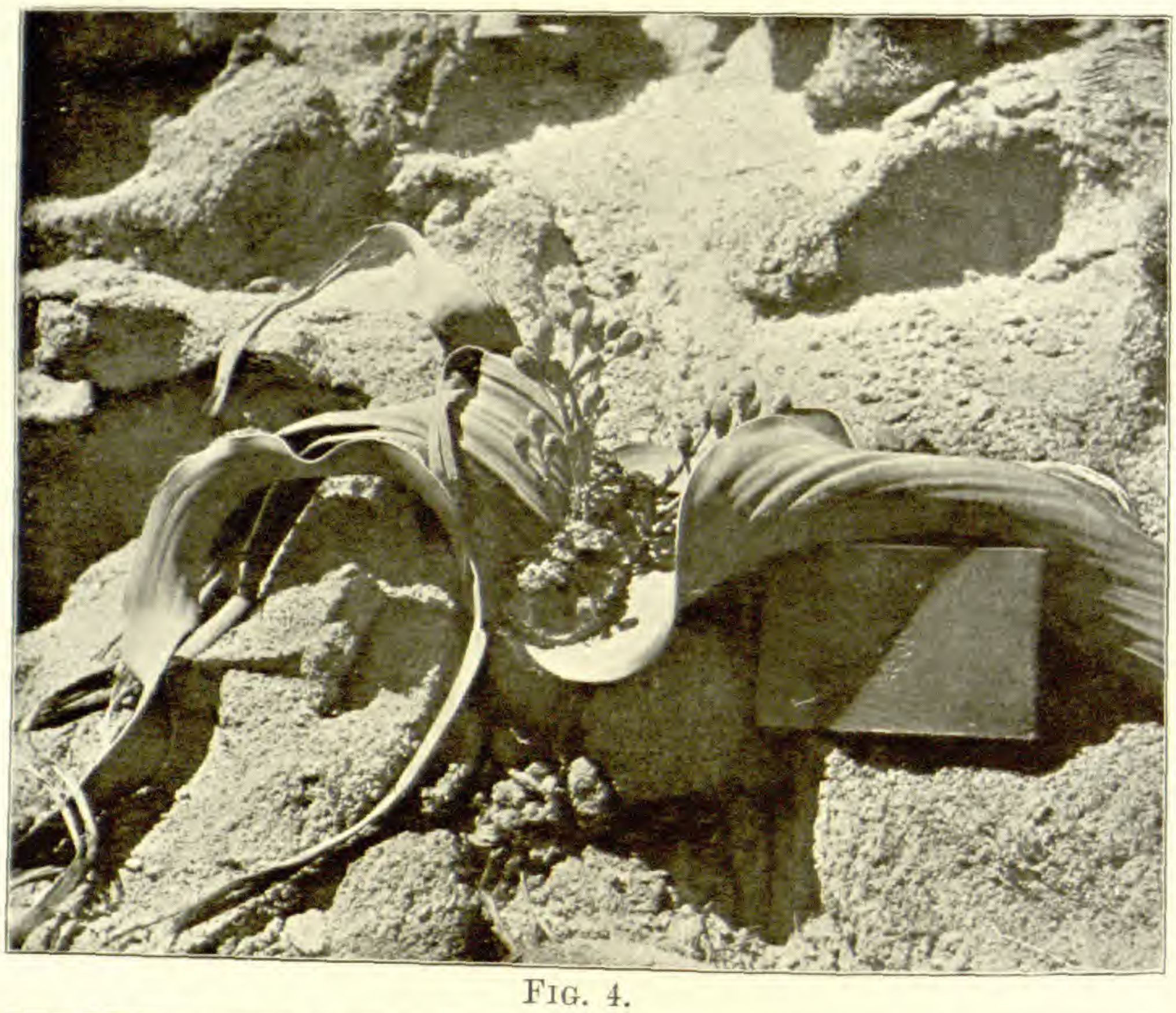


FIG. 4.

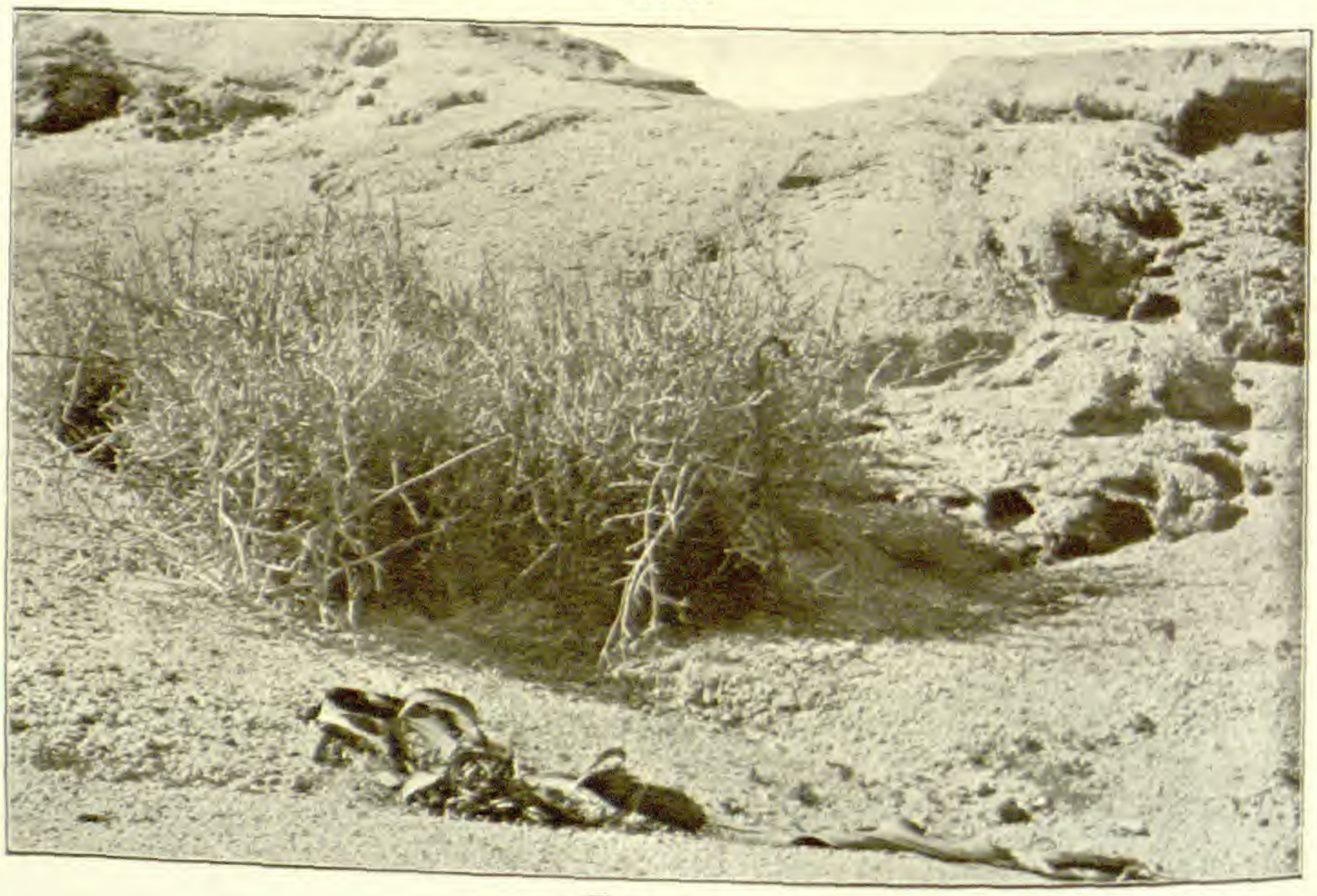


FIG. 5.

[*To face p.* 347.

More important rivers traversing this region are the Swakop, the Khuiseb, and the Khan, the latter a tributary of the Swakop which it joins at Haikamchab. These carry water as far as the sea, on the average, about once in seven years. Within a few miles of the coast the Khuiseb bed is flush with the surface,* while that of the Swakop is only a few feet below it. Higher up both the Swakop and also the Khan (the Khuiseb I have not followed for more than 5 or 6 miles inland) have eroded canons so deep that their beds, bounded by unscalable cliffs, now lie from 500 to 800 feet below the level of the Namib. For a mile—in places much more than a mile—on each side of the main bed, the orographical features of the country are extraordinarily complicated by the deep winding channels cut out by tributary streams. For some distance south of Usakos the Khan basin is a deep channel only 15 to 20 miles across, at the bottom of which lies the present bed of the river like an abrupt and narrow furrow in the middle of a storm-water drain. These facts again must indicate that the rainfall, not only of the Namib, but probably also of the higher land to the north and east, was sufficient to effect a degree of denudation which the existing conditions, even if acting through an indefinite period, could not possibly bring about.

Flora (Plateau).—Among the most generally prevalent and characteristic of the plants of the Namib plateau† the first place must probably be given to *Zygophyllum Stapfii*, Schinz, a bush with thick, fleshy, suborbicular, vertically-placed leaves, one of the surprisingly few succulents met with. A *Commiphora* (? *C. saxicola*, Engl.), a low shrub with very stout, spreading branches, is abundant in the eastern part of Namib, whence it extends beyond the desert boundaries into the transition region; both it and a *Sarcocaulon* (? *S. Marlothii*, Engl.), Fig. 3—the small bush to the left in the background—of somewhat similar habit and with rose-coloured petals, are commonly associated with *Welwitschia* to the south of Welwitsch. *Welwitschia*, Figs. 3, 4, and 5, was found fairly constantly both on the plateau and also in the upper portions of the lateral valleys leading down to the Swakop and Khan rivers, from a point about 6 miles south-west of Haikamchab, north-eastwards to the railway station at Welwitsch (*see* map). East of the latter place I believe that it does not occur. The first plant passed on the way to Haikamchab was found just before sunrise. I have no doubt that its western limit was crossed during the preceding night. Mr. Gale, of Walfish Bay, believes that it occurs as far south as the Tubas river channel. There is a tradition among the natives that it has been found within the memory of the present generation in the vicinity of Roodebank on the Khuiseb river. As far as I can learn it does not occur there now. From all the information available it would appear that in this locality the occurrence of *Welwitschia* is limited to an area measuring not more than 25 miles from north to south and 15 miles from west to east. Both Mr. Gale and Herr Bohr, an officer of the German Forest Department, have

---

* *I.e.*, the hard surface on which the sand-dunes move.

† An extensive collection of these and of the plants of the lower Khan and Swakop river-beds was made during the journey, principally by Mr. Galpin. A list will be published later.

seen it further north in old river-beds three or four kilometres from the sea in the latitude of Cape Cross. There is no record of its occurrence in the 60 or 70 miles of country which intervene between this point and the mouth of the Swakop. No precise information has as yet been obtained as to its presence elsewhere in German territory, though according to rumour it has been met with in the Kaokoveld between Cape Cross and the Cunene river.

Among the smaller plants of the plateau remarkable for the frequency of their occurrence are *Aerua desertorum*, Engl.; two small *Acanthaceae*, one a *Blepharis* which is constantly found near *Welwitschia*; a small *Tetragonia*; the handsome white-flowered *Bouchea gariepensis*, Schauer; *Bauhinia Marlothii*, Engl.; a tall Asclepiad with slender rod-like stems (? *Cryptolepis* sp.); and a few small stunted grasses, mostly *Aristidae*. An acaulescent *Aloe* grows socially here and there. *Citrullus ecirrhosus*, Cogn., and some other species of the same family spread out their long, prostrate stems in sandy places.

Flora (Main River-beds).—On the rocky sides and sandy floors of the lateral valleys of the Swakop and the Khan are found *Welwitschia*, *Commiphora*, the Asclepiad already mentioned, *Aristidae* and other grasses, with *Aloe dichotoma*, Linn. f., *Sarcostemma viminale*, R. Br. (Fig. 5), a cactoid *Euphorbia* with stems 6–8 ft. high and a *Hoodia* (? *H. Gordoni*, Sweet) of similar habit. These and other Namib forms here meet and mingle with plants belonging to the entirely different flora which prevails in the beds of the main rivers and consists of species which are at home on the higher levels to the north and east where these rivers take their rise. The dry sandy bed of the Swakop at Haikamchab (750 ft. alt.) supports a flora rich in individuals and fairly so in species, which includes among its more predominant forms *Acacia albida*, Del., the "Ana" tree; *A. giraffae*, Willd., the "Camel-thorn," perhaps the commonest tree in Damaraland; *Ficus damarensis*, Engl.; *Euclea pseudebenus*, E. Meyer; *Tamarix articulata*, Vahl.; the Walfish Bay *Caroxylon*, here a shrub 15 ft. high, with an undergrowth of the sand-binding thorny grass *Eragrostis spinosa*, Trin., which covers large areas of the river-bed almost to the exclusion of other plants of low habit; a *Tribulus* (? *T. erectus*, Engl.), 1–3 ft. high, with handsome yellow flowers; a white-flowered *Heliotropium* (? *H. albiflorum*, Engl.); and a white-flowered *Cleome*. The margins of the sandy bed are in many places fringed by a dense scrub of reeds.

From a description of the flora of the bed of the Khuiseb river at Roodebank which Dr. Sinclair, of Walfish Bay, has given me, I gather that it is very similar to that of the Swakop at Haikamchab, though, according to Galton, *Acacia giraffae* is not found within six miles of the former station. Schenck's photograph (*see* Schimper, Fig. 364) shows that above Roodebank the bed of the Khuiseb contains some, at least, of the species which are characteristic of the lower Swakop. In the bed of the Swakop, excluding the trees, the Haikamchab flora extends to within a mile of the sea, where it merges into a strand flora presenting some peculiar features.

These "rivers" of vegetation composed of xerophytes of a much less severe type than those of the plateau, running through so pronounced a desert as the Namib, are very remarkable. Two obvious hypotheses suggest themselves by way of explanation. At the first glance it seems possible that during exceptionally wet seasons seeds are washed down from the upper parts of the river basins and are able to establish themselves in the sandy beds when the flow has ceased. That they are washed down is certain for in 1904 I saw numbers of seeds of *Acacia albida* and *A. giraffae* and of other up-country plants among the refuse strewn along the beach at the mouth of the Swakop. But on the other hand some of these Haikamchab species occur not only in the main bed of the river but also up to 200 or 300 ft. above it in the lateral valleys. Conspicuous among these is *Acacia giraffae*, a species with massive pods and heavy seeds which, in these situations, cannot have been brought down from higher levels by flowing water (for the species does not occur on the plateau) and no natural agency seems sufficient to have carried them up from below. An alternative view is that the present vegetation of the Namib river-beds is the relic of a flora essentially identical with the *Acacia* formation now occurring on the higher lands to the east, which in former times flourished on the plateau much to the west of its present limits, perhaps almost to the sea. Evidence for the Namib having once enjoyed a moister climate has already been stated; the gradual retreat to the east of the seaward boundary of the *Acacia* formation would follow the diminishing rainfall and as it retreated descendants would be left behind wherever life was still possible to plants of this type. This condition is now only realised in the main river-beds. It would follow that the species at present found on the desert plateau are descended from constituents of the same flora which were sufficiently plastic to admit of adaptation to the altered environment, the severity of which has now become so pronounced. The fact that most of the genera and some of the species now found on the Namib are constituents of the *Acacia* formation lends support to this hypothesis.

Mirage and Night Fogs.—Other features of this most interesting desert-region, the Namib, which force themselves upon the notice of the traveller are the mirage and the night-fogs. Of the former, which has been so frequently described, there is nothing new to be said. Every bush, every hill more than a few hundred yards distant loses its stability and is raised above its proper level and surrounded by a sea of blue rippling air, whose resemblance to water is extraordinarily close. The severely barren plain between Welwitsch and Pforte, which has already been described, seen about 4 o'clock in the afternoon, forcibly suggested the agitated surface of an extensive lake. The night-fogs in so arid a region are hardly less remarkable. About 8 o'clock in the evening of January 24, as we crossed the dry bed of the Tubas river, a cloud appeared in the west. The stars were gradually obliterated, and by 10 o'clock we were shrouded in a cold 'Scotch mist.' After sleeping on the ground from midnight until 4 o'clock on the following morning I was able to wring the water out of my top-covering, a woollen rug. As soon as daylight came, the ground

was seen to be discoloured by the moisture absorbed, and the plants were copiously sprinkled with dew. At 7 a.m. on January 30 the water was dripping from the branches of the Tamarisks in the Khan valley at Haikamchab. That so regular and abundant a deposit of moisture should not be able to support a greater number of shallow-rooted plants than are found on the Namib seems at first remarkable. The explanation is no doubt to be found, in part at least, in the presence of a large proportion of soluble salts in the surface layers of the soil. Further, the temperature at the surface during the daytime is probably on most days sufficiently high to be injurious to germinating seeds.

Soil Temperatures.—The following temperatures of the upper half-inch of the sandy soil (in one case of a rock-surface) were recorded at Haikamchab. The observations, though not made at the same spot, were all taken at approximately the same elevation, and at points not more than two miles apart. The records are not all for the same day—a fact which, owing to the marked uniformity of the climatic conditions, is probably not of great importance :—

Jan. 31.	6.0 a.m.	...	22·0° C.
Jan. 30.	9.20 a.m.	...	44·0° C. (rock-surface)
Jan. 29.	10.20 a.m.	...	46·0° C.
Jan. 30.	10.20 a.m.	...	48·25° C.
Jan. 31.	12.30 p.m.	...	52·5° C.
Jan. 29.	2.45 p.m.	...	54·0° C.
Jan. 30.	4.50 p.m.	...	44·0° C.
Jan. 30.	9.0 p.m.	...	29·0° C.

It is, of course, well known that seeds in the resting condition can endure temperatures higher than 54° C. without being injured. It may, however, be worth recording that *Welwitschia* seeds which had been lying on the ground for six months subjected to such a daily range of temperature as is indicated by the above figures, bathed at night in dew and desiccated again by day, germinated within a fortnight under laboratory conditions. In spite of most careful search, none were found under natural conditions which showed any outward sign of even the commencement of germination. In order to effect a successful germination on a plateau subject to a daily maximum temperature even some degrees below 54° C., a seed must either have fallen in an exceptionally favourable position or its embryo must grow very rapidly when once germination has commenced, or again the protoplasm of its growing regions must have acquired an unusual power of resistance to high temperatures.

Rainfall records for a whole year are not yet available for any inland station within the Namib.* Observations were commenced at Welwitsch in July of last year. No measurable rain fell from the beginning of July to the end of November but 12·5 mm. were recorded in two days in December.

The Namib offers a remarkably promising field for observations on desert life. Its intense illumination, the high maximum and great daily range of temperature, the copious deposit of moisture during the night, and the great variety and peculiarity of the

* See also Appendix I.

mineral constituents of its surface layers contribute to the production of a complicated environment, whose effects upon the life-functions and structure of its vegetation would undoubtedly repay a close and continuous study. It would be difficult to find a more favourable region for the establishment of a Desert Botanical Laboratory. It may be hoped that some day the example set by the Carnegie Institute in the foundation and equipment of the Tucson Laboratory will be followed in the establishment in the Namib of a similar centre for research

Cultivation.—Of cultivation on the Namib plateau there is none. In the river-beds several farmers have settled and have been successful in the culture, under irrigation, of mealies (*Zea Mays*), cucumbers, melons, and other cucurbitaceous fruits, as well as of various vegetables. A few date palms have also been planted. I was informed that both the vine and tobacco are grown in the Swakop bed below Haikamchab, but saw neither. The native vegetation of the river-beds affords good grazing for cattle and goats. The fruits of the Ana tree, *Acacia albida*, are greatly relished by cattle.

Transition from the Namib to the Acacia Park Forest.

The transition zone from the Namib flora to that of the *Acacia* formation is entered between Pforte and Jakalswater on the Government railway, and about 10 miles north of Rössing station on the Otavi line.

Flora.—While the desert flora is still represented by such characteristic plants as *Zygophyllum Stapfii* and the small *Blepharis* already mentioned, a change is noticeable owing to the occurrence of new forms whose abundance gives a different character to the flora. There is also a marked increase in the number of species of grasses. Of the new forms the most conspicuous are a dwarf, spreading *Acacia* (? *A. heteracantha*, Burch.), and a bushy, terete-stemmed, leafless *Euphorbia* forming large clumps 5–8 feet high; this is evidently the same species as that photographed by Schenck at Guos, 200 miles to the south (Schimper, Fig. 360). Between 30 and 40 km. north of Rössing (on the Otavi railway) this plant becomes so abundant as to constitute a well-marked bush-formation. The station Sphinx is situated on a plain surrounded by hills whose slopes are studded with low bushes—no doubt mostly Acacias. This is the most marked change yet noticed, for the Namib hills as seen from a distance appear to be quite bare of vegetation. Beyond Sphinx a purple-flowered *Sesamum* is met with, a herb 2–3 feet high, which rapidly increases in importance, and remains a common plant for the next 80 miles. *Commiphora saxicola*, already seen at Haikamchab, becomes very abundant a few miles further on, where indeed it is the predominant plant in a scrub which also includes some dwarf Acacias. About the same place *Cataphractes Alexandri*, Don., is met with for the first time; it is a grey-leaved shrub with large, white flowers and is a prominent plant all the way to the high plateau east of Windhuk. Near the next station after Sphinx—situated at the head of a small channel tributary

to the Swakop, and appropriately named "Dorstrivier"—the Acacias begin to be predominant, but as yet they are represented by small shrubs, whose appearance suggests that the conditions of life are almost more than they can bear. In the dried up water-channels at least one species, probably *A. giraffae*, attains the form and dimensions of a tree. The small *Blepharis* still persists as does also a yellow-flowered Capparid (? *Cleome* sp.), which is one of the ornamental plants of the eastern Namib. From Kubas, whose station-house is built of marble, a short branch line to the west communicates with a water-hole in the bed of one of the Swakop tributaries, whence supplies for the engines are obtained. Here, while the vegetation is distinctly richer both in species and in individuals, there are still considerable areas of absolutely bare ground, and the few, small trees are almost confined to the dry water-channels. *Aloe dichotoma* is planted in front of the station and no doubt occurs wild in the neighbourhood. The bushy *Euphorbia* was not seen north of this point. A purple-flowered Acanthacea and an Amarantacea, both of which become more common beyond Karibib were here seen for the first time. *Tribulus* sp., *Commiphora saxicola*, and perhaps a second species were also recognised. Between Kubas and Karibib many specimens of a remarkable *Cissus* (*C. Cramerianus*, Schinz), are visible from the train; they possess stout erect stems with fleshy leaves and flourish among the rocks at the bases of the hills. Associated with them are the dwarf shrubby *Euphorbia Marlothii*, Pax, many grasses, small trees of *Acacia hebeclada*, DC., and other species of the same genus. The hills are now covered to the tops with an open *Acacia* shrub except where all the loose surface, often over large areas, has slipped down from the hillsides leaving steep *glacis* bare of vegetation. The flora gradually becomes more luxuriant up to Karibib, where the zone of transition from the Namib to the fully-developed *Acacia* formation may be considered to be left behind.

A similarly constituted transition zone is crossed on the west bank of the Khan river between Rössing and Usakos. The predominance of the leafless *Euphorbia* over large areas has already been noticed. *Acacia giraffae* is fairly common and other species, including *A. heteracantha*, Burch., (at first in the form of a small, almost prostrate bush), increase in importance towards the north. *Commiphora saxicola* and either another species or the same with a larger growth is frequently seen towards Usakos. Other shrubs are a *Lycium* and an unidentified Leguminosa. Among the smaller plants are many grasses (chiefly *Aristidae*) in gradually increasing numbers, the small *Blepharis*, the yellow-flowered Capparid and the acaulesent *Aloe* before mentioned. *Aloe dichotoma* is planted round a station 110 kms. from Swakopmund and what appeared to be wild specimens were seen in the distance to the east of the railway. It is noteworthy that most of the stations between Rössing and Usakos are distinguished, not by the names of villages or settlements—which appear to be absent from this region—but by the number of kilometres which separate them from Swakopmund. A comparison of the two journeys—Jakalswater to Karibib and Rössing

to the bed of the Khan river west of Usakos conveys the impression that the vegetation of the transition zone passed through by the former route is more luxuriant and richer in species than the corresponding flora on the west of the Khan. If this is generally true it is no doubt to be explained by the latter district being nearer to the sea. The conclusion that the Rössing-Usakos flora is merely a westerly extension of the same transition zone seen to the east of the Khan rests upon (1) the dominant position of the *Euphorbia*, (2) the increasing proportion of the grasses from south to north, (3) the gradual assumption of the "Acacia-scrub" character owing to the appearance of species not met with to the south and west, (4) the persistence of several characteristic Namib plants especially *Commiphora saxicola*; the acaulesent *Aloe*; *Blepharis* sp.; and the *Cleome*.

The essential elements of the *Acacia* formation, which extends from Usakos and Karibib as far as the most easterly point reached in this journey, can be seen as the train descends to the Khan bed. In the bed of the river we see a flora identical, as to its principal constituents, with that which flourishes in the Swakop river bed at Haikamchab, 100km. to the south-west, but including species not seen elsewhere. The following plants, already met with at Haikamchab, were recognised:—*Acacia albida*, *A. giraffae* (doubtfully), *Euclea pseudebenus*, whose habit so strongly suggests the Weeping Willow, *Caroxylon* sp., the white-flowered *Cleome*, and *Tamarix articulata*; a small *Sarcostemma* is possibly identical with that found some 300 feet above the Swakop at Haikamchab (*S. viminale*). Two other species of *Acacia* were noted and there were many other unrecognised shrubs and herbaceous plants.

For several miles as we approached the Khan we passed continuously through an enormous swarm of large locusts flying in a general westerly or north-westerly direction. They were accompanied by hundreds of large birds, obviously locust-eaters, locally designated as the "locust-bustard," which in these parts are only seen with the locusts.

The Acacia Park Forest.

Usakos has the appearance of a thriving little town in the construction of which wood plays a more important part than in settlements nearer the coast. The Otavi Company has established extensive railway works here. Its situation is in a valley leading down to the Khan, almost enclosed on three sides by low, rounded hills clothed to the summits with an *Acacia* 'park' forest and an undergrowth of shrubs and grasses. The impression given is very pleasing, partly due, no doubt, to the strong contrast between the green luxuriance of early summer and the yellow bareness of the Namib through which we have recently passed. No cattle were seen, but the country is doubtless capable of supporting them in large numbers.

Flora.—Of the flora between Usakos and Windhuk, which appears to find the most favourable conditions for its development in the neighbourhood of Okahandya, the most prominent constituents are the Acacias. Everywhere the predominant species

is *A. giraffae*. *A. albida* which is so abundant in the lower Swakop seems to be rare along this route since I recognised only one specimen—in the bed of the Swakop at Okahandya. *A. Maras*, Engl., the "Bastard" *Acacia* with heteromorphic thorns; *A. heteracantha*, Burch., also with heteromorphic thorns, which are pubescent when young; *A. detineus*, Burch., an umbrella-shaped shrub; *A. dulcis*, Marloth et Engl., usually a shrub but sometimes a small tree about 15 ft. high, easily recognised by the reddish bark of the young shoots which later become grey; *A. hebeclada*, DC., varying from a fair-sized shrub to a tree 30 or 40 ft. high and characterised by its short, hairy thorns and straight, stiff, erect pods; *A. horrida*, Willd., sometimes a small bush but apparently more commonly a handsome tree 40 or 50 ft. high, as well as other species, were commonly met with. *Gymnosperia crenulata*, Engl., occurs frequeutly between Usakos and Karibib. The Bignoniaceous shrubs *Rhigozum trichotomum*, Burch., and *Cataphractes Alexandri*, Don, were constantly seen all the way to Windhuk and beyond. The common Cape plant *Montinia acris*, Linn., is very abundant. *Boscia Pechuelii*, Kuntze, *Combretum apiculatum*, Sond., *Albizzia anthelmintica*, A. Brongn., *Elephantorhiza suffruticosa*, Schinz, *Dichrostachys nutans*, Bth., *Croton gratissimum*, Burch., and *Zizyphus mucronata*, Willd., were pointed out to me at Okahandya by Mr. Dinter. One of the commonest plants along the route is the shrubby *Vernonia* a single specimen of which was seen in the bed of the Khuiseb, a few miles from the sea at Walfish Bay. A yellow-flowered suffruticose *Crotalaria* is present in great abundance for many miles along the line and the white-flowered *Heliotropium*, already seen in the Swakop at Swakopmund and Haikamchab, occurs frequently between Karibib and Okahandya. Bulbous plants are very numerous between Karibib and Windhuk and include *Nerine lucida*, Herb., *Pseudogaltonia Pechuelii*, Kuntze, which is very common west of Okahandya, and many species of *Dipcadi*. *Buphane disticha*, Herb., a species widely spread in South Tropical Africa and extending southwards through the Upper Karroo region almost to the south-east coast, occurs frequently east of Windhuk. Between Okahandya, and Windhuk many extensive glades are seen among the Acacias thickly carpeted with grass which affords rich grazing for cattle both during the summer and also in its dried up winter-condition. This district is said to be much better suited for cattle than for sheep. I was informed that the country to the south of the Auas mountains is even more valuable for grazing purposes. About one hour by rail to the north of Windhuk extensive stretches are covered by a dense undergrowth of the white-flowered Capparid first found at Haikamchab while in the same locality there occur here and there broad pink carpets of a Namib *Ficoidea*. Only four *Pteridophyta* were found; an *Ophioglossum* (*O. vulgatum*, L.) occurs in great abundance on stony patches on the low hills to the west of Okahandya—in company with a species of *Harpagophytum*—whilst *Nothochlaena Eckliniana*, Kunze, and *Pellaea auriculata*, Link (?), both widely distributed in extratropical South Africa, were obtained about a mile east of Windhuk; these, with a small species of *Cheilanthes* are present on the hills near Okahandya.

Windhuk.—Windhuk, the seat of Government, formerly (*see* Chapman, Vol. I.) the headquarters of the famous Hottentot Chief, Jan Jonker, is a scattered town built mainly of warm red brick, charmingly situated in the broad valley. Through it, in a northerly direction, runs one of the main feeders of the Swakop river, which rises in the Auas mountains to the south. Near the centre of the town is a small public garden remarkable for a fine tree of *Acacia horrida*, under whose shade the religious services for the white population are conducted. A pool, supplied from one of the numerous springs in the neighbourhood, supports a strong growth of reeds, from the stems and leaves of which hang several hundreds of the woven grass nests of a yellow finch. A small meteorological observatory, soon to be replaced by a more extensive establishment on the outskirts of the town, a forest nursery and an assaying laboratory are other centres of scientific work. A square, red-brick fort, squat but extensive—a replica of one already seen at Okahandya—commands the valley, and has played an important part in the history of the earlier wars with the Hottentots.

Eastern Plateau.—Owing to the kindness of Mr. Erdmann I was able to see something of the surrounding country. At Gammans, 5 miles to the north-west of Windhuk, is a well-equipped veterinary bacteriological laboratory under the direction of Dr. Rikmann, where various animal diseases—in particular the horse sickness, which is so great a scourge in this region—are under investigation. The most easterly point reached was "Farm Hoffnung," 15 miles to the east of Windhuk, situated on an extensive plain about 1,850 m. above the sea. To the south is the massive range of the Auas trending from S.W. to N.E., while to the N.E. the summits of the Bismarck mountains are just visible. On this plateau is the watershed which determines the drainage to the west into the the Swakop, and to the east and south, round the eastern edge of the Auas, into the Orange river. At this elevation the trees are fewer and the undergrowth less abundant than in the Windhuk valley 220 m. below. The Acacias now have mostly the form of low bushes; trees of *A. horrida*, *A. giraffae*, and probably of other species also occur abundantly in the valleys. *Cataphractes Alexandri* remains a common shrub and with it are a small glaucous-leaved tree not in flower (? *Ebenacea*), a broad-leaved *Lycium*, a bushy *Solanum* and a suffruticose *Euphorbia* with slender, terete stems. Grasses and small herbaceous plants were represented to a smaller extent than anywhere along the route since leaving Usakos. This was certainly due in large measure to the depredations of locusts, which were unusually severe this year. For more than 20 miles we passed through swarms of small "Voetgangers," from which hardly a square foot of surface was free, hopping in a north-easterly direction with the wind behind them. In many places they were preyed upon by ants, which were sometimes as numerous as the locusts themselves. The exertions of at least three ants were usually necessary to effect the capture and removal of a single Voetganger. Conspicuous among the smaller plants which escaped the attention of the locusts were a gregarious, acaulescent *Aloe* with brilliant crimson flowers, an ericoid *Sutera* with brown, velvety flowers,

the leafless *Senecio* (*Kleinia*) *longiflorus*, Sch.-Bip., a *Commelina*, the white-flowered Capparid already seen elsewhere, a *Bulbine* and many other bulbous plants including *Buphane disticha*, at least two species of *Asparagus*, an *Oxalis* and an *Aptosimum*. A scarlet-flowered *Loranthus*, growing on *Acacia giraffae*, is perhaps identical with that which occurs so commonly on this and other host plants in the Swakop valley at Haikamchab. This *Acacia* bush-veld, with *A. giraffae* in the river-beds, seems to extend some 200 miles further east until, on the other side of the Bechuanaland border, it meets the western boundary of the Kalahari desert.

The predominant geological formation in the vicinity of Windhuk is mica-schist, large slabs of which are exposed on the steep hill-sides. In these hills there are many perennial springs, some of which yield hot water. Further north towards Okahandya the hills are mainly granite. White-ant hills, tall and tapering, are a feature of the scenery at higher levels.

Introduced Plants.—Among the aliens which have established themselves at higher levels are *Asclepias fruticosa*, Linn., a Mediterranean immigrant now very widely spread in South Africa; an *Opuntia* which at Okahandya and elsewhere is used as a hedge plant; *Ricinus communis*, L., and *Nicotiana glauca*, R. Grah.; *Boussingaultia baselloides*, H. B. K., is commonly used at all elevations as a climber for shade-producing purposes. At Windhuk *Nerium Oleander*, Linn., *Schinus Molle*, Linn., and *Prosopis juliflora*, DC., are largely planted for ornamental purposes.

Agriculture, Horticulture, and Forestry.—Writing of Barmen, 40 years ago, Chapman records that "some date trees, planted by Mr. Hahn, were in full bearing; tobacco, onions, potatoes, beets, water-melons, pumpkins, and other vegetables flourished beautifully, and wheat and barley are also grown." The cultivation of the date-palm, while still in the experimental stage, is receiving the careful attention of the Forest Department, and has already been attended by encouraging results. *Eucalyptus corynocalyx*, F. Muell., and *E. rostrata*, Schlecht., which are being raised on a considerable scale in the forest nurseries at Okahandya and Windhuk, are growing well in many parts of the country and are designed to supply pit timber as the mining industry develops. The great expense of carrying coal from the coast makes it seem probable that the cultivation of firewood for railway and other purposes would prove a profitable undertaking. The afforestation of large tracts of the upper country with more valuable timber-trees, introduced from elevated areas with summer rainfalls and dry winters, undoubtedly offers a promising field for forestal enterprise.

Agriculture is practised only on a small scale, and it is probable that the greater part of the country is not well suited for it. The principal vegetable foods of the Hereros (or Damaras), who occupy the central part of the Protectorate, have been ground-nuts (Hammond-Tooke) and wild roots (Chapman); since the time of their immigration they have almost lost the art of soil-cultivation. Ovamboland to the north is a rich agricultural region, and is no

doubt capable of great development in this direction, when the inevitable influx of the white settler takes place. In sheltered valleys in the vicinity of Windhuk fruit is grown with great success. At Klein Windhuk, Cape varieties of trellised vines cover a considerable area and both the fruit and a white wine produced there compare very favourably with the Cape products. Up to the present the vine has been entirely free from disease. Pears, apples and plums are grown in marketable quantities. I understand that the experimental cultivation of the peach has hitherto been a failure. The pomegranate and the fig are in flourishing condition. The meallie (*Zea Mays*) is widely grown on a small scale as also is tobacco, and potatoes are grown on the stock-farms. Horse-breeding is extensively followed south of the Auas range, and there is no doubt that, if the horse-sickness were once brought under control, this industry would rapidly increase in importance. Among the permanent industries at present carried on the first place belongs to cattle-raising, to which all the large farms in the neighbourhood of Okahandya and Windhuk are devoted. In former times the country carried many more cattle than are to be found there at present, but with the establishment of white settlers now in progress, and the advances made in the study of epidemic diseases, their numbers are soon likely to be increased. Many districts, especially in the south, are said to be very suitable for sheep-farming. Cotton is certainly worth a trial in the broad fertile valleys of Hereroland, where both the character of the soil and the distribution of the rainfall seem to offer favourable conditions for the successful cultivation of suitable varieties. The Castor-oil plant (*Ricinus communis*) could almost certainly be economically cultivated in most parts of the country, even in the Namib river-beds, where it has already established itself.

There is no doubt that beyond the maritime belt of desert, which extends from the Orange river to the Kaokoveld, there are many districts, especially in the north, which are of considerable agricultural promise. The efficient utilisation of these will certainly be accelerated by, and may in some instances be contingent upon, a preliminary scientific study of the flora of the upper country and of the conditions affecting the life of the plants composing it. A detailed knowledge of the native plants is no less necessary in the interests of the widely-spread grazing industry. Apart from its economic importance, a systematic examination of the flora would certainly yield much information that would be of great value from a purely scientific point of view. While the Cape botanists have gained a considerable knowledge of the plants of this side of Africa south of the Orange river, and Welwitsch and Baum have partially investigated the flora of the Angola plateau, comparatively little has been done in the tract between the Cunene and the Orange rivers. Excepting the results of the more or less hurried journeys of visiting botanists and of other travellers who have collected plants, the available information about the botany of the country is principally the result of the energy of Mr. K. Dinter. The only herbarium of the native flora in the country is of Mr. Dinter's collection, and this unfortunately suffered severely during the war. At a time when the African flora is engaging the attention of so many European botanists, a

more complete knowledge of the remarkably interesting flora of South-West Africa is greatly to be desired. It may therefore be hoped, as well in the interests of botanical science as of the economic development of the country, that Government encouragement and assistance will be given to the work in which Mr. Dinter has achieved so great a measure of success during the past eight years.

Some Ethnological Problems.

To the ethnologist and psychologist it would seem that this country can be hardly less interesting than to the botanist. Dwindling remnants of the pure Hottentot, the Berg-Damaras driven into the fastnesses of the mountains and the scattered representatives of the Bushman tribes, now afford opportunities for study which will soon be no longer available. The problem of the Herero must be one of especial interest and the unveiling of his past—if it be still possible—might be expected to throw much light upon the history of the tropical African races prior to the European penetration of the continent.

Mining.

The country is undoubtedly very rich in minerals. Copper ore is found at many places and several mines are already in working. The opening of the Otavi railway, thus placing the extensive mines of the Otavi district—whose ore is said to be of unusual purity—in communication with the sea, will contribute to the rapid development of the industry. Gold and precious stones are stated to occur in several localities, and there is also a belief in the existence of coal in the upper country.

In conclusion, I wish to record my strong appreciation of the very kind reception accorded to me both by the Government and its officers as well as by all the private residents whom I had the pleasure of meeting. I take this opportunity of expressing my grateful acknowledgments to His Excellency the Governor, Herr von Lindequist; to the Acting Governor, Herr Regierungsrath, Dr. Hintraeger; and to Herr Schroetter, Acting Imperial Consul-General in Cape Town; for their kindness in affording me every possible facility for successfully accomplishing the immediate object of my journey and in enabling me to see the country beyond the desert belt. I am deeply indebted to my friend Herr Dr. Georg Hartmann, whose influence removed many difficulties which would otherwise have confronted me. I have also great pleasure in expressing my thanks to Mr. D. Eadie, Resident Magistrate; and to Dr. Sinclair, of Walfish Bay; for their very effective assistance in organising the transport, thus allowing us to start for Haikamchab immediately after landing at Walfish Bay and obviating the necessity of wasting time in preliminary and protracted negotiations.

I should also state here that I was assisted in part by a grant from the British Association.

Appendix I.—Meteorology.

Near the coast the small rainfall is fairly evenly distributed over the year. Inland the rainy season, commencing usually in October, lasts until April, the rest of the year, at the stations named below, being for the most part rainless. Continuous records for long periods are not yet available, and the observations at many stations have been more or less interrupted in recent years. A remarkable inconstancy of the rainfall from year to year is shown by the figures cited below. In the published rainfall-records from German stations the meteorological year commences on the 1st of May. The measurements are given in millimetres :—

—	1900–1.	1901–2.	1903–4.	1904–5.
	mm.	mm.	mm.	mm.
Swakopmund	No records	29·3	23·4	17·0
Jackalswater	No records	20·6	58·9	18·7
Kubas	No records	No records	197·1	225·9
Karibib	73·8	111·6	No records	174·8
Okahandya	No records	226·9	412·9	390·5
Windhuk	253·4	184·9	387·9	372·1
Klein Windhuk	No records	186·7	No records	No records

	1900.	1903.
Walfish Bay (Jan.–Dec.)	3 mm.	8·9 mm.

Appendix II.—Bibliography.

Baines, T., 1864. Explorations in South-West Africa. London.

Chapman, J., 1868. Travels in the interior of South Africa. London.

Galton, F., 1889. Narrative of an Explorer in Tropical South Africa, being an account of a visit to Damaraland in 1851. London (Minerva Library).

Hartmann, G., 1904. Karte des nördlichen Teiles von Deutsch-Südwest-Afrika. Hamburg.

Tooke, W. Hammond, 1905. Uncivilised Man South of the Zambesi ; "Science in South Africa." Cape Town.

Schimper, A. F. W., 1903. Plant-geography upon a Physiological Basis (Eng. Trans.). Oxford.

Von Danckelman, F., 1902–6. Mitteilungen von Forschungsreisenden und Gelehrten aus den Deutschen Schutzgebieten. Berlin. (Containing Summaries of Meteorological Observations in German South-West Africa.)

Explanation of Plates.

Fig. 1.—*Acanthosicyos horrida*, Welw., showing vegetative shoots and the large thickened water-storing stems, which are usually buried in the sand. Walfish Bay.

Fig. 2.—*Acanthosicyos horrida*, Welw., vegetative shoots and the prickly fruits. Walfish Bay.

Fig. 3.—A group of three engrafted plants of *Welwitschia mirabilis*, Hook. f. (all ♀), the plant to the left shows a few subfoliar inflorescences. *Sarcocaulon* (? *S. Marlothii*) in the distance and a few twigs in the foreground and a small plant of *Zygpohyllum Stapfii*, Schinz, immediately behind the Welwitschias on the left. Welwitsch.

Fig. 4.—*Welwitschia mirabilis*, Hook. f. (♀), on an unusually steep slope of decomposing granite. The leaves are almost intact. The cones are just past the age at which pollination occurs. Haikamchab.

Fig. 5.—*Welwitschia mirabilis*, Hook. f. (♀), and *Sarcostemma viminale*, R. Br. Haikamchab.

LV.—DIAGNOSES AFRICANAE: XIX.

901. **Delphinium (Macrocentra) Wellbyi**, *Hemsl.* [Ranunculaceae-Helleboreae]; species *D. Leroyi*, Franch., proxima, a qua differt tamen floribus caeruleis, sepalis angustioribus, petalis 2 anterioribus integris, filamentis longe ciliatis et carpellis magis villosis.

Herba perennis, pilosula, erecta, circiter 60 cm. alta. *Caules* pauciramosi, ramis saepe trifloris. *Folia* radicalia non visa; caulina petiolata, 4–6 cm. diametro, palmatim 5-partita; segmenta 3–7-lobulata, lobulis acutis; petioli graciles 3–8 cm. longi. *Flores* pubescentes, caerulei, circiter 6 cm. diametro, pedunculati; pedunculi 4–7 cm. longi, bibracteolati, bracteolis linearibus circiter 1 cm. longis. *Sepala* obovato-rotundata, circiter 2 cm. longa, apice dorso incrassata, imbricata; calcar arcuatum, adscendens, circiter 4 cm. longum, gradatim attenuatum, vix acutum. *Petalorum* 2 superiorum (nectaria auctorum nonnullorum) limbus obliquus, sepalis brevior, subaequaliter bifidus, lobulis rotundatis. *Petala* 2 lateralia lineari-spathulata, integra, superiora fere aequantia. *Filamenta* dilatata, distincte ciliata. *Carpella* (matura non visa) 3, pilosa.

Abyssinia. Between Harrar and Addis Abeba, *Capt. M. S. Wellby*, Oct. 1898.

Dr. E. Huth (*Engler's Jahrb.* vol. xx. p. 473), establishes a tribe "*Macrocentra*" for *D. macrocentron*, D. Oliv., and *D. Lefroyi*, Franch., the latter of which, he states, has the longest spur of any species of *Delphinium*. *D. Wellbyi* has an equally long spur. It was discovered by Captain Wellby, the officer who traversed High Tibet from west to east with Lieut. Neill Malcolm. On his return from Abyssinia to England in 1899 he was ordered to South Africa, where he died from wounds received at Mertzicht.

902. **Cleome densifolia**, *C. H. Wright* [Capparidaceae]; a *C. spinosa*, Linn., foliis simpliciter oblongo-ovatis recedit.

Caulis erectus, 30–60 cm. altus, ramosus, sulcatus, stramineus, pilis purpureis instructus. *Folia* oblongo-ovata, acuta, basi rotundata vel cordata, 5 cm. longa, 2 cm. lata, utrinque (praecipue ad nervos) pilis crassis instructa, sursum in bracteas oblongas

approximatas gradatim minores transeuntia, inferiores petiolata; petiolus 1 cm. longus, patentim pilosus. *Racemi* terminales, densiflori; pedicelli demum 1 cm. longi, tenues, pubescentes. *Sepala* lanceolata, 7 mm. longi, extus glanduloso-pubescentia, uninervia. *Petala* carnea, macula lutea cordata notata, oblanceolata, obtusa, 1 cm. longa, 3 mm. lata. *Stamina* quam petala dimidio breviora; antherae oblongae, apiculatae, 2 mm. longae. *Ovarium* subulatum, dense hirsutum; stylus filiformis, curvatus, parte superiore glaber.

NYASALAND PROTECTORATE. Tuchila Plateau, Nyasaland, 1,800 m., *Purves*, 94.

903. Cordeauxia, *Hemsl.* [Caesalpinieae-Amhersticae]; genus novum ex affinitate *Schotiae*, Jacq., a quo differt sepalis 5 valvatis primum conniventibus, staminibus liberis, ovario biovulato, legumine dehiscente apice cornuto et semine saepissime solitario ovoideo.

C. edulis, *Hemsl.*; species unica.

Frutex humilis, scopiformis, densissime ramosus; rami erecti ligno durissimo. *Folia* exstipulata, paripinnata, 3–5 cm. longa. *Foliola* saepissime 4-juga, coriacea, ovali-oblonga, 1–2·5 cm. longa, subtus dense rubro-glandulosa. *Flores* pauci, in ramorum apicibus corymbosi, corymbis folia vix excedentibus. *Sepala* oblonga, obtusa, circiter 1 cm. longa, glandulosa. *Petala* fere aequalia, circiter 1·5 cm. longa, unguiculato-spathulata. *Stamina* 10, libera, filamentis infra medium barbatis. *Ovarium* breviter stipitatum, ut stylus creberrime glandulosum, stigmate terminali obtuso. *Legumen* coriaceum, compresso-ovoideum, 4–6 cm. longum, curvatum, cornutum, dehiscens, bivalve. *Semen* ovoideum, 3·5–5 cm. longum, exalbuminosum, cotyledonibus crasso-carnosis; radicula parva, recta; plumula tarde evoluta.

AFRICA. Somaliland, without exact locality. Seeds from Prof. A. H. Church, F.R.S., and Prof. W. R. Dunstan, F.R.S. An entire plant, detached flowers and pods, from Captain H. E. S. Cordeaux, C.B., H.M. Commissioner.

Captain Cordeaux states, in a letter to Kew, that this bush grows in great quantities in the "Haud" or waterless desert south of Bohotleh, and on the southern frontier of the British Protectorate.

This plant yields the "Yeheb Nut," particulars of which will be given in a future number of the *Bulletin*, and a full description, with figures, will appear in the next part of *Hooker's Icones Plantarum*.

904. Acacia pallens, *Rolfe* [Mimoseae-Acacieae]; ab *A. nigrescente*, Benth., foliorum rhachi parce aculeata, foliolis majoribus et pallidioribus differt.

Arbor mediocris. *Truncus* et rami aculeati, aculeis demum valde incrassatis et tuberculiformibus; cortex cinerascens. *Rami* juniores striati, cinerascentes, lenticellis pallidis adspersi; aculei validi, recurvi, 3–5 mm. longi. *Folia* 8–10 cm. longa, saepissime 3-juga; foliola 1-juga, subsessilia, oblique obovata vel obovato-rotundata, retusa, coriacea, pallida, 1–3 cm. lata, venis reticulatis; rhachis parce aculeata, aculeis parvis reflexis. *Flores* sessiles,

glabrae, in spicas densas 4–6 cm. longas dispositi. *Calyx* 2 mm. longus ; lobi triangulari-ovati, subacuti. *Stamina* 5 mm. longa. *Ovarium* glabrum, cum stylo 4 mm. longum. *Legumen* planum, subrectum, 8–12 cm. longum, 2·5–3 cm. latum, nitidum, parce reticulato-venosum.—*A. nigrescens* var. *pallens*, Benth. in Trans. Linn. Soc. xxx. p. 517.

S.E. AFRICA. Near Senna, Zambesi district, *Kirk*, 201; Komatie-poort, Transvaal, 300 m., *J. Burtt Davy*, 2,452 ; Bombo flats, near Barberton, *J. Burtt Davy*, 608 ; Barberton, *Grenfell*, 1022.

A valuable timber tree, originally referred to *A. nigrescens*, Oliv., when but a single imperfect specimen was known. Sir John Kirk described it as a tree 30 feet high, with a very hard heavy wood, used for making clubs, and Mr. J. Burtt Davy, of the Transvaal Department of Agriculture, remarks that the timber is exceedingly hard and is durable underground. It is considered to be one of the most valuable hardwood trees in the Transvaal, and is cut extensively for mine props for the Rand. It is characterised by the presence of prominent warts on the trunk and main branches, whence it has received the vernacular name of "Knopjesdoorn." By the natives it is known as "Um-Kai." In the Transvaal it appears to grow only in the low country of the Barberton district, and probably northward through the Lydenburg and Zoutspan districts to the Zambesi, where Sir John Kirk met with it.

905. **Cliffortia natalensis**, *J. M. Wood* [Rosaceae-Poterieae] ; *C. juniperinae*, L., similis, sed foliis semper 1–foliolatis recedit.

Suffrutex erectus, cortice fusco, ramis novellis brunneis villosis demum glabratis. *Folia* 4–8-na, fasciculata in ramulis brevissimis demum paulo elongatis, unifoliolata, subsessilia, linearia, plana, mucronulata, glaberrima, 1-nervia, infra secundum nervum utrinque dense glandulosa, 12 mm. longa, 1 mm. lata, ; stipulae membranaceae, amplexicaules, 2-dentatae, praeter pilorum ruforum fasciculum basalem glabrae, 2 mm. longae, persisentes, ramos diu vestientes. *Flores* solitarii, subsessiles in foliorum axillis ; bracteae 2, semi-amplexicaules, florem aequantes, late ovatae, acuminatae. *Calycis* limbus 3–4-partitus; tubus maturus induratus, substriatus, subrugosus, 3 mm. longus. *Stigma* compressum, latum, fimbriatum.

NATAL. Near Curry's post, 1,000–1,300 m., April, *Wood*, 4,449 ; Mount Gilboa, 1,700–1,800 m., September, *G. Wylie* (*Herb. Wood*, 10,029.)

906. **Peglera**, *Bolus* [Rhizophoraceae-Legnotideae ?] ; genus novum *Weiheae*, Spreng., et *Cassipoureae*, Aubl., et vultu et characteribus floralibus affine, sed a priore foliis alternis, floribus ebracteolatis, petalis integris et ovulis in loculis solitarils differt ; a posteriore foliis alternis, petalis integris et ovariis bilocularibus recedit.

P. capensis, *Bolus* ; species unica.

Arbuscula ramosa, omnino glaberrima, ad 15 m. alta. *Folia* petiolata, elliptica, cum petiolo 3–8 cm. longa, utrinque attenuata, acuminata, integra, vix coriacea, venis primariis lateralibus utrinque 12–20 rectis ; stipulae lanceolatae. *Flores* axillares

saepius 2 vel 3 aggregati; pedunculi ebracteati, 2–3 mm. longi. *Petala* obtusa, 7–8 mm. longa. *Discus* 5 mm. longus. *Filamenta* erecta, circiter 8 mm. longa. *Stylus* erectus, stamina paullo excedens; stigmatis lobi revoluti, acuti, glanduliferi. *Ovarium* ovatum, glabrum, circiter 2 mm. longum.

SOUTH AFRICA. In the Manubi forest, Kentani district, near the coast, *Miss A. Pegler*, 1,269.

A figure and full description of this novelty will appear in the next part of *Hooker's Icones Plantarum*."

Dr. Bolus has requested that the affinities of this plant be investigated, as its position is not obvious, and he was not quite satisfied that he had correctly placed it. He had previously submitted it for opinion, but it was impossible from cursory examination to suggest anything definite. Closer comparison indicates apparent relationships with *Irvingia* (Simarubaceae) in foliage and floral structure. Both *Peglera* and *Irvingia* have axillary convolute stipules and simple leaves, very similar in venation. The principal difference in the floral structure is the absence of a distinct separate disk in *Peglera*, where it is confluent with the base of the stamens.

Mr. Boodle furnishes the following remarks on the anatomy of *Peglera*:—

In the leaf the epidermis consists of a single layer, there is no hypoderm, and the stomata have subsidiary cells parallel to the pore. No mucilaginous cells or secretory cavities are present. The veins are embedded in the mesophyll, and are accompanied by sclerenchyma. In the stem there are pericyclic groups of sclerenchymatous fibres forming an interrupted ring (without sclerotic cells), and fibres are present in the secondary bast, which is stratified. The perforations of the vessels are simple, even in the neighbourhood of the primary xylem; the wood-fibres have bordered pits, and the medullary rays are either one or two cells in breadth.

Chiefly on account of the presence of fibres in the secondary bast, the absence of scalariform perforations in the vessels, and the character of the stomata, one would be inclined to doubt whether this genus should be placed in the Legnotideae. An anatomical comparison of *Peglera* with the Simarubaceae, however, shows a closer agreement, fibres in the secondary bast being common in this Order, the perforations of the vessels simple, and stomata similar to those of *Peglera* being found in a few genera. The published accounts dealing with the anatomy of the Legnotideae do not rest on a very broad basis, but, on the anatomical data available, it appears that this genus would find a more natural place in the Simarubaceae than in the Legnotideae. It resembles *Irvingia* in the nature of the stomata, but differs in having no mucilage-cavities, and in the absence of sclerotic cells in the pericycle.

907. **Psychotria Dupontiae**, *Hemsl.* [Rubiaceae-Psychotrieae]; species ex affinitate *P. Pervillei*, Baker, differt foliis brevioribus ellipticis vel obovatis basin versus minus attenuatis brevissime petiolatis et fructu majore.

Frutex paucipedalis, glaber, ramis floriferis crassis. *Folia* in ramorum apicibus conferta, coriacea, oblongo-elliptica vel interdum obovata, 5–10 cm. longa, utrinque rotundata vel interdum subcuneata, obtusa. *Flores* inter minores, in cymas subterminales quam folia multo breviores dispositi, albi, pentameri. *Calyx* obscure 5-dentatus, fructu paullo accrescente. *Corollae* tubus intus villosus. *Fructus* ovoideus, 6–8 mm. longus, coeruleus.

SEYCHELLES. Mahé: summit of Morne, 900 m., *J. Stanley Gardiner*, 1906.

Kew possesses a coloured drawing of this plant, made by Miss E. Dupont, daughter of Mr. R. Dupont, Curator of the Botanic Station, Seychelles, and also a photograph of the shrub in its natural habitat; both presented by Mr. Gardiner.

908. **Helichrysum argentissimum**, *J. M. Wood* [Compositae-Inuloideae]; affinis *H. albo*, N. E. Brown (a nobis non viso) sed foliorum forma et acheniis glandulosis distinctum.

Folia basalia dense rosulata, linearia vel lineari-oblonga, 2·5–5·5 cm. longa, 3–5 mm. lata, subamplexicaulia, in apicem obtusum attenuata, densissime albo-pannosa (imprimis juniora); folia caulina similia nisi breviora et apice hyalina, glabra, uninervia, apicibus superiorum $\frac{1}{3}$ longitudinis aequantibus, summorum involucri bracteas imitantibus. *Pedunculi* erecti, capitulum solitarium gerentes, ad 10 cm. longi, dense lanosi. *Capitula* ad 2·5 cm. diam., multiflora; involucri bracteae pluriseriatae, lanceolatae, acutae, patulae, 8–18 mm. longae, infimae 5 mm. latae, superiores 2 mm. latae, omnes argenteo-albae, nitentes, glabrae, supra basin transverse purpureo-notatae, basi incrassatae; receptaculum alveolatum, fibrilliferum. *Corolla* breviter 8-dentata, glabra. *Pappus* deciduus, setis apice clavato-barbellatis. *Achaenia* (immatura) turgida, glandulosa.

NATAL. On the summit of Mount Gilboa, in open stony ground and in crevices of rocks, 1,500–2,600 m., September, *J. Wylie* (*Herb. Wood*, 10,025).

The collector, Mr. Wylie, states that the plant grows in dense masses of 1–2 feet in diameter. With age the lowest leaves become glabrous and dark brown and shining beneath.

909. **Coreopsis bella**, *Hutchinson*, [Compositae-Helianthoideae]; affinis *C. pinnatipartitae*, O. Hoffm., sed foliis pubescentibus supra non scabridis, bracteis linearibus, pappo 2-aristato, et achaeniis pubescentibus.

Suffrutex circiter 1 m. altus. *Rami* sulcati, parce pubescentes. *Folia* petiolata, tenuiter coriacea, pinnatipartita, ambitu ovata, supra breviter subtus longe pubescentia segmentis ovato-lanceolatis acutis plus minusve profunde serratis vel irregulariter pinnatilobis. *Capitula* pedunculata, terminalia, circiter 2 cm. diametro. *Receptaculum* latum, planum; paleae oblongae, obtusae, 1 cm. longae, 1·5 mm. latae, glabrae, versus apicem leviter constrictae. *Involucri bracteae* obtusae, 1·3 cm. longae, 4 mm. latae, exteriores herbaceae, oblongae, pilosae, interiores membranaceae, extra pubescentes, intus glabrae. *Flores radii* 12, neutri; tubus brevis, extra pilosus; lamina oblongo-elliptica 12-nervia, 3 cm. longa, apice subacuta vel obscure dentata. *Achaenia* pilosa, pappo

nullo. *Flores disci* numerosi ; tubus 1·2 cm. longus, lobis ovatis *Antherae* obtusae, 3 mm. longae. *Stylus* glaber, stigmatibus glanduloso-pilosis. *Achaenia* plana, pilosa, 1 cm. longa, 2-aristata, aristis 1·5 mm. longis.

BRITISH EAST AFRICA. Cultivated at Kew from seeds collected in British East Africa, by R. Diespecker.

This is a very handsome *Coreopsis*, and the most showy species yet introduced from Africa.

910. **Haworthia Pearsoni**, *C. H. Wright* [Liliaceae-Aloineae] ; *H. translucenti*, Haw., affinis, foliis omnibus erecto-incurvatis primo aspectu differt.

Acaulescens. Folia circa 80, dense spiraliter congesta, oblanceolato-oblonga, in seta 7 mm. longa, acuminata, 3 cm. longa, 1·4 cm. lata, 5 mm. crassa, dilute viridia, dorso albo-striata, apice translucentia, supra convexa, subtus obtuse carinata et lineis duabus ciliarum instructa, marginibus setaque albo-ciliatis. *Scapus* 25 cm. longus, cylindricus, 2·5 mm. diam. ; bracteae late deltoideae, cuspidatae, pedunculo appressae, albae, brunneo-carinatae; pedicelli 2 mm. longi. *Perianthium* 1·5 cm. longum, parte inferiore curvatum ; segmenta oblonga, obtusa, dilute carnea, brunneo-costata. *Stamina* perianthio dimidio breviora.

SOUTH AFRICA ? Described from a plant received from Prof. H. H. W. Pearson, of Cape Town, in 1905, which flowered in the Succulent House at Kew in April, 1907.

This plant is allied to *H. translucens*, Haw. (*Aloe arachnoides*, var. *translucens*, Ker-Gawl. in *Bot. Mag.* t. 1417), which has fewer leaves with a different phyllotaxy, the outer ones spreading and the margins beset with flattened deltoid teeth, not with setae. In *H. Pearsoni* even the outermost leaves curve upwards.

LVI.—ADDITIONS TO THE FLORULA MARMARICA.

OTTO STAPF.

Last year Mr. W. L. Balls, of Cairo, presented to Kew a set of plants collected in the neighbourhood of Mirsa Matruk, about 250 km. west of Alexandria, by Dr. W. F. Hume, of the Geological Survey of Egypt. Another set from the same district, but collected by Dr. John Ball, also of the Geological Survey of Egypt, was communicated quite recently by Prof. G. Schweinfurth in order that it might be included in the present article, the object of which is to register such species out of the two collections as are not yet recorded from the Marmarica, or at least the neighbourhood of Mirsa Matruk. Dr. Ball informs me that his plants came from an area situated between the coast (from a point about 5 km. west of the fort of Mirsa Matruk to Ras Allem Rum) and a line about 15 km. inland, and that they were collected in March, April, and May of 1903. The soil is mostly a calcareous loam. The term "Marmarica" is used here to cover the Egyptian littoral between Arab Bay and Bomba Bay, that is in the same sense as it is understood by Schweinfurth and Ascherson in their "Primitiae

Florae Marmaricae" (*Bull. Herb. Boissier*, i., 1893). The enumeration following below is intended merely as "addenda" to their valuable paper, and for convenience the form and arrangement there adopted is adhered to, as well as their abbreviations, viz. :—

S. & A.: Schweinfurth & Ascherson, Primitiae Florae Marmaricae, in *Bulletin de l'Herbier Boissier*, vol. i., pp. 433–449, 584–603, 644–682, t. xx.

A. & S.: Ascherson & Schweinfurth, Illustration de la Flore de l'Egypt, in *Mém. de l'Inst. Egypt*, vol. ii., pp. 25–260.

B.: Boissier, *Flora Orientalis*, vols. i.–v.

A at the end of the line indicates that the plant also occurs in Egypt; C, that it has been found in the Cyrenaica.

The species recorded for the first time from the Marmarica are marked with an asterisk (*).

Concerning the general conditions of the vegetation of the Marmarica, I would refer to the very interesting sketch of the phytogeography of the district in the first part of Schweinfurth and Ascherson's paper. Unfortunately there are no notes with either collection which would throw fresh light on the physiognomy or ecology of the vegetation. The additions are therefore of interest mainly in as far as they extend our knowledge of the constitution of the flora of the Marmarica.

***Roemeria dodecandra**, *Stapf*, var. (?) **laevis**, *Stapf* (var. nov.); a forma typica differt omnibus partibus praeter foliorum imorum bases glaberrimis, foliorum laciniis anguste linearibus, carpellis stigmatisque lobis 4–5. (Coll. *Hume.*)

A very striking form. Unfortunately the material is too meagre to decide the question of its status as species or variety. Schweinfurth and Ascherson indicate a doubtful specimen of *R. dodecandra* from Matruk; possibly it is the form described above.

Didesmus bipinnatus, *DC.*; S. & A. 594. (Coll. *Hume.*) C

This indicates a slight extension of the area of that species to the east, it not having been found, so far, beyond Tobruk.

Reboudia microcarpa, *Coss.*; S. & A. 681; A. & S. 40. Syn., *Erucaria microcarpa*, Boiss.; B., i., 366. (Coll. *Ball.*) C A

***Helianthemum vesicarium**, *Boiss.*; A. & S. 45; B., i., 445. (Coll. *Hume.*) C A

Silene villosa, *Forsk.*; A. & S. 46; B., i., 592. (Coll. *Hume.*) A

Also in Algeria.

Erodium gruinum, *Willd.*; S. & A. 599; A. & S. 54; B., i., 892. (Coll. *Hume.*) C A

Ononis sicula, *Guss.*; S. & A. 601; A. & S. 61; B., ii., 60. (Coll. *Ball.*) A

Trigonella stellata, *Forsk.*; S. & A. 602; A. & S. 61; B., ii., 85. (Coll. *Ball.*) A

*Trifolium resupinatum, *L.*; A. & S. 63; B., ii., 137. (Coll. *Hume.*) A

Probably an escape from cultivation. Also in Algeria.

Hippocrepis multisiliquosa, *L.*; S. & A. 603; A. & S. 65; B., ii., 185. (Coll. *Hume.*) C A

*Astragalus Forskalii, *Boiss.*; A. & S. 67; B., ii., 392. (Coll. *Hume.*) A

Not known, so far, west of Alexandria.

Ebenus Armitagei, *Schweinf. & Taub.*; S. & A. 615. (Coll. *Ball.*)

So far only known from a single locality in the small bay of Mirsa Badia, almost 200 km. to the west of Mirsa Matruk.

The occurrence of this *Ebenus* in the Marmarica is phytogeographically very interesting. The genus is entirely absent in Egypt and Syria, and the nearest congener is found in Crete. This, *E. cretica*, L., is at the same time more closely allied to *E. Armitagei* than any other species. One other species occurs in North Africa, viz., *E. pinnatus*, Desf., ranging from Morocco to Tunis; but this represents another type (section *Onobrychioides*, Jaub. & Spach).

Vicia sativa, *L.*, var. angustifolia, *Alef.*; S. & A. 646; A. & S. 68. Syn., *V. angustifolia*, All.; B., ii., 574. (Coll. *Hume.*) C A

*V. calcarata, *Desf.*; S. & A. 646; A. & S. 68; B., ii., 590. (Coll. *Hume.*) C A

A very narrow-leafed form, possibly identical with Boissier's variety *cinerea* (*V. cinerea*, M.B.), which is known from South Palestine and Tunis as the nearest localities.

Lathyrus Aphaca, *L.*; S. & A. 647; A. & S. 68; B., ii., 602. (Coll. *Hume.*) C A

L. Cicera, *L.*; S. & A. 647; A. & S. 69; B., ii., 605. (Coll. *Hume.*) C A

*Aizoon hispanicum, *L.*; A. & S. 78; B., ii., 765. (Coll. *Ball.*) A

The nearest locality to the west for this species is Sfax in Tunis.

Odontospermum pygmaeum, *O. Hoffm.*; A. & S., Suppl., 760, 798; S. & A. 652. Syn., *Asteriscus pygmaeus*, Cass. et Dur.; A. & S. 85; B., iii., 179. (Coll. *Ball.*) A

Also from Tunis to Morocco.

Gnaphalium luteo-album, *L.*; A. & S. 88; B., iii., 224. (Coll. *Hume.*) A

Subcosmopolitan.

Anthemis Ballii, *Stapf* (sp. nov.); affinis *A. microspermae*, Boiss. et Kotschy, sed foliis minus et arctius dentatis, receptaculo elongato, conico, acheniis distinctius costatis costis glandulosis diversa. (Coll. *Ball.*)

Herba annua, pumila, gracilis, 7 cm. alta, e basi pauci-ramosa, caulibus tenuibus purpurascentibus inferne parce superne densius

crispo-villosis. *Folia* linearia vel lineari-lanceolata, acuta, superiora integra, inferiora utrinque 2–3-dentato-lobata lobis approximatis ovatis mucronulatis, 5–7 mm. longa, 1·5–3 mm. lata, crassiuscula, villosula. *Pedunculi* graciles, apice nutantes neque incrassati, 1–1·5 cm. longi. *Involucrum* tenuiter lanoso-villosulum phyllis exterioribus ovato-lanceolatis acutis, interioribus gradatim longioribus obtusioribus, intimis ad 4 mm. longis obtusissimis late hyalino-marginatis. *Receptaculum* elongatum, conicum, 2–3 mm. longum, paleis oblanceolatis acutis subcarinatis hyalino-scariosis. *Ligulae* albae, elliptico-oblongae, circiter 8 mm. longae, femineae. *Achaenia* pallida obovoidea, apice rotundata, minute umbonata, calva, 8-costata, ad costas glandulosa.

This also resembles meagre specimens of *A. deserti, Boiss.*, from which it differs in the conical receptacle and much smaller achenes.

***Calendula aegyptiaca,** *Desf.*; A. & S. 92; B., iii., 419. (Coll. *Hume.*)
C A

Atractylis flava, *Desf.*; A. & S. 93; S. & A. 655; B., iii., 452. (Coll. *Ball.*)
C A

***Amberboa Lippii,** *DC.*; A. & S. 95; B., iii., 606. (Coll. *Hume.*)
A

Westward from Tunis to the Canaries.

A. crupinoides, *DC.*; S. & A. 656; A. & S. 95; B., iii., 606. (Coll. *Hume, Ball.*)
C A

Centaurea dimorpha, *Viv.*; A. & S. 96; S. & A. 656; B., iii., 692. (Coll. *Ball.*)
C A

Picris coronopifolia, *DC.*; A. & S. 99; S. & A. 657; B., iii., 740. (Coll. *Ball.*)
C A

Urospermum picroides, *Desf.*; S. & A. 657; A. & S. 99; B., iii., 743. (Coll. *Hume.*)

***Coris monspeliensis,** *L.*; A. & S. 103. (Coll. *Ball.*) A

This is generally a West Mediterranean plant and not taken up in Boissier's *Flora Orientalis.* Ascherson and Schweinfurth, l.c., quote it as very rare near Alexandria, this being the only record of the plant having been observed in Egypt; but there is also a specimen of it at Kew from Aucher Eloy's collection, numbered 2598, and written up as having been collected in Syria.

***Convolvulus arvensis,** *L.*; A. & S. 107; B., iv., 108. (Coll. *Hume.*)
A

Subcosmopolitan.

Cistanche lutea, *Hoffm. & Link.* Syn., *Phelipaea lutea,* S. & A. 661; A. & S. 118; B., iv., 500. (Coll. *Ball.*) A

Also throughout North-West Africa.

Salvia lanigera, *Poir.*; S. & A. 662; A. & S. 121. Syn., *S. controversa,* Ten.; B., iv., 630. (Coll. *Hume, Ball.*)
C A

Rumex vesicarius, *L.*; S. & A. 667; A. & S. 134; B., iv., 1017. (Coll. *Hume, Ball.*)
C A

Euphorbia Paralias, *L.*; S. & A. 668; A. & S. 138; B., iv., 1130 (Coll. *Hume.*) C A

Arisarum vulgare, *Targ. Tozz.*; S. & A. 669; A. & S. 146; B., v., 44. (Coll. *Hume.*) C A

***Ornithogalum tenuifolium**, *Guss.*, var. **trichophyllum**, *Boiss. et Heldr.*; A. & S. 151; B., v., 219. (Coll. *Hume.*) A

Found only once by Ehrenberg near Alexandria.

***Allium roseum**, *L.*, var. **Tourneuxii**, *Boiss.*; A. & S. 152; B., v., 274. (Coll. *Hume.*) A

Schweinfurth and Ascherson (Fl. Marm. 672) indicate under *Allium Erdelii*, Zucc., a barren specimen from Matruk collected by Roth and enumerated as *A. roseum*, v. *Tourneuxii*, in their *Illustration de la Flore d'Egypte*, p. 152. Dr. Hume's specimen is in flower, and there can be no doubt about its identity with the original of Boissier's variety *Tourneuxii*.

Trisetum Loeflingianum, *Beauv.*; S. & A. 674. (Coll. *Hume, Ball.*) A

Ascherson and Schweinfurth do not mention it in their *Illustration de la Flore d'Egypte*, but there are specimens at Kew collected by Figari near Alexandria and in the Thebais.

Koeleria phleoides, *Pers.*; S. & A. 675; A. & S. 172; B., v., 572. (Coll. *Hume.*) C A

* **Bromus scoparius**, *L.*, var. **stenantha**, *Stapf* (var. nov.); a forma typica differt spiculis ipsis et partibus earum omnibus angustioribus. (Coll. *Hume.*)

The typical form is known from the Cyrenaica and Northern Egypt, but has so far not been recorded from the Marmarica. The valves of the variety described here measure 10–11 mm. by 2·25–2·75 mm. (flattened out) and the tip above the insertion of the awn is frequently over 3 to 4 mm. long, whilst the awn varies from 10–15 mm. in length. We have, what appears to me, the same state from Cyprus (Sintenis and Rigo, 367) and Syria (Post, 160, 692, 695, 698).

Hordeum murinum, *L.*; S. & A. 677; A. & S. 179; B., v., 686. (Coll. *Hume.*) C A

LVII.—MISCELLANEOUS NOTES.

Sansevieria grandis.—A specimen of fibre has recently been submitted to Kew for determination and for a report as to its commercial value. It was accompanied by a few leaves, which were sufficient to identify it as *Sansevieria grandis*, Hook. f. The sender, Mr. H. L. Hall, General Merchant, etc., of "Riverside," Nelspruit, Transvaal, describes the plant as growing plentifully there, and remarks that the fibre sent was made up by the natives some time ago, but "as it is now winter and the dry season" (date of letter Aug. 3rd, 1907), the fibre in the leaf "is not as good as when gathered in the summer." Thus the uncertainty

as to the native country of this species (cf. *Botanical Magazine*, t. 7877, 1903, which is quoted below) is now removed, and one locality, at least, defined.

Nelspruit is situated approximately in 25° 30′ S. Lat. and 31° E. Long., in the Barberton District of the Transvaal, so that the original source of *S. grandis* may now be regarded as Subtropical Africa, although it is still possible that it may exist in some of the neighbouring Tropical areas. This is by no means unlikely when the cosmopolitan character of some of the species of *Sansevieria* in Africa is considered, and also the readiness with which the plant under consideration may be propagated.

The plant appears to be well established—if not wholly naturalized—in Cuba, and it is a matter of some uncertainty as to how it got there. It may be worthy of note, that the Portuguese settlements in Africa were closely associated with Cuba in the early days of its colonization by the Spaniards (from 1511 onwards). As the Spaniards increased in numbers the conquered West Indian aborigines, whom they employed, died out with extraordinary rapidity, and the introduction of the stronger African negroes was proposed to take their place at the mines and on the sugar plantations ; King Charles of Spain in 1577 authorizing their importation from the Portuguese African settlements. It is within the bounds of possibility that the company to whom the introduction is attributed, found the plant already there.

Sansevieria grandis was first described in the *Botanical Magazine*, and Sir Joseph Hooker's account is reproduced here ; this, together with the information supplied by Mr. Hall, will give the sum of all that appears to be known about this plant up to the present time.

"Stem, a stout Iris-like rhizome. Leaves, few, very large, rosulate, sessile, unequal-sized, the largest three to four feet long by six inches or more broad, spreading, obovate-oblong, acute or mucronate, rigidly coriaceous, flat, dull green, crossed by broad bands of much darker green on both surfaces, margin with a very narrow, red-brown, cartilaginous border. Scape about two feet high, stout, green, bearing a few distant, narrow, lanceolate sheaths. Panicle two to three feet high, erect, narrow, spiciform, dense-flowered. Bracts minute, ovate, acuminate, scarious, three-flowered. Flowers sessile, or very shortly pedicelled, erect, about two inches long, pure white. Perianth-tube cylindric, inflated at the base ; segments about as long as the tube, linear sub-acute, dorsally costate. Stamens as long as the perianth segments. Anthers linear-oblong. Style slender, stigma minute, capitate.

"This very noble species of 'Bowstring hemp' was presented to the Royal Gardens, Kew, in 1896, by the Royal Botanic Society, Regent's Park, who received it from Dr. Heath, F.L.S., of Ebury Street, London. Referring to that gentleman, he told me that roots of it were given to him by a Cuban merchant, who informed him that the plants had been introduced into Cuba by a company formed to grow it for its fibre, and that the company had failed, owing to the cultivation of the plant not having been carried out in a practical manner. The fibre, he adds, is fine, white, silky, and is of extraordinary strength, far exceeding any other, a few strands of it being sufficient to hang a man.

"Referring to the Kew Museum of Economic Botany, I was informed by Mr. Hillier that in the Cuban Catalogue of textile materials in the Paris Exhibition of 1900, there is the following brief allusion to what is no doubt, *S. grandis*, 'Il y a d'autres plantes textiles, comme la Lengua de Vaca, *Sansevieria sp.*' The term, Cow's tongue, appears to be appropriate to the form of the leaf of this species.

"Regarding the value of the fibre, a specimen of rope made from it, given me by Dr. Heath, was submitted by the Director of the Royal Gardens Kew, to Messrs. Ide & Christie, Fibre Brokers, of 72 Mark Lane, E.C., who report that, 'it is a good class fibre, much liked; its value to-day (September, 1902) is £35 per ton; but that it is not a regular article of commerce, only odd sample bales having been received in this country. The plant thrives in Cuba, but money is wanted to develop the industry.'

"It remains to add that its native country, though unknown, may be presumed to be tropical Africa, whence ten species have been described, of which six, including the present, have been figured in this Magazine.

"*Sansevieria grandis* forms a strong tuft in a bed in the Temperate House, where it flowered for the first time in July 1901."

This plant has since been propagated and distributed to various botanical centres in the Colonies.

J. H. H.

Elandsbontjes, or Intolwana, of Natal.—In the *Kew Bulletin* for September, 1887, p. 13, a brief reference was made to the root of this plant as a tanning material, specimens of which were exhibited in the Natal Court of the Colonial and Indian Exhibition, 1886, and more recently at the South African Exhibition, held in London during the early part of this year.

The plant (*Elephantorrhiza Burchellii*, Bth.) is described as a shrublet of annual growth 1–2 ft. high from perennial roots, which are very large and thick. All grazing animals, both wild and domestic, are said to be exceedingly fond of the plant, which is very common in grassy places between the Klipplaat and Zwartkey rivers, in the Zulu country, and also in the Cradock and Queenstown districts. The following analysis of a sample of the fresh root appeared in the *Natal Agricultural Journal and Mining Record* for May 24th last, p. 555.

Moisture	70·66 per cent
Ash	1·57 „
Soluble solids	15·53 „
Non-Tannin	8·16 „
Tannins	7·37 „

This, when calculated to that of the air-dried state with 12·5 per cent. of moisture, in which condition it would most probably be considered commercially, represents:

Total soluble extract	46·1 per cent.
Non-Tannins	24·5 „
Tannins	21·6 „

As Wattle bark contains 35 to 38 per cent. of tannins, the root is inferior in this respect and the greater difficulty in growing and harvesting it would also count against it as compared with the

handling of wattle bark. The extract, according to an Imperial Institute Report, is besides not in favour with tanners, owing to the undesirable colour it gives to leather.

J. M. H.

Botanical Magazine for September.—The plants figured are: *Aconitum Napellus*, Linn., var. *eminens*, Wirtgen; *Angraecum infundibulare*, Lindl.; *Podophyllum versipelle*, Hance; *Bigelovia graveolens*, A. Gray; and *Prunus Besseyi*, L. H. Bailey. The *Aconitum* is remarkable on account of the height to which it grows, usually reaching 7 ft., and sometimes exceeding 9 ft. The very large panicle of purplish-blue flowers is much larger than in typical *A. Napellus*; the flowers are more gaping and the helmet longer. Tubers of this handsome variety were collected in 1904 in the limestone zone of the Eifel Mountains, Rhenish Prussia, by Dr. Otto Stapf, who supplied the specimen figured from his own garden. *Angraecum infundibulare* is a Tropical African species, resembling in habit *A. Eichlerianum*, Kraenzl., but very distinct in the larger lip and the longer spur. The figure was prepared from a plant sent to Kew in 1903 by Mr. M. T. Dawe, Director of the Scientific and Forestry Department, Uganda. The species was originally found in Prince's Island, West Tropical Africa, by Barter, about the year 1858. Its next appearance was in 1904, when a plant—collected on the Victoria Nyanza, Uganda—flowered in the collection of Lord Rothschild, of Tring Park. Though growing in a locality separated by more than a thousand miles from Prince's Island, the Uganda specimens scarcely differ from Barter's, except in having rather broader leaves. *Podophyllum versipelle* was introduced into cultivation by Messrs. James Veitch & Sons through their collector, Mr. E. H. Wilson, who found it in the woods and ravines of Western China. Its flowers are deep crimson, about 1 in. long. *Bigelovia graveolens* is a shrubby North American Composite, growing from 1 to 6 ft. high or more, and bearing large clusters of bright yellow flower-heads. The Kew plant was obtained from the Rev. Canon Ellacombe, of Bitton, Gloucester. Trained on a wall at the north end of the Herbaceous Ground, it now covers a space of about 8 yards, and has passed safely through the last four winters without protection. *Prunus Besseyi* is one of the three dwarf Cherries of North America, known as "Sand Cherries." The others are *P. pumila*, Linn., and *P. cuneata*, Raf. They are very closely allied, and are probably only varieties of one species. *P. Besseyi* has fruits $\frac{3}{4}$ in. long, which are black when ripe. They are very variable in quality, having a flavour comparable to that of the Morello Cherry. The figure was prepared from a plant sent to Kew in 1900 by Prof. C. S. Sargent, of the Arnold Arboretum.

The Julianiaceae.—The complete and beautifully illustrated account of this new natural order, by Mr. W. B. Hemsley, has just been published in the Transactions of the Royal Society. Two genera, *Juliania* and *Orthopterygium*—containing four and one species respectively—are included in the order. Their distribution is somewhat remarkable, for the genus *Juliania* occurs only in Mexico, whilst Western Peru is the home of *Orthopterygium*. The paper deals fully with the history, distribution, and general

morphology of the various members of the order; and some interesting photographs of the *Juliania* trees, taken by Dr. Rose in Mexico, are reproduced in the text. All the representatives of this order are dioecious shrubs or small trees with pinnately-compound leaves, which are deciduous. The flowers are small and inconspicuous, the female particularly so, but the male are in catkins, not unlike those of an oak.

The curious samaroid or winged composite fruit is, however, the conspicuous and most characteristic features of the *Julianiaceae*. They are pendulous, frequently hanging in dense clusters, and the seed-vessel proper is borne at the upper end of the flattened wing-like stalk. The peculiar ovule is described in detail with numerous figures, and a note on the microscopic structure by Mr. Boodle is included. It is characterized by a remarkably large funicular appendage.

With regard to the affinities of the order, the closest relationships seem to be with the *Anacardiaceae* and *Cupuliferae*, and there are also certain points of resemblance to the *Juglandaceae*, but the absolute separation of the sexes, and the very great diversity of floral structure of the sexes—associated with pinnate leaves—offer a combination of characters probably without a parallel. The most natural position for the *Julianiaceae* appears to be between the *Juglandaceae* and the *Cupuliferae*.

The genus Sageretia in Africa.—In an interesting collection of Somaliland plants, received recently from Dr. R. E. Drake-Brockman through the Colonial Office, was a specimen of a Rhamnaceous plant which proved to belong to *Sageretia*—a genus, so far as we are aware, not recorded hitherto from Africa. The distribution of *Sageretia* as previously known was as follows:—Southern United States, Mexico, Central America, South America, China, India, Malaya, Afghanistan, Baluchistan, Persia, and Tropical Arabia.

Dr. Drake-Brockman's specimen (No. 389) belongs to the relatively glabrous form of *Sageretia Brandrethiana* described by Boissier, *Fl. Orient.*, vol. ii., p. 22, and mentioned by Brandis, *Indian Trees*, p. 174, who suggests that *S. Brandrethiana* should possibly be united with *S. theezans*, a point which must be left to a monographer of the genus.

Yemen specimens of the glabrous form of *S. Brandrethiana* were described by Deflers, *Voy. Yemen*, p. 123, as a new species of *Berchemia*, *B. yemensis*, which Deflers, however, recognized as differing from its supposed congeners by having persistent stipules and flattened, orbicular seeds.

The same form of *S. Brandrethiana* has been collected in the Italian colony of Eritrea, by Schweinfurth and Riva, No. 1,207, and was distributed as *Berchemia yemensis*.

The most important distinction between *Berchemia* and *Sageretia* seems to be that the former has a 2-celled endocarp, the latter 2 or 3 pyrenes. The pyrenes of *Sageretia* are described as indehiscent in Bentham and Hooker f., *Genera Plantarum*, Boissier, *Flora Orientalis*, Engler and Prantl, *Pflanzen-familien* and elsewhere; but the writer has found that they dehisce by

a median longitudinal slit on the inner face, at all events in *S. Brandrethiana*; the specimens examined were Schweinfurth and Riva, No. 1207, from Eritrea, and Stocks, No. 861, from Baluchistan.

It may be useful to give the more important references to and distribution of *S. Brandrethiana.*

SAGERETIA BRANDRETHIANA, Aitch. in Journ. Linn. Soc. vol. viii. pp. 56, 62; Boiss. Fl. Or. vol. ii. p. 22; Brandis, For. Fl. p. 95; Lawson in Hook. f. Fl. Brit. Ind. vol. i. p. 642; Brandis, Indian Trees, p. 173. *Sageretia* sp., Aitch. in Journ. Linn. Soc. vol. xviii. p. 41. *Berchemia yemensis*, Deflers. Voy. Yemen, p. 123.

ERITREA. Saganeiti, 2200 m., *Schweinfurth and Riva*, 1207.

BRITISH SOMALILAND. *Drake-Brockman*, 389.

It occurs also in Southern Arabia, Southern Persia, Baluchistan, Afghanistan, Sind, Punjab and the outer hills of Kashmir.

T. A. S.

Calabash Tobacco Pipes.—A short note on Calabash pipes was published on p. 29 of the *Kew Bulletin* for this year. The following information, communicated by Professor H. H. W. Pearson (dated Cape Town, June 30th, 1907), regarding the cultivation and preparation of the Pipe Calabash in Cape Colony, forms an interesting supplement to the former note:

"The cultivation is carried on in various parts of the Colony. In the Robertson district, situated near the line which separates the summer and winter rainfall areas, the seed is sown in late August and September. The most suitable soil for the purpose is alluvium, rendered porous by the admixture of lime. The plants are watered once a week, but otherwise require little attention. The fruits are produced from December to May.

"The curve of the stalk-end of the fruit, from which the pipe is made, is produced naturally; but, if necessary, it is increased by subjecting the fruit to longitudinal pressure when it is half-grown. This is accomplished either by standing it in an erect position, so that its weight is borne by the stalk-end, or by a suitable arrangement of stones placed in contact with its lower half as it lies prone on the ground.

"As it ripens, the green colour of the fruit changes to a light yellow. After cutting, it is dried in the sun, and either the whole fruit, or only the lower half of it, is sent to the manufacturer.

"The process of manufacture appears to be very simple. After being cut to its proper size, the future pipe-bowl is boiled and the softened skin afterwards removed by scraping. The 'scraper' used in this operation is sometimes—and perhaps always—glass. The surface is then polished. It now only remains to furnish the prepared 'Calabash' with a fire-proof lining—tin in earlier days, now a clay product—and a mouthpiece and a pipe is produced whose capacity is well suited to the bulky Transvaal tobacco, and whose lightness recommends it to every smoker.

"The 'Calabash' is put to further uses in domestic affairs, in the form of water-bottles, flower-pots, ladles, &c."

We understand that Calabash tobacco pipes are now on sale in this country.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] [1907.

LVIII.—THE GUMS AMMONIAC OF MOROCCO AND THE CYRENAICA.

(*Ferula communis*, L., var. *brevifolia*, Mariz; *Ferula marmarica*, Aschers. and Taub.)

OTTO STAPF.

The origin of the Gum Ammoniac of Morocco has, in spite of repeated attempts to clear it up, remained doubtful. On Lindley's authority it is very generally accepted as the resin of *Ferula tingitana*; but Battandier * suggested already in 1889 that it was the produce of a form of *Ferula communis* which he called "*β gummifera*," and later Simmonds † came to a similar conclusion. Further, in 1892, Sir Joseph Hooker ‡ pointed to *Ferula Linkii* as the probable source of the gum. He was led to this assumption by some specimens, then in cultivation at Kew, of a *Ferula* which had been received from Morocco as representing the mother plant of the gum ammoniac; but as those specimens had not then flowered, an exact determination was not possible. They did so, however, before the year was over, and a drawing was made, which has been reproduced quite recently in the *Botanical Magazine*, tab. 8157. With its identification as a form of *Ferula communis*, the question as to the botany of the Morocco gum ammoniac is settled, and it is now possible to give a fairly complete account of the history of the drug. The early history of this gum, however, has been so obscure up to the present time that it will be necessary to deal first with its most recent phase. Having done that we shall be in a better position to interpret the very meagre accounts of earlier authors, and the relationship of the Morocco drug to the once so highly reputed Ammoniakon of Dioscorides.

---

* Battandier in Battandier and Trabut, Flore de l'Algérie, vol. i. p. 367.
† Simmonds in Amer. Journ. of Pharm. 1891, p. 76.
‡ Hooker fil. in Bot. Mag. tab. 7267.

1375 Wt 87 10/07 D & S 29 30018

Recent History (from the beginning of the 19th century) of the Gum Ammoniac of Morocco.

The first to call attention to the gum ammoniac of Morocco as a distinct drug was J. G. Jackson, in his "Account of the Empire of Morocco," published in 1809. In a second edition, published in 1814, the following account occurs on p. 136: "*Ammoniacum*, called *Feshook* in Arabic, is produced from a plant similar to the European fennel, but much larger. In most of the plains of the interior, and particularly about El Araiche, and M'sharrah Rummellah,* it grows ten feet high. The Gum Ammoniac is procured by incisions in the branches, which, when pricked, emit a lacteous, glutinous juice, which being hardened by the heat of the sun, falls on the ground, and mixes with the red earth below: hence the reason that Gum Ammoniac of Barbary does not suit the London market. It might, however, with a little trouble, be procured perfectly pure, by spreading mats under the shrubs to receive the gum as it falls. The gum in the above mentioned state, is used in all parts of the country for cataplasms and fumigations. The sandy light soil which produces the Gum Ammoniac abounds in the north of Morocco. It is remarkable that neither bird nor beast is seen where this plant grows, the vulture only excepted. It is, however, attacked by a beetle having a long horn proceeding from its nose, with which it perforates the plant and makes the incisions whence the gum oozes out." This description is accompanied by two plates, one representing a leaf (or portion of a leaf), and a fragment of the stem, whilst the other shows the insect† connected with the production of the resin.

Sprengel in his *Species Umbelliferarum minus cognitae* (1818), p. 88, ventured to refer Jackson's plant to *Ferula orientalis*, "although Jackson's figure is not perfect." Twenty years later the plant was met with again by Lieut. Washington, R.N., who mentions it repeatedly in his diary of a journey from Tangier to the City of Morocco and back.‡ Thus, on page 127, he records "plants like fennel, called el clagh (gum ammoniac)" from the country to the south-west of El Ksar, and "a forest of el clagh (gum ammoniac); some plants ten feet high, stem five inches thick," from the narrow strip of land between Murja Ras ed Dowra and the sea. Then again on p. 151, he mentions "that gigantic annual also, the gum ammoniac plant, like fennel, already putting forth its shoots and feathery leaves," in the plains

---

* East of the lake Murja Ras ed Dowra.

† Jackson calls the insect 'Dibben Fashook.' Dr. Charles Waterhouse informs me that it has not yet been identified. He believes it, however, to be a carpenter bee (*Xylocopa*). Mr. Horace P. White (*see* p. 379) made efforts to obtain the insect, but writes that it has not been observed on the gum ammoniac plants near Rabat. Jackson's account of the insect reads very like that by Aitchison concerning the puncturing of *Dorema* by boring beetles and the subsequent exudation of resin. Other *Umbelliferae* are also attacked in this way, but though the flow of the resin may be stimulated by the boring of those insects, its production of course does not depend on their presence. Any wound, as for instance one caused by tapping, would have the same effect.

‡ Washington in Journ. Geogr. Soc. I., 1830.

between Wādi Umer Rebia and F'dalah. The first two observations are dated 14th and 15th of November, and 16th of November respectively, the last January 15th to 21st.

Lindley accepted Sprengel's identification of the plant yielding the gum ammoniac of Morocco. In *Flora Medica* (1838), p. 46, he says in a note on *Ferula orientalis*: "What is supposed to be this plant yields in the State of Marocco a gum resin similar to Ammoniacum; whence it has been thought to be really the origin of that substance, and I think with good reason, so far as the drug of Dioscorides is concerned"; and in 1846 he repeats this view in his *Vegetable Kingdom* (ed. I., p. 776): "*Ferula orientalis*, which still furnishes a drug of the kind (*i.e.*, of Gumm ammoniac) in the Kingdom of Marocco." The same passage also occurs in the third edition of the *Vegetable Kingdom*, published in 1853; but in the same year, Pereira, in his *Materia Medica* (vol. III., p. 1715) inserted a note by Lindley—here reproduced—in which the mother plant of gum ammoniac is referred to as *Ferula tingitana*:—"I am indebted to Dr. Lindley for a fine sample of African Ammoniacum (Ἀμμωνιακόν, Diosc.). It was sent by W. D. Hay, Esq., the British Consul at Tangier, to the Hon. W. T. Fox Strangways, and is marked, 'Gumm Ammoniac or Fusògh, Tangier, 17 June, 1839, J. W. D. H.' It is an oblong piece, about three inches long, and one-and-a-half inches thick, and broad. Its weight is about 830 grains. Externally it is irregular and uneven, and has a dirty appearance, similar to what ammoniacum would acquire from repeated handling and long exposure to the air in a dusty situation. It is partially covered with paper. A few pieces of reddish chalky earth (which effervesces with acids) are found sticking to it, thus confirming the account given of it by Jackson, though the quantity of this on my specimen is not sufficient to affect in any way the saleability of it. It appears to be made up of agglutinated tears, like the lump Persian ammoniacum. Internally it has very much the appearance of lump ammoniacum, but is not so white, but has a brownish, reddish, and in some places a faint bluish tint. Its odour is very faint, and not at all like Persian ammoniacum. Heated on the point of a knife, its distinction from Persian ammoniacum is very obvious. Its taste is also much slighter than that of the commercial ammoniacum. Rubbed with water, it forms an emulsion like the latter. It is the produce of *Ferula tingitana* (Lindley)."

What may have induced Lindley to change his opinion is not quite clear, unless he had found out that *Ferula orientalis* was not a native of North Africa, whilst *Ferula tingitana* was indigenous in Morocco, and in fact was, at that time, the only species of *Ferula* known from that country; but then Jackson's figure of the Fashook plant should have been sufficient to make this identification at least highly doubtful. However that may be, Lindley's last view has been adopted by most subsequent writers.

Meanwhile Hanbury* had on several occasions received samples of Morocco gum ammoniac, some of which had been

* Hanbury in Journ. Pharm. Soc., March 22nd, 1873, p. 741; Science Papers, pp. 375–379.

imported from Mogador, and having enlisted the services of his friend Dr. Leared, he ascertained through him the following particulars* : "The plant is called *Kelth*, and grows up rapidly after the first rains. Its gum is not much shipped to Europe, but a great deal of it is taken by pilgrims to Egypt and Mecca, where it is used as incense. Its chief shipping port is Mazagan ; a little is sent from Mogador, but none from other ports. The *Greatham Hall*, the vessel in which Dr. Leared embarked, took on board 25 serons of the gum at Mazagan for Gibraltar, where they were to be reshipped for Alexandria. The shippers call it *Fasoy*." Dr. Leared also procured rootstocks of the plant for the Botanic Gardens at Kew and Regent's Park, but they did not grow.† In his book "Marocco and the Moors" (1876), Leared also mentions (p. 356) the plant, and says that he was informed that the Fashook plant grows at a place two days' journey from Mogador, on the road to the city of Morocco. Referring to this statement Sir Joseph Hooker,‡ however, remarks : "We, on the other hand, were persistently assured that it grew nowhere along that route, nor nearer to it than El Araiche, north of Marocco city. And this is confirmed by information obtained by Mr. R. Drummond Hay to the effect that it is found near Marocco, and chiefly around Tedla. The Moors who gave us this information at once recognised the figure by Jackson, and called the plant Kilch (Kelth according to Leared)."

Dr. Leared's account is of so great interest that it has seemed worth while to reprint it almost in full. In the second edition of his book (1891), p. 345, he refers to the gum as follows :— "FASHOOK — *Ferula* species — Gum ammoniac. Called Fasoy by the European merchants and Kelth by the Moors. It is abundant in Woled Bu Sba, two days' journey from Mogador, on the road to the city of Marocco. It grows very quickly after the first autumnal rain. A stalk obtained at Mogador was one inch and a quarter in diameter. Before parting with it the Moor broke off a portion, intending, as he said, to fumigate his sore eyes. Some roots procured by Signor R. Elmaleh were of the size and shape of carrots, of a blackish-brown colour, and studded over with numerous warty projections. When broken they exuded drops of milky juice which formed yellowish-white opaque tears. The taste of this gum resin was slightly bitter, with considerable acidity. A single fennel-like leaf accompanied the roots—it was evidently the leaf of an umbelliferous plant. It was found that the taste of this gum resin differed from that of a specimen of African Ammoniacum in the museum of the Pharmaceutical Society. . . . It seems probable, therefore, that African Ammoniacum is produced by more than one species. . . . On account of its adhesiveness the gum is used by the Moors as a depilatory. The seed when heated over a fire until it becomes glutinous is used as an application in skin diseases. Very little ammoniacum is sent to Europe. It is chiefly shipped from Mazagan to Gibraltar for reshipment to Alexandria ; a little is sent from Mogador, and none from the other ports. . . . The

* Hanbury, Science Papers, l.c.p. 377.
† Bentley & Trimen, Med. Plants, 1880, sub no. 129.
‡ Hooker & Ball, Marocco and the Great Atlas, 1878, p. 386.

Arabian physician Serapion, writing at the commencement of the ninth century, mentions two kinds of ammoniacum, the best sort of which was produced from the root of a plant found in Crete, and an inferior kind of which he says: 'Sed illud quid continet terram et lapides, nominat chironia et defertur a terrâ quae dicitur Monacon et est succus plantae, simili plantae galbani in similitudine suâ et nascit ibi.' This description agrees with the present Marocco product, and Monacon may be an early name for that country. It is observable that Serapion calls ammoniacum 'raxach.'* . . ." That Leared had in view the same plant as Jackson is evident from the specimen which, in 1875 (?), he communicated to D. Hanbury, and which is still preserved in the herbarium of the Pharmaceutical Society. It consists of a leaf, and may be the very one mentioned by Leared as having been with the root which Signor R. Elmaleh acquired. On the other hand it is quite true that otherwise the *Ferula* has never been recorded from or collected in the district Woled Bu Sba, which is traversed by the much frequented road from Mogador to Morocco City (Marakesh).

In 1884 another attempt was made to introduce the plant into Kew, Mr. Horace P. White having kindly sent rootstocks of the plant obtained from near Rabat. They were placed in the succulent house, but seem to have soon been lost sight of. Later in the same year Mr. White communicated a dried specimen with mature fruits also from Rabat, but they do not seem to have germinated. Mr. George P. Hunot, British Vice-Consul at Saffi, was, however, more fortunate, for he succeeded at last in sending rootstocks to Kew which were vigorous enough to strike. They arrived in January, 1886, and year after year threw up fine tufts of leaves, until in December, 1892, one of the plants flowered. It had stood outside in the sun for a few weeks in the summer, and it is this plant which forms the subject of plate 8157 of the *Botanical Magazine*. It will be useful to add here some passages from Mr. Hunot's letters to Sir W. T. Thiselton-Dyer, referring to the plant under consideration.—Letter dated Saffi, October 30, 1885: "On my return, however, I sent a Jew to the district where the gum is produced, and he has brought me two roots which I am forwarding by steamer for you. If this is the right kind, then you may be sure that large quantities of gum could be produced, as the tree grows in many places. I have lots on my own grounds that come up annually and produce large stems; in the hot season you can distinguish gum on the stems when they begin to dry. But the gum is secured by the Arabs by digging around the roots of the trees in the hot season, and piercing them, when the gum oozes out of the trees near or where the incision is made." Letter dated April 1, 1886 (referring to a sample of gum, bought at the City of Morocco): "You will see that the Arabs take no care in gathering it. They make an incision in the root, which they previously uncover, and in the great heat the gum oozes out, but gets mixed with dirt, as

---

* Leared's quotation from Serapion is not quite correct. I am not aware that he mentions Crete as the country whence the best ammoniacum comes, and as to Monacon, this is no doubt a corruption of Ammoniacum. I shall have to revert to Serapion's account in another place.

generally during hot weather there is a strong wind blowing. You will find it therefore mixed with dirt, but that is the state of the gum as a rule when sold." On January 6, 1887, he once more reverts to the subject: "The Fassook in this country commences to grow and push forward leaves in the latter part of November or early in December, and dies apparently in the latter end of August, leaving the canes of 7–8 feet in height dry with seed on them. In December again the same root pushes out leaves and commences to blossom about April."

To summarise briefly the information brought together in the preceding paragraphs, it is evident that a *Ferula* occurs in Western Morocco from the Wad el Kos, the river of El Araiche, to the Wad Ummer Rebia, and possibly still farther south. From this plant, when mature, a gum resin, known as gum ammoniac of Morocco, is obtained, which exudes either from the wounds caused by the boring of certain insects or by the tapping of the collectors. The resin is used in Morocco both medicinally and for fumigations, and is also exported to Egypt and Arabia, mainly from Mazagan. The vernacular names are given as Fashook (also spelt Feshook, Fasshook, Fasook), El clagh, Kelth, and Kilch.

Early History of the Gum Ammoniac of Morocco.

The vernacular names quoted in the preceding paragraph may be reduced to two, namely :—Fashook and K'lakh. The other ways of spelling are either due to dialectal variations or to different and no doubt in some cases faulty transliteration. From a note on Mr. White's letter of June 3, 1885, we learn that Fashook is really the name of the gum, while the plant itself is called K'lakh. Now, in the work of Ebn Baitar*, a Spanish Moor who wrote in the thirteenth century, the following information is given under Kalh; "Kalh-*Ferula communis*. This plant is called El-Kinnat by the peoples of Andalusia, which name I have already mentioned under the letter Kaf. With the Egyptians this word designates gum ammoniac, with which I have dealt under letter A under the word Oschak." El Kinnat is evidently the Kana, of which Ebn Baitar says†: "Kana-*Ferula communis*. This plant is known by the name El Kalch in *Western Afrika*, and the Greeks call it Nardex." Of Oshak, however, he says‡: "Oschak Gummi Ammoniacum. This gum is also called Oschadsch and Woschak§ and Lizak el dsalab, Chrysocolla." There is no doubt that the K'lakh (c'lagh, Kilch, Kelth) of the Moors of to-day is identical with the Kalh (Kalch) of Ebn Baitar, just as the modern Fashook corresponds to his Woshack (Washack, Oschak). Thus it is evident that the gum ammoniac plant of Morocco and its gum resin were known in Morocco at least six hundred years ago under the names which they still bear. The name Kana is preserved in the Spanish Canaheijo (giant cana), the common modern name for *Ferula communis*. Ebn Baitar does not say explicitly that the Egyptians of his day

---

* Ebn Baithar, Grosse Zusammenstellung der Heil-und Nahrungsmittel. Übersetzt bei J. V. Sontheimer, ii., p. 388.

† Ebn Baithar, l.c. ii., p. 326.

‡ Ebn Baithar, l.c. i., p. 48.

§ In the index Waschak stands for Woschak.

imported the gum from Morocco or "Western" Africa, but he was evidently convinced that their Kalch and Oschak was identical with the El Kalch and Cana of West Africa, which must have been familiar to him. As *Ferula communis* does not occur in Egypt and no form of it is known to produce gum resin in quantity nearer than Morocco and the adjacent districts of South-Western Algeria, the inference is suggested that a trade in Fashook gum from Morocco to Egypt existed in the middle ages. This is the more probable when it is remembered how close were the relations between North-Western Africa and the eastern centres of Islam after the conquest of Mauretania by the Arabs.

But it does not necessarily follow that all the Oshak which reached Egypt and, through Egypt, Europe, came from Morocco, nor that the terms Oshak and Kalch applied originally to the Morocco article. It has indeed been suggested that the African ammoniacum first mentioned by Dioscorides was very early supplanted by the Persian ammoniacum, the resin of *Dorema ammoniacum*, and that the Arab translators and commentators of Dioscorides, being partly Persians themselves, erroneously extended the Persian vernacular Ushaq to the African ammoniacum, including that of Dioscorides. This leads to the question as to what was the ammoniacum of Dioscorides.

The Ammoniakon of Dioscorides.

This is what Dioscorides says of his Ammoniakon, omitting the purely therapeutical part :—"Ammoniakon [is a herb from which the ammonian incense is gathered ; some call it agasyllon, some criotheon, or heliustrum, and the Romans gutta] : and this is the latex of a Ferula which grows in the Cyrenaica. The whole plant, including the root, is termed agasyllis. To be approved it should be of good colour, free of wood particles and stonelets, resembling tears of incense, pure and dense, free of impurities, smelling somewhat like castoreum and bitter of taste. This kind goes by the name of *thrausma* (fragments, analogous to the 'ammoniacum in lachrymis' or tears of modern pharmacopoeias), whilst the other, which contains particles of soil and stonelets, is called *phyrama* (cake, 'analogous to the ammoniacum in placentis seu massis, or 'lump ammoniacum '). It is produced in Libya in the neighbourhood of the Ammon temple, and is the latex of a tree ferula. It is a mollient, epispastic and calefacient, and a diaphoretic for hard and soft tumours. . . ." The above translation is from Sprengel's edition of Dioscorides, vol. I., p. 439. The paragraph agrees in all essential points with the text in the so-called *Codex Vindobonensis* (C), where it is accompanied by a somewhat crude, but characteristic, figure (tab. 46). This throws much light on the plant which Dioscorides, or at least his interpreters up to the beginning of the 6th century, had in view under the name of ammoniakon. It represents a whole plant with four basal leaves, four short, racemosely arranged flowering branches supported by inflated sheaths and a terminal inflorescence. The leaves are about half as long as the flowering stem, and each possesses three pairs of opposite segments of the first order ; these segments are themselves bipinnati-partite and ovate in outline ; the segments of the last (third) order are laciniate with few very short, divaricate lobes. The large, inflated sheaths or spathes at the base

of the branches bear reduced blades resembling the terminal segment of the ground leaves. Each of the flowering branches has a similar but smaller spathe on the side facing the stem. The compound umbels, evidently in the first stage of flowering, are much contracted and compact, and supported at the base by a few minute subulate or linear leaflets. It is clear that the figure represents a *Ferula*, and also that it cannot be *F. tingitana*, in which the ultimate leaf segments are much broader. Nor can it be the ordinary *Ferula communis*, which has very much longer and finer laciniae. It might represent the variety *brevifolia* of *F. communis* but for the less delicate and less numerous laciniae. *F. tingitana* and *F. communis* have been collected in the Cyrenaica; but there is a third species recorded from the Cyrenaica, namely, *F. marmarica*, Aschers. and Taub., which was discovered by Dr. P. Taubert in 1887, near Bomba, about 160 km. to the east of ancient Cyrene, and also by Dr. G. Schweinfurth at Badia. It is not well known and there are no specimens of it at Kew.

Dr. Schweinfurth was, however, kind enough to send me his material, consisting of leaves and young inflorescences, while Mr. W. Barbey and Mr. G. Beauverd courteously lent me some infructescences, collected by Dr. Taubert and preserved in the Herbarium Boissier. The former was particularly valuable, as it represents the plant in exactly the stage in which the ammoniakon of the *Codex Vindobonensis* is drawn. Holding the Badia plant and the plate in the *Codex* side by side, one is struck at once by their remarkable resemblance, although the leaves, in the picture, come out much less "compound." Indeed, as far as the figures of the *Codex Vindobonensis* go—and many of them, in spite of a certain crudeness, are very true—that of the ammoniakon, if it is intended for *F. marmarica*, may be pronounced as one of the best. There is, moreover, some circumstantial evidence for the theory of the identity of *F. marmarica* and Dioscorides' ammoniakon plant. Taubert†, in his account of an excursion to the western Marmarica, describes the appearance of *F. marmarica* near Bomba and the use to which it is put, in this way: "The most characteristic plant of this stony littoral plain is a *Ferula*, subsequently recognised as a new species (*F. marmarica*, Aschers. & Taub.), of which I had already seen ball-shaped masses rolling before the wind on the sandy shore after the fashion of 'wind-witches.' It was only after prolonged searching that I found a few specimens of it still standing in their places with some dried up leaves and young fruits‡, and, by their habit, reminding me very much of Drias (*Thapsia garganica*). Whence came then the numerous loose specimens, found on the shore, of a plant so rarely met with *in situ?* The mystery was solved when I came across a soldier who was busy collecting a resin which exuded from thick roots cut close to the ground and emitting a strong umbelliferous odour. My suspicion that they belonged to the *Ferula* was confirmed by the man, and I was told that the soldiers of Bomba and the few Bedouins that live there cut the plant—which is said to be more common farther eastward

† Taubert in Bull. Herb. Boissier, v. i., p. 447.
‡ The observation was made on June 4th.

—at the rootstock soon after flowering and cover it in with a sort of roof made of flat stones. Then they return after a while to gather the copiously exuding resin, which is at first of a bright and afterwards of a dirty yellow. It burns readily, leaving behind a not unpleasant smell; it serves for lighting fires and, made into candles, as a very poor illuminant. It is also a reputed medicine, but unfortunately I was unable to learn of its application. . . . Under the name of '*fassúch*' it is an article of trade and is sent far, as, for instance, to Derna." The eastward distribution of the plant is confirmed by Dr. Schweinfurth's discovery of the plant at Badia, about 100 km. east of Bomba, where it was just beginning to flower on the 10th of March,* and was known by the Arabic name of Kalch. In connection with Taubert's account of the tapping of the root, I would refer in this place to a passage in Serapion's paragraph on ammoniakon,† where he says "on the authority of Dioscorides" :—" Hec herba grece dicitur asios *cuius radix vulneratur egreditur lachrymus qui colligitur et servatur.*" The gum obtained in the manner described by Taubert would no doubt be of the "phyrama" kind (ammoniacum in placentis). It is apparently at present quite unknown in Europe and has, of course, never been analysed. There were, however, a few small drops of resin on the dry infructescences in the Herbarium Boissier such as would be classed as 'thrausma' (ammoniacum in lachrymis). They were of a deep yellow colour resembling amber. I tasted one half of one of them and burnt the other. The taste was moderately bitter without any subsequent addition of acridity, whilst the odour was decidedly stronger and pleasanter than that of burning Morocco Fashook.

Thus we still have in the Cyrenaica, the home of the Ammoniakon of Dioscorides, a *Ferula* very much resembling, if not identical with, Dioscorides' plant and producing a gum resin of the same kind as that described by him. The plant and its product go by the same name as the Morocco *Ferula* and its gum resin, Kalch and Fashook. There is, therefore, no reason to doubt the correctness of Dioscorides' account. The destructive method of tapping may have contributed much to the reduction of the area of his ammoniakon. It has, for instance, not been observed by recent explorers in the neighbourhood of the site of the old Ammon temple, where, almost more than anywhere else, it must have been exposed to the danger of extirpation by the gum collector. At the time when Ebn Baitar wrote, the Cyrenaica formed part of the Egyptian Ayyubi caliphate, and the "Egyptians" of whom he says that they designate gum ammoniac by the name Kalch which is also Ushaq, no doubt meant rather the Cyrenaican than the Moroccan gum although it is, of course, quite possible that they also received a certain quantity of the latter without distinguishing clearly between them. It appears therefore that the terms Kalch and Ushaq (Fashook) became *nomina generica* at a very early date, just as the name gum ammoniacum is used at the present day for at least three distinct umbelliferous gum resins.

---

* Schweinfurth and Ascherson, Primitiae Florae Marmaricae, in Bull. Herb. Boiss. vol. I. pp. 442, 649.

† Ortus Sanitatis, Matthaei Silvatici (1511), cap. xlv., and Liber Serapionis Agregatus, transl. Symon and Januensis (1473), cap. 254 (in contracted Latin).

Origin of the vernacular Names.

If the names Kalch and Ushaq (Fashook) were *nomina generica* as early as the beginning of the 13th century, where did they originate and what was their original meaning? To answer this question the assistance of the linguist has, of course, to be called in, but up to a certain point the botanist is able to prepare the way. We find the name Kalch—i.e., the name of the plant already mentioned in Ebn al Awwâm's 'Book of Agriculture'*—(10th to 12th century) and in Assaf's (the Jew's) list† of medicines (10th or 11th century). In the latter it occurs as an Aramaic name and synonym of Ammoniakon. As the Aramaic language was already dying out at the time when Assaf wrote, we may assume that its origin lies much further back. Löw interpretes Kalch as 'cava arundo,' so that its application to ammoniacum-yielding Ferulas is a parallel to that of Kana (canna arundo), both being descriptive of the full-grown stems of those Ferulas. The term Kalch takes us back therefore to one of the oldest members of the Semitic languages, and there can be little doubt that it was in use for the Cyrenaic ammoniacum plant long before it found its way into Morocco with the Arab conquerors. With the tenacity which characterises vernaculars connected with oriental folklore it has survived not only in Morocco and the Cyrenaica, but also further east on the frontier of Egypt and Syria where Ascherson found this name applied to a third species of *Ferula*, possibly *F. sinaitica*. As to Fashook, I have already stated that it is evidently only a slight variation of the Arabic Ushuq or Ushaq which appears as Woshak and Washak with early writers. The first authors to mention it are probably Honain Ben Isaháq (9th century) and Mazargawaih or Mohammed Ben Zakaria (9th to 10th century), both quoted by Ebn Baitar.‡ Then we find it in the 10th century with Mowafik§ in his *Liber Fundamentorum* (about 975), and after that with practically all the Arabic writers. Through Serapion the younger, a contemporary of Ebn Baitar, (13th century) it found its way into the books of the school of Salerno‖ and into Matthioli's commentary of Dioscorides. In the former it occurs as "vasac" or "fasaac (fasac)" and in the latter as "raxach seu assach" or "assac"; "raxach" being obviously a misreading for "vaxach." I cannot venture to discuss the etymology of Ushaq and its variations; but I may perhaps be permitted to call attention to the following fact. Dioscorides calls the plant, according to the *Codex Vindobonensis* (C) and the usual editions of his *Materia Medica*, Agasyllon or Agasyllis, a name which has, so far as I know, not been explained, nor can it be connected with one of the vernaculars which subsequently came into use. Serapion, however, who most probably knew another version

---

* *See* Löw, Aram. Pflanzennamen, p. 340.
† *See* Löw, l.c. p. 25, 340.
‡ Ebn Baithar, l c.
§ Mowafik, Liber Fundamentorum, Ed. Seligmann, p. 35; ed. Achundow, p. 154.
‖ e.g. Ortus Sanitatis, ed. Mentz, 1485, cap. xliii; ed. Jac. Meydenbach, Moguntiae, 1491, cap. xlv; ed. Matthaei Silvatici, 1511, cap. xlv.
¶ Matthioli, Comment. Dioscor., ed. 1565, p. 803.

of Dioscorides' work, says, as already quoted (p. 383) "auctoritate Dioscoridis" :—"hec herba grece dicitur *asios* . . ." Cannot the grecianised Asios and the Arabic Assac or Assach (Ushaq) have the same derivation from some libyan or old semitic vernacular, then in use in the home of the Cyrenaic ammoniacum plant?

It is frequently stated that Ushaq was originally the Persian name for the gum resin of *Dorema ammoniacum*, and erroneously transferred to the Ammoniakon of Dioscorides by the early Arabic writers, some of whom were Persians. Dymock * especially assumed that Mowafik (about 975 A.D.) in his paragraph on Ushaq meant the Persian and not the African drug. It is true that Seligmann in his translation of Mowafik's *Liber Fundamentorum* (p. 35) quotes under gummi ammoniacum : "Nota marg. Wesche, persice idem"; but Achundow has it not. It may be a later addition and mean no more than that the Persians call Dioscorides' gum ammoniac Wesche. There is otherwise nothing in Mowafik's paragraph which would suggest that he meant by Ushaq the Persian gum ammoniac. On the contrary, he adds "vocatur a Graecis afarikun" (African), which remark would certainly have challenged an explanation if he had had the Persian article in his mind. Nor is there in the later Arab writers any definite reference to a *Persian* Ushaq, and it appears to me more probable that the Persian Pharmacopoeias transferred the name Ushaq from the Arab literature to their own ammoniacum plant, the *Dorema ammoniacum*. The Ulfaz Udwiyeh of Mohammed el Shirazi (about 1450) has (no. 160) actually Ushuck as an Arabic name, whilst the Persian equivalent is given as 'Se-mugh te-rá-tees' and 'Se-mugh bil she-reen.' It is true, the same book mentions later on (no. 1134) derukht ushuk as the Persian name of the tree which produces the gum ammoniac, but this means simply Ushuk tree, 'derukht' (daracht) being Persian for tree.

Export.

The Ammoniakon of Dioscorides, Plinius and the later writers up to the conquest of the Cyrenaica by the Arabs, came no doubt from the ports of the Cyrenaica such as Darnis (Derna), Platea (an island in the Gulf of Bomba), &c., and from Alexandria, the great trade emporium of the Levant. The export to Europe continued, though much reduced, after the advent of the Arabs and their subsequent supercession by the Turks; for the drug was always more or less in demand for medicinal purposes. But apart from an occasional reference to Alexandria†, as the port from which it was shipped, and repetitions of Dioscorides' statement that it was gathered in the Cyrenaica, nothing more definite can be learned from mediæval and renaissance writers. Even Pomet in his '*Histoire des Drogues*' (1694), and Tournefort in his '*Materia Medica*' (1708), and Lemery in the '*Dictionnaire des Drogues*' (1698), fail to advance our knowledge on that point, and Linnæus himself in '*Materia Medica*' (1749), p. 182, still quotes

* Dymock, Warden and Hooper, Pharmacograph. Ind, vol. ii, p. 157.

† Matthioli, Comm. Diosc. ed. 1584, p. 379, says, "Very little comes to us from Alexandria in tear shape. Mostly it is impure, like pitch, and in compact masses."

"Lybia, Barca, Aegyptus occidentalis," as the country of origin for gummi ammoniacum. Nowhere can I discover the slightest reference to Morocco as another source of the drug, although it is very probable that when once the Morocco Fashook reached Alexandria it got mixed up with the Cyrenaica resin and followed the same trade channels. One thing is certain, however, that the drug, from wherever it may have come, was nearly always the coarser kind, the ammoniacum in lumps, with plenty of impurities.* Meanwhile the Persian drug, the gum resin of *Dorema ammoniacum*, crept in as a substitute for the African article unnoticed by the European pharmacists. Valentini (1732)† appears to have been the first to record it, although he himself was not aware of its distinctness from the ammoniacum of Dioscorides; but his words, "magnis frustris multa alba grana includentibus ex India Orientali in Europam fertur," leave no doubt that it was the *Dorema* resin to which he was referring. This came by way of Bombay and Alexandria, but part of it may have also come overland, as is suggested by a passage in Murray's *Apparatus Medicamentorum* (1792), vol. vi., p. 190: "Per Turciam ad nos transfertur, item ex India orientali," although the gum received "per Turciam" may have been in part Cyrenaica or Morocco gum. It was only then that attention was concentrated on the Persian article, with the result that its source was at length discovered in *Dorema ammoniacum*, and it has practically crowded out the African product from the European market.

The Morocco Fashook was first noticed, as already stated, by J. G. Jackson in the early years of the last century. Attempts to secure a place for it in Europe have been made repeatedly but with little success, owing, no doubt, to the extremely crude method of preparation. Considerable quantities of it were exhibited at the Vienna international exhibition of 1873. Vogel‡ described them as cakes, several kilograms in weight, made up of a dark brown mass consisting of lumps of resin, of the size of a walnut or less, soil, sand and fragments of the plant. The principal shipping port for Morocco gum ammoniac is Mazagan, whence it goes mostly via Gibraltar to Alexandria. Small quantities are also exported from Mogador.

Chemistry.

I have already observed that the chemistry of the gum ammoniac of the Cyrenaica is absolutely unknown. The Morocco gum has been examined repeatedly, but its exact constitution is still uncertain. By treating it with molten potash, G. Goldschmidt§ obtained resorcin and a crystallised substance of the formula $C_9H_8O_5$ which melts at 265°, and its aqueous solution turns a beautiful red on the addition of chloride of iron. Hirschsohn‖ found umbelliferon in it, whence Tschirch is inclined to place it next to Galbanum. The taste of the Moroccan

* *See* footnote on p. 385.
† Valentini, Hist. Simpl., p. 279.
‡ *See* Wiesner, Rohstoffe d. Pflanzenraichs, 2nd ed., v. i., p. 201.
§ *See* Wiesner, l.c. v. i., p. 205, and Tschirch, Die Harze und Harzebehälter, 2nd ed., p. 339.
‖ *See* Tschirch, l.c. p. 340.

gum ammoniac is less bitter and much less acrid than that of the Persian, and the odour of the burning gum resin is more pleasant. If alcoholic ammonia is poured over the former a bluish fluorescent liquid is obtained, which is not the case with *Dorema* gum. On the other hand, the colour of the Moroccan ammoniacum remains unaffected by a solution of chloride of lime, whilst the Persian gum assumes an orange colour.

Botany.

In the text accompanying plate 8157 of the *Botanical Magazine*, I have given a succinct account of the taxonomic position of the plant yielding the gum ammoniac of Morocco. To conclude the present article, it will be useful to repeat, and slightly extend, what has been said there. The earlier identifications with *Ferula orientalis* and *F. tingitana* may be dismissed without further comment (*see* p. 377). It is quite certain that the plant belongs to *Ferula communis*, L. (sensu lat.), and the only question to discuss is the place and name which it should be given within this taxonomic unit.

Ferula communis has a wide range in the Mediterranean countries, from the Canaries and Portugal to Constantinople, Asia Minor and Syria, but with the exclusion of Egypt. It is subject to a certain amount of variation, particularly in the length and width of the ultimate segments of the leaves, the size and also, within narrow limits, the shape of the fruits and the number of intravallecular vittae. It is the leaves which interest us most in this place. In typical *Ferula communis*, as it first became known and as it occurs commonly in Southern Europe, the ultimate leaf segments are generally over 2 cm., and frequently over 3 (up to 5) cm. long, with a width of 1 mm. or less. Occasionally, however, individuals occur with much shorter segments, that is, of less than 1 (to 0·5) cm. in length, and 0·5–1 mm. in width. Such specimens were described in 1820 from Portugal as *Ferula brevifolia* by Link in Roemer and Schultes' *Systema* (vol. VI., p. 592), and in Hoffmansegg and Link, *Flore Portugaise* (vol. II., p. 416, tab. 108); then, in 1842, from Sicily, as *Ferula nodiflora*, by Gussone in his *Flora Sicula* (vol. I., p. 353); in 1846, from the Canaries as *Ferula Linckii* by Webb and Berthelot in their *Isles Canaries* (*Phytographie*, vol. III., p. 160, tab. 75); and in 1848, from Southern France, as *Ferula nodiflora* var. *monspeliensis* by Grenier and Godron in their *Flore Française* (vol. I., p. 692). It appears under still another name in Buch *Beschreibung der Kanarischen Inseln* (1825), where Link enumerates it (p. 132) as *Ferula aurea*, adding as synonym *Peucedanum aureum* (auctorum),* under which name it had been figured a few years previously (1821) in the *Botanical Register*, tab. 559, from a specimen introduced into Lambert's garden at Boyton in 1790. No other character, except the less saturated green of the foliage, is adduced by the authors mentioned to separate the plant with the short leaf-segments from *Ferula communis*, and the more modern floras enumerate the form with the short segments as a variety of *Ferula communis*. I have, indeed, in the Botanic

---

* *Sic*, he does not give Solander as the authority.

Gardens at Kew, repeatedly seen leaves representing the common and the *Linkii* type of leaf in the same individual, and I was inclined to drop the distinction of the short-segmented form, even as a variety, if it had not been for the fact that the *Linkii* type is the only form of *Ferula communis* which I have so far seen from Morocco, although specimens from Morocco, under cultivation, sometimes show an approach to the typical form, as may be seen from the *Botanical Magazine* figure. It may be that in Morocco the *Linkii* type has become more fixed and has grown into a distinct race, characterised at the same time by a more abundant production of gum resin. Battandier and Trabut record from the south-western part of Algeria a variety of *Ferula communis* which they characterise merely by stating that "it exudes from the stems, and often also from the tips of the leaf-segments, a copious gum analogous to gum ammoniac, and possibly identical with the Fushog of the Moors." I have seen no specimens of this plant which they mark simply as "*β gummifera*," and have for the present preferred to accept Mariz's name for the variety, namely, *brevifolia*. As to the plant that produces the Cyrenaica gum ammoniac, I would refer to what I have said concerning its appearance in the paragraph on the Ammoniakon of Dioscorides, for it is obviously a quite distinct species.

LIX.—VISIT TO NEWPORT AND SOUTH WALES.

W. Dallimore.

The contribution of an exhibit to the forestry section of the "Bath, West of England, and Southern Counties Agricultural Societies' Show" by the Director of the Royal Botanic Gardens, Kew, furnished the object for my visit to Newport in June. After the necessary work attached to this exhibit was accomplished, I was able to go and see several gardens of interest during the show week, and the appended notes are the outcome of my journeyings.

Forestry Exhibition.—Although it is only the second year that the subject of forestry has formed one of the distinct features of the "Bath and West" show, it has excited a considerable amount of interest among landed proprietors, and a great many exhibits were got together on this occasion. These exhibits were of both educational and commercial value. On the one hand, the effects of culture on various trees were well shown—such as good and bad planting, pruning, the rate of growth of various timber trees on different kinds of land and at varying altitudes, &c., and the effect and treatment of insect and fungus pests. On the other hand, planks of home-grown timber, with the approximate ages of the trees, were shown; samples of various woods in the rough, planed, and polished; gates, window frames, doors, fencing suitable for farm work, all from home-grown timber, with details of cost. Then again timber showing the advantages accruing from treating with creosote previous to use, and various other items. During the exhibition lectures and demonstrations were given on various operations connected with forestry.

The Hendre.—On the outskirts of Monmouth, about two miles from the centre of the town, an entrance is gained to the park which

surrounds the mansion and gardens of Lord Llangattock. Through this park the carriage drive winds for a distance of two miles in the midst of delightfully picturesque country, until suddenly, on turning a bend, the mansion and gardens are seen nestling in a valley from which on all hands the ground rises, sometimes sharply, at others gradually, until it passes into mountainous ranges in the far distance. Throughout the whole of this two miles one's attention is continually claimed by some fresh object; in one place a group of Conifers with Douglas firs, and a fine example of *Abies nobilis* var. *glauca*, in another venerable old yews, extensive open glades sacred to deer and rabbits, with fine views over the surrounding country.

The natural timber about the park is principally oak, some of the trees being of great age and large dimensions. The tree of largest girth which I measured was 28½ feet in circumference at 3 feet above the ground. Within a short distance of this some yews were growing, not remarkable for height but of great girth. One, measured at three feet from the ground, was 18½ feet in circumference. In the garden the most striking trees were *Tilia petiolaris*, *Tilia platyphyllos* var. *asplenifolia*, 35 feet high; *Acer Pseudoplatanus* var. *foliis albo-variegatis*, 40 feet high; *Sequoia sempervirens*, 90 feet high, with a girth of 12 feet; *Pinus excelsa*, 90 feet high, and *Abies Nordmanniana*, 95 feet high and 9 feet 5 inches in girth. Scattered about the formal part of the garden are a number of golden yews cut into various fantastic shapes, and these at the time of my visit were very highly coloured. The Hendre has long been famous for its fruit, and at the time of my visit numerous houses were filled with exceptionally well-grown grapes, peaches, pines, &c.

Returning from Monmouth to Newport the journey can be made by the Wye valley route, by which the best of the famous Wye valley scenery can be seen, as the railway runs parallel with the river for a considerable distance.

CARDIFF CASTLE, which is the South Wales residence of the Marquis of Bute, is situated in the city within five minutes walk of the Great Western railway station. To the antiquary and historian it is of deep interest, for it formed one of the Roman strongholds, and portions of old Roman walls still exist. The castle was originally surrounded by high battlemented walls and a moat, both of which were partially ruined by Cromwell. Within recent years the moat has been cleared, and considerable portions of the walls have been rebuilt on the old foundations in accordance as nearly as possible with the original design. At a later date the estate was held by a religious body, and in two places dwarf walls have been built on the original foundations to mark out the positions of the chapel and various offices pertaining to the abbey. At the present time the gardens are in a transitional condition, for the old kitchen garden is required for building purposes and a new one with modern glasshouses is being formed over half a mile away. The pleasure grounds are of considerable extent, and consist of fine sweeps of lawn with groups and plantations of trees. The vineyards for which Cardiff Castle has so long been famous are situated several miles away, but as my time was limited I was unable to pay them a visit.

ST. FAGANS.—The castle of St. Fagans, the Welsh home of the Earl of Plymouth, crowns the summit of a low hill within a few minutes walk of St. Fagans station. It is of ancient origin and its strong, encircling walls—of which a considerable portion are still intact—afford evidence of its importance in the war-like times of the past.

Signs of the gardener's art are most conspicuous in the immediate neighbourhood of the castle, where a plateau enclosed by the old walls is divided up into a series of small gardens, each of which is devoted to some special feature. Thus, there is the Dutch garden with a central lawn on which flower beds have been arranged with a lavish hand, interspersed with formal and fantastically clipped golden yews. The beds at the time of my visit were filled with bedding plants conspicuous for bright coloured foliage and flowers, which in conjunction with the green turf and the young shoots and foliage of the yews proved most effective.

From this garden access is gained to the mulberry garden, famous for its venerable mulberry trees, which are remarkable on account of their low, horizontal branches, which grow out to a considerable distance from the centre of each tree. They are undoubtedly of great age, and their general appearance suggests that these horizontal branches are due to an attempt on the part of the trees to recover from some disaster which has occurred to the main trunks in times long past. Although central trunks are now absent, the manner of branching and the general aspect of the whole suggests that they must have been normal specimens at some previous period of their history.

A rose garden, planted with numerous varieties of the best types of garden roses, forms a pleasant feature. The annual garden is of more than passing interest ; this is apart from the other gardens and contains a number of old fruit trees, the ground below being entirely carpeted with groups of the most ornamental, hardy, and half-hardy annuals.

Then there is a paved garden, which is peculiar by reason of its numerous miniature beds intersected by narrow ornamentally paved paths. The beds are filled with dwarf, old-fashioned, herbaceous perennials, and the old place recalls descriptions of gardens such as delighted our forefathers of a couple of centuries ago. An instance of old-fashioned, ornamental paving is noticeable in a small courtyard near the annual garden. In this the pavement is of flat stones of irregular size and shape, fitted together with the greatest exactitude, the whole forming an interesting feature.

A distinctly harmonious note is struck by the manner in which the old walls are utilised as a wall garden. Although some assistance has probably been given by man, the hand of nature has been busy, and every crack and crevice has its occupant, Red Valerian, many species of fern, ivy-leaved Toad-flax, and hosts of other plants growing together in riotous profusion.

From the castle the ground falls rapidly by terraces to a series of formal lakes with well-wooded pleasure grounds beyond.

MARGAM PARK.—On alighting from the train at Port Talbot, a good four miles have to be traversed before the grounds

surrounding the mansion are reached, although for the greater portion of the route the public road bisects the Margam estate. The demesne, the property of Miss Talbot, is one of the noblest in South Wales and extends over an area of 20,000 acres. It presents a beautiful panorama of richly wooded hills, grassy mountain sides, fertile valleys, and fair homesteads, with here and there glimpses of wind-blown sand dunes. Below ground the estate is also of great value, for it is rich in coal.

Like many another stately British home, Margam has passed through various vicissitudes. At one period it occupied some importance in the ecclesiastical world, and the ruins of a large abbey, which dates back to the eleventh century, still exist. Near these ruins stands the mansion, a fine stone structure, crowning the summit of a small hill, and placed at the end of a long vista. In its vicinity are extensive lawns merging into well wooded park land, which gradually passes over to the distant series of hills and valleys thickly clothed with trees.

Throughout the gardens a number of fine specimens of native and exotic trees are to be met with, among them the sweet bay, *Laurus nobilis*, many specimens of which are remarkable both for height and spread of branches. Other noticeable trees are *Sequoia gigantea*, with a girth near the ground of 21 feet 11 inches; *Acer palmatum*, a well furnished tree 20 feet high; *Liriodendron tulipifera*, 96 feet high, with a girth of 13 feet 8 inches at 3 feet from the ground; *Aesculus Hippocastanum*, with a girth of 17 feet 10 inches; *Fagus sylvatica*, var. *heterophylla*, 40 feet high and 8 feet in girth, with a head diameter of 69 feet; *Abies cephalonica*, 12 feet 7 inches in girth; *Pinus pinea*, 7 feet 7 inches, and *Cryptomeria japonica*, 8 feet 3 inches in girth. *Pinus muricata* is represented by a fine example upwards of 60 feet in height, with a girth of 10 feet 8 inches at 3 feet above the ground. Amongst shrubs, *Olearia macrodonta* was in very fine condition at the time of my visit, one specimen 10 feet high and as far across being specially noteworthy.

Margam Park has long been celebrated for its orange trees, which looked remarkably well. About 50 specimens are grown in tubs, and during the summer they are placed on a lawn in the pleasure grounds, winter accommodation being provided in a spacious orangery 100 yards long. Although Margam can boast so many fine orange trees, little account is taken of them in comparison with two decrepit specimens that stand alone. These, I was informed, have been on the estate for about three centuries, and are supposed to be the first two plants introduced to the British Isles. They were sent from the Continent as a present to the then reigning monarch, but the vessel which carried them was wrecked, and the plants were washed ashore at Port Talbot, whence they were conveyed to Margam, and here the king directed them to be retained.

The orangery is similar in appearance to the majority of old orangeries seen in gardens. It contains, however, two interesting statues, one of the Emperor Servius, and the other of Hercules. Both are very ancient work, and the latter is said by antiquarians to belong to a period anterior to the advent of Christ.

The Margam estate is naturally well wooded, and of late years all the woods have been placed under the charge of a trained forester, who is proceeding with their development on the most approved lines. In the nursery quarters there were hundreds of thousands of larch, Scots pine, Douglas fir, and Norway spruce in various stages of development, and from these extensive plantations are made annually. Larch is grown more largely than any other tree, and it is singularly free from disease. The common larch is most frequently met with, but *Larix leptolepis* is also grown, and where the two are planted side by side the latter has quite outgrown the former. At present, however, the Japanese species is said to be too dear for profitable planting.

The work of the estate is carried out by about 300 men of various trades and occupations. The works yard contains shops for various tradesmen, such as carpenters, masons, painters, &c., and ample machinery is provided for sawing, planing, moulding, and various other kinds of work, the motive power being obtained from a water-driven turbine engine. As far as possible home grown timber is used for estate purposes, and wherever possible it is creosoted. The creosoting plant is a lesson in economy, the whole having been erected at a cost of £75. It consists of a large cylindrical boiler, such as was formerly used in collieries, placed horizontally above a furnace and open at the top like a trough. By its side is a large creosote tank with a pump connected with the boiler. The wood, such as gates, doors, window-frames, posts, and rails, or anything else that requires treatment, is placed in the boiler, and sufficient creosote is pumped in to cover the whole, and then the fire is lighted. The creosote is brought to about the boiling point of water, and is kept at this temperature for two days ; the liquid is then drawn off and the pickling is completed. Heated creosote is stated to be more efficacious than cold, especially when green wood is employed. To illustrate the value of creosoted timber over that which has not been so treated, some posts of birch, poplar, and beech were pointed out to me which had been in the ground for three years and were perfectly sound, whereas it rarely happens that unpickled wood of these trees, of similar dimensions, lasts for more than one year.

Statistics are preserved of the actual cost of material and labour for various kinds of work, and I was shown 5-barred farm gates 9 feet long and 4 feet high—specially braced and strengthened with iron clasps—made of larch rails and oak ends, the total cost of which, including hinges, fastenings and creosoting, was 17*s.* 6*d.*, or with a pair of strong oak posts 12*s.* extra.

An interesting fact was brought to my notice in the case of a large plantation of young larch that had been accidentally burnt. A portion of the land had originally been covered with bracken and the remainder with gorse. The year after the fire 50 per cent. of those trees planted amongst bracken sent out strong shoots from the ground line, whilst only 5 per cent. of those planted amongst the gorse grew again.

Experiments with Marram grass (*Ammophi'a arenaria*) are in progress near the shore in the neighbourhood of Port Talbot for the reclaiming of the sand dunes, and £30 a year is spent on this work. The results so far are said to be satisfactory.

SINGLETON ABBEY.—This, the demesne of Lord Swansea, is situated on the outskirts of Swansea and about two miles from the centre of the town. Like most of the South Wales estates it has great natural beauty, the grounds being undulating and well timbered, with here and there considerable open spaces of park-land dotted with fine specimen trees. The Abbey occupies a good position on rising ground and from it vistas have been opened up which carry the eye either to distant views of tree-clad hills or to the bay with the open sea on the horizon.

Of the many interesting subjects to be seen at Singleton the most important are the conifers and rhododendrons. A former proprietor about 70 years ago formed an extensive pinetum, planting in it every hardy conifer that he could then obtain; this has been added to from time to time since, so that it now contains a very large number of species. Amongst a few of the specimens noted were *Picea Menziesii*, 90 to 100 feet high, *Cryptomeria japonica*, 60 feet high with a trunk diameter of 18 inches, *Pinus excelsa*, 90 feet high and 9 feet in girth at 3 feet above the ground, *Tsuga Mertensiana*, 100 feet high with a girth of 7 feet 7 inches, *Araucaria imbricata*, 70 feet high with a girth of 6 feet 6 inches, *Sequoia sempervirens*, *Picea Morinda*, *Abies cephalonica*, *A. grandis*, a form of *Araucaria excelsa* with very small leaves and slender branches, and *Podocarpus macrophyllus*, 25 feet high, forming a perfect specimen from base to summit.

Himalayan rhododendrons are represented by many large examples, the finest of which are *R. Thomsoni*, 20 feet high with four main branches, *R. barbatum*, 33 feet high, with a magnificent head on a trunk 12 feet high, *R. Hodgsoni*, 12 feet high and very bushy, and *R. Falconeri*, 30 feet high with a head 18 feet through and a trunk girth of 35 inches. The last-mentioned plant is claimed to have been raised from the first batch of seeds received in this country. The seeds, I was informed, were sent to Edinburgh by Colonel Sykes, who commanded the first expedition in the Himalayas, and a portion of the consignment was sent from Edinburgh to Singleton. Hybrid rhododendrons, both evergreen and deciduous, are grown in large quantities, and many have attained large dimensions.

A few other interesting specimens which deserve mention are *Fagus sylvatica*, var. *laciniata*, 60 feet high with a trunk girth of 7 feet at 3 feet from the ground and a head diameter of 54 feet; *Prunus serrulata*, with a trunk 5 feet 6 inches in girth and a head 40 feet through; a magnificent specimen of *Fagus sylvatica*, var. *pendula*, 60 to 70 feet high and of perfect outline; many very fine examples of *Arbutus Unedo*, *Quercus coccifera*, and *Grevillea rosmarinifolia*.

CLYNE CASTLE is situated midway between Swansea and The Mumbles, and is the residence of W. G. Vivian, Esq. It may be reached by means of The Mumbles railway, Blackpill being the nearest station. As my visit was made during heavy rain I was unable, unfortunately, to make a thorough round of the gardens. Himalayan rhododendrons are grown in quantity, and good examples of *R. Hodgsoni*, *R. barbatum*, *R. grande*, *R. arboreum*, and *R. Falconeri*, *R. camelliaeflorum* and *R. campylocarpum* were

noted. *Embothrium coccineum* was in fine flower, as was also a good example of *Pieris formosa*; *Fabiana imbricata* in the open ground was noticed as a bush 6 feet high; *Abelia uniflora* 7 feet high and as much through; *Eriobotrya japonica* 20 feet high; two forms of *Colletia cruciata* 20 feet high; *Pittosporum Tobira* 12 feet by 12 feet; *Acacia dealbata* 25 feet high, and numerous large, well-flowered clumps of *Libertia formosa*. *Arbutus Unedo* was represented by numerous specimens of great size, as were also several conifers. Mr. Vivian favours a free and natural style of gardening, and under these conditions rambling roses and numerous other climbing shrubs have attained very large proportions.

PENLLERGAER.—Sir J. T. D. Llewelyn, Bart., is well known as an ardent horticulturist; his garden at Penllergaer contains a most interesting collection of plants and is one of the show places of South Wales. Situated about five miles from Swansea, it is rather difficult of access, but the visitor is well repaid for any inconvenience he may experience during the journey by the natural beauty of the country through which he passes. After leaving the public road there is a carriage drive over a mile in length before the garden is reached. This drive has been cut out of the side of a hill, and on the one hand rises well-timbered ground, whilst on the other the land dips rapidly to a well-watered valley with tree clad hills beyond. As an undergrowth to the trees rhododendrons, evergreen and deciduous, have been planted in profusion, and at the time of my visit they were gorgeous with flowers.

Sir John has long been a rhododendron enthusiast, and he has a fine collection of Himalayan species, with a large number of hybrids, many of which are of his own raising. Some of the finest examples noted were *R. arboreum album* 25 feet high, *R. Thomsoni* 15 feet high by 12 feet wide, *R. cinnabarinum* 15 feet high with a bushy head, *R. Hodgsoni* many specimens from 5 to 12 feet high, *R. campylocarpum* 8 feet high, quantities of fine plants of *R. barbatum*, *R. campanulatum*, and *R. lanatum*.

Hardy bamboos are also favourite plants at Penllergaer and many fine clumps of the various species were noticed. Hardy shrubs, especially those belonging to *Ericaceae* are much in evidence, and many fine examples of *Kalmia latifolia*, *K. angustifolia*, *Pieris floribunda*, *P. japonica*, *Pernettya mucronata*, &c., may be seen.

In one part of the garden my attention was directed to an ornamental pool which was formed for the express purpose of growing the *Victoria Regia* out of doors. The water in this pool was heated by hot water pipes, and the plant had been grown and flowered in the position. Its culture is now discontinued, and the principal interest attached to the pool at the time of my visit lay in several colonies of robust plants of *Primula sikkimensis* which grew about the margin.

Amongst conifers the finest specimens I noted were *Tsuga Mertensiana* 95 feet high and 12 feet 9 inches in girth at 1 foot from the ground, *Araucaria imbricata*, and *Cryptomeria japonica*.

The student of entomology visiting Penllergaer will find much to interest him, for, in addition to Sir John being deeply interested in the science, a pensioned gardener of his, Mr. Stafford, who is 85 years of age, has given the whole of his leisure to the subject for the last 60 years. He has got together a remarkable collection of native and exotic butterflies and moths.

ASHTON COURT, situated in the suburbs of Bristol, is of easy access either by tram or omnibus, yet it is quite away from the city and in the midst of rural surroundings. The demesne belongs to Lady Smyth, and covers a very extensive area. The park which immediately surrounds the house and gardens is enclosed by a wall 5 miles in length and extends from the famous suspension bridge at Clifton on the one side to the village of Long Ashton on the other. It is chiefly remarkable for the great number of fine, well-grown timber trees it contains. The prevailing tree is elm, closely followed by oak, with a fair sprinkling of beech. Many examples are in the prime of life, but some are of great age, and one oak, I was informed, is mentioned in the Domesday Book. This particular specimen, though hollow and decayed at one side, girths 21 feet at 3 feet above the ground, and still appears to have many years of life in store. Another oak I measured girthed 28 feet, whilst I found an elm 19 feet 3 inches and a beech 18 feet 9 inches in girth. The latter two trees were remarkable for the height of the bole.

The gardens are exceptionally well kept and contain a good collection of plants. Hardy shrubs and herbaceous plants are being planted extensively, whilst roses are grown in large quantities. On a wall I noticed fine examples of *Bignonia capreolata*, *Clematis montana*, *Fremontia californica*, and other similar plants. Near the flower garden I was shown a perfect specimen of *Buxus balearica* which was 12 feet high and as far through.

PUBLIC PARKS.—The parks of Newport, Cardiff and Swansea were visited. In the former town the principal park is situated within easy distance of the centre of the town and in a favourable position for good gardening. Unfortunately, however, too great a use has been made of laurel and privet in the planting, and, as these shrubs have been hard clipped, the general effect leaves much to be desired.

The chief parks of Cardiff are Roath and Victoria. The former is peculiar by reason of its great length and extreme narrowness, for in no part does it exceed 400 yards in width, whilst much of it is considerably less; yet so well is the narrowness masked by shrubberies, which carry the eye over the boundary fences to the rising ground beyond, that the lack of width is unnoticed. This park is divided by the public streets into several sections, each one of which is given over to a distinct feature. Thus, one portion is used as a botanical garden, and contains good collections of trees, shrubs and herbaceous plants, a rockery, cactus house and student's garden; another is laid out with bowling greens and tennis courts, with attractive surroundings of shrubberies and beds of various showy plants; a third is reserved as a general playground, whilst another contains a lake 30 acres in extent,

sacred to boating and fishing, and still another section is reserved as a wild garden. Provision is made for keeping the lake well stocked with fish by means of hatcheries and nurseries, many thousands of fish being turned out annually. Victoria park is situated on the opposite side of the city, and offers many attractions. In both places specimens of *Paulownia imperialis* were seen in flower.

Swansea is well endowed with parks, although their acreage is not large. These parks are widely spread over the town, and are in most cases of easy access by means of electric trams. Several are delightfully situated and both climate and soil are alike suitable for the successful cultivation of many semi-tender trees and shrubs, such as are cultivated out-of-doors in Devon, Cornwall and other favoured localities. Unfortunately the systematic upkeep of the parks has only been given serious attention for three or four years past and, although much has been done since the appointment of a general superintendent, there will be several years of hard work before they can be expected to do themselves justice. During the last two or three winters a considerable amount of work has been done in the formation of rose gardens, shrubberies, lawns, a rockery, tennis courts, bowling greens, &c. If the present ideas of gradually replacing worn-out specimens of common shrubs with those of a more interesting nature are carried out, together with the formation of a good herbaceous collection, Swansea will have good reason to be proud of her parks in the near future.

LX.—ZAPUPE FIBRE PLANT.

In continuation of the note published in the *Kew Bulletin*, No. 5, 1906, p. 190, the following report by Mr. L. J. Nunn, British Vice-Consul at Vera Cruz, Mexico, which we have received through the courtesy of the Under Secretary of State for the Colonies, is of considerable interest.

It is suggested that Zapupe might be profitably introduced into the West Indies and other tropical colonial stations, but at present, unfortunately, we are still ignorant of the specific identity of this *Agave*.

A small plant, grown from one of the bulbils referred to in the previous note, is making good growth in the gardens.

LETTER from the British Vice-Consul, Vera Cruz, Mexico, to L. J. JEROME, Esq., His Majesty's Consul, Mexico.

Vera Cruz,
June 20th, 1907.

SIR,

IN view of the increasing attention that is being given to the cultivation of the Zapupe, a fibre-producing plant similar in most respects to the Henequen or Sisal hemp, the source of so much wealth to the planters of Yucatan, I have the honour to transmit herewith a short report on its cultivation and uses, more

especially as compared with the Sisal, as I believe, from the nature of the soil in which it is raised in this State, that it might be profitably introduced into some of the islands of the West Indies and other parts of the Empire within the tropics.

I have, &c.,

(Signed) L. J. NUNN,
British Vice-Consul.

THE CULTIVATION AND USES OF THE ZAPUPE IN MEXICO.

Of the many experiments that have been made with fibre-producing plants to discover one that would equal for production and results the Henequen or Sisal of Yucatan, all seem to have given but little result with the possible exception of the Zapupe, to the cultivation of which, in a limited way, a considerable degree of attention has been devoted in the State of Vera Cruz during the last three or four years. Attempts have been made, as is well known, in various parts of the world, but more especially in some of the islands of the West Indies, to raise Sisal or Henequen, but in general these attempts have been failures, the consensus of opinion being that there are certain peculiarities in the barren and arid plains of Yucatan, which, together with climatic conditions, render the land unrivalled for the cultivation of this particular class of hemp-producer. It would seem, however, that in the Zapupe a rival to the Henequen or Sisal has been discovered, that can be produced under equally as economical conditions, and which will give as good if not better results under more varied conditions of soil and climate.

Botanists, it would appear, have not yet decided on the exact classification of the Zapupe, and although it resembles in many points the Henequen, it can only be said that they are both of the Agave family.

The first experiments in the cultivation of the Zapupe were undertaken in the year 1901 or 1902 on a small scale, on some lands cleared for this purpose in the Canton of Tuxpam, in the State of Vera Cruz, where it is found in its wild state, and it is estimated that in the same vicinity there are now set out over five million plants in various stages of growth.

The cultivation of the plant requires no particular skill nor does it require much attention, a point of considerable moment in countries where labour is scarce and apt to be unreliable. The usual methods adopted are to take the young shoots when they are but a few inches high, cut them clear from the parent plant and set them out in carefully prepared nurseries, where they are allowed to remain from eight to ten months, by which time they will have assumed a height of from a foot to two feet above the ground. At this stage they are then transplanted to ordinary lands, all the preparation required being to turn the ground up with a plough and set the young plants in the furrow, banking the soil up around them so that they may be well covered. One of the reasons for this is that when the young plants are lifted from the nursery all the roots are cut off, that part where the roots

should be resembling more or less the sharp end of a tent peg, so closely are they cut down. As a rule the furrows are run in the usual parallel manner, about seven feet apart with a distance between each plant of about five feet, which would give a little over one thousand plants to the acre. Between three and four years subsequent to transplanting the plant will bloom unless pruned, when flowering will not take place for a matter of fifteen years. In order to increase the fibre producing power of the plant the flowering period must be kept in check as long as possible.

At from four to five years old the cutting of the leaves can be begun, the plant continuing to produce for a term of eight to ten years. Cutting takes place three times a year, each yield per individual plant being from about twenty-five to thirty leaves, the weight of fibre per leaf amounting to probably not quite half an ounce, so that each plant would give per year about two and one-half pounds of fibre.

From three years and onwards each plant will give off anywhere from two to a half dozen shoots and, if allowed to flower in its early stage, from the stalk which runs up from the centre to a height of twelve feet and more, it is possible to cut a hundred or more slips.

Although up to the present no extensive plant has been erected for the treatment of this fibre by machinery, there is little doubt as to the confidence in its future possessed by those engaged in its cultivation, for whereas experiments as to the possibility of its uses and production were only begun in 1901, it is safe to say that at present there are fully four to five thousand acres of ground now cleared and set out with four to five million plants in various stages of growth.

The best localities for the cultivation of the Zapupe are gently sloping plains or mountain foothills, with a soil fairly rich to poor and of not too porous a nature. Drainage must be good, as if the plants get set too long in stagnant water the roots will rot and in general the growth and production of fibre will be retarded. As the plant is essentially tropical it is perhaps needless to say that its cultivation at any considerable altitude is an impossibility; the best results in fact will be obtained where the atmosphere is warm and humid and with but slight variations in the temperature. A too sandy soil should be avoided as absorbing too quickly the surface moisture on which the shoots, especially from the parent plant, are dependent. A clayey soil again is equally as bad, as it seems to cause the roots to double and break in their endeavours to spread.

A rough estimate would show that the outlay for tending the young plants in the nursery, preparing the ground for transplanting, together with cost of the plants would be approximately :

	$
Shoots per 1,000	35.00
Sowing and tending in nursery per 1,000	7.50
Preparing ground and planting	7.50
Total	$50.00

Up to the present time the general uses to which this fibre has been applied have been limited to the making of food and game bags, lariats, and a species of gunny cloth, but more recent experiments have demonstrated its adaptability for working up into rope, and it is on this ground that several local companies have been formed and are projected for the raising of this plant on a large scale in order to compete with the Henequen or Sisal hemp growers of Yucatan, in the production of a rope-making fibre.

Comparison between the respective merits of Sisal hemp and Zapupe from the point of view of the cultivator show many points in favour of the latter if, as is hoped, the fibre of the Zapupe should prove to be equal for commercial purposes to that of the Sisal. For example, the rapid growth and development of the Zapupe is quite extraordinary. In from three to four years, in many cases, the plant will have arrived at a stage where the gathering or cutting of the leaves may be taken in hand, whereas the Henequen or Sisal takes fully six years to arrive at a condition of sufficient maturity to permit of the culling of the leaf.

From the point of view of yield of fibre the difference in favour of the Zapupe is again very marked, as the following data will show :—

——	Zapupe.	Henequen or Sisal.
Plant	1	1
Yearly yield of leaves	80	25
Cuttings per annum	3	2
Weight of fibre per leaf	½ oz.	1 oz.
Product	2½ lbs.	1½ lbs.

It will be seen from the foregoing that the Zapupe will yield in a year fully a third more weight of fibre than can be obtained from the Sisal, but on the other hand the labour and increased work entailed makes it doubtful whether the revenue derived from the extra weight of fibre produced by the Zapupe would not be more than swallowed up by the excess occasioned in expenditure. For instance, in the Zapupe three cuttings per year are necessary. Eighty leaves have to be culled and carted to the decorticating machine. The eighty leaves have to be put through the scraper three times, and the refuse to be removed is equally as great in volume, whereas with the Henequen or Sisal there are only twenty-five leaves per plant to handle from the plantation to the machine shed, the same results are obtained with two scrapings as are produced by three in the case of the other plant, so that it remains quite a question as to whether the larger quantity of fibre obtained really does offset the increase in expenditure that so much extra labour must entail, and scarcity of labour in the hotlands of Mexico, especially near the coast, is and probably will be for many years to come the most formidable difficulty that the planter of this and other produce has to contend with.

It must, however, also be borne in mind that the cultivation of the Sisal is one to which for the last thirty years and more the closest study has been given, and every possible experiment tried, with the object of increasing the yield and effecting, by improved

machinery, economies in the expenses of treatment, the result of which has been that whilst sale prices have remained at a most profitable figure, the cost of production has steadily decreased.

That there is a bright future for those engaged in the production of Zapupe, there can be but little doubt, the value of the fibre having been proved beyond the experimental stage, in addition to which it has been shown that it possesses both for toughness and tensile strength, the necessary qualities to admit of its being worked up into "binder twine," and even more profitable use than its manufacture into rope. As a matter of fact, probably over ninety per cent. of the Sisal to-day produced and exported from the peninsula of Yucatan to the United States is made into "binder twine," and even with this there is a constant demand for other raw materials as substitutes.

It may prove of interest to prospective Zapupe planters to learn the gigantic strides that have taken place in the production of Sisal during the last twenty-five years, which are shown by the following table showing the quantities and value of the exports of this produce from Yucatan alone. It is also worthy of note that at its lowest selling price of three-and-a-half cents Mexican per pound, (the Mexican cent is about equal to one farthing) there was still a margin of profit to the planter, whose gains were simply notorious throughout the country when the maximum price of nineteen-and-a-half cents Mexican per pound was attained :—

Years.	Number of Bales.	Weight in Metric Tons.	Total Value of Exports.
			£
1880	112,911	18,179	177,757
1881	154,730	24,911	272,656
1882	150,585	24,244	273,655
1883	202,805	32,651	353,750
1884	261,137	42,043	347,164
1885	267,478	43,064	333,481
1886	242,791	39,089	392,972
1887	224,865	36,283	589,442
1888	218,129	35,118	664,125
1889	252,432	40,641	1,024,369
1890	279,907	45,079	523,030
1891	323,585	52,065	657,168
1892	363,881	58,584	839,994
1893	360,857	58,097	846,713
1894	373,773	61,605	684,817
1895	383,413	61,729	611,219
1896	397,163	65,762	726,423
1897	419,975	70,545	821,869
1898	418,972	68,834	1,891,807
1899	445,978	73,190	2,021,124
1900	499,634	81,093	2,261,603
1901	517,519	83,191	2,278,345
1902	528,246	83,993	3,643,279
1903	590,430	93,058	3,333,115
1904	606,008	97,205	3,202,258
1905	597,289	96,534	2,962,543
1906	599,568	97,198	2,724,752

LXI.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW : VI.

INSECTA.

W. J. Lucas.

Since the publication of the list of the Wild Fauna of the Royal Gardens, Kew, in the *Bulletin, Additional Series* V., the following species have passed through my hands :—

ORTHOPTERA.

The common Earwig, *Forficula auricularia*, Linn., came in large numbers to sugar, spread as a lure to Lepidoptera, on the evening of 22nd September, 1906.

Two common British short-horned Grasshoppers are new to the Kew list : *Stenobothrus bicolor*, Charp., and *St. parallelus*, Zett.

A long-horned Grasshopper—the very delicate green *Meconema varium*, Fabr., which lives on trees—came to the sugar on 22nd September, 1906, and is also new. To the same order belongs an immature *Phaneroptera* sp., taken in the Jodrell Laboratory by Mr. G. Massee ; this is not a British insect. Also belonging to the same family, the *Locustidae*, was a specimen of *Diestrammena marmorata*, de Haan, of the sub-family *Stenopelmatinae*, which is most probably a native of Japan.

Several Crickets taken by Mr. Massee in the Jodrell Laboratory are named *Gryllodes* (*? hebraeus*, Saussure), by Mr. R. Shelford ; these also are not British.

Three records of Cockroaches already published (*K.B., Additional Series* V., pp. 23, 24), are now found to need revision.

Ischnoptera sp. has been identified as *I. natalensis*, Wlk. The *Nauphoeta cinerea* of the *Bulletin* is really *N. brazzae*, Bolivar, whilst the smaller species of the same genus is *N. cinerea*, Oliv., and not *N. circumvagans*. The last two are now figured.

NEUROPTERA.

Of Dragon flies I have received four species taken in the Gardens—one *Sympetrum striolatum*, Charp., captured by Mr. G. Nicholson, August, 1907 ; *Ischnura elegans*, Lind., two males ; *Enallagma cyathigerum*, Charp., one female ; *Aeschna cyanea*, Müll., one male. Only the first, however, is new to the list.

One specimen of the extremely useful green Lacewing, *Chrysopa vulgaris*, Schn., was taken on the wing in the evening of 22nd September, 1906, and three others were sent to me by Mr. Nicholson—the first Kew record of this group. Since then Mr. Nicholson has sent me a specimen of the less common *Ch. tenella*, Schn., and on the evening of 21st June, 1907, I took in the Gardens two specimens of a brown Lacewing, *Hemerobius lutescens*, Fabr. *Sialis lutaria*, Linn., the Alder-fly, also belonging to this group, was taken by Mr. A. Sich beside the Lake on 16th May, 1907.

At last a few Caddis-flies (*Trichoptera*) have been taken. *Halesus radiatus*, Curt., sent by Mr. Nicholson; *Phryganea grandis*, Linn., one undated male from Mr. Nicholson, and a pair taken *in cop.* by Mr. Sich on a tree-trunk in the Arboretum, 6th July, 1907; a female *Mystacides longicornis*, Linn., sent by Mr. Nicholson; and *Leptocerus aterrimus*, Steph., also from Mr. Nicholson. (Mr. K. J. Morton kindly assisted with the identification of a few of the Neuroptera.)

Hymenoptera.

The very handsome *Chrysis ignita*, Linn., a common parasite on various Hymenoptera and very variable in size. It was sent by Mr. Nicholson, who obtained it at Queen's Cottage. (Mr. E. Saunders examined it.)

A small male of *Apanteles juniperatae*, Bouché, a parasite bred from larvae of *Urapteryx sambucata*, Linn., 5th September, 1906. Mr. Claude Morley, who examined it, says it is not a very common species, and has not been bred from this host before, though it has been reared from the allied *Odontopera bidentata*, Linn.

Coleoptera.

Helops striatus, Fourc., and *Dromius meridionalis*, Dej., taken when sugaring on 22nd September, 1906. (Examined by Mr. F. B. Jennings.) The former appears in the earlier list.

A large living beetle bred from a pupa which reached the Gardens in a Wardian case from Tobago, 29th August, 1906. Mr. G. J. Arrow, who examined it, says that it belongs to the family *Dynastidae*, and is a member of the genus *Strategus*. Being a female its species cannot be properly determined.

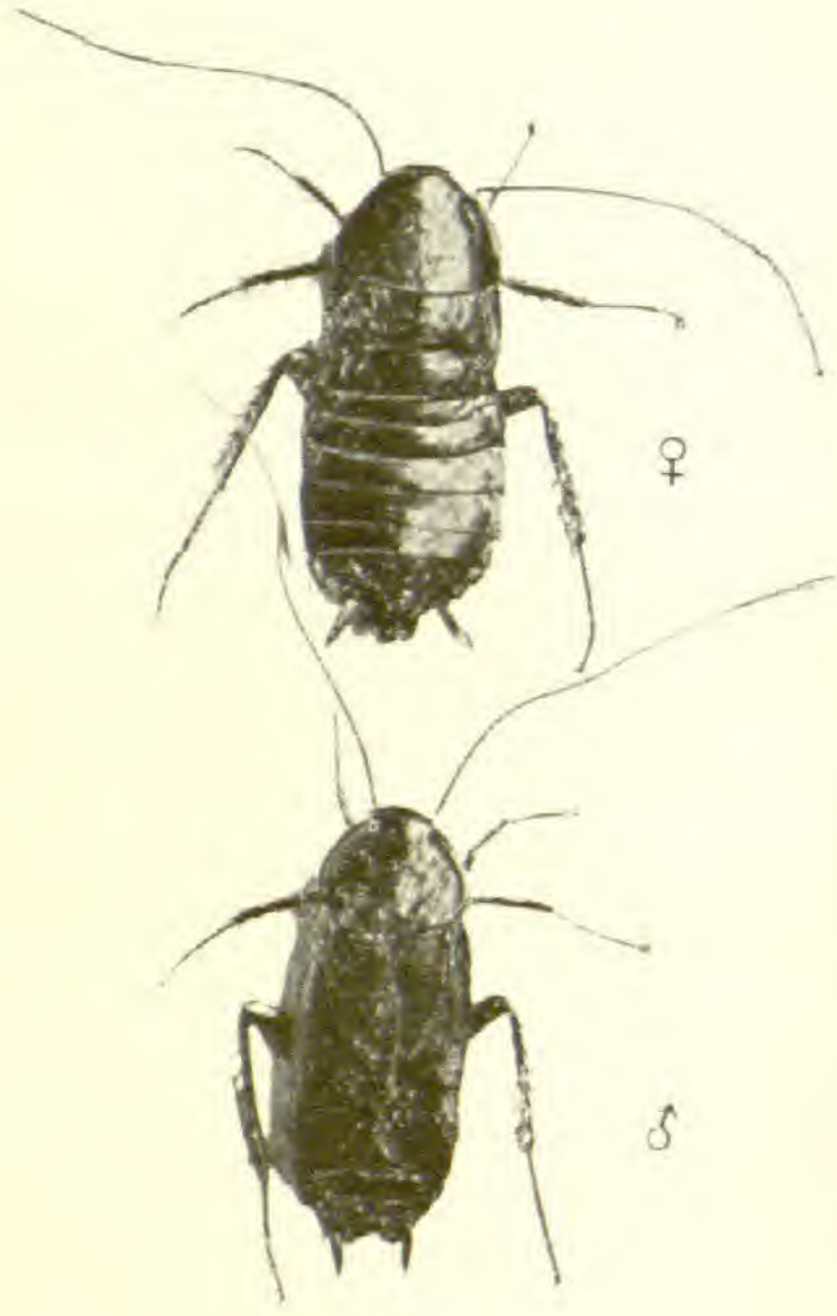
Tropical Cockroaches.

W. Watson.

The tropical plant houses at Kew are infested with cockroaches which are only prevented from doing a great deal of damage to the plants by constant trapping. At least three species are injurious, namely, *Blatta orientalis*, Linn., *B.* (*Periplaneta*) *americana*, Linn., and *B.* (*P.*) *australasiae*, Fab., the second being the largest and the third by far the most abundant. Their haunts are dry holes and corners about the stages and hot-water pipes, the sheathing bases of palm, banana and pandanus leaves, and among the crocks in large plant-pots and tubs. They are in hiding during the day, but at night they come out and run or fly about among the plants, devouring flowers and leaves like rabbits. Such plants as *Eucharis*, *Crinum* and *Alpinia*, when in flower, have little chance in the palm house, where the cockroaches are most abundant; they also find out the ripening bananas and soon devour them. They are as clever as mice in scenting food and more clever in learning what to avoid in the shape of a trap or poison. Jars with a little treacle at the bottom will trap them for a few weeks, then the bait must be changed to beer, linseed oil or sugar and water, otherwise the cockroaches cease to be attracted. Poisons, such as phosphorus paste or "Beetle-cute," have no



1.



3.



2.



4.

W. J. Lucas. Photo.

[*To face page* 403.

terrors for these pests. We once caught about a score and put them into a box with nothing but "Beetle-cute" to feed upon, but they lived happily enough until they grew so hungry that they began to devour each other. We have caught as many as 400 in one night in the palm house, and as they appear to be vegetarians as a rule and to eat a great deal of food it will be seen how troublesome they may become in large plant houses. In the smaller houses they give less trouble, because they can be more easily kept down. They breed very rapidly and the young start foraging very early.

Fresh importations of cockroaches sometimes accompany packages of plants, &c., from tropical countries; it is probable, however, that they get into the packages during transit, as they are known to infest the steamers which ply between the tropics and this country. They are also numerous in some warehouses.

Although not known to be mischievous, but with habits that justify suspicion, a fourth species, *Leucophaea surinamensis*, here figured, infests the cocoa-nut fibre beds in the tropical propagating houses, where it is sometimes very abundant. It buries itself in the loose fibre with astonishing facility, disappearing with diver-like action. The only method we have tried for its destruction is hand-catching.

Explanation of the Plate.

All the figures are natural size.

Fig. 1. *Nauphoeta brazzae*, Bolivar.

Fig. 2. *Nauphoeta cinerea*, Oliv.

Fig. 3. *Blatta orientalis*, Linn.

Fig. 4. *Leucophaea surinamensis*, Linn.

LXII.—MISCELLANEOUS NOTES.

Mr. Crawford Noble has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Forest Officer in Cyprus. Mr. Noble holds the Diploma in Agriculture of the University of Aberdeen, and has studied Forestry in the French École Nationale des Eaux et Fôrets at Nancy.

Mr. William Wright Smith, M.A., Assistant to the Professor of Botany in the University of Edinburgh since 1902, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, Curator of the Herbarium of the Royal Botanic Gardens, Calcutta, in succession to Capt. A. T. Gage, I.M.S.

Mr. William James Down, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Agricultural Instructor and Assistant Superintendent of the Hope Gardens and Experiment Station, Jamaica.

We regret to notice the death of Major J. T. CRAMER, R.G.A., which occurred at the village of Adonikia, Sierra Leone, on the 3rd of February last. Major Cramer spent about five weeks at Kew during June and July of last year, when he received instruction in systematic and economic botany with special reference to the colony of Sierra Leone. He was a keen and intelligent observer, and had acquired an extensive knowledge of the natural products of the colony. The instruction he received here, added to his already accumulated information, had fitted him to do useful work in the interests of the colony which, owing to his untimely death, has not been able to be realised.

W. R. BUTTENSHAW.—News has been received at Kew of the death, in September last, of Mr. W. R. Buttenshaw, M.A., B.Sc., the recently appointed Economic Botanist for the Bengal Agricultural Department. Mr. Buttenshaw was appointed, in 1899, Lecturer in Agriculture for Jamaica (*K.B.*, 1899, p. 220). In 1903 he was transferred to the Imperial Department of Agriculture for the West Indies as Scientific Assistant. This post he relinquished in the early part of this year to take up the Indian appointment. He had only been a few days in Calcutta when he fell a victim to heat-stroke. Mr. Buttenshaw had done much good work in the Colonial service and his tragic death, at the early age of 30, has cut short a career of much promise.

The Seeding of the English Elm (*Ulmus campestris*, L.).—The right of *Ulmus campestris* to a place in the British Flora has long been disputed. The fact that it was never found to produce fertile seed, and that its perpetuation in the British Isles appeared to be accomplished solely by means of root-suckers has naturally supported the view that it is an alien. It may be mentioned in passing, however, that the absence of the faculty of reproduction by sexual agency does not, in itself, absolutely prove that a tree is foreign to the country where it grows. A familiar instance is the Rose Acacia (*Robinia hispida*, L.), which had been known for many years, both wild and cultivated, before it was discovered bearing seeds. Instances have been found on plants growing wild on the Alleghanies, but even now they are exceedingly rare. Practically, the species has lost the power to reproduce itself except by suckers. These, however, as in the case of the Elm, are produced so plentifully that the production of seeds is no longer essential for the perpetuation of the species. With regard to *Ulmus campestris* there is no record of its having produced fertile seed in England, and when, in a communication received at Kew from Lady Rayleigh, it was stated that a large number of young seedlings had sprung up in the grounds at Terling Place, in Essex, the question appeared to deserve investigation. A visit was accordingly paid on Sept. 10th, 1907.

From the number of young seedlings, many still carrying the cotyledons, which were to be found on such places as rubbish heaps, garden borders, in workmen's gardens and even in the

woods, it was evident that a large quantity of fertile seed had ripened earlier in the year.

From an examination of the trees, however, it was evident that they were not *Ulmus campestris* in the common acceptation of the term. The adult leaves were glabrous, except in the axils of the veins beneath, as were also the shoots of the year. These characters as well as the shape of the leaves point to an affinity with *Ulmus glabra*. On the other hand strong sucker growths from near the base of the trunk bore leaves that were pubescent on every part. No clearly defined line separates *U. glabra* from *U. campestris*. There are several forms that may as reasonably be put under one as the other. The Terling Place Elm appears to be *U. glabra* with a certain leaning towards *U. campestris*.

The tree is quite common in the district. The hedgerows are lined with it, it is the common tree of the woodland, and there is a picturesque group in the village of Terling. In the open, it forms a short, thick trunk, then divides into a number of spreading limbs, the final subdivisions of the branch being long, thin and pendulous. In some specimens this slender, pendant habit is extraordinarily developed, giving the tree a singularly beautiful, fountain-like appearance—an appearance quite distinct from the more columnar, lumpy aspect of the ordinary *U. campestris*. Grown closely together it makes fine straight timber such as the forester loves. A specimen of the more spreading sort was approximately 95 feet high and 15 feet in girth of trunk.

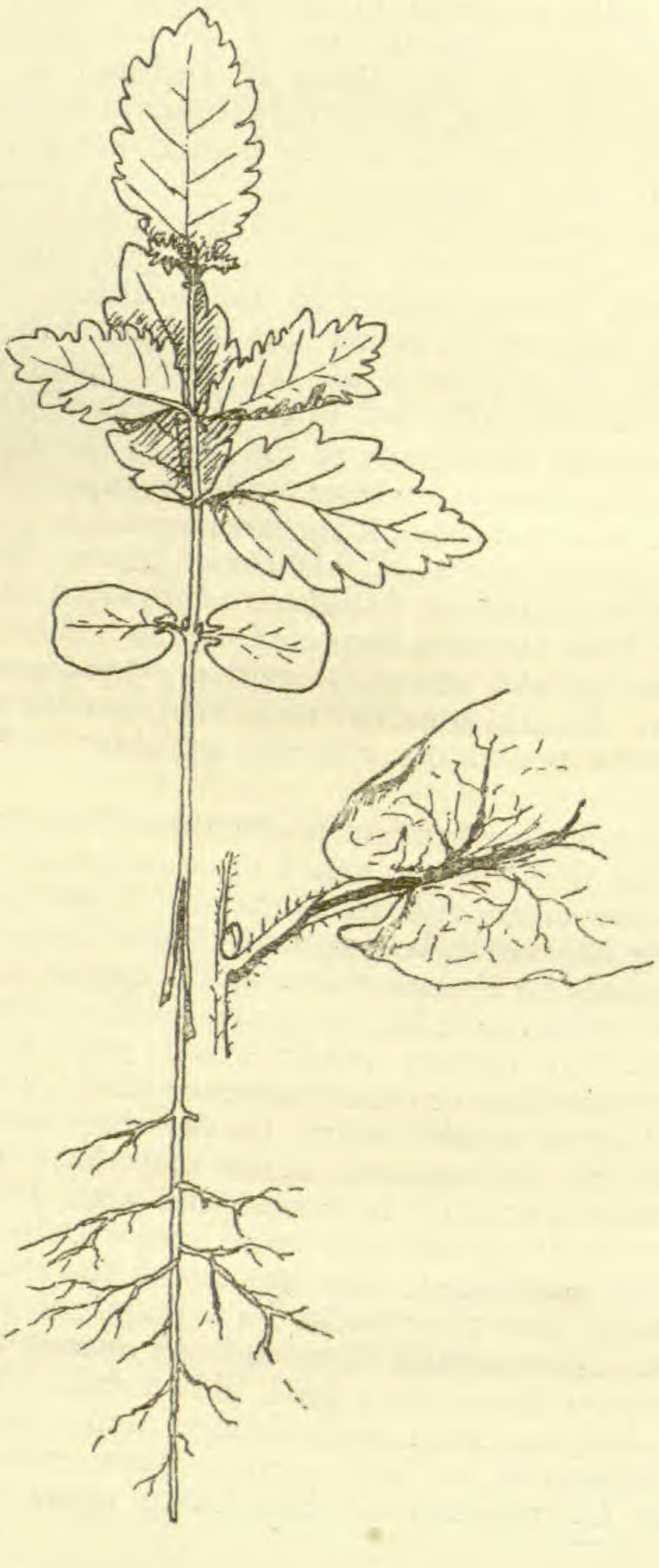
Judging from the abundance of the tree in the district, and the fact of its seeding freely (for from evidence supplied by residents, this is a common occurrence), it appears reasonable to conclude that this tree is a genuine native of this part of Essex. The presence of young trees of various ages would have supported this view. But their absence from the area inspected during a short visit is easily accounted for by the ordinary garden operations of digging, scything, &c. An examination of a wild, uncultivated patch of woodland might reveal the presence of older trees of seedling origin.

Interesting as is the abundant production of fertile seeds by the elms at Terling, it leaves untouched the question of the sterility of the true *Ulmus campestris* in England. A genuine instance of fertile seeding has yet to be recorded, if not discovered. Seeing that the tree seeds in France, there would appear to be no reason why it should not do so in Britain, provided the climatic conditions were suitable. It flowers freely every year, and one would imagine that some time or other, however rarely, a season suitable for seed production would occur. On the other hand, propagation for centuries by root-suckers alone may have perpetuated a functionally sterile strain. In connection with this question, the occurrence of seedling elm plants at King's College, Cambridge, deserves to be mentioned. On the top of the stonework of the gateway leading into the "Backs" a number of young elms are growing in the crevices, and there is every reason to believe that they have grown there from seed blown from the ancient elm trees near. Judging from their foliage alone, which is scabrid above and pubescent on both surfaces, these young trees would appear to be *U. campestris*. But leaves alone do not provide

adequate evidence of identity, especially if derived from juvenile trees, whose leaves are frequently much more pubescent than those of the adult tree. The publication of this note may direct attention to the matter and bring instances of the natural reproduction of *U. campestris* by seed to light. The part of the country in which this is most likely to occur is East Anglia, with its drier and more sunny climate.

W. J. B.

The seeding of the English Elm being so uncommon, it has been thought advisable to supplement the foregoing note with figures and descriptions of the authentic seedlings therein mentioned :—



The figure represents one of the seedlings from Terling Place, drawn to the natural size, together with an enlarged view of the base of a cotyledon seen from behind. The stem, cotyledons and leaves are hairy, the upper surfaces of the leaves being more hairy than the lower. The cotyledons are about $\frac{3}{8}$ to $\frac{7}{16}$ of an inch long by $\frac{1}{4}$ to $\frac{5}{16}$ inch broad, obovate-obtuse in outline and with pronounced auricles at the base.

It is of interest to notice that the foliage leaves of the young seedling are arranged in pairs, and it appears to be some time before the characteristic alternate arrangement of the adult tree is assumed. The dentation of the leaves is also of a simple type. A comparison of these seedlings with those figured by Hempel and Wilhelm* shows that the auricles of the cotyledons are typical of the seedlings of the genus *Ulmus*.

From their figures of the seedlings of *U. campestris*, *U. montana* and *U. effusa*, it appears that the cotyledons are similar in all cases, but the first foliage leaves are somewhat different in the three species, those of *U. montana* being larger and more definitely pointed at base and apex than those of *U. campestris*, whilst those of *U. effusa* are more decidedly ovate in outline and have more pronounced teeth. In all cases the first foliage leaves show a decussate arrangement.

The first layer of cork is beginning to be shed from the hypocotyl of the seedling figured on the opposite page.



* Hempel & Wilhelm, *Bäume und Sträucher des Waldes, Vol. III.* Vide *U. campestris*, p. 2, and Taf. xxxvii., Fig. 3 ; *U. montana*, p. 7, and Taf. xxxviii., Fig. 3 ; *U. effusa*, p. 9, and Taf. xxxix., Fig. 3.

For comparison with the Terling Place seedling a natural size drawing of a twig of one of the seedling Elms from the "Backs" Gate of King's College, Cambridge, is reproduced.

The young twigs, petioles, and the veins on the lower side of the leaf are covered with hairs, and both surfaces of the leaf lamina are also hairy.

The leaves have assumed the normal alternate arrangement and the dentation of the laminae is like that of the leaves of an adult tree. The general shape of the leaves agrees with those of *Ulmus campestris*,* though their hairiness is like that of *U. montana*, the latter character, however, appears to be correlated with the juvenile condition and does not therefore indicate that these seedlings are those of the Wych Elm.

Seedlings of the true *U. campestris* grown in the Gardens from seed collected by Mr. A. Henry in France prove to be very variable in character, the seeds being from the same tree. In all cases the leaves are hairy on both surfaces, and some of the specimens are remarkably similar to the Cambridge seedlings.

It seems highly probable, therefore, all things considered, that the "King's College" s edlings are those of the true *U. campestris*.

Sterculia rhinopetala.—Flowering specimens of a Sterculiaceous tree from Lagos were received from Mr. Cyril Punch in 1901, and were referred provisionally to *Cola*. In 1907 fruiting specimens of the same species, collected in Southern Nigeria by Mr. E. W. Foster, were received, and it was found, on examination of the seed, that the species belonged to the genus *Sterculia*, and was *S. rhinopetala*, K. Schum.

According to Zenker (K. Schumann in *Engler's Monogr. Afr. Pflanzen-familien*, vol. V., p. 102), the seeds of *S. rhinopetala* are used as Cola at Yaunde in the Cameroons. The accuracy of Zenker's statement is called in question by Schumann—firstly, because Zenker gave the number of seeds as 10–12 per follicle, whereas only 5 ovules were found in each ovary by Schumann; he considered therefore that the fruit could hardly belong to the flowering specimens. Secondly, because *S. rhinopetala* is a true *Sterculia*, he thought that its seeds could hardly be eaten, inasmuch as the seeds of *Sterculia* have a hard seed coat and an oily albumen.

The follicles collected by Foster contain, however, from seven to nine seeds each, and it is recorded in *Watt's Dictionary of Economic Products*, Vol. VI., part iii., pp. 362–5, that the seeds of *S. foetida*, *S. guttata* and *S. urens* are roasted and eaten like chestnuts, especially in times of scarcity. We are also informed by Dr. Hochreutiner that he has eaten, whilst at Buitenzorg, the seeds of several species of *Sterculia* (proper), and found them pleasant.

---

* *Cf.* Hempel & Wilhelm, l.c., Vol. III. *Ulmus campestris*, Spach., p. 2, and Taf. xxxvii., Fig. 2; *U. montana*, Smith, p. 7, Figs. 230, 231, and Taf. xxxviii., Fig. 2.

Sterculia rhinopetala is a large forest tree and is said to attain a height of more than 100 feet. Schumann gives the height as 25–35 metres, Foster says "up to 100 feet," and Punch describes it as a large tree. In Lagos it is known by the names *Orodu* and *Oro* (*Punch*). Its distribution as at present known is as follows :—

LAGOS. Ibadan Forest Reserve, *Punch*, 106.

S. NIGERIA. Ilara, *Foster*, 172.

CAMEROONS. Yaunde, *Zenker*, 606.

S. rhinopetala is interesting botanically, inasmuch as the androecium consists of two irregular rows; in *Sterculia* the anthers are usually crowded together without order into a head, and in *Cola* they are arranged in one or two very regular rows, so that in this respect *S. rhinopetala* exhibits intermediate characters.

The sessile ovaries and sessile stigmas are, according to Schumann, characteristic of *S. rhinopetala*.

T. A. S.

Botanical Magazine for October.—The plants figured are : *Ferula communis*, Linn. var. *brevifolia*, Mariz, *Rosa Soulieana*, Crépin, *Iris verna*, Linn., *Bulbophyllum dichromum*, Rolfe, and *Paeonia Cambessedesii*, Willk. The *Ferula* is an interesting plant. A rootstock, which produced the plant figured, was sent to Kew in 1886 by Vice-Consul G. P. Hunot, from Saffi, Morocco, and, owing to its successful cultivation, it has been possible to determine that the gum ammoniac (Fashook) of Morocco is obtained from *Ferula communis*. A full account of the history of gum ammoniac is included in this number of the *Kew Bulletin*. *Rosa Soulieana* is a vigorous-growing species with rather small, ivory-white flowers and attractive ovoid or almost globose, orange-vermilion fruits. It has been introduced into cultivation from Western China by Messrs. de Vilmorin, from whom Kew received it in 1899. The discoverer of this pretty rose was the Abbé Soulié, who was attached to the Catholic Mission at Yerkalo, on the Tibetan-Chinese frontier; he was murdered by Tibetan fanatics at Batang in Szechuen, in the latter part of June, 1905 (see *Journal of Botany*, 1905, p. 368). *Iris verna* is an old inhabitant of English gardens, having been in cultivation as long ago as 1739. The specimen figured was received from Mr. R. I. Lynch, Curator of the Botanic Garden, Cambridge. It is a native of the Eastern United States. The *Bulbophyllum* is a particularly attractive species from Annam, whence it was introduced by Messrs. F. Sander & Sons, of St. Albans. The specimen figured came from Mr. F. W. Moore, of the Royal Botanic Garden, Glasnevin, where a plant flowered in February last. The dark purple of the lip contrasts very strikingly with the deep yellow of the rest of the flower. *Paeonia Cambessedesii* is a native of the Balearic Islands and Corsica, the introduced plants having been collected in the Island of Majorca by Miss Frances Geoghegan, of Glasnevin, Dublin. The drawing

was prepared from a flowering specimen produced by an offset from Miss Geoghegan's original plant, which was sent to Kew in April of the present year. Its flowers are deep rose-pink.

The Flora of the Bombay Presidency.—The fourth and penultimate part of the second volume of Dr. T. Cooke's work, prepared at Kew and bearing the above title, was published in July. It contains the families *Euphorbiaceae* to *Araceae*, in part as to the first and last, and comprises pages 625 to 816; thus the second volume already exceeds the first by 170 pages. But those who use the book will not be disposed to criticism on this point, as much useful information is added to the purely descriptive matter. It is interesting to note that there are no *Coniferae*, *Cycadaceae*, or *Casuarinaceae* indigenous to the Bombay Presidency, but the author includes brief descriptions and gives references to figures of the principal species belonging to these families found in gardens. This course is followed under all the families for useful and ornamental plants, as well as prominent weeds.

Taking the whole of India, Orchids are far more numerous in species than any other family. In the Bombay Presidency they number only 73 species, belonging to 39 genera, 17 of which are represented by only one species each. *Habenaria* (17 species) is the only genus represented by more than five species. *Peristylus*, five species, and *Platanthera*, one species, are restored to generic rank. Judging from various deviations from other authorities, Dr. Cooke has worked on careful and critical lines. Taking the genus *Musa* as an example, *M. zebrina*, Van Houtte, regarded by Baker as a variety of *M. sapientum*, is given specific rank. *M. paradisiaca*, Linn., has been made the type, and *M. sapientum* the variety, for reasons stated. Some previous botanists have treated them inversely. There are also many valuable notes on some of the other cultivated species. *M. rosacea*, Jacq., and *M. superba*, Roxb., are the only indigenous species.

W. B. H.

The Orchids of the Malay Peninsula.—The first part of the Materials for a Flora of the Malayan Peninsula, by H. N. Ridley, M.A., F.R.S., Director of the Botanic Gardens, Singapore, is devoted to the Natural Orders *Hydrocharidaceae*, *Orchidaceae* and *Apostasiaceae*. Of *Hydrocharidaceae* six species are enumerated, belonging to as many genera, and thus the bulk of the work is devoted to *Orchidaceae*, for it is better to consider the *Apostasiaceae*—here treated as a distinct Order—as an ancestral tribe of *Orchidaceae*, since they are less distinct from *Cypripedieae* than are the latter from the great sub-order *Monandreae*. In fact, Mr. Ridley's definition of *Orchidaceae* would exclude *Cypripedieae* from that Order so far as the pollen, stigmas and rostellum are concerned. The *Orchidaceae*, in the sense of Bentham and Hooker's *Genera Plantarum*, form a very large and important element in the Flora, 546 species being enumerated, arranged in 90 genera. Of this

number 280 species, or just over half, are considered endemic, though it is probable that when the adjacent parts of the Archipelago have been better explored the proportion may be considerably modified. The area covered is not defined, but apparently includes the Peninsula from the northern boundary of Ligor, with the islands of Penang, Langkawi, Singapore, and a few others lying close to the coast of the Peninsula.

The arrangement followed is substantially that of Bentham and Hooker's *Genera Plantarum*, with the exception of the exclusion of the *Apostasiaceae*. There are several modifications for example, the sub-tribe *Erieae* is abolished, *Eria* and *Phreatia* being referred to *Dendrobieae*, and *Spathoglottis* to *Bletieae*. The latter tribe is enlarged by the inclusion of *Chrysoglossum*, *Collabium*, *Plocoglottis*, *Spathoglottis*, *Calanthe*, *Arundina* and *Dilochia*, which were scattered in four different sub-tribes in the Genera Plantarum. *Agrostophyllum* and *Ceratochilus* are transferred from *Coelogyneae* to *Dendrobieae*. *Geodorum*, *Thecostele* and *Polystachya* are removed from *Cymbidieae*—the first to *Eulophieae*, the second to *Notylieae*, and the third to a new sub-tribe, *Polystachyeae*, in which the anomalous genus *Leucolena*, Ridl., is now included. *Podochilus* (including *Appendicula*), *Thelasis* and *Oxyanthera* are separated from *Notylieae* as sub-tribe *Podochilineae*. Of the tribe *Neottieae* only two divisions are recognised, *Listereae* and *Goodyereae*, the former absorbing *Vanilleae* and *Arethuseae* and the latter *Corymbieae*, while two Indian genera included by Bentham in *Diurideae* are divided between them, *Neottieae* taking *Corysanthes*, while *Cryptostylis* goes into *Goodyereae*.

Two new genera appear here, *Podephyllum* and *Ascotainia*, the first based on *Agrostophyllum pauciflorum*, Hook. f., and *Eria minutiflora*, Ridl., and the second on *Tainia penangiana*, Hook. f. The latter genus is said to include two other species not belonging to this Flora, namely, *T. Hookeriana*, King & Pantling, and *T. viridifusca*, Lindl. *Dendrobium* is the largest genus, of which 73 species are enumerated, and this is closely followed by *Bulbophyllum* (including *Cirrhopetalum*) with 68, *Eria* with 49, and *Saccolabium* (including *Cleisostoma* and *Sarcanthus*) with 35. *Coelogyne* has 21 species and *Oberonia* 20, while no fewer than 28 genera are represented by only a single species.

The union of *Sarcanthus* and *Cleisostoma* with *Saccolabium*, though not made for the first time here, invites some comment, for Mr. Ridley still utilises them as natural sections of the larger genus, apparently without taking into account the difficulty of separating *Saccolabium* from *Angraecum* by absolute characters; he also retains *Acampe*, which had been united with *Saccolabium*. In fact there seems to be a modern tendency to excessive splitting on the one hand and undue agglomeration on the other—even within the limits of the same work—and the latter sometimes tends to "chaotic agglomerations of forms under a common generic name."

A few minor details may be pointed out. *Dendrobium Dalhousieanum*, Wall., is now well-known to be *D. pulchellum*

Roxb. *Cirrhopetalum gracillimum*, Rolfe, antedates *C. psittacoides*, Ridl., by over a year, and if *Cirrhopetalum* must be merged in *Bulbophyllum* the species must stand as *B. gracillimum*. *Coelogyne tomentosa*, Wawra, is Lindley's plant of the same name, and both it and *C. Massangeana*, Reichb. f., are quite distinct from *C. Dayana*, Reichb. f. In short *C. Dayana*, Ridl. (not of Reichb. f.), is, by his own cited specimens, *C. tomentosa*, Lindl. Mr. Ridley is probably correct in uniting his *Cymbidium acutum* and *C. Simonsianum*, King & Pantl., though the latter should have been adopted as the earlier name. Fortunately both are antedated by *C. Dayanum*, Reichb. f., described a quarter of a century earlier. *Renanthera alba*, Ridl., is *R. Hookeriana*, Reichb. f. A very curious circumstance about *Neuwiedia Curtisii*, Rolfe, is recorded by Mr. Ridley, namely, that it differs from its allies in its fruit being a "red, succulent berry," not a capsule, and he identifies with it the *Tupistra* (?) *singapureana*, Wall. Cat. n. 5,195. A comparison with the unique fruiting specimen in the Wallichian Herbarium now confirms the determination, though, so far as can be seen from the dried specimen, which has been somewhat damaged by insects, the structure of the fruit and seeds does not differ in other respects. The history of the species is thus carried back for over 60 years, and the name should now stand as *Neuwiedia singapureana*.

The work forms an important contribution to Orchidology.

R. A. R.

Welwitschia.—In connection with Professor Pearson's account of his recent journey published in the last number of the *Bulletin*, the distribution of *Welwitschia* in German South-West Africa is discussed in some detail (*Kew Bulletin*, No. 9, p. 347). It should not be forgotten, however, that Welwitsch discovered this plant in Angola near Cape Negro (lat. 15° 40′ S.), in the year 1860. During the autumn of 1861 and before Welwitsch's specimens reached Kew, sketches and material of the same plant were received from Baines, and also from Anderson, in Damara-land at a spot about 500 miles to the south of Cape Negro. Both these collections together with additional material sent to Kew by Monteiro are described and figured in the *Transactions of the Linnean Society*, vol. 24, p. 1, by Dr. J. D. Hooker, and form the material on which the genus *Welwitschia* was founded. According to Monteiro, the northern limit of the genus is about 14° S. lat. in the neighbourhood of Mossamedes, and a short account of the finding of the plant, together with a plate, is given by him in his book *Angola and the River Congo*, vol. II., pp. 228–231, pl. XV.

Erratum.—Page 360 and cover of No. 9, *for* "Diagnoses Africanae: XIX." *read* "Diagnoses Africanae: XX."

INDEX.

A.

Abbott, F., 72.
Acacia pallens, *Rolfe*, 361.
Acanthosicyos horrida (with plate), 343.
Aconitum Gammiei, *Stapf*, 56.
— gymnandrum, 71.
— Napellus, var. eminens, 372.
Adenium oleifolium, *Stapf*, 53.
— swazicum, *Stapf*, 53.
Adenophora polymorpha, 9.
African mahogany, 64.
— oak, 64.
— tree rubber, 187.
Agave (Littaea) Watsoni, *J. R. Drummond et C. H. Wright*, 322.
Algae, marine, from Chatham Islands, 37.
—, —, new or little-known, from the East (with plate), 260.
Aloe campylosiphon, 200.
— nitens, 337.
— pallidiflora, 140.
American rubber plants, 153.
Andropogon (§ Arthrolophis) Bentii, *Stapf*, 224.
— cyrtocladus, *Stapf*, 209.
— Ischaemum, var. somalensis, *Stapf*, 210.
Angraecum infundibulare, 372.
Annals of the Royal Botanic Garden, Calcutta, 32.
Anthemis Ballii, *Stapf*, 367.
Anti-opium plants, 198.
Apples, Cape, Bitter pit in, 142. 250.
Appointments :—
Brown, T. W., 18.
Butcher, F. H., 246.
Down, W. J., 403.
Gallagher, W. J., 100.
Hill, A. W., 296.
Morton, A., 72.
Noble, C., 403.
Smith, W. W., 403.
Stroud, E. G., 246.
Aralia quinquefolia, var. Ginseng, 73.
Arctostaphylos Manzanita, 141.
Aristida somalensis, *Stapf*, 216.
Ascochyta Cookei, *Massee*, (with fig.), 241.
Ashton Court, 395.

B.

Bamboos, cultivated, flowering of, 228.
Bassia, Malayan species of, 112.
Benthamiana, 200.
Berkheya (§ Stobaea) macrocephala, *J. M. Wood*, 50.
Bigelovia graveolens, 372.
Bignoniaceae, reductions of Wallichian herbarium, 16.
Bird's nest from Trinidad, 70.
Bitter pit in Cape apples, 142, 250.
Blepharocalyx spiraeoides, 140.
Boehmeria nivea in Tirhut, 4.
Bombay Presidency, Flora of, 410.
Books :—
Annals of the Royal Botanic Garden, Calcutta, 32.
Botanical Magazine, 29, 71, 106, 140, 141, 200, 248, 336, 337, 372, 409.
Bromeliaceae Andreanae, 304.
Diagrams of Plant Diseases, 202.
Flora of Bombay Presidency, 410.
Forests and Forest Flora of the Cape, 303.
Guide to Museum I., 300.
Hooker's Icones Plantarum, 30.
Indian Trees, 30.
London Botanic Gardens, 305.
Materials for Flora of Malay Peninsula, 109.

Books—*cont.*
Orchids of N. W. Himalaya, 32.
Rubber Cultivation in the British Empire, 304.
— in the East, 107.
Botanic Garden, Hobart, 72.
— —, Liverpool, 65.
— Gardens, London, 305.
Botanical Magazine, 29, 71, 106, 140, 141, 200, 248, 336, 337, 372, 409.
Brandis, Sir D., "Indian Trees," 30.
Brazilian Linen Plant, 338.
British East Africa, Mgoa rubber in, 283.
— Empire, rubber cultivation in, 304.
— Somaliland, grasses of, 203.
Bromeliaceae Andreanae, 304.
Bromus scoparius, var. stenantha, *Stapf*, 369.
Brown, T. W., 18.
Bruckenthalia spiculifolia, 337.
Bulbophyllum dichromum, *Rolfe*, 128, 409.
— tridentatum, *Rolfe*, 128.
Burdett-Coutts, Baroness, 18.
Burkill, I. H., alpine notes from Sikkim (with plate), 92.
Butcher, F. H., 246.
Buttenshaw, W. R., 404.
Butter-nuts, 344.

C

Cacao seeds, treatment of, for export, 297.
Caesalpinia vernalis, 200.
Caiophora coronata, 140.
Calabash tobacco pipes, 299, 374.
Calanthe burmanica, *Rolfe*, 129.
Calathea angustifolia, 337.
Calcutta, Annals of the Royal Botanic Garden, 32.
Calliandra portoricensis, var. major, 141.
Calyptospora Goeppertiana (with plate), 1.
Camphor, distillation of, 88.
Candle-snuff fungus, 108.
Canhamo Braziliensis Perini, 338.
Cape apples, bitter pit in, 142, 250.
— , Forests and Forest Flora of, 303.
Cardiff Castle, 389.
— Public Parks, 395.
Castilloa, 156.
Catalpa Bungei, 102.
— cordifolia, 43.
— speciosa, 43.
— , the Western, 43.
Cecropia, illustrations of, 106.
Ceylon, Funtumia rubber in, 189.
— Rubber Exhibition, 34.
Chatham Islands, marine algae from, 37.
China, Sassafras in, 55.
Chinese species of Eriocaulon, 3.
Chlamydites, a new genus of Compositae, 90.
— Prainii, *Drummond*, 91.
Chrysophyllum Roxburghii, 109.
Cienfuegosia heteroclada, *Sprague*, 48.
Cinnamomum Camphora, 88.
Clarke, C. B., a memorial of, 71.
Cleisostoma secundum, *Rolfe*, 131.
Cleome densifolia, *C. H. Wright*, 360.
Clerodendron (Cyclonema) phlebodes, *C. H. Wright*, 54.
Cliffortia natalensis, *J. M. Wood*, 362.
Clonostachys Simmonsii, *Massee* (with fig.), 242.
"Cluster-cup," disease of Conifers (with plate), 1.
Clyne Castle, 393.
Coca, a substitute for, 136.
Cockroaches, tropical (with plate), 402.
Codonopsis Tangshen (with plate), 9.
Coelogyne Mooreana, *Hort. Sand.*, 129.
Collybia lutea, *Massee*, 122.

Combretum sundaicum, 198.
Conifers, "cluster-cup" disease of (with plate), 1.
Coorongite, 145.
Cordeauxia, *Hemsl.*, gen. nov., 361.
— edulis, *Hemsl.*, 361.
Corea, Ginseng in, 73.
Coreopsis bella, *Hutchinson*, 364.
Cotton at Liverpool, 62.
— seeds, disinfecting, 299.
Cramer, Major J. T., 404.
Cricket bat willow (with plates), 311.
Crimson-cup fungus, 108.
Cymbidium erythrostylum, 141.
— pumilum, *Rolfe*, 130.
Cyperaceae of the Philippines, 305.
—, reductions of Wallichian herbarium, 264.
Cyrenaica, Gums Ammoniac of, 375.

D.

Daedalea papyracea, *Massee*, 124.
Dalbergia Lacei, *Prain*, 58.
Dasyscypha coccinea, 108.
Dasystachys nervata, *C. H. Wright* 55.
Davidia, 301.
Decades Kewenses, 56, 316.
Delphinium macrocentron, 337.
— (Macrocentra) Wellbyi, *Hemsl.*, 360.
Dendrobium Ashworthiae, 248.
Diagnoses Africanae, 45, 360.
Diagrams of plant diseases, 202.
Didymosphaeria tetraspora, *Massee*, 124.
Diospyros Kaki, 141.
Disa Bakeri, *Rolfe*, 132.
Diseases of Plants :—
Bitter pit in Cape apples, 142, 250.
"Cluster-cup" disease of Conifers (with plate), 1.
Calyptospora Goeppertiana, 1.
Diagrams of Plant Diseases, 202.
Diseases of Plants—*cont.*
Investigations in, 139.
Potatoes, degeneration in (with plate), 307.
Dixon, Abraham, 246.
Down, W. J., 403.
Dubouzetia, a revision of, 125.
— acuminata, *Sprague*, 58, 127.
— campanulata, 127.
— caudiculata, *Sprague*, 57, 127.
— elegans, 128.
— leionema, *Sprague*, 127.
Dysoxylum pachyphyllum, *Hemsl.*, 58.

E.

East Africa, Funtumia rubber in, 189.
Economic notes, Liverpool, 61.
Ehretia trachyphylla, *C. H. Wright*, 53.
Elandsbontjes, 371.
Elephantorrhiza Burchellii, 371.
Elm, English, seeding of (with figs.), 404.
Entada spiralis, stem of, 106.
Eriocaulon, Chinese species of, 3.
Erodiophyllum acanthocephalum, *Stapf*, 318.
Errata, ii., 412.
Eupatorium glandulosum, 248.
Euphorbia fulva, 294.
Euptilota Fergusonii, *Cotton* (with plate), 262.
Exosporium laricinum, *Massee* (with fig.), 242.

F.

Falkia canescens, *C. H. Wright*, 54.
Ferula communis, var. brevifolia, 375, 409.
— marmarica, 375.
Fibres :—
Canhamo Braziliensis Perini, 338.
Sansevieria grandis, 369.
Zapupe, 396.

Fiji, Mikania scandens in, 306.
Flora of the Bombay Presidency, 410.
Florula Marmarica, additions to, 365.
"Forests and Forest Flora of the Cape," 303.
Foster, Sir M., 65.
Fruit at Liverpool, 63.
Fungi as decorative plants, 108.
— Exotici, 121.
—, new and additional species of (with plate), 238.
Funtumia elastica, 187, 249.

G.

Gallagher, W. J., 100.
Gamble, J. S., Gutta Percha trees of the Malay Peninsula, 109.
Geigeria Wellmanii, *Hutchinson*, 49.
Gentiana ornata, 248.
German South - West Africa, notes on a journey in, 339.
Gesneraceae, reductions of Wallichian herbarium, 94.
Ginseng in Corea, 73.
Glaziou, A. F. M., 66.
Grasses, hints for the collection of, 226.
—, mud-binding, 190.
— of British Somaliland, 203.
Guayule rubber, 285.
Guide to Museum I., 300.
Gum, Sudan, 23.
Gums ammoniac of Morocco and the Cyrenaica, 375.
Gutta percha, measures for increasing supply of, 117.
— — trees of the Malay Peninsula, 109.
Gymnogramme (Eugymnogramme) hirtipes, *C. H. Wright*, 61.
Gynura ovalis, 199.

H.

Hanbury, Sir T., 132.
Haviland, G. D., 197.
Haworthia Pearsoni, *C. H. Wright*, 365.
Heaths, hardy, at Kew, 101.
Helichrysum argentissimum, *J. M. Wood*, 364.
Hemiptera - Homoptera, Newstead, 97.
Hendre, 388.
Herbertia Amatorum, *C. H. Wright*, 321.
Hevea, 153.
Hibiscus Allenii, *Sprague et Hutchinson*, 45.
— gossypinus, 48.
— Hildebrandtii, *Sprague et Hutchinson*, 46.
— radiatus, 338.
— shirensis, *Sprague et Hutchinson*, 47.
Hill, A. W., 296.
Himalaya, North - Western, orchids of, 32.
Hobart Botanic Garden, 72.
Hoodia Currori, 200.
Hooker, Sir J. D., Linnean Bicentenary Gold Medal, 256.
—, — — —, Order of Merit, 296.
Hooker's Icones Plantarum, 30.
Hydnum lateritium, *Massee*, 124.
Hypericophyllum, multicaule, *Hutchinson*, 50.
Hypholoma peregrinum, *Massee* (with fig.), 239.

I.

Incarvillea longiracemosa, *Sprague*, 320.
— Younghusbandi, *Sprague*, 320.
"Indian Trees," 30.
Insecta, Lucas (with plate), 401.
Intolwana, 371.
Ipomoea peltata, stem of, 106.
Ire rubber, 187.

Iris verna, 409.
— Wilsoni, *C. H. Wright*, 321.
Isonandra, Malayan species of, 110.

J.

Java teak, 64.
Jodrell Laboratory, research in, 137.
Julianiaceae, 372.

K.

Kaempferia (Soncorus) lutea, *C. H. Wright*, 60.
Kennedya retrorsa, 336.
Kew, a Russian estimate of, 201.
—, Assistant Director, appointment of, 296.
— Gardens, presentations to, 199.
— Herbarium, additions to, 24, 200.
—, heaths, hardy, 101.
—, investigations in plant pathology, 139.
—, Jodrell Laboratory, 137.
— lake, 101.
— Library, catalogue of, supplement to, Appendix II.
— —, presentations to, 27, 200.
—, Lonicera collection, 69.
—, memorial of the late C. B. Clarke, 71.
— Museums, Forestry exhibits, 336.
— —, Guide to museum I., 300.
— —, oils, fatty, in, 106.
— —, presentations to, 106, 199, 336.
—, plant pathology, investigations in, 139.
— publications, 1896–1906, list of, Appendix V.
—, rubber plants, distribution of, 103.
Kew, Tropical African plants, accession of, 233.
—, visitors during 1906, 18.
—, Wild Fauna and Flora, additions to, 97, 156, 238, 282, 401.
Kuntze, Dr. O., 100.

L.

Labrador, plants from, 76.
Lagenaria vulgaris, 300.
Lake, The, 101.
Lamprothamnus Fosteri, *Hutchinson*, 49.
Landolphia Monteiroi, *Dyer Ms. ex Stapf*, 51.
Lepidoptera, Simmonds (with plate). 156.
Leptochloa Appletonii, *Stapf*, 223.
Lilium tigrinum, 297.
Linnean Bicentenary, 251.
Liverpool Botanic Garden, 65.
—, economic notes, 61.
Lomatia ferruginea, 71.
"London Botanic Gardens," 305.
Loniceras at Kew, 69.
Lophira alata, 64.

M.

MacGregor, Sir W., plants from Labrador, 76.
Mahogany, African, 64.
Malay Peninsula, gutta percha, trees of, 109.
— —, Materials for a Flora of, 410.
— —, orchids of, 410.
Mann, Gustav, portrait of, 247.
Margam Park, 390.
Marine algae from Chatham Islands, 37.
Mariola, 293.

Mascarenhasia elastica, 283.
Masters, M. T. (with Bibliography), 325.
Meconopsis bella, 141.
— (Eumeconopsis) Forrestii, *Prain*, 316.
— punicea, 106.
Mgoa rubber in British East Africa, 283.
Mikania scandens in Fiji, 306.
Milowia amethystina, *Massee* (with fig.), 243.
Mimusops, Malayan species of, 117.
Ming-t'ang-shen, 9.
Miscellaneous Notes, 18, 65, 100, 132, 197, 246, 296, 325, 369, 403.
Mitragyne speciosa, 198.
Mollusca, Sich, 282.
Montanoa mollisima, 336.
Montserrat, vegetable products from, 199.
Morocco, Gums Ammoniac of, 375.
Morton, A., 72.
Moupine, Climate, &c., 302.
Mud-binding grasses, 190.
Mud from the Lake, 101.

N.

Naras, 343.
Nerine Bowdeni, 106.
New garden plants, Appx. III.
Newport Forestry Exhibition, 388.
— Public Park, 395.
—, visit to, 388.
N'hangellite, 145.
—, report on a sample from Inhambane, 151.
Nigeria, Northern, notes from, 248.
Noble, C., 403.
Nolanea nana, *Massee*, 123.

O.

Obituary Notices :—
Burdett-Coutts, Baroness, 18.
Buttenshaw, W. R., 404.
Cramer, Major J. T., 404.
Dixon, Abraham, 246.
Foster, Sir M., 65.
Glaziou, A. F. M., 68.
Hanbury, Sir T., 132.
Haviland, G. D., 197.
Kuntze, Dr. O., 100.
Masters, M. T., 325.
Pfitzer, E., 68.
Winter, J. N., 68.
Ocimum (Hierocimum) odontopetalum, *C. H. Wright*, 54.
× Odontioda heatonensis, 200.
Odontoglossum Leeanum, 336.
Oil, palm, 61.
Oils, fatty, collection of, in Kew Museum, 106.
Olearia speciosa, 106.
Omphalia fuliginosa, *Massee*, 122.
— Oedipus, *Massee*, 122.
Oncinotis natalensis, *Stapf*, 52.
Orchids, new, 128.
— of the Malay Peninsula, 410.
— — — North-Western Himalaya, 32.
Orchis longibracteata, flowering of, 144.
Orthopterygium, 372.
Othonna decurrens, *Hutchinson*, 50.

P.

Paenyptila cayanensis, 70.
Paeonia Cambessedesii, 409.
Palaquium, Malayan species of, 113.
Palm kernels, 62.
— oil, 61.
— stem, branching, 106.
Palo amarillo, 294.
Panicum (§Eupanicum) Appletonii, *Stapf*, 225.
Panus Bartlettii, *Massee*, 123.

Paphiopedilum villosum, var. annamense, 140.
Para rubber seeds, transport of, 334.
Parthenium argentatum, 285.
— incanum, 293.
Payena, Malayan species of, 110.
Pearson, H. H. W., notes on a journey from Walfish Bay to Windhuk, 339.
Pedalineae, reductions of Wallichian herbarium, 16.
Peglera, *Bolus*, gen. nov., 362.
— capensis, *Bolus*, 362.
Penllergaer, 394.
Pergularia, The Genus, 323.
Pfitzer, E., 68.
Philippines, Cyperaceae of, 305.
Phyllodoce Breweri, 336.
Pipes, Calabash, 299, 374.
Plant diseases, diagrams of, 202.
— pathology, investigations in, at Kew, 139.
Plants suitable for warmer parts of United Kingdom, 20.
Pleurotus Cheelii, *Massee*, 122.
Podocarpus milanjiana, var. arborescens, 22.
Podophyllum versipelle, 372.
Portuguese East Africa, Report on a sample of N'hangellite from, 151.
Potatoes, degeneration in (with plate), 307.
Primula deorum, 140.
— muscarioides, *Hemsl.*, 319.
— orbicularis, 200.
Prunus Besseyi, 372.
Psalliota Burkillii, *Massee*, 123.
Psychotria Dupontiae, *Hemsl.*, 363.
Pyrenochaeta Phloxidis, *Massee* (with fig.), 241.

R.

Radermachera pentandra, 198.
Ramie in Tirhut, 4.
Ramularia Necator, *Massee*, 243, 298.
Redwood, Sir Boverton, report on a sample of N'hangellite, 151.
Renanthera annamensis, 71.
Rhododendron, a new Chinese, 244.
— Benthamianum, *Hemsl.*, 319.
— Delavayi, 248.
— (§ Azalea) Mariesii, *Hemsl. et E. H. Wils.*, 244.
Rhodophyllis chathamensis, *Cotton*, 40.
Ribes mogollonicum, 106.
Rosa Soulieana, 409.
— Willmottiae, *Hemsl.*, 317.
Rubber, African tree, 187.
— cultivation in the British Empire, 304.
— Exhibition, Ceylon, 34.
—, Guayule, 285.
— in the East, 107
— Ire, 187.
—, Mgoa, in British East Africa, 283.
— plants, American, 153.
— —, distribution of, from Kew, 103.
— tree, new, 294.
—, wet blocking of, 103.

S.

Saccolabium rubescens, 106.
— Woodfordii, *Rolfe*, 131.
Sageretia Brandrethiana, 373.
—, the genus, in Africa, 373.
St. Fagans, 390.
Salix alba, var. caerulea (with plate), 312.
— fragilis (with plate), 312.
— Russelliana, 315.
— viridis, 313.
Sansevieria grandis, 369.
Sapium, 155.
Sarcosperma paniculatum, 109.
Sarcostemma viminale (with fig.), 348.
Sassafras in China, 55.
— officinale, 56.
— Tzumu, 55.

Scinaia complanata, *Cotton*, 260.
Seeds available for distribution, Appx. I.
—, Cacao, treatment for export, 297.
— Cotton, disinfecting, 299.
— from crops of wild ducks, 36.
—, Para rubber, transport of, 334.
Sideroxylon, Malayan species of, 109.
Sikkim, alpine notes from (with plate), 92.
Singleton Abbey, 393.
Smith, W. W., 403.
Somaliland, British, grasses of, 203.
South African Exhibition, plants from, 199.
— — —, economic products from, 199.
South Wales, visit to, 388.
Spartina alterniflora, 192.
— stricta, 190.
— Townsendi, 192.
Specimens for use in elementary schools, 72.
Splachnobryum delicatum, 136.
Sporobolus Brockmanii, *Stapf*, 220.
— fruticulosus, *Stapf*, 218.
— longibrachiatus, *Stapf*, 219.
— variegatus, *Stapf*, 218.
Staffs of Botanical Departments, list of, Appx. IV.
Stauropsis chinensis, *Rolfe*, 130.
— luchuensis, *Rolfe*, 131.
Sterculia rhinopetala, 408.
Stewartia Malachodendron, 336.
Stilbum sphaerocephalum, *Massee* (with fig.), 243.
Streptocarpus Holstii, 337.
Strophanthus Gerrardii, *Stapf*, 52.
Stroud, E. G., 246.
Sudan Gum, 23.
Sugar-canes, seedling in the West Indies, 306, 337.
Swansea Public Parks, 395.
Swedish beer flagons, 106

T.

Tamarix pentandra, 248.
T'ang-shen (with plate), 9.
Teak, Java, 64.
Tillandsia (Anoplophytum) argentina, *C. H. Wright*, 60.
Timbers at Liverpool, 63.
—, African Mahogany, 64.
—, — Oak, 64.
—, Catalpa cordifolia, 43.
—, Java Teak, 64.
—, Washiba, 64.
—, Willow, Cricket bat, 311.
Tirhut, Ramie in, 4.
Tree rubber, African, 187.
Tricuspidaria dependens, 71.
—, synonymy and distribution of, 10.
Trinidad, bird's nest from, 70.
Tropical African plants, accession of, from 1899–1906, 233.

U.

Ulmus campestris, seeding of (with figs.), 404.

V.

Viburnum Carlesii, 71.
Vitex sarawakana, *H. H. W. Pearson*, 60.
— smilacifolia, *H. H. W. Pearson*, 59.

W.

Walfish Bay to Windhuk, notes on a journey (with map and plates), 339.
Wallichian herbarium reductions of :—
— Bignoniaceae ; Pedalineae, 16.
— Cyperaceae, 264.
— Gesneraceae, p. 94.

Washiba, 64.
Welwitschia mirabilis (with plate), 360, 412.
Werneria dactylophylla, a substitute for Coca, 136.
West Indies, seedling sugar-canes in, 306, 337.
Willow, Cricket bat, 311.
Windhuk, 355.
Winter, J. N., 68.
Wrightia natalensis, *Stapf*, 51.

X.

Xylaria hypoxylon, 108.

Z.

Zapupe fibre plant, 396.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1907.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1906. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena macrostemon.
microphylla.
Novae-Zealandiae.
ovalifolia.
pinnatifida.

Achillea Ageratum.
alpina.
Clavenae.
macrophylla.
rupestris.

Aconitum barbatum.
columbianum.
uncinatum.
vulparia.
Wilsoni.

Actaea alba.
spicata.
— var. rubra.

Actinella scaposa.

Actinomeris squarrosa.

Adenophora denticulata.
liliifolia.
polymorpha.
verticillata.

Adenostemma viscosa.

Adesmia muricata.

Adonis autumnalis.
pyrenaica.

1375 Wt 72 11/06 D & S 29 26487

Aethionema cappadocicum.
cordatum.
grandiflorum.
pulchellum.
saxatile.

Agrimonia odorata.
repens.

Agropyron acutum.
Aucheri.
junceum.
tenerum.

Agrostis alba.
capillaris.
elegans.
nebulosa.

Ajuga Chamaepitys.

Allium acuminatum.
albo-pilosum.
atropurpureum.
canescens.
cardiostemon.
derderianum.
giganteum.
globosum.
karataviense.
narcissiflorum.
nigrum.
odorum.
ostrowskianum.
pulchellum.
subvillosum.
Suworowi.
Tubergeni.
zebdanense.

Alonsoa Warscewiczii.

Alstroemeria aurantiaca.
Hookeri.
pulchella.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
pontica.
rosea.
sinensis.
sulphurea.
taurinensis.

Alyssum argenteum.
creticum.
gemonense.
incanum.
maritimum.
moellendorfianum.
podolicum.
rostratum.
spinosum.

Amaranthus caudatus.
Dussii.
hypochondriacus.
polygamus.
retroflexus.
speciosus.
viridis.

Ambrosia artemisiaefolia.
trifida.

Amellus annuus.

Amethystea caerulea.

Ammobium alatum.

Ammophila arundinacea.

Amphoricarpus Neumayeri.

Anacyclus clavatus.
officinarum.
Pyrethrum.

Anaphalis cinnamomea.
nubigena.

Anchusa capensis.
italica.

Andryala integrifolia.

Anemone apennina.
baldensis.
blanda.
decapetala.
multifida.
parviflora.
polyanthes.
pratensis.
Pulsatilla.
— var. lilacina.
rivularis.
sylvestris.
virginiana.

Angelica dahurica.

Anoda hastata.
Wrightii.

Antennaria dioica.
— var. tomentosa.

Anthemis austriaca.
carpatica.
mixta.
tinctoria.

Anthericum Liliago.
ramosum.

Anthoxanthum Puelii.

Anthriscus cerefolium.
nemorosa.

Antirrhinum Asarina.
Orontium.

Apera interrupta.
Spica-Venti.

Aplopappus croceus.

Aquilegia alpina.
canadensis.
chrysantha.
glandulosa.
Kitaibeli.

Arabis alpestris.
alpina.
arenosa.
blepharophylla.
hirsuta.
Holboellii.
pumila.
purpurea.

Aralia racemosa.

Arctium intermedium.
majus.
nemorosum.

Arctotis stoechadifolia.

Arenaria balearica.
Biebersteinii.
cephalotes.
foliosa.
graminifolia.
grandiflora.
gypsophiloides.
laricifolia.
montana.
pinifolia.

Argemone grandiflora.
hispida.
ochroleuca.
platyceras.
stenopetala.

Arisaema japonicum.

Aristida adscensionis.

Aristolochia rotunda.

Armeria canescens.
juncea.
latifolia.
majellensis.
plantaginea.

Arnica Chamissonis.
longifolia.
montana.
sachalinensis.

Arnoseris pusilla.

Artemisia annua.
argentea.
lanata.

Arthraxon ciliaris.

Asperella Hystrix.

Asphodeline liburnica.

Asphodelus albus.

Aspilia buphthalmiflora.

Aster alpinus.
canescens.
foliaceus.
Herveyi.
pyrenaeus.
radula.
subcaeruleus.
trinervius.

Astilbe chinensis.
rivularis.
Thunbergi.

Astragalus alopecuroides.
boeticus.
chinensis.
chlorostachys.
frigidus.
maximus.
penduliflorus.
pentaglottis.
sinicus.

Astrantia Biebersteinii.
carniolica.
helleborifolia.

Athamanta Matthioli.
vestina.

Atriplex littoralis.
nitens.
rosea.
sibirica.

Atropa Belladonna.

Aubrietia erubescens.
Pinardi.

Baeria coronaria.

Baptisia australis.
leucantha.

Barbarea arcuata.
intermedia.
praecox.

Basella rubra.

Beckmannia erucaeformis.

Belamcanda punctata.

Beta trigyna.

Bidens frondosa.
grandiflora.
leucantha.

Biserrula Pelecinus.

Biscutella auriculata.
ciliata.
didyma.
laevigata.

Bloomeria aurea.

Blumenbachia insignis.
muralis.

Bocconia cordata.
microcarpa.

Borago laxiflora.
officinalis.

Brachycome iberidifolia.

Brachypodium distachyum.
pinnatum.
sylvaticum.

Brassica alba.
campestris.
— var. chinensis.
Cheiranthos.
Erucastrum.
juncea.

Brevoortia Ida-Maia.

Briza geniculata.
maxima.
minor.

Brodiaea grandiflora.
Hendersoni.
Purdyi.

Bromus adoënsis.
albidus.
breviaristatus.
brizaeformis.
carinatus.
ciliatus.
Kalmii.
macrostachys.
marginatus.
maximus.
Porteri.
pumpelianus.
purgans.
racemosus.
Richardsoni.
rubens.
secalinus.
squarrosus.
Tacna.
tectorum.
Trinii.
unioloides.

Bulbine annua.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum Candollei.
ranunculoides.

Caccinia strigosa.

Calamagrostis confinis.
epigeios.
varia.

Calamintha patavina.

Calandrinia grandiflora.
Menziesii.
umbellata.

Calceolaria mexicana.
polyrrhiza.

Calla palustris.

Callirhoë lineariloba.

Callistephus hortensis.

Caltha polypetala.

Calystegia sylvatica var. rosea.
sepium var. dahurica.

Camassia Cusickii.
esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
barbata.
bononiensis.
Cervicaria.
lactiflora.
latiloba.
latifolia.
longistyla.
macrostyla.
primulaefolia.
sarmatica.
spicata.
sulphurea.
thyrsoides.

Capsella Heegeri.

Carbenia benedicta.

Cardamine chenopodifolia.

Carduus cernuus.
niveus.
tenuiflorus.

Carex arctata.
depauperata.
paniculata.
pendula.

Carlina acaulis.

Carthamus leucocaulos.
tinctorius.

Carum buriacticum.
copticum.

Cardiospermum Halicacabum.

Catananche cœrulea.
lutea.

Cedronella cana.

Celsia Arcturus.

Cenchrus tribuloides.

Cenia turbinata.

Centaurea atropurpurea.
Crocodylium.
cynaroides.
dealbata.
depressa.
moschata.
pulchra.
rupestris.
rutaefolia.
ruthenica.
salmantica.
tauromenitana.

Centranthus Calcitrapa.
macrosiphon.
Sibthorpii.

Centromadia pungens.

Cephalaria alpina.
ambrosoides.
leucantha.
radiata.
tatarica.
transsylvanica.

Cerastium alpinum.
perfoliatum.
purpurascens.
tomentosum.

Cerinthe alpina.
aspera.
major.

Chaenostoma foetidum.

Chaerophyllum aromaticum.
aureum.
nodosum.

Charieis heterophylla.

Chelidonium franchetianum.
lasiocarpum.

Chelone glabra.
Lyoni.
nemorosa.
obliqua.

Chenopodium ambrosoides.
Bonus-Henricus.
hybridum.
Quinoa.
urbicum.
virgatum.
Vulvaria.

Chloris barbata.
elegans.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum cinerariaefolium.
corymbosum.
macrophyllum.
multicaule.
Myconis.
pallens.
palmatum.
setabense.
viscosum.
Zawadski.

Chrysopogon Gryllus.

Chrysopsis villosa.

Cicer arietinum.

Cimicifuga cordifolia.
elata.
racemosa.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Claytonia asarifolia.

Clematis diversifolia.
integrifolia.

Cleome violacea.

Clintonia umbellata.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
canus.
Casabonae.

Cnicus arachnoideus, *cont.*
eriophorus.
oleraceus.
pannonicus.

Cochlearia danica.
officinalis.
saxatilis.

Codonopsis lanceolata.
ovata.
rotundifolia.
Tangshen.
ussuriensis.

Coix Lacryma-Jobi.

Collinsia bicolor.
verna.

Collomia coccinea.
gilioides.
grandiflora.
linearis.

Commelina coelestis.
Hasskarlii.
sellowiana.

Conringia orientalis.

Convolvulus farinosus.
siculus.
tricolor.
undulatus.

Coreopsis auriculata.
coronata.
Drummondi.
grandiflora.
lanceolata.
tinctoria.

Coriandrum sativum.

Cornucopiae cucullatum.

Coronilla elegans.
scorpioides.

Corydalis capnoides.
cheilanthifolia.
glauca.
lutea.
nobilis.
racemosa.
rosea.
thalictrifolia.
tomentella.
vesicaria.

Cosmidium burridgeanum.

Cosmos diversifolius.

Crepis aurantiaca.
aurea.
blattarioides.
grandiflora.
rubra.
sibirica.

Crocus ancyrensis.
aureus.
biflorus var. Weldeni.
cancellatus.
— var. mazziaricus.
candidus.
Fleischeri.
hadriaticus.
hermoneus.
iridiflorus.
Korolkowi.
longiflorus.
medius.
pulchellus.
reticulatus.
Tourneforti.
vernus.
vitellinus.
zonatus.

Crucianella aegyptiaca.

Cucubalus baccifer.

Cuminum Cyminum.

Cuphea Llavea.
Zimapani.

Cuscuta glomerata.

Cyclamen Coum.
ibericum.
libanoticum.
repandum.

Cynara Scolymus.

Cynoglossum microglochin.
nervosum.
pictum.
Wallichii.

Cynosurus Balansae.
echinatus.

Cypella Herberti.

Cyperus vegetus.

Dactylis aschersoniana.

Danthonia Thomasoni.

Datura ceratocaula.

Delphinium Ajacis.
Barlowi.
cashmirianum.
dyctiocarpum.
elatum.
grandiflorum.
hybridum.
maackianum.
pictum.
Pylzowi.
speciosum.
— var. glabratum.
— var. turkestanicum.
Staphisagria.
vestitum.

Demazeria sicula.

Deschampsia caespitosa.

Desmodium canadense.

Dianthus caesius.
capitatus.
cruentus.
giganteus.
Seguieri.
superbus.
sylvestris.

Dictamnus albus.

Digitalis ferruginea.
lanata.
lutea.
tomentosa.

Dimorphotheca pluvialis.

Diotis candidissima.

Dipcadi serotinum.

Dipsacus asper.
atratus.
Fullonum.
inermis.
plumosus.

Dischisma spicatum.

Disporum lanuginosum.

Dorycnium herbaceum.
rectum.

Downingia elegans.
pulchella.

Draba alpina.
altaica.
Athoa.
carinthiaca.
cuspidata.
fladnizensis.
hirta.
incana.
Kotschyi.
stellata.
streptocarpa.

Dracocephalum austriacum.
moldavicum.
peregrinum.
ruyschiana.
— var. japonicum.
stamineum.
urticaefolium.

Dracunculus vulgaris.

Drypis spinosa.

Eatonia pennsylvanica.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinocystis lobata.

Echinops bannaticus.
exaltatus.
niveus.
sphaerocephalus.

Echinodorus ranunculoides.

Echium plantagineum.
vulgare.

Ehrharta panicea.

Eleusine coracana.
stricta.

Elsholtzia cristata.

Elymus canadensis.
Caput-Medusae.
condensatus.
giganteus.
sabulosus.
virginicus.

Emilia flammea.

Encelia calva.

Epilobium Dodonaei.
montanum.
nummularifolium.
rosmarinifolium.

Epipactis palustris.

Eragrostis elegans.
maxima.

Eremurus Bungei.
himalaicus.
Olgae.

Erianthus Ravennae.

Erigeron alpinus.
compositus.
glabellus.
glaucus.
macranthus.
multiradiatus.
philadelphicus.
rupestris.
strigosus.

Erinus alpinus.

Erodium Botrys.
chium.
ciconium.
Manescavi.
moschatum.
romanum.

Eruca sativa.

Eryngium alpinum.
amethystinum.
campestre.
dichotomum.
ebracteatum.
giganteum.
Lasseauxii.
maritimum.
oliverianum.
palmatum.
planum.
Spinalba.
Vaseyi.
vesiculosum.
Zabelii.

Erysimum arkansanum.
perofskianum.
rupestre.

Erythraea capitata.
Massoni.

Erythronium giganteum.
grandiflorum.
Hartwegii.
Hendersoni.
Johnsoni.
revolutum.

Eschscholzia caespitosa.
californica.
Douglasii.

Eucharidium Breweri.
concinnum.

Eupatorium ageratoides.
perfoliatum.
purpureum.
serotinum.

Euphorbia altissima.
Characias.
coralloides.
dentata.
epithymoides.
kotschyana.
spinosa.
terracina.
Wulfeni.

Euthamia leptocephala.

Falcaria vulgaris.

Felicia fragilis.
tenella.

Ferula communis var. glauca.
Jaeschkeana.
monticola.
syriaca.
tingitana.

Festuca bromoides.
Eskia.
foliosa.
Halleri.
Myuros.
rigida.
tenuiflora.

Foeniculum dulce.
virescens.

Fragaria daltoniana.

Frankenia pulverulenta.

Fritillaria acmopetala.
acutiloba.
aurea.
askabadensis.
citrina.
lutea.
pallidiflora.
pluriflora.
pontica.
ruthenica.
tenella.
Tuntasia.

Funkia ovata.
sieboldiana.

Gaillardia amblyodon.
aristata.

Galactia glabella.

Galactites tomentosa.

Galega orientalis.
patula.

Galeopsis pyrenaica.
Tetrahit.

Galium recurvum.
tenuissimum.
tricorne.

Gastridium australe.

Gaudinia fragilis.

Gaura oenotheriflora.
parviflora.

Gentiana Andrewsii.
asclepiadea.
Cruciata.
decumbens.
lutea.
phlogifolia.
septemfida.
tibetica.

Geranium albiflorum.
albanum.
armenum.
incisum.
libanoticum.
macrorrhizum.
rivulare.
sanguineum.

Gerbera Anandria.
kunzeana.
nivea.

Geum album.
chiloense.
Heldreichii.
macrophyllum.
montanum.
pyrenaicum.
rhaeticum.

Gilia androsacea.
capitata.
coronopifolia.
densiflora.
dianthoides.
liniflora.
squarrosa.
tricolor.

Glaucium corniculatum.
flavum.
— var. fulvum.
— var. tricolor.

Glycine Soja.

Glycyrrhiza echinata.

Grindelia glutinosa.
humilis.
inuloides.
integrifolia.
lanceolata.
squarrosa.

Gymnolomia multiflora.

Gynandropsis speciosa.

Gypsophila acutifolia.
elegans.
muralis.
paniculata.
repens.
Steveni.

Hablitzia tamnoides.

Halenia Perrottetii.

Hastingia alba.

Hebenstreitia comosa.
tenuifolia.

Hedysarum coronarium.
esculentum.
flexuosum.
microcalyx.

Helenium Bigelovii.
Bolanderi.
quadridentatum.

Helianthus Nuttallii.
tuberosus.

Helichrysum bracteatum.
foetidum.
thianshanicum.

Heliophila amplexicaulis.
crithmifolia.

Helipterum corymbosum.
Manglesii.
roseum.

Helonias bullata.

Hemerocallis Dumortieri.
flava.
Middendorfii.
Sieboldi.
Thunbergii.

Heracleum granatense.
gummiferum.
lehmannianum.
Panaces.
persicum.
Wallichii.

Herniaria glabra.
hirsuta.

Hesperis matronalis.

Heterospermum Xanti.

Hibiscus Trionum.

Hieracium amplexicaule.
aurantiacum.
gymnocephalum.
lanatum.
maculatum.
pannosum.
villosum.

Hilaria rigida.

Hippocrepis multisiliquosa.
unisiliquosa.

Hordeum bulbosum.
jubatum.
maritimum.

Hosackia purshiana.

Hunnemannia.
fumariaefolia.

Hyacinthus amethystinus.
azureus.
orientalis.
romanus.

Hydrophyllum virginicum.

Hyoscyamus albus.
aureus.

Hypecoum grandiflorum.
procumbens.

Hypericum elodioides.
hirsutum.
origanifolium.
polyphyllum.

Iberis Amara.
tenoreana.

Impatiens fulva.
Noli-tangerre.
scabrida.

Incarvillea Delavayi.
variabilis.

Inula macrocephala.
orientalis.
racemosa.
royleana.
salicina.
squarrosa.
thapsoides.

Ionopsidium acaule.

Iris albo-purpurea.
aurea.
caucasica.
Clarkei.
Delavayi.
ensata.
foetidissima.
— var. citrina.
graminea.
laevigata.
Milesii.
prismatica.
setosa.
tectorum.
unguicularis.
watsoniana.

Isatis glauca.
Villarsii.

Isopyrum fumarioides.

Iva xanthifolia.

Jasonia tuberosa.

Juncus alpinus.
Chamissonis.
tenuis.

Jurinea ambigua.

Kniphofia kewensis.
foliosa.
pauciflora.
rufa.
Tuckii.
Tysoni.

Kochia arenaria.
scoparia.
—var. trichophila.

Koeleria albescens.
phleoides.
setacea.

Lactuca Bourgaei.
hastata.
macrophylla.
muralis.
Plumieri.

Lagascea mollis.

Lagurus ovatus.

Lallemantia iberica.
peltata.
royleana.

Lamarckia aurea.

Laserpitium hispidum.
Siler.

Lasthenia glabrata.

Lathyrus angulatus.
Aphaca.
articulatus.
cirrhosus.
Clymenum.
filiformis.
latifolius.
luteus.
montanus.
Nissolia.

Lathyrus angulatus, *cont.*
Ochrus.
palustris.
pisiformis.
polyanthus.
rotundifolius.
setifolius.
sphaericus.
tuberosus.
undulatus.
variegatus.
venosus.
violaceus.

Laurentia tenella.

Lavatera cachemiriana.
thuringiaca.
trimestris.

Layia elegans.
glandulosa.
platyglossa.

Lens esculenta.

Leonurus Cardiaca.
sibiricus.
tataricus.

Lepachys columnaris.

Leptosyne maritima.
Stillmanni.

Lepturus cylindricus.

Leuzea conifera.

Liatris spicata.

Libertia formosa.
grandiflora.

Ligusticum alatum.
scoticum.
Seguieri.

Limnanthes alba.
Douglasii.

Linaria anticaria.
bipartita.
dalmatica.
Elatine.
maroccana.
origanifolia.
reticulata.
saxatilis.
triphylla.
viscida.

Lindelofia spectabilis.

Lindheimera texana.

Linum augustifolium.
capitatum.
flavum.
monogynum.
narbonense.
nervosum.
usitatissimum.

Loasa hispida.
lateritia.
vulcanica.

Lobelia sessilifolia.
syphilitica.
urens.

Lolium multiflorum.
temulentum.

Lonas inodora.

Lopezia coronata.

Lotus Jacobaeus.
ornithopodioides.
Requienii.
Tetragonolobus.

Lunaria biennis.

Lupinus Cruckshanksii.
Douglasii.
elegans.
Hartwegii.
micranthus.
nootkatensis.
pubescens.
tricolor.

Luzula albida.
Fosteri.
Hostii.
nivea.

Lychnis alpina.
Chalcedonica
Coeli-rosa.
corsica.
Flos-jovis.
Githago.
Lagascae.

Lycurus phleoides.

Lythrum hyssopifolia.

Madia dissitiflora.
elegans.

Malcolmia chia.
flexuosa.
mongolica.

Malope trifida.

Malva Alcea.
Duriaei.
oxyloba.

Malvastrum limense.

Martynia lutea.
proboscidea.

Matricaria Tchihatchewii.

Matthiola fenestralis.
sinuata.

Meconopsis cambrica.
heterophylla.
simplicifolia.

Medicago littoralis.
marina.
murex.
orbicularis.
turbinata.

Melica altissima.
ciliata.
nutans.
uniflora.

Melilotus alba.
officinalis.

Melissa officinalis.

Melittis Melissophyllum.

Mentzelia Lindleyi.

Mesembryanthemum pyropeum.

Meum Athamanticum.

Mibora verna.

Mimulus cardinalis.
luteus.

Mirabilis divaricata.
wrightiana.

Molinia cœrulea.

Molopospermum cicutarium.

Monolepis trifida.

Moricandia arvensis.

Moscharia pinnatifida.

Muscari armeniacum.
Bourgaei.
compactum.
latifolium.
paradoxum.
polyanthum.
szovitzianum.

Myagrum perfoliatum.

Myriactis Gmelini.
Wallichii.

Myosuros minimus.

Nardus stricta.

Nardostachys Jatamansi.

Nemophila insignis.
maculata.
Menziesii.

Nepeta caesarea.
Cataria.
Mussini.
nuda.
tuberosa.

Neslia paniculata.

Nicandra physaloides.

Nicotiana Langsdorffii.
paniculata.
sylvestris.

Nigella arvensis.
damascena.
hispanica.
orientalis.
sativa.

Nolana prostrata.

Ocimum Basilicum.
canum.

Œnanthe pimpinelloides.
silaifolia.

Œnothera nocturna.
pumila.
riparia.
rosea.

Œnothera nocturna, *cont.*
sinuata.
tenella.
tetraptera.
triloba.

Omphalodes linifolia.

Ononis alopecuroides.
Natrix.
rotundifolia.

Onosmodium Thurberi.

Opoponax Chironium.

Ornithogalum arcuatum.
fimbriatum.
narbonense.
pyrenaica.

Ornithopus sativus.

Orobanche elatior.
flava.
Hederae.
ramosa.
speciosa.

Orthrosanthes multiflorus.

Ostrowskia magnifica.

Oxyria digyna.

Oxybaphus nyctagineus.

Pallenis spinosa.

Panicum bulbosum.
capillare.
colonum.
Crus-galli.
Isachne.
miliaceum.
sanguinale.
Teneriffae.

Papaver alpinum.
apulum.
arenarium.
Argemone.
commutatum.
glaucum.
laevigatum.
lateritium.
nudicaule.
pavoninum.
rupifragum.
somniferum.

Parnassia palustris.

Paspalum dilatatum.
floridanum.

Pelargonium australe.

Peltaria alliacea.

Pennisetum longistylum.
macrourum.
Ruppellii.

Pentstemon barbatus.
campanulatus.
coeruleus.
confertus.
deustus.
diffusus.
glaber.
gracilis.
Hartwegii.
heterophyllus.
Jamesii.
linarioides.
ovatus.
pubescens.
puniceus.
secundiflorus.
spectabilis.
tubiflorus.

Petunia nyctaginiflora.

Phleum arenarium.
alpinum.
Michelii.

Physalis Alkekengi.
Francheti.
peruviana.

Phlomis agraria.
setigera.
tuberosa.
viscosa.

Physochlaina orientalis.

Physostegia virginiana.

Phyteuma canescens.
Michelii.
nigrum.
orbiculare.
scorzonerifolia.

Phytolacca acinosa.
bogotensis.
icosandra.
polyandra.

Picridium tingitanum.

Pimpinella magna.

Plantago amplexicaulis.
arenaria.
Candollei.
Coronopus.
Isphagula.
Lagopus.
maritima.
maxima.
ovata.
Psyllium.
virginica.

Platycodon grandiflorum.

Platystemon californicus.

Pleurospermum Golaka.
pulchrum.

Plumbago micrantha.

Poa abyssinica.
nevadensis.

Podolepis gracilis.

Polemonium foliosissimum.
mexicanum.

Polycalymnia Stuarti.

Polygonatum biflorum.
commutatum.
verticillatum.

Polygonum alpinum var. polymorphum.
capitatum.
cilinode.
molle.
orientale.
viviparum.
Weyrichii.

Polypogon littoralis.
maritimus.
monspeliensis.

Polypteris callosa.
hookeriana.
texana.

Portulaca grandiflora.

Potentilla alpestris.
arguta.
argyrophylla.

Potentilla alpestris, *cont.*
Detommasii.
Fenzlii.
gelida.
glandulosa.
gracilis.
Griffithii.
hippeana.
hirta.
leuconota.
mollis.
montenegrina.
multifida.
nepalensis.
pyrenaica.
recta.
sericea.
tanacetifolia.

Poterium alpinum.
canadense.

Pratia angulata.
begonifolia.

Primula frondosa.
japonica.
mollis.
Palinuri.
rosea.
variabilis.

Prunella grandiflora.
hyssopifolia.

Psoralea macrostachya.
physodes.

Pulicaria vulgaris.

Puschkinia scilloides.

Queria hispanica.

Ramondia pyrenaica.

Ranunculus asiaticus.
auricomus.
brutius.
Chius.
Cymbalaria.
falcatus.
Nelsoni.
trilobus.

Rehmannia angulata.

Relhania sessilifolia.

Rhagadiolus edulis.

Rheum Emodi.
Rhaponticum.
webbianum.

Richardsonia pilosa.

Rodgersia pinnata.
podophylla.

Roemeria hybrida.

Romulea Bulbocodium.
candida.
Columnae.
ramiflora.
Requienii.

Rudbeckia ampla.
bicolor.
californica.
radula.

Rumex alpinus.
bucephalophorus.
salicifolius.

Sagina nodosa.

Salpiglossis variabilis.

Salsola Kali.
— var. Tragus.

Salvia Aethiopis.
amplexicaulis.
argentea.
campanulatus.
carduacea.
coccinea.
Columbariae.
glutinosa.
Horminum.
japonica.
nemorosa.
nutans.
Przewalskii.
recognita.
regeliana.
Sclarea.
taraxacifolia.
tiliaefolia.
umbratica.

Sambucus Ebulus.

Sanicula europaea.

Saponaria calabrica.
orientalis.

Saussurea albescens.
discolor.

Saxifraga cartilaginea.
cernua.
cochlearis.
crustata.
erosa.
hirsuta.
lingulata.
— var. lantoscana.
macnabiana.
rocheliana, var. coriophylla.
rotundifolia.
Sibthorpii.
stellaris.
tenella.

Scabiosa brachiata.
candolleana.
caucasica.
graminifolia.
gramuntia.
isetensis.
lucida.
leucophylla.
longifolia.
micrantha.
monspeliensis.
ochroleuca.
prolifera.
Pterocephala.
speciosa.
stellata.
vestina.

Scilla amethystina.
amoena.
bifolia.
Hohenhackeri.
hispanica.
Lilio-Hyacinthus.
messeniaca.
patula.
peruviana.
pratensis.
verna.

Scirpus Caricis.
Eriophorum.
triqueter.

Scleranthus annuus.

Scolymus hispanicus
maculatus.

Scopolia sinensis.
tangutica.

Scorpiurus vermiculata.

Scrophularia alata.
vernalis.

Scutellaria altissima.
baicalensis.
indica var. japonica.

Secale cereale.
dalmaticum.

Securigera Coronilla.

Selinum serbicum.
vaginatum.

Senecio aconitifolius.
alpinus.
aureus.
chrysanthemoides.
Clivorum.
Doria.
Ledebouri.
Ligularia.
sibiricus.
tanguticus.

Serratula coronata.
Gmelini.
quinquefolia.

Seseli Libanotis.
tenuifolium.

Sesleria cœrulea.

Setaria glauca.
italica.
vulpiseta.

Sida Napæa.

Sidalcea candida.
Listeri.
malvaeflora.
neo-mexicana.
spicata.

Siderites scordioides.

Siegesbeckia orientalis.

Silaus flavescens.

Silene alpestris.
asterias.
ciliata.

Silene alpestris, *cont.*
clandestina.
colorata.
conoidea.
cretica.
fimbriata.
Fortunei.
fuscata.
glauca.
italica.
juvenalis.
longicilia.
melandrioides.
Muscipula.
noctiflora.
nutans.
odontopetala.
pendula.
quadrifida.
rubella.
squamigera.
stylosa.
Tanakae.
tatarica.
tenuis.
verecunda.
virginica.
viridiflora.
Zawadskii.

Silphium integrifolium.
scaberrimum.
terebinthinaceum.
trifoliatum.
— var. ternatum.

Silybum eburneum.
Marianum.

Sisymbrium polyceratum.
strictissimum.

Sisyrinchium angustifolium.
iridifolium.
striatum.

Sium lancifolium.

Sophora flavescens.

Spartina polystachya.

Sphaeralcea acerifolia.

Spilanthes Acmella.

Sporobolus asper.
cryptandrus.

Stachys Alopecuros.
alpina.
græca.
grandiflora.
iberica.
lanata.
longifolia.
recta.
setifera.

Statice Bonduelli.
sinuata.
Suworowi.
tatarica.

Stenanthium robustum.

Stevia Eupatoria.
serrata.

Stipa Aristella.
arundinacea.
Calamagrostis.
gigantea.
papposa.
pennata.
viridula.

Stylophorum diphyllum.

Swertia connata.
longifolia.

Symphyandra Hofmanni.
pendula.
Wanneri.

Symphytum asperrimum.
orientale.

Telephium Imperati.

Tellima grandiflora.

Tetragonia crystallina.
expansa.

Teucrium Botrys.
canadensis.
hyrcanicum.
multiflorum.
oxyodon.
pyrenaicum.

Thalictrum angustifolium.
calabricum.
odorum.
purpurascens.
squarrosum.

Thermopsis caroliniana.
fabacea.
montana.

Thladiantha dubia.

Thlaspi alpestre.
perfoliatum.
violascens.

Tolpis barbata.

Tradescantia congesta.
reflexa.

Tragus racemosus.

Trautvetteria palmata.

Tricholepis furcata.

Tricyrtis latifolia.

Tridax trilobata.

Trifolium agrarium.
angustifolium.
alpestre.
clypeatum.
fragiferum.
glomeratum.
Johnstoni.
leucanthum.
maritimum.
obtusiflorum.
pannonicum.
Perreymondi.
physodes.
resupinatum.
scabrum.

Trigonella corniculata.
caerulea.
cretica.
Foenum-graecum.
ovalis.
polycerata.
radiata.

Trillium grandiflorum.

Trinia Kitaibelii.

Triosteum perfoliatum.

Trisetum distichophyllum.
flavescens.

Triticum Aegilops.
amyleum.
dicoccum.

Triticum Aegilops, *cont.*
monococcum.
ovatum.
polonicum.
Requienii.
Spelta.
turgidum.

Troximon grandiflorum.

Tyrimnus leucographis.

Ursinia pulchra.

Urtica pilulifera.
— var. balearica.

Uvularia grandiflora.

Valeriana Phu.
pyrenaica.

Valerianella Auricula.
carinata.
coronata.
dentata.
echinata.
eriocarpa.
vesicaria.

Venidium perfoliatum.

Veratrum nigrum.

Verbascum Blattaria.
Chaixii.
Haensleri.
phœniceum.

Verbena Aubletia.
bonariensis.
erinoides.
hastata.
polystachya.
urticaefolia.

Verbesina helianthoides.

Veronica crassifolia.
glauca.
incana.
Ponae.
saxatilis.
spicata.
virginica.
— var. japonica.

Vicia atropurpurea.
calcarata.
gigantea.
hirsuta.
narbonensis.
pisiformis.
sylvatica.
unijuga.

Vincetoxicum fuscatum.
nigrum.
officinale.

Viola arenaria.
cornuta.
palustris.
persicifolia.
sagittata.
sylvestris

Volutarella Lippii.
muricata.

Wahlenbergia dalmatica.
Kitaibelii.
undulata.

Xanthisma texanum.

Xanthium macrocarpum.
spinosum.

Xanthocephalum gymnospermoides.

Ziziphora tenuior.

Zygadenus elegans.
muscitoxicum.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Acanthopanax spinosum.

Acer circinatum.
monspessulanum.

Ailanthus glandulosa.

Alnus cordifolia.
firma.
incana.
japonica.
oregona.
orientalis.
rhombifolia.
viridis.

Amorpha canescens.

Aplopappus ericoides.

Aralia chinensis.

Berberis aetnensis
concinna.
Darwinii.
ruscifolia.
sinensis.
stenophylla.
valdiviana.
wallichiana.

Betula davurica.
fruticosa.
humilis.
lutea.

Bruckenthalia spiculifolia.

Buddleia japonica.
variabilis.

Calophaca wolgarica.

Calycanthus occidentalis.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
brevispina.

Carmichaelia australis.
flagelliformis.

*Carpinus caroliniana.
*cordata.

Cassinia fulvida.

Ceanothus americanus var.
opacus.
Arnoldi.

Cedrus atlantica.

Celastrus articulatus.

*Celtis occidentalis.
Tournefortii.

Cephalotaxus drupacea.
Fortuni.

Chimonanthus fragrans.

*Cistus corbariensis.
cyprius.
garganicus.
hirsutus.
laurifolius.
purpureus.
villosus.

Cladrastis amurensis.

Clematis aethusifolia.
— var. latisecta.
Bergeroni.
connata.
globosa.
Hendersonii.
heracleaefolia var. stans.
intermedia.
orientalis.
— var. tangutica.
*Pallasi.
parviflora.
Viticella.

Clerodendron trichotomum.

Clethra acuminata.
— alnifolia.
— canescens.

Colutea arborescens.
cruenta.
longialata.

Cornus circinata.

Cotoneaster affinis.
bacillaris.
buxifolia.
frigida.
integerrima.
laxiflora.
lucida.
microphylla.
pannosa.
rotundifolia.
Simonsii.
thymifolia.
uniflora.

*Crataegus acutiloba.
Carrierei.
cordata.
Crus-Galli.
dippeliana.
flava.
hiemalis.
melanocarpa.
mexicana.
mollis.
nigra.
orientalis.
pentagyna.
punctata.
Pyracantha.
rivularis.
sinaica.
succulenta.
tanacetifolia.
tomentosa.

*Cupressus lawsoniana.
*pisifera.
*sempervirens var. sphaerocarpa.
— var. globulifera.
thyoides.

Cydonia japonica.
Maulei.

Cyrilla racemiflora.

Cytisus albus.
biflorus.
capitatus.
Heuffeli.

Cytisus albus, *cont.*
nigricans.
purgans.
purpureus.
sessilifolius.

Daboëcia polifolia.

Desmodium viridiflorum

Deutzia corymbosa.
crenata.

Diervilla rivularis.
sessilifolia.

Elaeagnus umbellata.

Enkianthus campanulatus.

Erica arborea.
ciliaris.
— var. maweana.
multiflora.
scoparia.
stricta.
Tetralix.
vagans.

Escallonia philippiana.

Euonymus latifolius.

Exochorda Alberti.

*Fraxinus americana.
*mandschurica var. japonica.

Gaultheria Shallon.

Genista aethnensis.
germanica.
hispanica.
pilosa.
radiata.
sagittalis.
virgata.

Helianthemum formosum.
halimifolium.

Hymenanthera crassifolium.

Hippophaë rhamnoides.

Hydrangea arborescens.
Bretschneideri.

Hypericum Androsaemum.
Ascyron.
*Coris.

Hypericum Androsaemum, *cont.*
densiflorum.
elatum.
hircinum.
moserianum.
patulum var. Henryi.
prolificum.
uralum.

*Ilex opaca.
verticillata.

Indigofera gerardiana.

Jasminum fruticans.
humile.

*Juniperus phoenicea.
*rigida.

Kalmia angustifolia.
glauca.
latifolia.

Laburnum alpinum.
Parksii.

Ledum palustre.

Lespedeza bicolor.

Ligustrum medium.

Lonicera alpigena.
depressa.
involucrata.
minutiflora.
Morrowii.
nigra.
pileata.
segreziensis.
Sullivanti.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium pallidum.

Magnolia tripetala.

Metaplexis Stauntoni.

Microglossa albescens.

Myrica cerifera.

Myricaria germanica.

Neillia amurensis.
capitata.
opulifolia.
Torreyi.

Notospartium Carmichaeliae.

*Nyssa aquatica.

Olearia Haastii.

Ononis arragonensis.
fruticosa.
rotundifolia.

*Oxycoccus macrocarpus.

Pernettya mucronata.

Petteria ramentacea.

*Phellodendron.
*— sachalinense.

Philadelphus acuminatus
coronarius.
gordonianus.
insignis.
Lemoinei.
Lewisii.

*Picea alba.
*hondoensis.

*Pinus muricata.

*Platanus occidentalis.

Prunus acida var. semperflorens.
Besseyi.
japonica.
*maritima.
Maximowiczii.
*orthosepala.
*pendula.
*pensylvanica.
*pseudocerasus.
*siberica.
*virginiana.
*Watsoni.

Ptelea trifoliata.

Pyrus alpina.
arbutifolia.
Aria.
Aucuparia var. fructu luteo.
Chamaemespilus.
crataegifolia.
decaisneana.

Pyrus alpina, *cont.*
Hostii.
intermedia.
lanata.
nigra.
Ringo.

Rhamnus cathartica.
crenata.
libanotica.
spathulifolia.

Rhododendron ferrugineum.

Rhodotypus kerrioides.

Rhus aromatica.
*trichocarpa.

Ribes alpinum.
mogollonicum.

Rosa lucida alba.

Rubus biflorus.
calycinus.
crataegifolius.
deliciosus.
leucodermis.
melanolasius.
neglectus.
nutkanus.
occidentalis.
parvifolius.
phoenicolasius.
spectabilis.
xanthocarpus.

Ruta graveolens.
montana.

Sambucus canadensis var. maxima.

Shepherdia argentea.

Skimmia japonica.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
albiflora.
betulifolia.
bullata.
concinna.
conspicua.
Douglasi.
expansa.
Foxii.
lindleyana
microthyrsa.
nobleana.
pachystachys.
rubra.
salicifolia.
tomentosa.

Staphylea colchica.
pinnata.

Styrax japonica.

Symphoricarpus Heyeri.
racemosus.

Symplocos crataegoides.

*Taxus canadensis.
cuspidata.

Thuya japonica.
orientalis.
plicata.

*Tilia maximowicziana.

Torreya nucifera.

Viburnum dentatum.
Lantana.
molle.

*Vitis assamica.
*Coignetiae.

*Zanthoxylum alatum.
Bungei.
planispinum.

Zenobia speciosa.
— var. pulverulenta.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE.
By DARLING & SON, Ltd., 34-40, Bacon Street, E.

1906.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1907.

NOTE.

IN the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1906, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page, to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

1375 Wt 72 2/07 D & S 29 26989

CATALOGUE OF THE LIBRARY.

Additions received during 1906.

§ 1.—GENERAL.

Abercrombie, John. The British fruit-gardener, and art of pruning, etc. London, 1779. 8vo.

—— The universal gardener's kalendar, and system of practical gardening, etc. London, 1789. 8vo.

Abrams, Le Roy. Flora of Los Angeles and vicinity. Stanford University, Calif., 1904. 8vo.

Adams, J. Guide to the principal families of Flowering Plants (after ENGLER'S system). Dublin, 1906. 8vo.

Aejmelaeus, Christen. *Resp.* See **Thunberg, C. P.** *Gladiolus*, diss. 1784.

Anastasia, G. Emilio. Le varietà tipiche della *Nicotiana Tabacum*, L. Scafati, 1906. 8vo.

Archer, Francis Bisset. The Gambia Colony and Protectorate: an official handbook. London [1906 ?]. 8vo.

Atlases. Bartholomew, J. G. Atlas of the World's Commerce. London (1906). fol.

Baker, John Gilbert. North Yorkshire: studies of its botany, geology, climate, and physical geography. Ed. 2. London, 1906. 8vo.

Bald, Claud. The cultivation of *Ficus elastica*. Calcutta, 1906. 8vo.

Balfour, John Hutton. Description of Asafœtida Plants (*Narthex Asafœtida*, Falconer), etc. (Trans. Roy. Soc. Edinb. xxii.) Edinburgh, 1860. 4to.

Beckurts, H. See **Berendes, J.**

Beinling, Theodor Rudolf. De Smilacearum structura. Diss. Vratislaviæ, 1850. 8vo.

Belfield, H. Conway. Handbook of the Federated Malay States. Ed. 2. London (1904). 8vo.

"Belgica." Expédition antarctique belge. Résultats du voyage du S.Y. Belgica en 1897–99 sous . . . A. de Gerlache de GOMERY. Rapports scientifiques. Travaux hydrographiques et instructions nautiques par G. LECOINTE. Fasc. 1. Anvers, 1905. 4to. Cartes. Ib.. 1903. 4to.—Botanique. Mousses et coup d'œil sur la flore bryologique des Terres Magellaniques par J. CARDOT. Ib., 1901. 4to. Lichens par Ed. A. WAINIO. Ib., 1903. 4to. Champignons par E. BOMMER et M. ROUSSEAU. Ib., 1905. 4to. Les Phanérogames des Terres Magellaniques par É. De WILDEMAN. Ib., 1905. 4to.

Bennett, Alfred William. See **Seboth, J.**

Bentham, George. Life. See **Jackson, B. D.**

Berendes, J. Die Pharmacie bei den alten Culturvölkern. Historisch-kritische Studien. Mit einem Vorworte von H. BECKURTS. Halle a. S., 1891–92. 2 vols. 8vo.

Bern. Botanic Garden. See **Fischer, E.**

Blackwell, E. W. See **Laing, R. M., & E. W. B.**

Blankinship, Joseph William. Native Economic Plants of Montana. (Montana Agric. Coll. Exper. Stat. Bull. 56.) Bozeman, 1905. 8vo.

—— 1. A century of Botanical Exploration in Montana, etc. 2. Supplement to the Flora of Montana, etc. (Montana Agric. Coll. Sci. Studies, i. n. 1–3.) Bozeman, 1905. 8vo.

Blankinship, Joseph William, & Hester F. Henshall. Common names of Montana Plants. (Montana Agric. Coll. Sci. Studies, i. n. 1–3.) Bozeman, 1905. 8vo.

Blume, Carl Ludwig. Catalogus van eenige der merkwaardigste zoo in- als uit-heemsche Gewassen te vinden in 's Lands Plantentuin te Buitenzorg. (Batavia) (1823). 8vo.

Blytt, Axel Gulbrand. Haandbog i Norges Flora, efter forfatterens död afsluttet og udgivet ved Ove DAHL. Kristiania, 1906. sm. 8vo.

Bohny, Paul. Beiträge zur Kenntnis des Digitalisblattes, etc. Diss. Basel, 1906. 8vo

Bommer, E., & M. Rousseau. Expédition antarctique belge. Champignons. See "**Belgica.**"

Börgesen, Frederick C. E. The Algæ-vegetation of the Færöese coasts, with remarks on the phyto-geography. (Botany of the Færöes, pt. ii.) Copenhagen, 1905. 8vo.

Borromeo, Conte Giberto. Catalogo delle Piante dei Giardini d'Acclimazione delle Isole Borromee. Intra, 1906. 8vo.

Botaniska Studier. Botaniska Studier tillägnade F. R. KJELLMAN den 4 November, 1906. Uppsala, 1906. 8vo.

Boudier, Emile. Icones mycologicæ, série i. [–ii.]→ Paris, 1904–06. 4to.

Boutcher, William. A treatise on Forest-Trees, etc. Edinburgh, 1775. 4to.

Bower, Frederick Orpen. Notes on Botany in the University of Glasgow in the 18th century. (Trans. Nat. Hist. Soc. Glasgow, n.s., vii.) (Glasgow, 1905.) 8vo.

Brandis, Sir Dietrich. Indian Trees: an account of Trees, Shrubs, etc., indigenous or commonly cultivated in the British Indian Empire. London, 1906. 8vo.

Brookes, Gilbert. The complete British Gardener, etc. London, 1779. 8vo.

Brotherus, Victor Ferdinand. Fragmenta ad floram bryologicam Asiæ orientalis cognoscendam. I. (Trav. Sous-Sect. Tröitzkossawsk-Kiakhta Soc. Imp. Russ. Géogr. vii.) S. Peterburg, 1905. 8vo.

—— Contribution à la flore bryologique de la Nouvelle Calédonie. (Öfversigt af Finska Vet.-Soc. Förh. xlviii.) [Helsingforsiæ, 1906.] 8vo.

Brown, Robert N. Rudmose. Antarctic Botany: its present state and future problems. (Scott. Geogr. Mag., 1906.) [Edinburgh] (1906.) 8vo.

Bruce, William S. The area of unknown Antarctic Regions, compared with Australia, etc. (Scott. Geogr. Mag., 1906.) [Edinburgh, 1906.] 8vo.

Brueckmann, Franz Ernst. Diss. . . . de Avellana mexicana . . . præside J. C. SPIES. Helmstadii, 1721. sm. 4to.

Bruhns, Karl. Alexander von HUMBOLDT. Eine wissenschaftliche Biographie im Verein mit R. AVÉ-LALLEMANT, etc. Leipzig, 1872. 3 vols. 8vo.

Buchenau, Franz. Juncaceae. See **Engler, A.** Pflanzenreich.

Buchwald, Johannes de. Specimen medico-practico-botanicum, seu brevis & dilucida explicatio virtutum plantarum & stirpium indigenarum, etc. [cum speciminibus plantarum]. Hafniae, 1720. sm. 4to.

Buitenzorg. Botanic Garden. See **Ramaley, F.** 1905.

Buitenzorg. 's Lands Plantentuin. See **Blume, C. L.** 1823.

Capellini, Giovanni, & Hermann, Graf zu Solms-Laubach. I tronchi di Bennettitee dei Musei Italiani. (Mem. Accad. Sci. Ist. Bologna, 5, ii.) Bologna, 1892. 4to.

Cardano, Gironimo. See **Scaliger, J. C.** 1557.

Cassell & Company. The Encyclopædic Dictionary, etc. London, 1889. 7 vols. la. 8vo. Supplementary volume. Ib., 1902. la. 8vo.

Chambers, William, & Robert Chambers, Ltd. Chambers's Encyclopædia : a dictionary of universal knowledge. New Edition. London, 1904. 10 vols. la. 8vo.

Cheeseman, Thomas F. Manual of the New Zealand Flora. Wellington, 1906. 8vo.

Chiswick. A catalogue of the fruits cultivated in the garden of the Horticultural Society of London. Ed. 2. London, 1831. 8vo.

Chodat, Robert. Rapport . . . sur l'activité de l'Institut de Botanique (de l'Université de Genève) pendant . . . 1904–1905. Genève, 1905. 8vo.

Clark, W. S. The circulation of sap in Plants. (Mass. State Board Agric.) Boston, 1874. 8vo.

—— Observations on the phenomena of Plant Life. (22nd Ann. Rep. of the Secretary, Mass. State Board Agric.) Boston, 1875. 8vo.

Collin, Eugène. See **Greenish, H. G., & E. C.**

Collins, Samuel. Paradise retriev'd : plainly and fully demonstrating the most beautiful, durable, and beneficial method of managing and improving Fruit-trees . . . with a treatise on Mellons and Cucumbers. London, 1717. 8vo.

Comes, Orazio. Delle razze dei Tabacchi, filogenesi, qualità ed uso. Napoli, 1905. 4to

Conwentz, Hugo Wilhelm. Die Eibe in Westpreussen, ein aussterbender Waldbaum. (Abh. Prov. Westpr. iii.) Dantzig, 1892. 4to.

Cornevin, Ch. Des plantes vénéneuses et des empoisonnements qu'elles déterminent. Paris, 1887. 8vo.

Cousins, Herbert Henry. See **Jamaica.** Board of Agriculture. §3.

Crépin, François. Manifestation en l'honneur de F. C. See **Errera, L., & Th. Durand.**

Cristofoletti, Ugo. Studien über *Rheum rhaponticum*. Diss. Bern, 1905. 8vo.

Cross, Charles Frederick, & Edward John Bevan. Researches on Cellulose, 1895–1900. London, 1901. 8vo. —— II. 1900-1905. Ib., 1906. 8vo.

Cultivation (The) of Rubber as an Investment. See **Rubber.**

Curiosities of nature and art. See **Vallemont, Pierre Lorrain, Abbé de.**

Dahl, Ove. See **Blytt, A. G.** 1906.

Darbishire, A. D. On the difference between physiological and statistical laws of Heredity. (Mem. & Proc. Manch. Lit. & Phil. Soc. l.) (Manchester, 1906.) 8vo.

Davy, Joseph Burtt. Alien Plants spontaneous in the Transvaal. (Rep. S. African Assoc. Adv. Sci., 1904.) [Johannesburg, 1905 ?] 8vo.

De Toni, Giovanni Batta. Phyceae japonicae novae, addita enumeratione Algarum in ditione maritima Japoniae hucusque collectarum. [Title also in Italian.] (Mem. Ist. Ven. Sci. xxv.) Venezia, 1895. fol.

De Vries, Hugo. Unity in variability. (Contrib. Bot. Seminary Univ. Calif. 2. Repr. from Univ. Chron. i.) Berkeley, 1898. 8vo.

De Wildeman, Émile. Expédition antarctique belge. Les Phanérogames. See **"Belgica."**

Dictionaries of Languages:—English. See **Cassell & Company.** Encyclopædic Dictionary.

Diels, Ludwig. Jugendformen und Blütenreife im Pflanzenreich. Berlin, 1906. 8vo.

Diels, Ludwig. Die Pflanzenwelt von West-Australien, etc. See **Engler, A., & O. Drude.** Vegetation der Erde. vii.

—— Droseraceae. See **Engler, A.** Pflanzenreich.

Digby, Sir Kenelme. Of bodies and of man's soul, . . . with two discourses—Of the Powder of Sympathy, and Of the Vegetation of Plants. London, 1669. sm. 4to.

Dillenius, Johann Jacob. Horti elthamensis plantarum rariorum icones et nomina . . . in horto J. SHERARD, etc. Lugduni Batavorum, 1774. 2 vols. fol. A new edition of the plates without text.

Doerfler, Ignaz. Botaniker Porträts. Lief. 1–2. Wien (1906)→ 4to.

Dunn, Stephen Troyte. Alien Flora of Britain. London, 1905. 8vo.

Durand, Théophile, & Benjamin Daydon Jackson. Index kewensis plantarum phanerogamarum. Supplementum primum (1886–1895). Bruxellis, 1901–1906. 4to.

Duthie, John Firminger. See **Strachey, Sir R.** 1906.

Duyfjes, J. J. See **Haarlem.** 1905.

Eastwood, Alice. A handbook of the Trees of California. (Occasional Papers Calif. Acad. Sci., ix.) San Francisco, 1905. 8vo.

Edwall, Gustavo. See **Loefgren, A., & G. E.**

Eeden, Frederik Willem van. Houtsoorten van Nederlandsch Oost-Indië, etc. Derde . . . Uitgave bewerkt door J. J. DUYFJES. See **Haarlem.** 1905.

Ehrenberg, Christian Gottfried. Sylvae mycologicae berolinenses. Berolini, 1818. 4to.

Elliot, George Francis Scott. A first course in Practical Botany. London, 1906. 8vo.

Encyclopædia. See **Chambers, W., & R. Chambers, Ltd.**

Encyclopædic Dictionary. See **Cassell & Company.**

Engler, Adolf, & Oscar Drude. Die Vegetation der Erde. vii. Die Pflanzenwelt von West-Australien südlich des Wendekreises, etc. von L. DIELS. Leipzig, 1906. 8vo.

Erichsen, F. Beiträge zur Flechtenflora der Umgegend von Hamburg und Holsteins. (Verhandl. naturwiss. Ver. Hamb. 1905.) (Hamburg, 1905.) 8vo.

Errera, Léo, & Théophile Durand. Manifestation en l'honneur de F. CRÉPIN. Compte-rendu . . . par L. E. & T. D. Gand, 1892. 8vo.

Evelyn, John. Silva, or a discourse of Forest-trees . . . together with . . . Terra . . . Pomona . . . also Acetaria, or a discourse of Sallets, with Kalendarium hortense. Ed. 4. London, 1706. fol.

Fedtschenko, Boris. Flore des Iles du Commandeur. Cracovie, 1906. 8vo.

Ferguson, John. The beginning, rise, and progress of the cultivation of the Coconut Palm in Ceylon. n. l. (Roy. Asiat. Soc. Ceylon Branch.) (Colombo, 1906.) 8vo.

Finet, Eugène Achille, & François Gagnepain. Contributions à la flore de l'Asie orientale. Fasc. 1. (Bull. Soc. Bot. France, l–li.) Paris, 1905. 8vo.

Fischer, Eduard. Jahresbericht über den botanischen Garten in Bern pro 1905. Bern, 1906. 8vo.

Fisher, William Richard. The Forest of Essex: its history, laws, administration, etc. London, 1887. la. 8vo.

Fleetwood, William. See **Vallemont, Pierre Lorrain, Abbé de.**

Fliche, Paul. Note sur des bois fossiles de Madagascar. (Bull. Soc. Géol. France, 4, v.) Paris, 1905. 8vo.

Flora berolinensis. See **Hecker, J. J.**

Floyd, Bayard F. Some Fungous Diseases and their treatment. (Ann. Rep. Missouri State Hort. Soc., 1905). (Columbia, 1905.) 8vo.

Floyer, Sir John. ΦΑΡΜΑΚΟ-ΒΑΣΑΝΟΣ: or the Touch-stone of Medicines, etc. Vol. i. London, 1687. 8vo. [Title and part of the dedication in MS.]

Ford, Sibille O. See **Seward, A. C., & S. O. F.** 1906.

Forster, Georg. Vom Brodbaum. [Cassel] 1784. sm. 4to.

Fullmer, Samuel. The young Gardener's best companion, etc. London, 1881. 2 vols. 12mo.

Gagnepain, François. See **Finet, E. A., & F. G.**

Gambia. Gambia Colony and Protectorate. Official handbook. See **Archer, F. B.**

Gerlache de Gomery, A. de. Expédition antarctique belge. See **" Belgica."**

Goebel, Karl. I. Ueber die Biologie der Epiphyten. II. Ueber die Rhizophoren-Vegetation. (Naturforsch. Ges. Rostock.) [Rostock, 1887 ?] 8vo.

Goiticoa, N. Veloz. See **Venezuela.**

Graf, Ferdinand. See **Seboth, J.**

Great Britain and Ireland. Fruit Industry of Great Britain. Report of the Departmental Committee appointed by the Board of Agriculture and Fisheries. London, 1905. fol. —— Minutes of Evidence, etc. Ib., 1905. fol.

Greene, Edward Lee. Leaflets of botanical observation and criticism. i. Washington, D.C., 1903-06 → 8vo.

Greenish, Henry George, & Eugène Collin. An anatomical atlas of Vegetable Powders. London, 1904. 8vo.

Grosourdy, Renato de. El médico botánico criollo. Paris, 1864. 4 vols. 8vo.

Guéguen, Fernand. Les champignons parasites de l'homme & des animaux, etc Préface de M. RADAIS. Paris, 1904. 8vo.

Guimarães, José d'Ascensão. Monographia das Orobanchaceas portuguezas. Diss. (Brotéria, iii.) Lisboa, 1904. 8vo.

Gutta-Percha. Some facts concerning Gutta-Percha. (Electrical Review, 1890–91.) [London] (1891). 8vo. [From an article by M. SÉRULLAS in La Lumière Electrique.]

Haarlem. Koloniaal Museum. Beschrijvende catalogus, etc. Houtsoorten van Nederlandsch Oost-Indië . . . door F. W. van EEDEN. Derde . . . Uitgave bewerkt door J. J. DUYFJES. Haarlem, 1905. 8vo.

—— —— Beschrijvende catalogus, etc. Vetten, Oliën en Wassen door J. J. A. WIJS. Haarlem, 1906. 8vo.

Haij, Daniel. *Resp.* See **Thunberg, C. P.** Diss. de *Drosera*. 1797.

Hammer, Christopher. Floræ norvegicæ prodromus, etc. Kjöbenhavn, 1794. 8vo.

Hannaford, Samuel, *Junior*. The Wild Flowers of Tasmania, etc. Melbourne, 1866. 8vo.

Hardy, Marcel. Esquisse de la géographie et de la végétation des Highlands d'Écosse. Paris, 1905. 8vo.

Hart, John Hinchley. See **Lodge, F.**

Hartlib, Samuel. Universal Husbandry improved, or divers rare and choice experiments and secrets relating to all kinds of Husbandry, etc. London [1650 ?]. sm. 4to.

Hayata, B. See **Matsumura, J., & B. H.**

Heckel, Edouard. Sur le "Solanum Ohrondi" Carr. et sur sa fructification au Jardin botanique de Marseille. (Rev. Hort. des Bouches-du-Rhone, n. 509.) Marseille, 1896. 8vo.

[**Hecker, Johann Julius.**] Flora berolinensis : das ist, Abdruck der Kräuter und Blumen nach der besten Abzeichnung der Natur, etc. Cent. 1 [-2]. Berlin, 1757. fol.

Hemp. Cultivation in India. Agra, 1855. See **India** (*general*).

Hemsley, William Botting. History of the Botanical Magazine. See **Botanical Magazine.** § 3.

Henshall, Hester F. See **Blankinship, J. W., & H. F. H.**

Hill, *M.D.*, **John.** The Vegetable System, etc. London, 1761-63. 5 vols. (in 6.) 8vo.

Hogg, Robert. British Pomology ; or the history, description classification, and synonymes of the fruits and fruit trees of Great Britain.—The Apple. London, 1851. 8vo.

Hooper, Robert. Observations on the structure and economy of Plants, to which is added the analogy between the animal and the vegetable kingdom. Oxford, 1797. 8vo.

Houba, J. Les Chênes de l'Amérique septentrionale en Belgique, etc. Hasselt, 1887. la. 8vo.

Hughes, William. The Compleat Vineyard : or an excellent way for the planting of Vines, etc. London, 1670. sm. 8vo.

Humboldt, Friedrich Heinrich Alexander von. Biographie. See **Bruhns, K.**

Huss, Harald Axel. Beiträge zur Morphologie und Physiologie der Antipoden. Diss. - Zürich, 1906. 8vo.

Hutchinson, William. Handbook of Grasses, treating of their structure, classification, etc., also describing the British species and their habitats. London, 1895. 8vo.

Iggulden, William. The Tomato: with up-to-date cultural directions, etc. Ed. 5. (Frome, 1901.) 8vo.

India (*general*). Papers relating to the cultivation of Hemp in India. Agra, 1855. 4to.

—— Economic Products. Miscellaneous printed matter with some correspondence and memoranda in manuscript. 28 vols. fol.

India (*special*). Punjab. A manual of Arboriculture prescribed for the use of district officers . . . in the Punjab. Lahore, 1890. fol. —— Ed. 3. Lahore, 1905. fol.

Istvánffi de Csik Madéfalva, Gyula. D'une maladie de la vigne causée par le *Phyllosticta bizzozeriana*. (Ann. Inst. Ampél. R. Hongrois, iii.) Budapest, 1905. 8vo.

—— Etudes microbiologiques et mycologiques sur le rot gris de la vigne. (Ann. Inst. Ampél. R. Hongrois, iii.) Budapest, 1905. 8vo.

Jaap, Otto. Weitere Beiträge zur Moosflora der Umgegend von Hamburg. (Verhandl. Naturv. Ver. Hamb., 3, xiii.) (Hamburg, 1905.) 8vo.

Jackson, Benjamin Daydon. George BENTHAM. (English Men of Science.) London, 1906. 8vo.

Jaeggli Mario. Notizie sulla florula del colle di Sasso Corbario, presso Bellinzona. (Boll. Soc. ticinese Sci. Nat. 1905.) (Locarno, 1905.) 8vo.

Jávorka Sándor. Hazai *Onosma*-Fajaink. (Species hungaricae generis *Onosma*.) (Ann. Mus. Nat. Hungar. iv.) [Budapest] (1906). 8vo.

Jessen, Carl Friedrich Wilhelm. Deutschlands Gräser und Getreidearten zu leichter Erkenntniss nach dem Wuchse, den Blättern . . . zusammengestellt, etc. Leipzig, 1863. 8vo.

Johannsen, Wilhelm Ludvig. Das Aether-Verfahren beim Frühtreiben mit besonderer Berücksichtigung der Fliedertreiberei. Zweite Auflage. Jena, 1906. 8vo.

Jörgensen, Alfred. Micro-organisms and fermentation, translated by A. K. MILLER and A. E. LENNHOLM. Ed. 3. London, 1900. 8vo.

Junge, P. Aus der Flora der nordwestdeutschen Tiefebene. (Verhandl. Naturw. Ver. Hamb., 3, xiii.) (Hamburg, 1905.) 8vo.

Jussieu, Adrien de. De Euphorbiacearum generibus medicisque viribus tentamen, etc. Parisiis, 1824. 4to.

Kew. Royal Botanic Gardens. Hand-List of Ferns and Fern Allies cultivated in the Royal Botanic Gardens. Ed. 2. London, 1906. 8vo.

—— —— Catalogue of Portraits of Botanists. See **Milner, J. D.**

Kjellman, Frans Reinhold. See **Botaniska Studier.**

Klebahn, Heinrich. Vortrag über "Die Tulpe, ihre Geschichte, ihre Kultur, ihre Feinde." (Hamburg, 1903.) 8vo.

Knischewsky, Olga. Beitrag zur Morphologie von *Thuja occidentalis.* Diss. Bonn, 1905. 8vo.

Knowles, M. C. A contribution towards the Alien Flora of Ireland. (Irish Naturalist, xv.) (Dublin, 1906.) 8vo.

Knuth, Paul Erich Otto Wilhelm. Handbook of Flower Pollination, etc. Translated by J. R. Ainsworth DAVIS. Vol. i. Oxford, 1906. 8vo.

Kobus, J. D. Die chemische Selection des Zuckerrohrs. (VI. Congr. Internaz. Chim. Applic.) (Roma, 1906.) 8vo.

Koorders, S. H. Resultaten van een voorloopig mikroskopisch onderzoek eener wortelziekte van jonge kinaplantjes veroorzaakt door *Heterodera*-aaltjes en een schimmel. (Cultuurgids, vii.) Malang, 1906. 8vo.

Kranz, C. A. See **Weber, J. K.**

Krause, K. Aponogetonaceae. See **Engler, A.** Pflanzenreich.

Krylow, Porphir. Flora Altaya i Tomskoï Ghubernii. i.–iii. Tomsk, 1901–04. 8vo.

Laing, R. M., & E. W. Blackwell. Plants of New Zealand. Christchurch, etc., 1906. 8vo.

Lamotte, Martial. Catalogue des plantes qui croissent spontanément en France. Paris, 1841. 8vo.

Le Bey, R. See **Lignier, O., & R. Le B.**

Lecointe, G. Expédition antarctique belge. Travaux hydrographiques. See **"Belgica."**

Lenormand, Sebastien René. Herbier LENORMAND. See **Lignier, O., & R. Le Bey.**

Léveillé, Augustin Abel Hector. Bouquet de fleurs de Chine. (Bull. Soc. Agric. Sarthe, 1904.) [Le Mans, 1904.] 8vo.

—— Les vignes de la Chine. (Bull. Soc. Agric. Sarthe, 1905.) [Le Mans, 1905.] 8vo.

—— Glanes sino-japonaises. (Bull. Soc. Agric. Sarthe, 1905.) [Le Mans, 1905.] 8vo.

—— Liliacées, Amaryllidacées, Iridacées et Hémodoracées de Chine. (Mem. Pontif. Accad. Romana dei Nuovi Lincei, xxiv.) Roma, 1905. 4to.

—— Contribution à la caricologie orientale. (Mém. Soc. Sci. Cherb. xxxv.) (Cherbourg, 1905.) 8vo.

Lewis, Francis John. The history of the Scottish Peat Mosses and their relation to the Glacial Period. (Scott. Geogr. Mag. 1906.) [Edinburgh] (1906.) 8vo.

Lignier, Octave. Notes sur l'accroissement radial des troncs. (Bull. Soc. Linn. Norm. 5, ix.) (Caen, 1905.) 8vo.

Lignier, Octave, & R. Le Bey. Liste des plantes vasculaires que renferme l'Herbier général de l'Université et de la Ville de Caen. Herbier LENORMAND. Fasc. 1–4. (Bull. Soc. Linn. Norm., 5, v.–viii.) (Caen, 1901–04.) 8vo.

Linné, Carl von. Systema naturae, etc. Secundum sextam stockholmiensem emendatam et auctam editionem. Lipsiae, 1748. 8vo.

—— See **Whitlaw, C.**

Lloyd, Curtis Gates. The Tylostomeae. Cincinnati, 1906. 8vo.

Loddiges, Conrad, & Sons. Orchidaceae in the collection of C. L. and Sons, Hackney . . . with their native countries, years of introduction, etc. London [1844]. 8vo.

Lodge, F. Report on forest conservation in Trinidad and Tobago. Port of Spain, 1900, fol. Review of Mr. Lodge's report . . . by J. H. HART. Ib., 1900. fol.

Loeffler, H. Uber verschiedene *Ficaria*-Formen und über die Fortpflanzung bei *Ficaria verna* Huds. (Verh. Nat. Ver. Hamburg, 3, xiii.) (Hamburg, 1905.) 8vo.

Loefgren, Alberto, & Gustavo Edwall. Flora Paulista. 1–3. (Comm. Geogr. e Geol. de São Paulo, Bol. n. 12–14.) São Paulo. 1897. 8vo.

London. British Museum (Natural History). Special Guides, n. 2. Books and Portraits illustrating the History of Plant Classification exhibited in the Department of Botany. London, 1906. 8vo.

Lotsy, John P. See **Vienna.** Kongress, 1905. Résultats scientifiques.

Loudon, Jane Wells. Mrs. LOUDON'S First book of Botany. . . . New edition . . . by D. WOOSTER. London, 1870. 8vo.

Lundmark, Pehr. *Resp.* See **Thunberg, C. P.** *Restio.* Diss. 1788.

McAlpine, Daniel. The Rusts of Australia; their structure, nature, and classification. Melbourne, 1906. 8vo.

Macdougal, Daniel Trembly. Heredity and the origin of species. (Monist, 1906.) Chicago, 1905. 8vo.

Maiden, Joseph Henry. Wattles and Wattle-barks, etc. Ed. 3. Sydney, 1906. 8vo.

Makino, Tomitarō. See **Miyoshi, M., & T. M.**

Malay States. Handbook of the Federated Malay States. See **Belfield, H. C.**

(Mann, Horace.) Catalogue of the Phænogamous Plants of the United States . . . and of the Vascular Cryptogamous Plants of North America. Ed. 2 (by B. Pickman MANN.) Cambridge, Mass. (1872.) 8vo.

Marquand, Ernest David. The Guernsey dialect and its Plant names. (Trans. Guerns. Soc. Nat. Sc. 1905) (Guernsey, 1905.) 8vo.

Martinet, Gustave. Essais de Blés sélectionnés organisés par la Société vaudoise d'Agriculture en 1904–05. (Chron. Agric. Vaud, 1906.) Lausanne, 1906. 8vo.

Massee, George Edward. A text-book of plant diseases caused by cryptogamic parasites. (Ed. 2.) London, 1903. 8vo.

—— Text-book of Fungi, including morphology, physiology, pathology, classification, etc. London, 1906. 8vo.

Massee, George Edward. & Charles Crossland. New and rare British Fungi. (Naturalist, 1906.) London, 1906. 8vo.

Matsumura, Jinzō, & B. Hayata. Enumeratio Plantarum in insula Formosa sponte crescentium, etc. (Journ. Coll. Sci. Tōkyō, xxii.) Tōkyō, 1906. 4to.

Maurer, H. Das Beerenobst: seine Kultur, Fortpflanzung und Benutzung, etc. Zweite Auflage. Stuttgart, 1883. 8vo.

Mayr, Heinrich. Fremdländische Wald- und Parkbäume für Europa. Berlin, 1906. 8vo.

Medvedeff, J. S. Derev'ya ī Kustarnīkī Kavkaza, etc. [*i.e.*, Trees and Shrubs of the Caucasus.] I. Gymnospermae. Tiflis, 1905. la. 8vo.

Mehner, Hermann. Treibgärtnerei für Landwirte. (Deutsche Landw.-Ges. 1906.) (Berlin, 1906.) 4to.

Menezes, Carlos Azevedo. Madeira Ferns. Translated . . . by H. GILBERT. Funchal, 1906. sm. 8vo.

Miller, Philip. Catalogus Plantarum Officinalium quae in Horto Botanico Chelseyano aluntur. Londini, 1730. 8vo.

—— The Gardeners Dictionary, etc. Ed. 6. London, 1752. fol.—Ed. 7. Ib., 1759. fol.

Milner, James D. Catalogue of Portraits of Botanists exhibited in the Museums of the Royal Botanic Gardens (Kew). London, 1906. 8vo.

Miyoshi, Manabu. Atlas of Japanese vegetation . . . : With explanatory text. Set i. [—vi.]. Tokyo, 1905–06. 4to.

Miyoshi, Manabu, & Tomitarō Makino. Pocket-atlas of Alpine Plants of Japan. i. Tokyo, 1906. 8vo.

Mohr, Daniel Matthias Heinrich. Observationes botanicæ, etc. Diss. Kiliae, 1803. sm. 8vo.

Moore, Albert Hanford. A list of Plants collected in Bermuda in 1905, including a description of two new species. Cambridge, Mass., 1906. 8vo.

Moquin-Tandon, Christian Horace Bénédict Alfred. Éléments de botanique médicale, etc. Ed. 2. Paris, 1866. 8vo.

Mossman, R. C. Some meteorological results of the Scottish National Antarctic Expedition. (Scott. Geogr. Mag., 1906.) [Edinburgh, 1906.] 8vo.

Mutel, Auguste. Flore du Dauphiné, etc. Paris, 1830. 2 vols. 12mo.

Naudin, Charles. Description et emploi des *Eucalyptus* introduits en Europe principalement en France et en Algérie. Second mémoire. Antibes, 1891. 8vo.

Nelson, Aven. An analytical key to some of the common Flowering Plants of the Rocky Mountain region. New York, 1903. 8vo.

Niedenzu, Franz. De genere *Hiraea*. (Verz. Vorles. Lyc. Hos. Braunsb., 1906–7.) Braunsberg, 1906. 4to.

Nietner, Th. Die Rose: ihre Geschichte, Arten, Kultur und Verwendung, etc. Berlin, 1880. 4to.

Nobbs, Eric A. Ueber die Einwirkung von Kalidüngemitteln und Kalk auf die physikalischen Eigenschaften des Bodens. Diss. Giessen, 1902. 8vo.

—— Agricultural problems at the Cape of Good Hope. (Science in South Africa, 1905.) [Cape Town, 1905.] 8vo.

Observations on modern Gardening. London, 1770. 8vo.—Ed. 4. Ib., 1777. 8vo. See [**Whately, T.**]

Orloff. Hortus orloviensis. See **Pursh, F.** 1815.

Osterhout, Winthrop, J. V. Problems of Heredity. (Contrib. Bot. Seminary Univ. Calif. 1. Repr. from Univ. Chron. i.) Berkeley, 1898. 8vo.

Palacký, Johann. Catalogus Plantarum madagascariensium. I. Monocotyledoneæ. Pragae, 1906 8vo.

Pavillard, Jules. Recherches sur la flore pélagique (Phytoplankton) de l'Étang de Thau. (Trav. Inst. Bot. Univ. Montpellier.) Montpellier, 1905. 8vo.

Payne, Joseph Frank. Old Herbals: German and Italian. (Magazine of Art, 1885.) (London, 1885). 4to.

—— English Medicine in the Anglo-Saxon times. (Fitz-Patrick Lectures for 1903.) Oxford, 1904. 8vo.

Pečírka, Josef. Die Giftgewächse Oesterreich's und Deutschland's, etc. Prag, 1859. 8vo.

Peck, Charles Horton. See **Sargent, C. S., & C. H. P.**

Perak. See **Belfield, H. C.** Handbook of the Federated Malay States.

Petagna, Vincenzo. Delle facultà delle piante trattato, etc. Napoli, 1796. 3 vols. 8vo.

Petrasch, J. See **Seboth, J.**

Pharmacopœa Belgica; or the Dutch Dispensatory, revised and confirmed by the College of Physitians, etc. Rendered into English . . . . (by John ROULAND). London, 1659. 8vo.

Pirotta, Romualdo. Flora della Colonia Eritrea. Parte 1, fasc. 1–2. (Ann. Istit. Bot. Roma, viii.) Roma, 1903-4. 4to.

Pobéguin, H. Essai sur la Flore de la Guinée française. Paris, 1906. 8vo.

Prain, David. Noviciæ indicæ: some additional species of Indian Plants, xi., xii., xiv.-xxiv. (Journ. Asiatic Soc. Bengal, pt. 2, lxv.–lxxiii.) (Calcutta, 1896–1904.) 8vo. [The title-page, contents, systematic digest, and index were published in London in 1905.]

Pulle, August Adriaan. An enumeration of the Vascular Plants known from Surinam, etc. Leiden, 1906. 8vo.

Pursh, Frederick. Hortus orloviensis; or, a catalogue of Plants cultivated in the island of Orloff, near St. Petersburg, by Peter BUCK. London, 1815. 8vo.

Radais, Maxime. See **Guéguen, F.**

Ramaley, Francis. The Botanical Garden at Buitenzorg, Java. (Popular Science Monthly, 1905.) [New York] (1905). 8vo.

—— Plants of the Florissant region in Colorado. (Univ. of Colorado Studies, iii.) (Boulder, 1906.) 8vo.

—— The Seed and Seedling of the Mountain Globe-Flower. (Univ. of Colorado Studies, iii.) (Boulder, 1906.)

Renner, Otto. Beiträge zur Anatomie und Systematik der Artocarpeen und Conocephaleen insbesondere der Gattung *Ficus*. Diss. (Engl. Bot. Jahrb. xxxix.) Leipzig, 1906. 8vo.

Richter, P. B. Beiträge zur Flora der unteren Kreide Quedlinburgs. Teil 1. Leipzig, 1906. 4to.

Rogers, C. S. The forest resources of the colony [Trinidad]. Port of Spain, 1903. 8vo.

Rosander, H. A. Studier öfver Bladmossornas Organisation, etc. Uppsala, 1906. 8vo.

Roth, Georg. Die europäischen Torfmoose. Nachtragsheft zu den europäischen Laubmoosen. Leipzig, 1906. 8vo.

Rouland, John. See **Pharmacopœa Belgica.** 1659.

Rousseau, M. Expédition antarctique belge. Champignons par E. BOMMER & M. R. See **"Belgica."**

Royal Parks and Pleasure Grounds. Detailed estimates, 1891–1903. [London, 1891-1903.] fol.

Rubber. The Cultivation of Rubber as an Investment, by the Editor of the India-Rubber Journal. London, 1906. 8vo.

Saint-Germain, J. J. de. Manuel des végétaux, ou catalogue latin et françois de toutes les plantes . . . connus sur le globe, etc. Paris, 1784, 8vo.

St. Louis. International Exhibition, 1904. Report of His Majesty's Commissioners. (London) [1906?]. 8vo.

Sander & Sons, Frederick. Orchid Hybrids. SANDER'S *complete* up-to-date list, etc. St. Albans [1906]. 8vo.

Sargent, Charles Sprague, & Charles Horton Peck. Species of *Crataegus* found within twenty miles of Albany. (N. Y. State Mus. Bull. 105.) Albany, 1906. 8vo.

Scaliger, Julius Cæsar. Exotericarum exercitationum liber quintus decimus de subtilitate ad Hieronymum CARDANUM. Lutetiae, 1557. sm. 4to.

Schellens, Walther. Ueber das Verhalten von pflanzenlichen und tierischen Textilstoffen zu Metallsalzlösungen. Diss. Strassburg, 1905. 8vo.

Schlich, William. Forestry in the United Kingdom. London (1904). 8vo.

Schmid, Eduard. Beiträge zur Entwicklungsgeschichte der Scrophulariaceae. Diss. Zürich, 1906. 8vo.

Schroeder, August. Beiträge zur Kenntnis einiger ausländischen Fette und Öle. Diss. Strassburg, 1905. 8vo.

Schuchardt, Bernhard. Die Kola-Nuss in ihrer commerciellen, kulturgeschichtlichen und medicinischen Bedeutung. Zweite vermehrte Auflage. Rostock i. M., 1891. 8vo.

Schumacher, Christian Friederich. Den kjöbenhavnske flora, etc. Oversat af det latinske . . . af F. C. KIELSEN. Kjöbenhavn, 1804. 8vo.

—— Medicinsk plantelære for studerende læger og pharmaceutiker. Kjöbenhavn, 1825–26. 2 vols. 8vo.

Seboth, Joseph. Alpine Plants painted from Nature. Edited by A. W. BENNETT, with introductions by F. GRAF [and J. PETRASCH. London (1879–80). 4 vols. (series). 8vo.

Sérullas. See **Gutta-Percha.**

Seward, Albert Charles, & Sibille O. Ford. The Araucarieæ, recent and extinct. (Phil. Trans. cxcviii.) London, 1906. 4to.

Sigismund, Reinhold. Die Aromata in ihrer Bedeutung für Religion, Sitten, Gebraüche, Handel und Geographie des Alterthums, etc. Leipzig, 1884. 8vo.

Simmons, Herman G. The Vascular Plants in the Flora of Ellesmereland. (Rep. 2nd Norwegian Arctic Exped. in the "Fram," n. 2.) Kristiania, 1906. 8vo.

Smith, A. Bernhard. Poisonous Plants of all countries, with the active chemical principles which they contain, etc. Bristol, 1905. 8vo.

Smith, Johannes Jacobus. Die Orchideen von Ambon. Batavia, 1905. 8vo.

Solms-Laubach, Hermann, Graf zu. See **Capellini, G., & H., Graf zu S.-L.**

Soudan. See **Sudan.**

Spies, Johann Karl. *Praeses.* See **Brueckmann, F. E.**

Spinner, Henri. Des relations existant entre la disposition du parenchyme vert dans les feuilles de *Carex* et les localités habitées par ces végétaux. (Bull. Soc. Neuchatel. Sci. Nat. xxxi.) (Neuchatel, 1904.) 8vo.

Spinner, Henri. Sur des fruits anormaux de *Cheiranthus*. (Bull. Soc. Neuchatel. Sci. Nat. xxxii.) (Neuchatel, 1905.) 8vo.

—— L'anatomie caulinaire des *Carex* suisses. (Bull. Soc. Neuchatel. Sci. Nat. xxxii.) Neuchatel, 1905. 8vo.

Spire, Camille, & André Spire. Le Caoutchouc en Indo-Chine; étude botanique, industrielle et commerciale, Paris, 1906. 8vo.

Stapf, Otto. Flora of Liberia. See **Johnston, Sir H. H.** Liberia. § 2.

Stopes, Marie C. A new Fern from the Coal Measures, *Tubicaulis Sutcliffii* spec. nov. (Mem. & Proc. Manch. Lit. & Phil. Soc. l.) (Manchester, 1906.) 8vo.

Strachey, Sir Richard. On the computation of the quantity of heat in excess of any fixed base temperature . . . to supply a standard for comparison with the progress of vegetation. (Quart. Weather Rep. 1878.) (London, 1884). 4to.

—— Catalogue of the Plants of Kumaon and of the adjacent portions of Garhwal and Tibet, etc. Revised and supplemented by J. F. DUTHIE. London, 1906. 8vo.

Strail, Ch. A. Essai de classification et descriptions des Menthes qu'on rencontre en Belgique. (Bull. Soc. Bot. Belg. xxvi.) Gand, 1887. 8vo.

Stuckert, Teodoro. Distribución geográfica de la Flora Argentina. Géneros de la familia de la Compuestas. (An. Mus. Nac. Buenos Aires, xiii.) Buenos Aires, 1906. 8vo.

Sudan. Reports on the finance, administration, and condition of the Sudan, 1904. Khartoum, [1905 ?] → 8vo.

Swederus, M. B. Botaniska Trägården i Upsala, 1655–1807. Falun, 1877. 8vo.

Sweert, Emmanuel. Florilegium amplissimum et selectissimum, etc. Amstelodami, 1631. fol.

Terracciano, Achille. Revisione monografica delle specie *Gagea* della flora spagnola. Palermo, 1905. 8vo.

[**Theatrum Florae,** in quo ex toto orbe selecti mirabiles venustiores ac praecipui flores tanquam ab ipsius Deae sinu proferuntur. Lutetiae Parisiorum (apud P. FIRENS) 1633 ?] fol.

Thellung, A. Die Gattung *Lepidium* (L.) R. Br. Eine monographische Studie. (Mitt. Bot. Mus. Univ. Zürich, xxviii.—Neue Denkschr. Schweiz. Ges. Naturwiss. xli.) Basel, Genève & Lyon, 1906. 4to.

Thornton, Robert John. A family Herbal : or familiar account of the medical properties of British and Foreign Plants, etc. Ed. 2. London, 1814. 8vo.

Thunberg, Carl Pehr. *Præses. Gladiolus.* Diss. . . *resp.* C. AEJMELÆUS. Upsaliæ, 1784. sm. 4to.

—— *Restio.* Diss. . . . *resp.* P. LUNDMARK. Upsaliæ, 1788. sm. 4to.

—— Diss. de *Drosera* . . . *resp.* D. HAIJ. Upsaliæ, 1797. 4to.

Tibet. Papers relating to Tibet. (Government Publication, Cd. 1920.) London, 1904. fol.—Further papers, etc. (Cd. 2054.) Ib., 1904. fol.

Tison, Adrien. Remarques sur la chute des bourgeons terminaux de certains arbres. (Bull. Soc. Linn. Normandie, 5, ix.) (Caen, 1905.) 8vo.

Tonning, Henrik. Norsk medicinsk og oeconomisk flora, etc. Forste Deel [all published]. Kjöbenhavn, 1773. 4to.

Tournefort, Joseph Pitton de. Histoire des plantes qui naissent aux environs de Paris, etc. Paris, 1698. 12mo.

Triggs, H. Inigo. The Art of Garden Design in Italy. Illustrated . . . by Mrs. Aubrey LE BLOND. London, 1906. la. 4to.

Tubeuf, Karl, Freiherr von. Beiträge zur Kenntniss der Baumkrankheiten. Berlin, 1888. 8vo.

Umlauft, Anton. Die Wahrheit über die Wetterpflanze. (Wien) [1906 ?]. 8vo.

United States. Department of the Interior. U.S. Geological Survey of the Territories. Misc. Publ. n. 5. Descriptive catalogue of the photographs of the U.S. Geol. Survey . . . 1869 to 1875. Ed. 2. Washington, 1875. 8vo.

Unwin, W. C. Illustrations and dissections of the genera of British Mosses. Lewes, 1878. 4to.

Upsala. Bot. Trädgården. See **Swederus, M. B.**

Vahl, M. Madeiras Vegetation. Geografisk monografi. Köbenhavn & Kristiania, 1904. 8vo.

Vallemont, Pierre Lorrain, Abbé de. Curiosities of nature and art in husbandry and gardening, etc. London, 1707. 8vo.

There is a second title-page, as follows:—Agriculture and gardening in their perfection; or, Curiosities of nature and art in the vegetation of plants. Written in French by the Abbot de VALLEMONT. Now done into English [by William FLEETWOOD?]. London, 1707.

Vaucher, Jean Pierre Étienne. Histoire physiologique des plantes d'Europe, etc. Paris, 1841. 4 vols. 8vo.

Veitch, James Herbert. Hortus Veitchii: a history of the rise and progress of the nurseries of Messrs. James Veitch and Sons, etc. (Special edition.) London, 1906. la. 8vo.

Venezuela. Geographical sketch, natural resources, etc., edited . . . by N. Veloz GOITICOA. 1904. (International Bureau of American Republics.) Washington, 1904. 8vo.

Viborg, Erik Nissen. Forsög til systematiske danske navne af indenlandske planter, etc. Kiöbenhavn, 1793. 8vo.

—— Botanisk-oekonomisk beskrivelse over de i landhuusholdningen vigtigste Aspe- og Pilearter. Kiöbenhavn, 1800. 8vo.

Vienna. II. Internationaler botanischer Kongress, 1905. Verhandlungen (Actes) . . . herausg. von R. von WETTSTEIN, J. WIESNER und A. ZAHLBRUCKNER, redigiert von J. BRIQUET, etc. Jena, 1906. la. 8vo.

—— —— Résultats scientifiques (Wissenschaftliche Ergebnisse) etc., herausg. von R. von WETTSTEIN, J. WIESNER und A. ZAHLBRUCKNER, redigiert von J. P. Lotsy. Jena, 1906. la. 8vo.

Wainio, Edvard August. Expédition antarctique belge. Lichens. See "**Belgica.**"

Walker, Hugh. John B. Leicester WARREN, Lord de Tabley. A biographical sketch. London, 1903. 8vo.

Wallace, Robert. Farming Industries of Cape Colony. London, 1896. 8vo.

Walter, Johannes Ernst Christian. Blomster-Museum eller colorerede afbildninger af de skjönneste blomster og siirplanter, etc. (Title also in German.) Hefter 8–10. (Kiöbenhavn, 1838–46.) 8vo.

—— —— Flora eller colorerede afbildninger af pragt-blomster med dansk og tydsk beskrivelse. (Title also in German.) Hefter 24, 27–31, 33–38, 40, 41, 44–49, 51. Kiöbenhavn, 1839–43. 4to.

Ward, Harry Marshall. Trees : a handbook of forest-botany for the woodlands and the laboratory. (Cambridge Biological Series.) Cambridge, 1904–05. 3 vols. 8vo.

Ward, Stephen H. The Wardian cases for Plants and their applications. London, 1854. 8vo.

Warming, Johannes Eugen Bülow. Dansk Plantevækst. 1. Strandvegetation af J. E. B. W. Köbenhavn & Kristiania, 1906. 8vo.

Warren, John Byrne Leicester, 3rd Baron de Tabley. Biographical sketch. See **Walker, H.**

Webber, Wingfield. The Forests of Upper India and their inhabitants. London, 1902. 8vo.

Weber, Johann Karl. Die Alpen-Pflanzen Deutschlands und der Schweiz in colorirten Abbildungen, etc. Dritte Auflage. Mit . . text von C. A. Kranz. München, 1872. 4 vols. 12mo.

West, William, & George Stephen West. A comparative study of the Plankton of some Irish lakes. (Trans. Roy. Irish Acad. xxxiii.) Dublin, 1906. 4to.

Westerdijk, Johanna. Zur Regeneration der Laubmoose. Diss. Nijmegen [1906.] 8vo.

Wettstein, Friedrich. Entwicklung der Beiwurzeln einiger dikotylen Sumpf- und Wasserpflanzen. Diss. Zürich, 1905. 8vo.

Wettstein von Westersheim, Richard, Ritter von. Der Ursprung des Pollenschlauches. (Naturwiss. Rundschau, xxi.) [Braunschweig, 1906 ?] 4to.

—— —— Neues aus der Biologie der Orchideen. (Vortr. Ver. z. Verbreit. Naturwiss. Kenntn. in Wien, xlvi.) Wien, 1906. 8vo.

—— —— See **Vienna.** Kongress, 1905. Résultats scientifiques.

[**Whately, Thomas.**] Observations on modern Gardening, illustrated by descriptions. London, 1770. 8vo.

Wheatley, Thomas. See **Whately, T.**

Whitlaw, Charles. Whitlaw's new medicinal discoveries, with a defence of the Linnæan doctrine, and a translation of his Vegetable Materia Medica, etc. London, 1829. 2 vols. 8vo.

Wiesner, Julius. See **Vienna.** Kongress, 1905. Résultats scientifiques.

Wijs, J. J. A. Vetten, Oliën en Wassen. See **Haarlem.**

Witte, Hernfrid. Till de Svenska Alfvarväxternas Ekologi. Uppsala, 1906. 8vo.

Wittmack, Louis. Violette Weizenkörner. (Sitzungsb. Ges. Naturforsch. Freunde, 1906.) (Berlin, 1906.) 8vo.

Wood, John Medley. Report on Natal Botanic Gardens and Colonial Herbarium for the year 1905–1906. Durban, 1906. 8vo.

Wooster, David. See **Loudon, Jane Wells.**

Wright, Herbert. *Hevea brasiliensis* or Para Rubber, etc. Ed. 2. Colombo, 1906.

Zacharias, Eduard. Blütenbiologische Beobachtungen. (Verhandl. naturwiss. Ver. Hamb., 1905.) (Hamburg, 1905.) 8vo.

Zahlbruckner, Alexander. See **Vienna.** Kongress, 1905. Résultats scientifiques.

Zigno, Barone Achille de. Flora fossilis formationis oolithicae. Padova, 1856–85. 2 vols. 4to.

---

§ 2.—TRAVELS.

Borchgrevink, Carsten E. First on the Antarctic Continent, being an account of the British Antarctic Expedition, 1898–1900. London, 1901. 8vo.

Burton, Sir Richard Francis. First footsteps in East Africa, or an exploration of Harar. London, 1856. 8vo.

Byron, Hon. John. See **"Dolphin," H.M.S.**

Conway, Sir William Martin. Aconcagua and Tierra del Fuego. London, etc. 1902. 8vo.

Dawe, Morley Thomas. Report on a botanical mission through the forests districts of Buddu and the western and Nile provinces of the Uganda Protectorate. (Parliamentary Blue Book.) London, 1906. fol.

"Dolphin," H.M.S. A voyage round the world in His Majesty's ship the "Dolphin," commanded by the Honourable Commodore Byron . . . by an officer on board the said ship. London, 1767. 8vo.

Foreman, John. The Philippine Islands, etc. Ed. 2. London, 1899. 8vo.

Fortune, Robert. A journey to the Tea Countries of China; including Sung-lo and the Bohea Hills, etc. London, 1852. 8vo.

Guppy, Henry Brougham. Observations of a Naturalist in the Pacific between 1896 and 1899. I. Vanua Levu, Fiji, etc. London, 1903. 8vo. II. Plant-dispersal. Ib., 1906. 8vo.

Johnston, Sir Harry Hamilton. The River Congo from its mouth to Bolobo, etc. Ed. 4. London, 1895. 8vo.

—— —— Liberia. With an Appendix on the Flora of Liberia, by Otto STAPF. London, 1906. 2 vols. 8vo.

Kingsley, Mary H. Travels in West Africa, Congo français, Corisco and Cameroons. London, 1897. 8vo.

—— —— West African Studies. London, 1899. 8vo.

Kloss, C. Boden. In the Andamans and Nicobars. London, 1903. 8vo.

Luillier, Sieur. Nouveau voyage aux Grandes Indes, avec une instruction pour le commerce des Indes orientales, etc. Rotterdam, 1726. sm. 8vo.

Martin, Percy F. Through five republics (of South America). A critical description of Argentina, Brazil, Chile, Uruguay and Venezuela in 1905. London, 1905. 8vo.

Morgan, E. Delmar. See **Prejevalsky, N. M.**

Olufsen, O. Through the Unknown Pamirs. The Second Danish Pamir Expedition, 1898–99. London, 1904. 8vo.

Prejevalsky, Nicolai Mikhailovitch. Mongolia, the Tangut Country, and the solitudes of Northern Tibet: being a narrative of three years' travel in Eastern High Asia. Translated by E. Delmar MORGAN, with introduction and notes by Col. H. YULE. London, 1876. 2 vols. 8vo.

Prichard, H. Hesketh. Through the heart of Patagonia. London, 1902. la. 8vo.

Przewalski, N. M. See **Prejevalsky, N. M.**

Raffles, Sir Thomas Stamford. The History of Java. London, 1817. 2 vols. 4to.

Scott, Robert Falcon. The voyage of the "Discovery." London, 1905. 2 vols. 8vo.

Waddell, Lawrence Austine. Lhasa and its mysteries, with a record of the expedition of 1903-1904. London, 1905. 8vo.

Yule, Sir Henry. See **Prejevalsky, N. M.**

---

§ 3.—PERIODICALS.

Including the Publications of Societies.

Agricultural Journal of India. See **India.** Imperial Department of Agriculture.

Alaska. Alaska Agricultural Experiment Stations. Bulletin, n. 2. Washington, 1905 → 8vo.

Annali di Botanica, publicati dal Prof. R. PIROTTA, i—iv. Roma, 1904–06 → 8vo.

Annals (The) of Horticulture and Year-Book of Information on Practical Gardening. London, 1846-50. 5 vols. 8vo. This work was published in numbers as the Horticultural Magazine.

Bambou (Le). Son étude, sa culture, son emploi. Bulletin périodique. 1re Année, n. 1. Mons, 1906 → 8vo.

Berichte der bayerischen botanischen Gesellschaft. See **Munich.**

Birmingham. Birmingham Natural History and Microscopical Society. Report and Transactions, 1880. Birmingham (1881). 8vo.

Botanical Magazine. A new and complete index . . . 1787 to the end of 1904 . . . To which is prefixed a History of the Magazine by W. Botting HEMSLEY. London, 1906. 8vo.

Buitenzorg. 'sLands Plantentuin. Institut de Botanique. Bulletin, n. 1–22. Buitenzorg, 1898–1905. 8vo. *Continued as* Bulletin du Département de l'Agriculture aux Indes Néerlandaises, n. 1. Buitenzorg, 1905→ 8vo.

Calcutta. Asiatic Society of Bengal. Memoirs, i. n. 1–8. Calcutta, 1905–06→ 4to.

Cottage Gardener. . . . Conducted by G. W. JOHNSON (and R. HOGG). Vols. iii.–xxiii. London, 1850–60. 4to.

Garden (The) Album and Review. Edited by J. WEATHERS. i. n. 1–5. London, 1906. 8vo.

Garden Companion and Florists' Guide, by A. HENFREY, T. MOORE, W. P. AYRES, and other practical cultivators, January to October, 1852 (all published). London, 1852. la. 8vo. It is stated on the wrappers that this forms a new series of the Gardeners' Magazine of Botany.

Gardeners' and Foresters' Record, conducted by Joseph HARRISON, i.–iii. London (1833–36). 3 vols. 8vo.

Horticultural Magazine. See **Annals of Horticulture,** etc.

India. Imperial Department of Agriculture. Annual report, 1904–05. Calcutta, 1906. 8vo.

—— —— Agricultural Journal of India, i. n. 1–4. Pusa, 1906→ 8vo.

—— —— Memoirs. Botanical series, i. n. 1–3. Pusa (1906)→ 8vo.

Institute of Commercial Research in the Tropics. See **Liverpool.**

Jamaica. Board of Agriculture. Sugar Cane Experiment Station. Report, 1905, by H. H. COUSINS. Kingston, 1906. 8vo.

Lavoura (A.). See **Rio de Janeiro.**

Liverpool. Liverpool University. Institute of Commercial Research in the Tropics. Quarterly Journal, i. n. 1–3. (Liverpool), 1906→ 8vo.

London. Therapeutical Society. Transactions, 1903–04. London (1903-04). 8vo.

Luxemburg. Société Botanique du Grand-Duché de Luxembourg. Recueil des Mémoires et des Travaux, n. ix.–x. 1883–84. Luxembourg, 1884. 8vo.

Montana. Montana Agricultural College. Science Studies, i. n. 1–3. See **Blankinship, J. W.** § 1.

Munich. Bayerische botanische Gesellschaft. Berichte, i.–vii. München, 1891–1900. 7 vols. la. 8vo.

Natal. Department of Agriculture. Bulletins, 1–8, 10, 11. Pietermaritzburg, 1902–06. 8vo.

Oesterreichische Garten-Zeitung. See **Wiener Illustrirte Garten-Zeitung,** Neue Folge.

Orchis. Monatsschrift der Deutschen Gesellschaft für Orchideenkunde. Herausg. von U. DAMMER. i. Berlin, 1906→ fol.

Paris. Société dendrologique de France. Bulletin, n. 1. Paris, 1906→ 8vo.

Pflanzer (Der). Ratgeber für tropische Landwirtschaft, i. Tanga, 1905–06→ 8vo.

Philippine (The) Journal of Science, edited by P. C. FREER. i. n. 1–6. Manila, 1906→ 8vo. —— Supplement. i. n. 1–4. Ib., 1906→ 8vo.

Rio de Janeiro. Sociedade Nacional de Agricultura. Boletim (A Lavoura). vii.–ix. (Rio de Janeiro, 1905–06)→ 8vo.

San José de Costa Rica. Sociedad Nacional de Agricultura. Boletin, n. 1–8. San José, 1906→ 8vo.

São Paulo. Commissão Geographica e Geologica de S. P. Boletim, n. 12–14. Flora Paulista. See **Loefgren, A., & G. Edwall.** §1.

Science Progress in the Twentieth Century. Edited by N. H. ALCOCK & W. G. FREEMAN, n. 1 & 2. London, 1906→ 8vo.

Scottish (The) Naturalist: a magazine of Scottish Natural History. Edited by F. BUCHANAN WHITE. Vols. i.–v. Perth, etc., 1871–80. 8vo.

Tribune (La) Horticole. Organe officiel des Sociétés Royales Linnéenne et de Flore de Bruxelles. i. Bruxelles, 1906→ 8vo.

Tropical Life. A monthly journal . . . edited by H. H. SMITH. i.–ii. London, 1905–06→ 4to.

Wiener Illustrirte Garten-Zeitung. Neue Folge, as **Oesterreichische Garten-Zeitung.** i. Wien, 1906→ 8vo.

Zeitschrift für wissenschaftliche Botanik von M. J. SCHLEIDEN und C. NAEGELI. Hefte i.–iv. Zürich, 1845-46. 3 vols. 8vo.

---

§ 4.—MANUSCRIPTS.

Banks, Rt. Hon. Sir Joseph, Bart. Correspondence and Banksiana. Index, by B. Daydon JACKSON. fol.

Cambridge, Octavius Pickard. See **Kew.** Roy. Bot. Gard. Wild Fauna and Flora.

China. Index floræ sinensis. Correspondence, etc., 1883–1905. fol.

Jackson, Benjamin Daydon. See **Banks, Rt. Hon. Sir J., Bart.**

Jamaica. Cultural Products. Correspondence, memoranda, etc., with miscellaneous printed matter, 1848–1904. 3 vols. fol.

Kew. Kew Bridge. Correspondence, etc. fol.

—— Kew Eyot. Correspondence. fol.

—— Kew Green. Correspondence, etc. fol.

—— Kew Roads. Correspondence. fol.

— Royal Botanic Gardens. Estimates, with correspondence and memoranda, 1842–1904. 5 vols. fol.

—— —— Queen's Cottage Grounds. Correspondence, etc. fol.

—— —— Wild Fauna and Flora. Correspondence, etc., 1896–1906. 4to.

—— —— Wild Fauna and Flora. Lists of Spiders, by O. Pickard CAMBRIDGE. 1897-1902. fol.

Richmond. Old Deer Park. Correspondence, etc. fol.

St. Louis. International Exhibition, 1904. Chiefly correspondence. fol.

Schomburgk, Sir Robert Hermann. *Lightia lemniscata*, a new genus of the family Büttneriaceæ by R. H. S. 6 ff.

Trinidad. Cultural Products. Correspondence, with miscellaneous printed matter, 1860–1904. 3 vols. fol.

Page missing
from book
at time
of scanning.

botanicus

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1907.

NEW GARDEN PLANTS OF THE YEAR 1906.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1906. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1906, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

1375 Wt 72 2/07 D & S 29 27160

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows :—*B. H. B.*—Bulletin de l'Herbier Boissier. *B. K.*—Guerke, Blühende Kakteen. *B. M.*—Botanical Magazine. *B. P.*—Bollettino del R. Orto Botanico di Palermo. *B. S. B. B.*—Bulletin de la Société Royale de Botanique de Belgique. *B. S. B. F.*—Bulletin de la Société Botanique de France. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *G. W.*—Gardening World. *Gartenwelt*—Die Gartenwelt. *I. S. H. T.*—Icones Selectæ Horti Thenensis. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *L.*—Lindenia. *Lemoine Cat.*—Lemoine Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Berlin. *O. G. Z.*—Oesterreichische Garten-Zeitung. *O. R.*—Orchid Review. *Orch.*—Orchis. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Späth Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch Nov.*—J. Veitch & Sons, List of Novelties. *Veitch I. N.*—J. Veitch & Sons, Illustrated Notes on Hardy Plants.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies concolor falcata. (*M. D. G.* 1905, 212.) Coniferae. H. Leaves sickle-shaped, curved upwards. (W. F. Niemetz, Temesvár, Hungary.)

Abies concolor globosa. (*M. D. G.* 1905, 212.) H. Plant spherical, with symmetrical short branches. (W. F. Niemetz, Temesvár, Hungary.)

Abies Delavayi. (*G. C.* 1906, xxxix. 212, f. 82.) H. A tree 20–50 ft. high, having leaves that are remarkable for the manner in which they are rolled back along the margin. Cones deep plum colour, cylindric-oblong, truncate, 2½-3 in. long ; bracts broadly oblong-spathulate, ending abruptly in a short point which projects beyond the scales ; scales wedge-shaped at the base, somewhat rounded at the apex. Western China. (J. Veitch & Sons.)

Abies Fargesii. (*G. C.* 1906, xxxix. 212, f. 83.) H. A very handsome tree attaining a height of nearly 200 ft. Leaves very white on the under surface, nearly flat, though sometimes rolled back along the margin. Cones deep purple, barrel-shaped ; bracts narrow, spathulate, with a short point which does not project beyond the scales ; scales broad at the base, rounded at the apex. Central and Western China. (J. Veitch & Sons.)

Acacia celastrifolia. (*B. T. O.* 1897, 252, t. 11 ; *G. C.* 1906, xxxix. 213.) Leguminosae. G. See **A. podalyriaefolia.**

Acacia Motteana. (*G. C.* 1906, xxxix. 213.) G. See **A. podalyriaefolia.**

***Acacia podalyriaefolia.** (*G. C.* 1906, xxxix. 213.) G. An ornamental species flowering in mid-winter. It closely resembles *A. cultriformis*, but it is larger and more vigorous. The whole plant is densely covered with fine velvety hairs. Phyllodes less angular and somewhat larger than in *A. cultriformis*. Flower-heads globose, rich yellow, in unbranched racemes much longer than the phyllodes.

Eastern Australia. (Sir T. Hanbury, La Mortola.) [See *G. C.* 1894, xv. 37, f. 5. Syns. *A. Motteana*, Hort. and *A. celastrifolia*, Hort. not of Benth.]

Acalypha hispida ramosa. (*Jard.* 1906, 99.) Euphorbiaceae. S. A variety in which the inflorescences arising in the axils of the uppermost leaves are branched. (*Parc* de la Tête-d'Or, Lyons)

Acer insigne Wolfii. (*M. D. G.* 1905, 210.) Sapindaceae. H. Leaves 10 in. long and nearly as broad, red on the under side and glabrous even when young. Caucasus. (Fritz Graf von Schwerin, Wendisch - Wilmersdorf, Germany.)

Acer Negundo Schwerini. (*M. D. G.* 1905, 212.) H. Leaves green, densely whitish - marbled, or when young flecked and striped with a rosy colour; petioles long, reddish.

Acer saccharinum chlorocinctum. (*R. H.* 1906, 128; *M. D. G.* 1905, 209.) H. Leaves greyish green, with a clearly defined margin of dark green. (C. Gebbers, senr., Wiesenburg, Germany.) [= *A. dasycarpum*, Ehrh. var.]

***Achillea Sieheana.** (*K. B.* 1906, 73.) Compositae. H. A very fragrant undershrub 2–2½ ft. high. Leaves sessile, linear-oblong, the longest 1 in. long, minutely serrulate. Flower-heads 3 or 4, very small, arranged in a corymb at the apex of the branches. Florets all ligulate, 7 or 8, very short, golden-yellow. Asia Minor. (Kew.)

Adenia lobata. (*T. H.* 1906, i. 182, t. 11.) Passifloraceae. S. A climbing plant, with rounded leaves 4–5 in. across, and axillary fascicles of pale greenish yellow flowers about 1 in. long. Calyx tubular - campanulate, with 5 slightly spreading acute lobes. Tropical Africa. (Brussels B.G.) [Syn. *Modecca lobata*, Jacq.]

Adonis vernalis alba. (*J. of H.* 1906, lii. 39.) Ranunculaceae. H. A variety with white flowers. (S. Arnott.)

***Aechmea gigas.** (*B. M.* t. 8107.) Bromeliaceae. S. Allied to *A. Lalindei*, with which it has been united, but it differs in having the large crimson bracts furnished with very numerous sharp teeth. Its leaves are about 3 ft. long. Peduncle nearly a foot long, bearing a dense spike of white and pale green flowers. Probably Brazil. (Kew.)

Aerides virens Sanderae. (*G. C.* 1906, xl. 36; *G. M.* 1906, 480.) Orchidaceae. S. A form in which the flowers are pure white. (F. Sander & Sons.)

***Ailantus glandulosa pendulifolia.** (*R. H.* 1906, 545, f. 205.) Simarubaceae. H. The leaves, which attain a length of nearly 5 ft., have a drooping habit, and do not possess the characteristic disagreeable odour of those of the type. (Barbier & Co., Orleans.)

Alocasia Bayeriana. (*O. G. Z.* 1906, 52, f. 13.) Araceae. S. A garden hybrid between *A. cuprea* and *A. Sanderiana*.

***Aloe laxiflora.** (*G. C.* 1906, xxxix. 130.) Liliaceae. G. A new species characterized by the very lax arrangement of the flowers, horizontal bracts and pedicels, a long vertically pendulous perianth which is 1⅓ in. long, orange-red in the lower part, light yellow at the apex, with a greenish keel to the outer segments and a brown margin to the inner. The plant described has a stem about 4 ft. high, and produced a raceme 3–4 in. long. Cape Colony. (Kew.)

Aloe Winteriana. (*M. K.* 1906, 32.) G. A garden hybrid between *A. arborescens* var. *frutescens* and *A. Salmdyckiana*.

Alpinia longepetiola. (*B. S. B. F.* liii. 134.) Scitamineae. S. A new species of robust habit, growing about 6 ft. high. Leaves elliptic, the uppermost broadly linear, up to 1¾ ft. long, 3⅓–4½ in. broad; petiole long, semiterete, winged at the apex. Flowers in a terminal panicle, white or rose, purple-spotted. Calyx about ¼ in. long. Corolla-lobes about ½ in. long, 1–1½ lin. broad. West Tropical Africa. (Paris B. G.)

***Alyssum saxatile luteum.** (*Jard.* 1906, 29; *R. H.* 1906, 511.) Cruciferae. H. Distinguished by its dwarf habit and pale yellow flowers. (M. Herb, Naples.) [=*A. saxatile* var. *citrinum*.]

Androsace Henryi. (*Gard.* 1906, lxix. Suppl. June 2, [4].) Primulaceae. H. A very distinct species with almost *Heuchera*-like leaves and heads of white flowers. Central China (J. Veitch & Sons.)

Anemone apennina plena. (*G. M.* 1906, 301.) Ranunculaceae. H. Flowers perfectly double, mauve or lilac. (C. G. van Tubergen, Haarlem; S. Arnott) [See *G. C.* 1906, xl. 385.]

Anemone apennina purpurea. (*G.M.* 1906, 265; *G. C.* 1906, xl. 385.) H. Flowers red-purple. (C. G. van Tubergen, Haarlem; S. Arnott.)

***Angraecum Arnoldianum.** (*T. H.* 1906, i. 83, t. 6; 118, t. 8.) Orchidaceae. S. The same as *A. Eichlerianum*. Congo Free State. (Brussels B. G.)

***Anthurium Forgeti.** (*G. C.* 1906, xxxix. 161.) Araceae. S. A new species allied to *A. crystallinum*, differing in being much smaller, and the rich deep green leaves are constantly peltate and entire, with fewer differently curved veins. Colombia. (F. Sander & Sons.)

***Aponogeton capensis.** (*G. C.* 1906, xxxix. 306; xl. 341.) Naiadaceae. H. Like *A. distachyon* in miniature, having small long-stalked leaves and small white flowers. South Africa. (A. Perry; Kew.) [*A. angustifolium*, Ait.]

Aponogeton (Ouvirandra) Henkelianum. (*G. C.* 1906, xl. 270, ff. 108, 109.) S. Described as a new species. It differs from *A. fenestrale*, which it closely resembles, in having a larger rhizome, covered at the growing point with a few very small scales only, and it appears to be erect, not creeping. The leaves are a paler green and do not persist so long. Madagascar. (F. Henkel, Darmstadt; Rostock B. G.)

Araucaria Cookii var. **aurea.** (*R.H.B.* 1906, 82, f. 26.) Coniferae. G. A variety with golden-yellow foliage. (Hartman, Mont St. Amand, Belgium.)

Arctotis elmensis. (*B. T. O.* 1906, 277.) Compositae. H. H. A garden hybrid between *A. aspera* and *A. aureola*. (C. Sprenger, Naples.)

Arctotis regalis. (*B. T. O.* 1906, 276.) H. H. A garden hybrid between *A. aureola* and *A. grandis*. (C. Sprenger, Naples.)

Arctotis vomerensis. (*B. T. O.* 1906, 277.) H. H. A garden hybrid between *A. aspera* and *A. aureola*. (C. Sprenger, Naples.)

***Ardisia gigantifolia.** (*K. B.* 1906, 74.) Myrsinaceae. G. A new species remarkable on account of the large size of its leaves. These are elliptic or elongate-elliptic, 12–14 in. long and about 8 in. broad. Flowers small, rose-coloured, in a long-stalked loosely branched panicle. South China. (J. Veitch & Sons.)

Argyreia Pierreana. (*R. H.* 1906, 560, ff. 208, 209.) Convolvulaceae. S. A climbing plant with long pubescent stems. Leaves stalked, ovate-lanceolate, 4–8 in. long, acuminate. Flowers in capitate forked cymes accompanied by large persistent bracts. Corolla funnel-shaped, slightly 5-lobed, 2–2½ in. long, 2 in. across at the broadest part, white, tinted with rose. Tonquin. (Paris B. G.)

***Artemisia lactiflora.** (*G. C.* 1906, xl. 387; *Veitch Nov.* 1906, 2, f.) Compositae. H. A bushy plant 5–6 ft. high. Stems well clothed with elegantly cut dark-green foliage and bearing on the upper half much-branched panicles of fragrant white flower-heads. Central China. (J. Veitch & Sons.)

Asparagus Colmani. (*G. C.* 1906, xxxix. 109, as *A. Colmanni*; *G. M.* 1906, 130.) Liliaceae. G. A dwarf bushy plant scarcely 1 ft. high, producing numerous growths from the base similar to those of *A. Sprengeri*, but they are more slender. Cladodes small, linear. (J. Colman.)

Asplenium laceratum. (*G. C.* 1906, xl. 263, f. 107; *G. M.* 1906, 659, 661, 672 f., as *A. Nidus-Avis laceratum*.) Filices. S. Allied to *A. Nidus* and possibly a variety of that species. The fronds are narrower and are cut into irregular lobes, each lobe bearing a black stripe about 3 in. long. Brazil. (J. Hill & Sons.)

***Babiana flabellifolia.** (*I. S. H. T.* v. 161, t. 200.) Iridaceae. G. Corm subglobose, 7–10 lin. across. Leaves 4 or 5, stalked, deltoid; limb up to 4½ in. long, and about ¾ in. broad, toothed at the apex, pubescent and ciliate; petiole 2–4 in. long. Flowers 2 to 5, in a short erect spike. Perianth-tube long and slender; segments oblong, about ⅔ in. long, 2 of the lower ones with a blotch in the middle. South Africa. (L. van den Bossche, Tirlemont, Belgium.)

Begonia calabarica. (*K. B.* 1906, 20.) Begoniaceae. Stem short, prostrate. Leaves peltate, obliquely and broadly cordate-ovate, 2–3 in. long and broad, glabrous above, ciliate-fimbriate on the margin, at first softly hirsute on the veins beneath; petioles 1½–2 in. long. Peduncle about 1 in. long, few-flowered. Male flowers of 2 elliptic-rounded sepals about ½ in. long, red, yellow, and golden. Female flowers of 2 sepals, smaller than the male but similar. Calabar. (Kew.)

Begonia Cayeuxi. (*R. H.* 1906, 534.) G. A garden hybrid between a variety of *B. semperflorens* and *B. lucida*. (Cayeux & Le Clerc, Paris.)

Begonia elatior. (*G. C.* 1906, xl. 297.) G. A garden hybrid between *B. socotrana* and a variety of the tuberous-rooted section. (J. Veitch & Sons.)

***Begonia gracilis luminosa.** (*Gard.* 1906, lxix. 115.) G. A variety with dark foliage and large dark scarlet flowers.

***Begonia Poggei.** (*T. H.* 1906, i. 157, t. 10.) S. A tall slender plant with stalked ovate-elliptic leaves slightly oblique and cordate at the base. Flowers very small, apparently white, in axillary fascicles. Congo. (Brussels B. G.)

***Bellevalia lycaonica.** (*G. C.* 1906, xxxix. 210.) Liliaceae. H. A synonym of *Hyacinthus lineatus*.

***Berberis acuminata.** (*Veitch I. N.* 1906, 2, f.) Berberidaceae. H. An attractive evergreen shrub with arching branches; young wood bright red. Leaves sessile, lanceolate, 3–5 in. long, 1 in. broad, acuminate, spiny along the margins, dark green. Flowers bronzy-yellow, on slender stalks, clustered in the axils of the uppermost leaves. Central and South-West China. (J. Veitch & Sons.)

Beschorneria pubescens. (*G. C.* 1906, xl. 350, f. 138.) Amaryllidaceae. G. A new species characterized by having pubescent flowers. It is a rather small stemless plant. Leaves linear-lanceolate, 24 in. long, 2 in. broad, glaucous, finely toothed. Inflorescence 4–5 ft. high, rather slender, with a bright red scape. Flowers fascicled in the axils of ovate bracts, about 2½ in. long, green, fading to yellow. Mexico. (Sir T. Hanbury, La Mortola.)

Bifrenaria Fuerstenbergiana. (*Orch.* i. 25, f. 12.) Orchidaceae. G. Pseudobulbs ovoid-conical, quadrangular, 2–3 in. long, 1-leaved. Leaf oblong-elliptic, acute, including the short petiole 8–10 in. long. Raceme loosely 2- or 3-flowered. Sepals oblong, obtuse, nearly 1½ in. long, yellow-green, the lateral forming at the base a straight spur about ¾ in. long. Petals rhomboid-elliptic, yellow-green, tinted with violet inside, as long as the sepals. Lip 3-lobed, about 1¾ in. long, with a glabrous shortly 3-lobed callus running from the base to the middle. Brazil, (Baron von Fuerstenberg, Schloss Hugenpoet, near Mintard, Germany.)

***Bonatea Ugandeae.** (*J. of H.* 1906, liii. 451; *G. C.* 1906, xl. 378.) Orchidaceae. G. A new species resembling a *Habenaria* in its curiously shaped flowers and long spurs. The flowers are light green with white column. Uganda. (Kew.)

Brassocatlaelia balarucensis. (*O. R.* 1906, 135.) Orchidaceae. G. A garden hybrid between *Laelio-Cattleya Schilleriana* and *Brassavola Digbyana*. (F. Denis, Balaruc les Bains, Hérault, France.)

Brasso-cattleya Digbyano-Forbesii. (*O. R.* 1906, 350.) Orchidaceae. G. A garden hybrid between *Brassavola Digbyana* and *Cattleya Forbesii*. (Major G. L. Holford.)

Brasso-laelia fladosa. (*O. R.* 1906, 286.) Orchidaceae. G. A garden hybrid between *Brassavola nodosa grandiflora* and *Laelia flava*. (J. Colman.)

Brasso-laelia Lellieuxii. (*Jard.* 1906, 48; *J. H. F.* 1906, 30; *O. R.* 1906, 60.) G. A garden hybrid between *Laelia anceps* and *Brassavola Digbyana*. (C. Maron, Brunoy, France.)

***Buddleia asiatica.** (*G. C.* 1906, xxxix. 62, 106, f. 44; *Gard.* 1906, lxix. 89, f.) Loganiaceae. G. A bush about 3 ft. high, tomentose on the young shoots, underside of the leaves, and on the inflorescences. Leaves lanceolate, 4–8 in. long, finely serrate. Flowers white, small, fragrant, in long narrow terminal racemes. East Indies; warmer parts of China. (J. Veitch & Sons.) [Reintroduced. It was in cultivation in 1874, but was lost. *See B. M.* t. 6323.]

*Bulbophyllum calabaricum. (*K. B.* 1906, 114.) Orchidaceae. S. Pseudobulbs ovoid-tetragonal, ½–¾ in. long, 1-leaved. Leaves oblong or lanceolate-oblong. Scapes suberect or arched, 3–5 in. long, many-flowered. Flowers small, light yellowish green, with a dull reddish purple lip. Old Calabar. (Kew.)

*Bulbophyllum capituliflorum. (*K. B.* 1904, 84.) S. Pseudobulbs ovoid, ¼–⅓ in. long, 1-leaved. Leaves elliptic-oblong, ⅔–1 in. long. Scapes slender, 1¼-2 in. long. Flowers few, very small, aggregated into a small head. Sepals and petals whitish green, suffused with light purple-brown towards the apex. Lip deep lurid purple. West Tropical Africa. (Glasnevin B. G.)

Bulbophyllum Kerrii. (*K. B.* 1906, 84.) S. A new species allied to *B. hirtum*, from which it is easily distinguished by its shorter sepals, broader and minutely crenulate petals. The oblong leaves are deciduous. Flowers dull yellow, pubescent throughout. Siam. (Trinity Coll. B. G.)

*Calathea Gouletii. (*K. B.* 1906, 77.) Scitamineae. S. A stemless plant. Leaves obliquely elliptic, acute, 7–9 in. long, white-green above between the pale green midrib and the deep green margins, purple beneath; leaf-sheaths to 4 in. long, glabrous, purplish as well as the leaf-stalks. Scapes 9–18 in. long. Spikes subcylindric, to 5 in. long. Flowers white. Corolla-tube about ⅔ in. long; segments oblong-lanceolate. Native country unknown. (Kew.) [Syn. *Maranta Gouletii*, Hort.]

*Calceolaria kewensis. (*G. C.* 1906, xxxix. 390, f. 158.) Scrophulariaceae. G. Obtained by crossing Jefferies' Hybrid *Calceolaria* with the best forms of the herbaceous varieties. (Kew.)

Camassia Leichtlini atroviolacea. (*J. of H.* 1906, liii. 60.) Liliaceae. H. A fine variety, having long spikes of large deep purple flowers. (A. Perry.)

*Campanula imeretina. (*G. C.* 1906, xl. 23.) Campanulaceae. H. A dwarf-growing species resembling *C. sibirica*. Stems branching, having small leaves and violet-blue flowers. Caucasus. (Kew.)

Campanula laciniata. (*G. C.* 1906, xl. 165, f. 66, and suppl.) H. A robust erect biennial forming a compact bush about 2 ft. high, slightly pubescent. Basal leaves 8 in. long, 2½ in. broad, deeply laciniate, light shining green; cauline smaller, only 2–3 in. long. Stem much branched, densely covered with flowers at the ends of the branches. Flowers bell-shaped, about 2 in. across at the mouth, rather more than 1 in. long, pale blue. This is the true plant. That figured as *C. laciniata* in *Andrews' Bot. Rep.* vi. t. 385, and in *Nicholson's Dictionary*, is *C. tomentosa*. Grecian Archipelago. (R. A. Beamish.)

*Campanula longistyla. (*G. W.* 1906, 671, f.) H. Stems 2–2½ ft. high, branched from the base. Radical leaves in a rosette, spathulate; cauline leaves much smaller. Flowers in a lax panicle, campanulate, elongated, pendulous, blue-purple. Caucasus. (Kew.)

*Campanula Raddeana. (*G. C.* 1906, xl. 23.) H. A glabrous perennial about 1 ft. high, with a very distinct habit. Leaves cordate, on long petioles. Flowers large, in colour like those of *C. pulla*. Caucasus. (Kew.)

*Campanula Stansfieldi. (*G. C.* 1906, xl. 93.) H. A garden hybrid probably between *C. carpatica* and *C. Waldsteiniana*. (W. H. Stansfield.)

*Carduus Kerneri. (*G. C.* 1906, xl. 52, f. 23.) Compositae. H. Apparently a biennial, growing from 2–3 ft. high, with prickly stems and leaves. Flower-heads large, produced singly on long peduncles, with rich red-purple bracts and rose-purple florets. Bulgaria. (R. H. Beamish.)

*Catasetum eburneum. (*K. B.* 1906, 86.) Orchidaceae. S. A new species characterized by the flowers being ivory-white, with the sac of the lip deep yellow, slightly spotted with brown, by the reflexed sepals and petals, the thick fleshy lip, and the very thick column. Colombia. (Charlesworth & Co.)

Cattleya Davisii. (*G. C.* 1906, xl. 224.) Orchidaceae. G. A garden hybrid between *C. velutina* and *C. Hardyana*. (J. G. Fowler.)

Cattleya Farquharsoniana. (*O. R.* 1906, 316.) G. A garden hybrid between *C. bicolor* and *C. Iris*. (J. Colman.)

Cattleya Forgetiana. (*O. R.* 1906, 143.) G. A distinct species having some resemblance to *C. Lawrenceana*. Scape 6 in. long, bearing two flowers on pedicels 2¾ in. long. Sepals and petals bright rose-purple, nearly 3 in. long, the former oblong-lanceolate, 8 lin. broad, the latter elliptic-oblong, 1¾ in. broad. Lip entire, obovate-oblong, bilobed at the apex, about as long as the other segments, with the front lobe rich purple crimson, margin of the side lobes light rose-purple, throat yellow, and the disk striped with crimson. Brazil. (F. Sander & Sons.)

Cattleya Hardyana Rex. (*G. C.* 1906, xl. 234; *J. of H.* 1906, liii. 304.) G. "One of the very finest and darkest forms." (Marquis de Wavrin, Château de Ronsele, Belgium.)

Cattleya Jenmanii. (*K. B.* 1906, 85.) S. Allied to *C. Gaskelliana*, but it has much broader leaves and much smaller flowers. The leaves are elliptic-oblong, 7–8 in. long, 2–3½ in. broad. Flowers rosy mauve, the front lobe of the lip crimson and the disk yellow, with radiating red-brown lines. Sepals and petals 2½–3 in. long. Lip entire, about 2½ in. long and 2 in. broad. British Guiana. (Miss Sinnock.)

Cattleya lucida. (*R. H.* 1906, 339.) G. A garden hybrid between *C. Bowringiana* and *C. Schilleriana*. (A. A. Peeters, Brussels.)

Cattleya Pannemaekeriana. (*L.* xvii. 71, t. 802.) S. A garden hybrid between *C. Hardyana* and *C. Rex*. (L. Linden & Co., Moortebeek, Brussels.)

Cattleya Trianae var. **Brandneriana.** (*L.* xvii. 75, t. 804.) G. Distinguished by the dark purple-violet colour of the anterior part of the lip. The sepals and petals are pure white. (L. Linden & Co., Moortebeek, Brussels.)

Cattleya Trianae var. **Fascinator.** (*L.* xvii. 87, t. 810.) G. Flower of good form, with sepals and petals pale violet, and the lip pale violet at the base, deep violet on the anterior part, yellow at the throat. (L. Linden & Co., Moortebeek, Brussels.)

Cattleya Trianae var. **Holtzeri.** (*R. H.* 1906, 99.) G. A variety having a dark lip. (C. Béranek, Paris.)

Cattleya Trianae var. **Wellesleyae.** (*O. R.* 1906, 50.) G. "A pretty white form." (F. Wellesley.)

Cattleya Warscewiczii saturata. (*G. C.* 1906, xl. 98.) S. Flower large, bright rose, with a rich ruby-crimson lip darkest in the centre. (F. Sander & Sons.)

Cattleya Wildemanii. (*O. R.* 1906, 342.) G. A garden hybrid between *C. velutina* and *C. Trianae alba*. (Marquis de Wavrin, Château de Ronsele, Belgium.)

Ceropegia fusca. (*B. M.* t. 8066.) Asclepiadaceae. G. Stems many, succulent, almost leafless, 1½ ft. high or sometimes much taller, simple or repeatedly forked, jointed, glabrous. Flowers in fascicles at the nodes, erect. Pedicels very short. Corolla about 1⅓ in. long, dull reddish-brown, glabrous outside; tube thinly hairy inside and white or very pale yellow, about 1 in. long, swollen at the base, cylindric above and slightly bent; lobes about ½ in. long, deltoid-lanceolate, tapering into slender tails; corona light yellow. Grand Canary. (Kew.)

***Ceropegia hybrida.** (*G. C.* 1906, xl. 383, f. 148.) S. A natural hybrid between *C. similis* and *C. Sandersonii*. (W. E. Ledger, Wimbledon; Leiden B. G.)

***Ceropegia similis.** (*G. C.* 1906, xl. 383, f. 147.) S. A new species, in cultivation under the name of *C. Thwaitesii*, "but it differs from that species in the much shorter corolla-lobes, which are white or pale green at the basal part instead of yellow, and by the presence of cilia upon them." The outer corona is also different. Native country unknown. (Kew; Leiden B. G.; W. E. Ledger, Wimbledon.)

Chamaecyparis Lawsoniana vars. (*O. G. Z.* 1906, 411.) Coniferae. H. The following varieties, differing from the type in the mode of branching, and in coloration, are briefly described: *epacroides*, *falcata*, *Olbrichii* and **Youngii*. [*Cupressus Lawsoniana* vars.]

***Chloraea virescens.** (*B. M.* t. 8100.) Orchidaceae. G. A terrestrial herb 1-1½ ft. high. Leaves tufted, oblong, obtuse, 3–6 in. long, ¾–1 in. broad.

Scape stout, erect, bearing a dense raceme 4–6 in. long. Pedicels stout, about ½ in. long. Flowers large, yellow, veined with green. A re-introduction. Chili. (H. J. Elwes; Kew.)

***Cissus adenopodus.** (*K. B.* 1906, 247.) Ampelidaceae. S. A herbaceous plant, the stems climbing by means of tendrils. Root tuberous. Leaves of 3 ovate acuminate coarsely serrate leaflets, coloured, as well as the young shoots, bright red. Flowers in flat panicles. Pedicels about 2 lin. long, clothed with gland-tipped hairs. Uganda. (Kew.)

Citrus Aurantium × decumana. (*B. P.* iv. 174.) Rutaceae. G. A garden hybrid. (Palermo B. G.)

Citrus Bigaradia × Limonum. (*B. P.* iv. 175.) G. A garden hybrid. (Palermo B. G.)

Citrus japonica fructu elliptico. (*G. C.* 1905, xxxviii. 446, f. 168; 1906, xxxix. 30, 46 & 59, f. 29.) G. A variety with narrow leaves and small golden elliptic fruits, which are produced very freely even on small plants. (J. Veitch & Sons.)

***Codonopsis Tangshen.** (*B. M.* t. 8090.) Campanulaceae. H. A perennial climbing herb, with a long much thickened root. Stems slender, 2 ft. long or more. Leaves ovate or ovate-lanceolate, 1¼–2½ in. long, slightly toothed; petioles very slender, ½–¾ in. long. Flowers solitary, on peduncles up to 2¾ in. long. Corolla campanulate, 1¼–1½ in. long, greenish, purple-spotted and striped inside. The root is much used in China as a tonic medicine. Central China. (J. Veitch & Sons.)

Coelia densiflora. (*K. B.* 1906, 375.) Orchidaceae. S. A new species characterized by a dense-flowered raceme, wingless ovary, and an oblong mentum. The flowers are about ½ in. long, white, with a yellow anther-case. Central America. (Glasnevin B. G.)

Coelogyne Brymeriana. (*O. R.* 1906, 173.) Orchidaceae. S. A garden hybrid between *C. Dayana* and *C. asperata*. (Col. Brymer.)

Coelogyne Mooreana. (*G. C.* 1906, xl. 414.) S. Flowers 7 or 8, in arching spikes, nearly as large as those of *C. cristata*, pure white, with a yellow disk to the lip. Annam. (F. Sander & Sons.)

Coelogyne speciosa × C. cristata alba. (*Gartenwelt*, x. 198.) S. A garden hybrid. (P. Wolter, Magdeburg, Germany.)

Colax tripterus. (*K. B.* 1906, 34.) Orchidaceae. S. A new species allied to *C. placantherus*, but it has a 3-winged ovary, and the disk of the lip bears a broad fleshy callus. Sepals and petals light green, the latter densely speckled with dark brown. Lip yellowish white, with lines of minute light purple dots on the disk. Brazil. (Glasnevin B. G.)

Colchicum Bivonae superbum. (*J. of H.* 1906, 411, f.; *G. M.* 1906, 697.) Liliaceae. H. A variety with large deeply coloured flowers. (Barr & Sons.)

***Coreopsis Grantii.** (*G. C.* 1906, xxxix. 162, f. 64; *Gard.* 1906, lxix. 161, f.; *B. M.* t. 8110.) Compositae. G. A compact bushy leafy plant about 2 ft. high, with elegant dark green bipinnate leaves, and bright yellow flower-heads about 2 in. across. It flowers in the winter. Eastern Tropical Africa. (Kew.)

***Corylopsis Griffithii.** (*G. C.* 1906, xxxix. 19, 210.) Hamamelidaceae. H. A new name proposed for the plant in cultivation as *C. himalayana*.

Corylopsis sinensis. (*G. C.* 1906, xxxix. 18, f. 12.) H. A new species closely allied to *C. spicata*, differing in having the stipules of the flowering branches broader than long, the leaves broadest above the middle, the orbicular petals suddenly narrowed into a distinct claw, and in having yellow anthers and white seeds. Central and Western China. (J. Veitch & Sons.)

***Cotyledon devensis.** (*B. M.* t. 8104.) Crassulaceae. G. A garden hybrid probably between *C. glauca* and *C. gibbiflora* (*Echeveria metallica*). It is remarkable for its great size, the flower-stems being 5–7 ft. long. (Kew.)

***Crassula variabilis.** (*K. B.* 1901, 122.) Crassulaceae. G. A new species allied to *C. pyramidalis*. Plant 3–6 in. high, branched at the base. Leaves in 4 rows, densely imbricate, ovate, 1½–4 lin. long, minutely papillose-ciliate on the margin. Flowers 5–7, in small cymes which are arranged in a narrow terminal panicle or are sometimes sub-

corymbose. Corolla 2½–3 lin. long, 4- or 5-lobed to the middle; lobes linear, white or red outside. South Africa. (Kew.)

Crinum. (*B. T. O.* 1906, 17–20.) Amaryllidaceae. G. The following garden hybrids are enumerated: *C. Arnottianum* (abyssinicum × yemense), *C. Comesi* (parentage doubtful), *C. formosum* (Moorei × abyssinicum), *C. gallanum* (Moorei × Powellii), *C. gracillimum* (MacOwani × capense album), *C. Linneanum* (yemense × capense album), *C. Luisae* (yemense × Schmidtii), *C. Margaritae* (yemense × Moorei), *C. paradoxum* (yemense × Moorei), *C. Puccianum* (yemense × Moorei), *C. Sieheanum* (yemense × Schmidtii), *C. vomerense* (Moorei × yemense), *C. Wittmackianum* (Moorei × yemense). (C. Sprenger, Naples.)

Cuscuta Upcraftii. (*K. B.* 1906, 5.) Convolvulaceae. H. Stems slender, thread-like. Spikes lax, few-flowered, simple, ½–¾ in. long. Flowers sessile, 1-2 lin. long. Corolla-tube cylindric; lobes elliptic, obtuse, shorter than the tube. This new species has been grown successfully on the potato. Its natural host is unknown. Eastern Tibet. (A. K. Bulley.)

Cyclamen Pseudo-graecum. (*Gfl.* 1906, 629.) Primulaceae. H? A new species which has been confused with *C. graecum*, to which it is very closely allied. It differs in having longer filaments, and anthers elongated, 3-angled, acuminate. The corolla-lobes are very pale rose, almost white. Crete. (Freiburg B. G.)

Cycnoches Egertonianum viride. (*G. C.* 1906, xl. 139; *G. M.* 1906, 564.) Orchidaceae. S. A variety with pale green flowers. (Sir Trevor Lawrence.)

Cymbidium Colmanae. (*G. C.* 1906, xxxix. 286; *G. M.* 1906, 300.) Orchidaceae. G. A garden hybrid between *C. eburneo-Lowianum* and *C. eburneum Dayanum*. (J. Colman.)

Cymbidium eburneo-giganteum. (*G. C.* 1906, xxxix. 110; *Gard.* 1906, lxix. 112.) G. A garden hybrid between the species indicated in the name. (Charlesworth & Co.)

Cymbidium Holfordianum. (*G. C.* 1906, xxxix. 110; *O. R.* 1906, 85; *G. M.* 1906, 130, f.) G. A garden hybrid between *C. eburneum* and *C. grandiflorum*. (F. Sander & Sons.)

Cynoglossum amabile. (*K. B.* 1906, 202.) Boraginaceae. H. Allied to *C. furcatum*, but it has rather larger flowers of a very pleasing blue. It is a perennial herb, reaching a height of 2 ft. Basal leaves lanceolate-elliptic, 2-4 in. long; cauline oblong or lanceolate, to 4 in. long. Racemes in loose panicles. Corolla-limb 3½–4½ lin. across. South-west and West China. (M. Leichtlin, Baden-Baden.)

***Cynorchis compacta.** (*B. M.* t. 8053; *G. C.* 1906, xxxix. 158.) Orchidaceae. G. A dwarf herb, with ovoid or fusiform subterranean tubers ½–1 in. long. Stems very short, stout, bearing a fully developed ovate-oblong leaf and 1 or 2 loose tubular sheaths. Scape solitary, erect, 4–7 in. high. Raceme many-flowered; pedicels ⅓–¾ in. long. Flowers white, with the disk of the lip spotted with red. Natal. (Kew; Baron Sir H. Schroder.)

Cypripedium Bridgei. (*G. C.* 1906, xxxix. 63; *G. M.* 1906, 130.) Orchidaceae. S. A garden hybrid between *C. Godseffianum* and *C. Argus Moensii*. (G. F. Moore.) [*Paphiopedilum.*]

Cypripedium callo-Rothschildianum. (*O. R.* 1906, 243; *G. C.* 1906, xl. 36; *G. M.* 1906, 480.) S. A garden hybrid between *C. callosum* and *C. Rothschildianum*. (J. Gurney Fowler.) [*Paphiopedilum.*]

Cypripedium Chantino-Lawrenceanum. (*L.* xvii. 91, t. 812.) G. A garden hybrid between *C. insigne* var. *Chantinii* and *C. Lawrenceanum*. (L. Linden & Co., Moortebeek, Brussels.) [*Paphiopedilum.*]

Cypripedium eboraicum. (*J. of H.* 1906, liii. 554, 589, f.; *G. C.* 1906, xl. 414.) G. A garden hybrid between *C. insigne* var. and *C. nitens magnificum*. (J. H. Craven.) [*Paphiopedilum.*]

Cypripedium Fletcherianum. (*G. C.* 1906, xl. 234, 254, f. 103; *J. of H.* 1906, liii. 339, f.) S. A garden hybrid between *C. Godefroyae leucochilum* and *C.* "*Lord Derby*." (H. Low & Co.) [*Paphiopedilum.*]

Cypripedium Headlandianum. (*O. R.* 1906, 51.) S. A garden hybrid between *C. Lathamianum* and *C. Memoria-Moensii*. (H. D. Headland.) [*Paphiopedilum.*]

Cypripedium imperiale. (*O. R.* 1906, 216.) S. A garden hybrid between *C. Stonei* and *C. Rothschildianum*. (F. Sander & Sons.) [*Paphiopedilum.*]

Cypripedium insigne var. **cinnamomeum.** (*L.* xvii. 77. t. 805.) G. The flower has the same form as that of the type, but the sepals and petals are chiefly a pale yellow or greenish yellow, and the lip is pale yellow, tinted and striped with reddish brown. (L. Linden & Co., Moortebeek, Brussels.) [*Paphiopedilum.*]

Cypripedium Magdalenae. (*J. H. F.* 1906, 25.) S. A garden hybrid between *C. Boxallii* and *C. Leeanum superbum*. (Duval & Son, Versailles.) [*Paphiopedilum.*]

Cypripedium Sidneyanum. (*G. C.* 1906. xxxix. 2.) G. A garden hybrid between *C. insigne*, Harefield Hall variety, and *C. Leeanum Massereelsianum*. (H. A. Tracy.) [*Paphiopedilum.*]

Cypripedium Vialianum. (*L.* xvii. 81, t. 807.) S. A garden hybrid between *C. Lathamianum* and *C. Druryi*. (L. Linden & Co., Moortebeek, Brussels.) [*Paphiopedilum.*]

Cypripedium villosum annamense. (*O. R.* 1906, 112.) S. "Remarkable for having a dark band on the dorsal sepal." (F. Sander & Sons.) [*Paphiopedilum.*]

Cypripedium westpointense. (*O. R.* 1906, 16.) S. A garden hybrid between *C. callosum Sanderae* and *C. bellatulum album*. (S. Gratrix.) [*Paphiopedilum.*]

Davallia canariensis elegans. (*G. C.* 1906, xxxix. p. 157; *Gard.* 1906, lxix. 168.) Filices. G. A variety with elegant finely divided fronds. (J. Hill & Sons.)

Davallia elegans Mayi. (*G. C.* 1906, xl. 35; *G. M.* 1906. 480.) S. A fine variety, with graceful deep green much-divided fronds. (H. B. May.)

Davallia solida superba. (*G. C.* 1906, xxxix. 316; *Gard.* 1906, lxix. May 19, viii.) S. The fronds are somewhat crispate, not flat as in the type, and in the young state they are tinted with red. (H. B. May.)

Dendrobium annamense. (*K. B.* 1906. 113.) Orchidaceae. S. Stems slender, 16–20 in. long. Leaves oblong, 2–3 in. long. Flowers axillary, fascicled at the leafless nodes or shortly racemose, very often in threes, buff-yellow, rather membranous. Sepals and petals about 5 lin. long. Lip broadly oblong, 7½ lin. long, obtuse; disk smooth. Annam. (F. Sander & Sons.)

Dendrobium Brandtiae. (*G. C.* 1906, xl. 404.) S. A new species resembling *D. Phalaenopsis*. The flowers are more fleshy than in that species, are mauve-purple, with silvery crests to the lip, and are remarkable in having twisted or curled sepals and petals. Native country not known; possibly North Australia or New Guinea. (Mrs. Ida Brandt, Zurich.)

Dendrobium Brodiei. (*G. C.* 1906, xxxix. 110; *O. R.* 1906, 80; *G. M.* 1906, 130.) S. A garden hybrid between *D. Dominianum* and *D. Wiganiae*. (J. Colman.)

***Dendrobium Bronckarti.** (*G. C.* 1906, xxxix. 380.) S. A new species resembling *D. Farmeri* in habit, but the stems are slender. Leaves ovate, 4½ in. long. Racemes lateral, many-flowered, about 13 in. long, pendulous; bracts ovate-lanceolate, very long. Sepals and petals about 1 in. long, rose-tinted, broadly ovate. Lip rhomboid, obtuse, clawed, about ¾ in. long and ⅔ in. broad, rose-tinted, with an orange-yellow disk. Indo-China. (G. Bronckart, Charleroy, Belgium.)

Dendrobium convolutum. (*K. B.* 1906, 375.) S. Pseudobulbs club-shaped, about 9 in. long, 2-leaved. Scape slender, terminal, 5–6 in. long, 4-flowered. Flowers similar to those of *D. chloropterum*, but larger. Sepals and petals light green, with a few small dark brown markings at the base. Lip green and dark brown. New Guinea. (F. Sander & Sons; Sir Trevor Lawrence.)

***Dendrobium Dartoisianum.** (*G. C.* 1906, xxxix. 380.) S. A new species which appears to be allied to *D. Pierardi* and resembles some of the forms of *D. nobile*. The stems attain a length of 2½ ft. Leaves distichous, lanceolate, 3½–4 in. long. Racemes 7 or 8 on each stem, 3- or 4-flowered. Sepals and petals ivory-yellow, the latter undulated and twisted, 1¾ in. long

longer than the sepals. Lip as long as the petals, undivided, hooded, shortly clawed, yellowish at the base, violet in the central part, ivory-yellow at the apex. Indo-China. (G. Bronckart, Charleroy, Belgium.)

Dendrobium lasioglossum. (*O. R.* 1906, 152, 222.) S. Allied to *D. Ruckeri* and *D. luteolum*. Stems tufted, slender, 10–18 in. long, pendulous. Leaves lanceolate, acuminate, 3–5 in. long. Flowers in fascicles of 2 or 3, white, streaked with light purple on the side lobes of the lip; crest yellow and very hairy. Burma. (Sir Trevor Lawrence.) [This was in cultivation in 1868 (see *B. M.* t. 5825), but appears to have been lost for many years.]

Dendrobium Phalaenopsis splendens. (*G. C.* 1906, xl. suppl. Nov. 10, iv.) Flowers bright magenta-rose, white at the base of the segments. (W. M. Appleton.)

Dendrobium Schinzii. (*K. B.* 1906, 31.) S. Primary stems creeping, the secondary forming oblong 1-leaved pseudobulbs. Leaves sessile, ovate- or elliptic-oblong, 2–2½ in. long. Flowers solitary or fascicled, pale green, very fugacious. Sepals and petals 2–3 lin. long. Lip 4 lin. long, 3-lobed. Sumatra. (Zurich B. G.)

Dendrobium shillongense. (*G. C.* 1906, xxxix. 254; *O. R.* 1906, 152, 222.) S. Identical with *D. lasioglossum*.

***Dendrobium tonkinense.** (*T. H.* 1906, i. 21.) S. A new species most nearly allied to *D. revolutum*, from which it differs in having an entire lip furnished with crests, the median one being very prominent. Tonquin. (G. Bronckart, Charleroy, Belgium.)

Dendrobium Wilsoni. (*G. C.* 1906, xxxix. 185.) G. A new species belonging to the section *Eudendrobium* and allied to *D. transparens*. Pseudobulbs cylindric, slender, 1½–2 ft. long. Leaves oblong or lanceolate-oblong, 2–3 in. long, 6–10 lin. broad. Racemes 2- or 3 flowered, ½ in. long, borne on the old leafless stems. Flowers over 3 in. across, a delicate pink or sometimes nearly white, with a small yellow blotch on the disk of the lip and a number of minute dark purple dots. Western China. (J. Veitch & Sons.)

Deutzia discolor stellata. (*Lemoine Cat.* 1906, n. 164, viii.) Saxifragaceae. H. A garden hybrid between *D. scabra* and *D. discolor grandiflora*. (V. Lemoine & Son, Nancy.)

Deutzia globosa. (*G. C.* 1906, xl. 238.) H. A new species characterized by having creamy white flowers in dense globose panicles. Leaves shortly petiolate, ovate-lanceolate or elliptic, 2–3¾ in. long, obtusely acuminate, densely pilose on the midrib and veins on the under side. Flowers cup-shaped, ⅔ in. across. Wings of the longer filaments abruptly angular. Central China. (J. Veitch & Sons.)

Deutzia gracilis fastuosa. (*Lemoine Cat.* 1906, n. 164, vii.) H. A garden hybrid between *D. gracilis* and *D. Sieboldiana*. (V. Lemoine & Son, Nancy.)

Deutzia mollis. (*G. C.* 1906, xl. 238.) H. A new species resembling some of the forms of *D. parviflora*. It is a shrub, 3–8 ft. high. Leaves petiolate, elliptic-lanceolate or broadly ovate, 2–4 in. long, obliquely and obtusely acuminate, pilose on both sides. Panicles short, loosely corymbose. Flowers ⅓–½ in. across, white or sometimes tinged with pink. Petals suborbicular, about ¼ in. long. Wings of the filaments not toothed. Central China. (J. Veitch & Sons.)

Deutzia reflexa. (*G. C.* 1906, xl. 238.) H. A new species differing from all hitherto described in having the petals reflexed along the lateral margins. It is a small slender shrub, with narrowly elliptic-lanceolate leaves, and rather small pure white flowers in loose corymbose panicles. Central China. (J. Veitch & Sons.)

Deutzia Wilsoni. (*B. M.* t. 8083.) H. A new species very closely allied to *D. discolor*, from which it may be distinguished by its more hairy and scabrous foliage, more robust branchlets and pedicels, shorter and broader calyx-lobes, flatter corolla, and by its more narrowly winged filaments which are not bilobed towards the apex. Western China. (J. Veitch & Sons.)

***Diandrolyra bicolor.** (*K. B.* 1906, 204.) Gramineae. G. A new genus allied to *Olyra*. It is a perennial densely tufted grass, with erect culms bearing usually 1–3 leaves. Leaves lanceolate or lanceolate-oblong, 2½–3¾ in. long, 5–7½ lin. broad, dark green above,

violet-purple beneath. Inflorescence terminal, narrow, 7½ lin. long. Spikelets in pairs, the lower female and the upper male. Male flowers with 2 stamens only. Native country unknown. (Kew.)

Dicliptera Niederleiniana. (*I. S. H. T.* v. 153, t. 198.) Acanthaceae. G. A subshrubby plant with rather slender pubescent stems. Leaves stalked, oval, up to 3 in. long and 1½ in. broad, rounded at the apex, densely pubescent. Flowers about 1¼ in. long, several crowded together in a terminal paniculate cyme. Argentina. (L. van den Bossche, Tirlemont, Belgium.)

Dictamnus caucasicus. (*R. H. B.* 1906, 254, f. 59.) Rutaceae. H. This is described as being very much prettier than *D. albus*. Its flowering-stems are very straight and are more than a yard high. Caucasus.

***Disa erubescens.** (*O. R.* 1906, 69.) Orchidaceae. S. Plant more than 1 ft. high, bearing in the wild state racemes of 5–8 flowers. Flowers large and handsome, somewhat resembling in colour those of *D. grandiflora*. Dorsal sepal obovate-spathulate, 1¼ in. long ; spur linear, 5 in. long. Lateral sepals spreading, oblong, 10 lin. long. Petals erect, auriculate at the base, extending upwards into a linear lobe. Lip linear, ½ in. long. Eastern Tropical Africa. (Kew.)

***Dissotis modesta.** (*K. B.* 1906, 78.) Melastomaceae. G. Stem slender, sparingly setose. Leaves oblong, to 1¾ in. long, acute, minutely serrulate, hirsute on both sides. Flowers few, crowded at the ends of the branches. Petals obovate-elliptic, to ½ in. long. Stamens blue-purple, reddish and yellow. Style purple. Uganda. (Kew.)

***Distylium racemosum.** (*G. C.* 1906, xxxix. 422 ; xl. 303, f. 120.) Hamamelidaceae. H. A shrub with flexuose branches. Leaves alternate, shortly stalked, leathery, oblong, about 2 in. long and ½ in. broad. Flowers in short axillary racemes, about ½ in. long. Sepals 5, oblong. Petals absent. Stamens 5, with purple anthers. Japan. (T. Smith, Newry.)

Dolichos pseudopachyrrhizus. (*N. B.* iv. 233, ff.) Leguminosae. G. A climbing plant with a large tuberous rootstock. Stems long. round or angular. Leaves long-stalked, 3-foliolate ; leaflets very variable in shape, the lateral often ovate or elliptic and the terminal broadly rhomboid, 3¼–8 in. long, 2½–7 in. broad. Flowers small, chiefly violet-blue, in racemes ½–1¾ ft. long. Tropical Africa. (Berlin B. G.)

***Draba elata.** (*G. C.* 1906, xxxix. 363.) Cruciferae. H. A tall-growing biennial. During the first year it forms a rosette of spathulate leaves, from which arise in the following spring stems about 1 ft. high, sparingly leafy, and bearing heads of bright yellow flowers. Himalayas. (Kew.)

Echinocactus Kurtzianus. (*M. K.* 1906, 55.) Cactaceae. G. A new species differing from *E. Mostii* in having 8 radial spines instead of 7, and white flowers reddish at the base. Argentina. (Berlin B. G.)

Echinocactus Mostii. (*M. K.* 1906, 11.) G. A new species allied to *E. multiflorus*, Hook. Stem simple, depressed-globose, 2½–3 in. high, unarmed at the summit, 11–14-ribbed. Spines 7 radial and 1 central. Ovary glabrous, furnished with 8–10 scales. Flowers small, pale red. Argentina. (Berlin B. G.)

Echinopsis Fiebrigii. (*N. B.* iv. 184 ; *M. K.* 1906, 25, f. ; *Gfl.* 1906, 49.) Cactaceae. G. A new species. Stem simple, depressed-globose, nearly 4 in. high, 6 in. broad, tubercled and not armed at the summit, with 18–24 crenate ribs. Spines 8–10 radial and 1 central, all curved, strong, yellowish when young, sometimes marbled. Flowers white, nearly 8 in. long. Bolivia. (Berlin B. G.)

Echinopsis Hempeliana. (*M. K.* 1906, 94 ; *B. K.* t. 85.) G. Stem ellipsoid, rounded above, up to about 6 in. high ; summit flattened, furnished with a dense pale yellow wool ; ribs 20, straight. Radial spines 8–12, unequal, 5–15 lin. long ; central spines 3 or 4, up to 2 in. long. Flowers about 3 in. long, funnel-shaped ; segments lanceolate, cinnabar-red, of a different shade at base and apex. Native country unknown. (F. Fobe, Ohorn, Germany.)

***Eleutherococcus Simoni.** (*M. D. G.* 1905, 12.) Araliaceae. H. Very closely allied to *E. senticosus*, but the stem and branches are furnished with sharp strong spines instead of long fine prickly bristles. (Simon-Louis Frères, Plantières, near Metz.)

Epicattleya decipiens. (*J. H. F.* 1905, 803.) Orchidaceae. G. A garden hybrid between *Epidendrum ciliare* and *Cattleya Gigas*. (L. Gaud, Marseilles.)

Epicattleya madeburgensis. (*Gartenwelt*, x. 198, 200, f.) G. A garden hybrid. Parentage not recorded. (P. Wolter, Magdeburg, Germany.)

***Epiphyllanthus obtusangulus.** (*M. K.* 1906, 166.) Cactaceae. G. An epiphytic plant with jointed much-branched stems; branches pendulous; joints cylindric or club-shaped, sub-angular; areolae very small, the larger covered with black wool from which arise 4–8 or more short black bristles. Flowers at the ends of the young growths, somewhat irregular, resembling those of an *Epiphyllum*, nearly 2 in. long, rose-coloured. Brazil. (Cultivated on the Riviera.) [Syns. *Epiphyllum obtusangulum*, Lindb.; *Cereus obtusangulus*, K. Schum.]

Eremurus Michelianus. (*G. C.* 1906, xl. 83.) Liliaceae. H. Supposed to be a hybrid between *E. Warei* and *E. Bungei*. (Jardin du Crest, near Geneva.)

Erigeron glabellus var. **arizonicus.** (*J. of H.* 1906, liii. 251.) Compositae. H. Stems about 1 ft. high. Flower-heads violet-purple, 1–1½ in. across. Arizona. (M. Leichtlin, Baden-Baden.)

***Eryngium serbicum.** (*Gard.* 1906, lxx. 79.) Umbelliferae. H. A small-growing plant, 12–18 in. high, with numerous thin stems bearing very finely divided leaves of a fresh green colour. Servia. (S. Arnott.)

***Euonymus yedoensis.** (*Späth Cat.* 1906–07, 97.) Celastraceae. H. A shrub 6–10 ft. high. Leaves ornamental, large, oval, acute. Flowers large, yellowish green, with purple anthers. Fruit carmine-rose. Japan. (L. Späth, Berlin.) [See *Gfl.* 1904, 31, f. 13.]

***Eupatorium Purpusi** var. **monticola.** (*G. C.* 1906, xxxix. 274.) Compositae. G. The upper portion of the stems, pedicels and involucres are very glandular-viscid, and the achenes are brown and slightly scabrid, not nearly white and smooth as in the type. The leaves are also thicker. This plant has been erroneously called *E. petiolare* (*G. C.* 1904, xxxv. 142, 163, f. 68). The name *E. viscosissimum* has been applied to it. Lower California. (Kew.)

Euphorbia Dinteri. (*M. K.* 1906, 109.) Euphorbiaceae. G. A new species closely allied to *E. virosa* with which it has been confused. It differs in being much more robust, and the *Cactus*-like stems are 7- or 8-angled. The flowers are unknown. German South-West Africa. (Sir T. Hanbury, La Mortola.)

***Fagus antarctica** var. **uliginosa.** (*K. B.* 1906, 381.) Cupuliferae. H. The leaves of this variety are cordate, with an oblique base, ½–1¼ in. long, irregular and minutely crenate, rather crowded on the slender unbranched shoots; petioles very short. Chili and Argentina. (Kew.)

***Fagus obliqua.** (*K. B.* 1906, 381.) H. A fine rapid-growing tree, having a hard heavy reddish-brown wood. Leaves deciduous, oblong-ovate, 2–3 in. long, doubly crenate, dark green above, paler and rather glaucous beneath. Southern Chili. (Kew.)

***Ficus Dryepondtiana?** (*R. H. B.* 1906, 85, t.; *R. H.* 1906, 222.) Urticaceae. S. A new species with long-stalked oblong leaves more than 10 in. long and 4 in. broad, undulate, prominently veined, green above, brownish purple beneath. Congo. (Brussels B. G.)

***Ficus Krishnae.** (*B. M.* t. 8092.) S. A new species most nearly allied to *F. bengalensis*. It is remarkable in having the leaves cup-shaped, the under side of the leaf forming the inside of the cup. India. (Kew.)

Forsythia spectabilis. (*Gfl.* 1906, 227, f. 26.) Oleaceae. H. A garden hybrid between *F. suspensa* and *F. viridissima*. (L. Späth, Berlin.) [= *F. intermedia spectabilis* in Späth Cat. 1906–07, 99.]

***Freesia Chapmanii.** (*Gard.* 1906, lxix. Jan. 27, x. and 99.) Iridaceae. G. A variety of *F. refracta* obtained by crossing the typical form (*F. aurea*) with the variety *alba*. (F. H. Chapman.)

*Freesia Tubergeni. (*Gard.* 1906, lxix. 168, 184, f.; *G. C.* 1906, xxxix. 157; *J. of H.* 1906, lii. 298, f.) G. A garden hybrid between *F. refracta alba* and *F. Armstrongi*. (C. G. van Tubergen, Haarlem.)

*Galanthus Gottwaldi. (*G. C.* 1906, xxxix. 105.) Amaryllidaceae. H. Identical with *G. byzantinus*.

Galanthus nivalis flavescens. (*G. C.* 1906, xxxix. 165.) H. The markings on the inner segments of the perianth, and the ovary, are yellow, and the stems are more yellow than green. It is larger and brighter than the variety *lutescens*. (S. Arnott.)

*Genista dalmatica. (*B. M.* t. 8075.) Leguminosae. H. A small rigid shrub, forming dense tufts of numerous spiny hairy branches 3–4 in. long. Leaves few, small, linear. Flowers bright yellow, in rather dense terminal racemes 1–1½ in. long. Balkan Peninsula. (Kew.)

*Genista nyssana. (*I. S. H. T.* v. 151, t. 197.) H. A shrub 1¾–2 ft. high, covered with whitish hairs. Branches ascending, straight or curved. Leaves alternate, trifoliolate, sessile; leaflets oblong, mucronate. Flowers small, solitary, yellow, forming long terminal spikes. Servia. (L. van den Bossche, Tirlemont, Belgium.)

*Gentiana ornata. (*G. C.* 1906, xl. 182.) Gentianaceae. H. A tufted plant with stems 5–6 in. long, narrow fleshy leaves and solitary terminal turquoise blue flowers; these are about the size of those of *G. septemfida*, and are marked on the outside of the tube with dull purple and buff coloured stripes. The plant figured as *G. ornata* in *Bot. Mag.* t. 6514 is incorrectly named. Central and Eastern Himalaya. (Kew.)

*Geranium platyanthum. (*G. C.* 1906, xxxix. 52; *Veitch Nov.* 1906, 3, f.) Geraniaceae. H. A handsome new species allied to *G. eriostemon*. Stems erect, 2–3 ft. high, covered with white spreading hairs. Leaves broadly reniform, 5–7 in. broad, densely covered on the underside with grey shining hairs; lower leaves long-stalked, usually 5-lobed; upper nearly sessile and often only 3-lobed; lobes broad, coarsely toothed. Peduncles 2 or more, axillary. Pedicels densely glandular-pilose, erect in fruit. Corolla rose-purple, very flat, 1⅓ in. across. Central and Western China. (J. Veitch & Sons.)

*Gerbera aurantiaca. (*B. M.* t. 8079.) Compositae. H. H. or G. This is the correct name of the plant included in the list of 1905 as *G. Elsae*. It is a native of Natal and the Transvaal. (Kew.)

Gerbera Jamesoni formae. (*Gn.* 1906, 15, 16.) G. The following forms, differing slightly from the type, are briefly described: *acanthifolia*, *elmensis*, *sanguinea*, *superba*, and *vomerensis*. (C. Sprenger, Naples.)

*Geum Eweni. (*G.C.* 1906, xxxix. 214.) Rosaceae. H. Said to be a hybrid between *G. Heldreichii* and *G. miniatum*. It has the appearance of a semi-double variety of the former, not quite so deep in colour as *G. Heldreichii superbum*. (S. Arnott.)

*Gladiolus carmineus. (*B. M.* t. 8068.) Iridaceae. H. H. A new species allied to *G. hirsutus*. Stem erect, slender, about 1½ ft. high. Leaves linear, acuminate, 8 in. long, ⅓ in. broad, glabrous. Flowers about 3 in. across. Perianth-tube narrowly funnel-shaped, ½ in. across, almost white outside; lobes ovate, acuminate, ¾ in. broad, carmine, two of the inner ones with a paler spot at the base surrounded by a darker border. Anthers oblong, pale yellow. South Africa. (Kew.)

Gladiolus glaucus. (*R. H.* 1906, 318.) H. H. A dwarf plant not exceeding 12 in. high. Stems and leaves erect, rigid. Flowers numerous, bluish-red, striped with white and red at the base. Greece. (Herb, Naples.)

Godetia Schamini fl. pl. (*Gard.* 1906, lxx. 203, t.) Onagraceae. H. Flowers pink, large and double, produced on long stems. (Dobbie & Co.) [*Oenothera.*]

*Gomesa scandens. (*O. R.* 1906, 208; *K. B.* 1906, 376.) Orchidaceae. S. A distinct species characterized by having an elongated stem and climbing habit, the pseudobulbs being 2–4 in. apart. Leaves oblong, 2–4 in. long. Racemes arching, 5–7 in. long, bearing numerous light green flowers with narrow segments. Brazil. (Kew.) [= *G. Glaziovii*, Cogn. in Mart. Fl. Bras. iii., pars 6, 248, t. 53.]

Gongora Beyrodtiana. (*Orch.* i, 4.) Orchidaceae. A new species allied to *G. truncata*. It is an epiphytic plant, with ovoid 4-furrowed pseudobulbs

about 2½ in. long, each bearing two oblong leaves 8–10 in. long. Inflorescence pendulous, about 16 in. long. Flowers pale yellow, purple-spotted, almost the same in size as those of *G truncata*. Colombia. (O. Beyrodt, Marienfelde, near Berlin.)

Gurania malacophylla. (*B. M.* t. 8085.) Cucurbitaceae. S. This is the correct name of the plant included in the list of 1904 as *G. eriantha*. It differs from the true *G. eriantha*, Cogn., by having a capitate instead of a spicate inflorescence.

***Habenaria triquetra.** (*K. B.* 1906, 87.) Orchidaceae. G. Plant 12–18 in. high, somewhat glaucous. Radical leaves ovate-lanceolate, 1–2 in. long; stem-leaves oblong or oblong-lanceolate, 2½–4 in. long. Raceme about 10-flowered, with foliaceous bracts. Sepals 10 lin. long, light green. Petals and lip about as long as the sepals, white. Ovary triquetrous or almost 3-winged. Shan States. (Kew.)

***Haplocarpha scaposa.** (*G. C.* 1906, xl. 122, f. 49.) Compositae. H.? A stemless herbaceous perennial resembling an acaulescent species of *Arctotis*. Leaves lanceolate to elliptic, 3–9 in. long, 1–3 in. broad, more or less obtusely toothed or sometimes nearly entire, green above, covered with a white felted tomentum beneath. Peduncles ¾–2½ ft. long, white-tomentose, leafless, bearing a solitary radiate clear yellow flower-head, 1½–2½ in. across, having a woolly involucre. South Africa. (W. E. Gumbleton; R. A. Beamish.) It appears to have been first introduced in 1894.

***Hedysarum multijugum** var. **apiculatum.** (*B. M.* t. 8091.) Leguminosae. H. Differs from the type in the leaves, which have fewer leaflets, glabrous on the upper side, and apiculate. It has been in cultivation for a long time as H. multijugum. Central Asia. (Kew.)

Hemerocallis fulcitrina. (*G.C.* 1906, xl. 159.) Liliaceae. H. A garden hybrid between *H. fulva maculata* and *H. citrina*. (C. Sprenger, Naples.)

Hemerocallis fulva var. **Cypriani.** (*G. C.* 1906, xl. 159; *B. T. C.* 1906, 204.) H. A distinct variety, dwarfer than the type and more floriferous. The flowers are coppery red with a golden centre, and a well-marked golden line down the middle of the segments. Central China. (C. Sprenger, Naples.)

Hemerocallis fulva var. **hupehensis.** (*G. C.* 1906, xl. 159; *B. T. C.* 1906, 205.) H. Flowers very bright coppery red, with a yellow throat, the segments very reflexed and undulating. Central China. (C. Sprenger, Naples.)

Herpetospermum grandiflorum. (*B. S. B. B.* xlii. 231.) Cucurbitaceae. H. An annual climbing herb, probably dioecious. Leaves on very long stalks, broadly ovate-cordate, to 4¼ in. long and 4¾ in. broad, more or less angular. Male flowers 3–6 at the apex of a peduncle 3–5 in. long, with large golden-yellow petals. Female flowers solitary or in pairs, very shortly stalked, slightly smaller than the male. Fruit greenish, 7- or 8-ribbed, densely hairy, about 2½ in. long, 1¾ in. broad. Central China. (Vilmorin-Andrieux & Co., Verrières-le-Buisson, France.)

Heuchera sanguinea maxima. (*R. H. B.* 1906, 208, f. 41.) Saxifragaceae. H. A very vigorous variety, with large panicles of large deep crimson flowers. (Haage & Schmidt, Erfurt.)

***Hoodia Currori.** (*G. C.* 1906, xl. 62, f. 27.) Asclepiadaceae. S. A *Stapelia*-like plant, with a leafless stem 1–2 ft. high and 2¼ in. or more in diam., bearing 12 longitudinal ridges, each consisting of 30 confluent spine-tipped mammae. Flowers 5 in. across, saucer-shaped, dull rosy-lilac with dark radiating lines and covered with soft hairs inside, paler and glabrous outside; they are odourless and last about a month. Portuguese West Africa. (Kew.)

***Impatiens Holstii hybrida.** (*R. H.* 1906, 488.) Geraniaceae. G. or H. H. The following forms, obtained by hybridising *I. Holstii* and *I. Sultani*, are enumerated:—*albo-maculata*, *albo-rosea*, *atroviolacea*, *carminea*, *cinnabarino-aurantiaca*. (Haage & Schmidt, Erfurt.)

***Iris demavendica.** (*G. C.* 1906, xxxix. 364.) Iridaceae. H. A distinct dwarf species belonging to the Cushion Irises. Stems about 6 in. high, each bearing 2 large rich claret-red flowers. The standards are paler, and the falls are richly veined with lines of a deeper shade. Mt. Demavend, Persia. (Kew.)

Iris Taitii. (*G. C.* 1906, xl. 145.) H. A new species allied to *I. Xiphion* from which it differs in having small bulbs with light brown finely-ribbed coats, filiform leaves, less panduriform sepals (falls), and in the later flowering. Portugal. (Sir M. Foster.)

Kniphofia elmensis. (*B. T. O.* 1906, 196.) Liliaceae. H. A garden hybrid between *K. pauciflora* and *K. rufa.* (C. Sprenger, Naples.)

Kniphofia ruvaria. (*B. T. O.* 1906, 196.) H. A garden hybrid between *K. rufa* and *K. uvaria.* (C. Sprenger, Naples.)

Kniphofia vomerensis. (*B. T. O.* 1906, 195.) H. A garden hybrid between *K. pauciflora* and *K. rufa.* (C. Sprenger, Naples.)

Laelia canariensis. (*O. R.* 1906, 84.) Orchidacae. S. A garden hybrid between *L. harpophylla* and *L. anceps.* (C. L. N. Ingram.)

Laelio-cattleya Denisii. (*O. R.* 1906, 135.) Orchidaceae. G. A garden hybrid between *Laelia superbiens* and *Cattleya Lueddemanniana.* (F. Denis, Balaruc les Bains, Hérault, France.)

Laelio-cattleya Hopkinsii. (*G. C.* 1906, xxxix. 223; *O. R.* 1906, 146.) S. A garden hybrid between *L.-C. Pallas* and *Laelia tenebrosa.* (F. Wellesley.)

Laelio-cattleya Hurstii. (*O. R.* 1906, 221.) S. A garden hybrid between *Cattleya Skinneri* and *Laelia purpurata.* (E. F. Clark.) [The plant with this name in the list of 1900 is a hybrid between *Laelia pumila* var. *Dayana* and *L. purpurata* var. *rosea* and is therefore *L. Diana.*]

Laelio-cattleya Peetersi. (*R. H.* 1906, 99.) G. A garden hybrid between *Laelia glauca* and *Cattleya Lawrenceana.* (C. Maron, Brunoy, France.)

Laelio-cattleya perrilosa. (*O. R.* 1906, 350.) S. A garden hybrid between *Laelia Perrinii* and *Cattleya granulosa.* (R. I. Measures.)

Laelio-cattleya tenegottoi. (*O. R.* 1906, 350.) S. A garden hybrid between *Laelia tenebrosa* and *Laelio-Cattleya Gottoiana.* (R. I. Measures.)

Laelio-cattleya Wolteri. (*Gartenwelt*, x. 198.) G. A garden hybrid between *Cattleya Gaskelliana* and *Laelia pumila.* (P. Wolter, Magdeburg, Germany.)

Laelio-cattleya woodfordiensis. (*G. C.* 1906, xl. 201.) G. A garden hybrid between *Laelia crispa* and *Laelio-Cattleya*, "*C. G. Roebling.*" (J. G. Fowler.)

Lantana Pictavi. (*R. H.* 1906, 81, 233, f. 109; *Jard.* 1906, 277, f. 148.) Verbenaceae. G. A hybrid between *L. Sellowiana* and a garden variety. (G. Bruant, Poitiers.)

Larix europaea virgata. (*M. D. G.* 1905, 81, t. 10.) Coniferae. H. The name given to a monstrous form which has been growing for many years near Rottenmann in Upper Styria, Austria. It has long outstretched tortuous primary branches, which have few secondary branches, and are forked towards the extremities. The tufts of leaves are very crowded, giving the branches the appearance of being thickly overgrown with moss.

Larix Potanini. (*G. C.* 1906, xxxix. 178, f. 68.) H. A tree 20–60 ft. high, producing a valuable timber. Leaves glabrous, linear, ¾–1 in. long, or occasionally much shorter, apiculate, flattish, with a prominent midrib. Mature cones 1½–1⅔ in. long, ¾ in. broad, oblong-ovoid, obtuse, sessile, deflexed; bracts conspicuous, membranous, lanceolate, often markedly acuminate and recurved; cone-scales brownish grey, rounded-truncate. Seeds winged. Western China. (J. Veitch & Sons.)

***Lilium Duchartrei.** (*B. M.* t. 8072.) Liliaceae. H. Stems about 3 ft. high, glabrous, terete, 1–7-flowered. Leaves lanceolate or linear-lanceolate, acuminate, 2½ in. long, ½ in. broad, 3-nerved. Flowers nodding, about 3 in. across, white tinged with rose outside, finely spotted with rose inside, except towards the tips of the oblong recurved segments. Western and South-Western China. (J. Veitch & Sons.)

***Lilium myriophyllum.** (*B. M.* t. 8102.) H. A handsome species closely allied to *L. Brownii*, from which it differs in having 1-nerved linear leaves, and the perianth more or less saccate at the base. The flowers are about 5 in. long, white inside, yellow in the tube, flushed with dull crimson outside, and darker on the midribs. Western and South-Western China. (J. Veitch & Sons.)

Lilium pardalinum × Parryi. (*G. W.* 1906, 597, f.) H. A garden hybrid. (L. Burbank, Santa Rosa, California.) [= *L. Burbankii.*]

Lisianthus eythropensis. (*G. C.* 1906, xl. 35; *G. M.* 1906, 480.) Gentianaceae. G. A garden name for the well-known *L. Russellianus.* (Miss Alice Rothschild.)

***Listrostachys fimbriata.** (*K. B.* 1906, 115.) Orchidaceae. S. A very floriferous new species very similar to *L. fragrantissima*, but the spur of the lip is longer and more slender. Flowers translucent white, with a slight greenish tinge. Uganda. (Kew.)

***Listrostachys hamata.** (*B. M.* t. 8074.) S. A distinct new species characterized by having the spur hooked at the tip. It is a stout epiphytic herb less than 1 ft. high. Leaves recurved, oblong, about 6 in. long. Scapes arching to pendulous, about 6 in. long, many-flowered. Flowers white, with a green spur. Tropical West Africa. (Kew.)

Lonicera Ferdinandi. (*M. D. G.* 1905, 197; *Späth Cat.* 1906–07, 105.) Caprifoliaceae. H. A vigorous-growing shrub; younger branches more or less covered with setose reflexed hairs bulbous at the base. Leaves very shortly stalked, ovate, up to 1¾ in. long, acute or acuminate, rounded or slightly cordate at the base, sparsely setulose, ciliate. Flowers axillary, in pairs. Corolla 2-lipped, ¾ in. long, pale yellow. Mongolia and China. (Bonn B. G.; L. Späth, Berlin.)

***Lonicera involucrata serotina.** (*Gfl.* 1906, 322; *Späth Cat.* 1906-07, 105.) H. Leaves broader than in the type, more acute, glabrous on the under side and less shining. Mountains of California. (L. Späth, Berlin.)

Lycaste Hennisiana. (*Orch.* i. 33.) Orchidaceae. G. A new species allied to *L. lasioglossa*, which it resembles in the large size of its flowers and the shape of the shining green sepals. Petals more white than green. Lip quite glabrous, white or cream-coloured. Column pure white, hairy above the middle. Colombia. (W. Hennis, Hildesheim, Germany.)

Lycaste tricolor albens. (*G. C.* 1906, xl. 56; *Gard.* 1906, lxx. July 21, vi.) G. Sepals very pale green. Petals white, with a tinge of green at the ends. (J. Bradshaw.)

***Lychnis Sartori.** (*G. M.* 1906, 162.) Caryophyllaceae. H. Somewhat resembles *L. diurna*, but it has narrower leaves, and the inflated calyx is more elongated. Plant about 1 ft. high. Flowers purple, about ½ in. across. China? (M. Leichtlin, Baden-Baden; S. Arnott.)

Lycoris incarnata. (*Gartenwelt*, x. 489, t.) Amaryllidaceae. H. Scape 1–1¾ ft. high, bearing 6–12 flowers. Flowers large, widely expanded, pale flesh-coloured or bright rose, fragrant; segments scarcely undulate, not so much reflexed as in the Japanese species. Central China. (C. Sprenger, Naples.)

Magnolia globosa. (*G. C.* 1906, xxxix. 234.) Magnoliaceae. H. A bush or small tree, 6–15 ft. high. Leaves deciduous, ovate or ovate-elliptic, acuminate, 5–9 in. long, 3–5 in. broad, nearly glabrous above, densely silky-hairy beneath; petiole short. Flowers solitary, terminal, shortly stalked, white, saucer-shaped, fragrant, appearing with the leaves, often on small plants. Stamens and pistil bright red. Fruit oblong, pendulous. 2 in. long. Sikkim and Western China. (J. Veitch & Sons.)

Mammillaria chionocephala. (*M. K.* 1906, 41, f.) Cactaceae. G. A new species of which the stem is densely covered on the upper part with a snow-white wool. Stem with a milky juice, simple or rarely proliferous, globose or semi-globose, 4–5 in. high, rounded or depressed at the summit. Tubercles arranged in 13–21 series, obtusely tetragonal-pyramidal. Radial spines 22–24, white, rigidly setaceous; central spines usually 2–4, straight or somewhat curved. Flowers rose-red, in a circle near the summit. Mexico. (Darmstadt B. G.)

Mammillaria lenta. (*M. K.* 1906, 40, f.) G. A tufted species. Tufts thick and flat. Stems half-globose, about 1¼ in. high and 2½ in. thick; apex slightly depressed, furnished with white wool. Papillae needle-like, ⅓ in. long, pale to yellowish green, truncate. Radial spines about 40, transparent, white, glabrous, unequal, up to 2½ lin. long, interlaced; central spines wanting. Flowers not described. Mexico. (L. Quehl, Halle on the Saale, Germany.)

Maranta Alberti. (*R. H. B.* 1906, 20.) Scitamineae. S. Leaves curiously variegated. (Pynaert & Van Geert, Ghent.)

Masdevallia igneo-Estradae. (*G. C.* 1906, xxxix. 223; *O. R.* 1906, 146.) Orchidaceae. G. A garden hybrid. (Sir Trevor Lawrence.)

Masdevallia peruviana. (*K. B.* 1906, 112.) G. Allied to *M. atropurpurea*, but the light brown tube of the sepals is broad and not constricted, the tails are shorter, and the lip keeled in the middle. The apex of the lateral sepals is red-purple, fading to whitish near the base. Petals and lip white, tinged with lilac. Peru. (Glasnevin B. G.)

Masdevallia Tonduzii. (*B. H. B.* 1906, 82.) G. A new species. Leaves oblong-lanceolate, 3-toothed at the apex. Peduncle erect, terete, slender, 1-flowered. Sepals connate at the base, triangular, 3-nerved, whitish, softly pilose and citron-coloured inside, elongated into very slender flat yellow tails. Petals linear at the base, oblong above. Lip oblong, cordate at the base, white. (Hort. Chambésy, near Geneva.)

Maxillaria Binoti. (*Orch.* i. 25, f. 13.) Orchidaceae. G. Pseudobulbs ovoid, compressed, $\frac{3}{4}$–$1\frac{3}{4}$ in. long, 2-leaved. Leaves sessile, lanceolate, obtuse. Peduncles solitary or geminate, slender, about $1\frac{1}{2}$ in. long. Flowers yellow, suberect. Sepals oblong, about $\frac{1}{2}$ in. long. Petals oblong, slightly shorter than the sepals. Lip obovate, densely and minutely purple-dotted towards the middle, about as long as the petals. Brazil. (Brussels B. G.)

Maxillaria Ferdinandiana var. **luteola.** (*Orch.* i. 26.) G. Differs from the type in having yellow flowers larger in every part. Brazil. (Brussels B. G.)

***Meconopsis discigera.** (*A. B.* xx. 356, t. 24, f. 12.) Papaveraceae. H. Plant clothed with spreading dark golden-brown barbed hairs. Leaves in a radical tuft, spathulate, 4–6 in. long, subacute, sparingly and coarsely toothed or slightly lobed towards the apex. Stem to 1 ft. high, simple, scape-like. Flowers racemose, on pedicels $\frac{3}{4}$ in. long. Sepals and petals unknown. Ovary bearing at the summit a disk with incised lobes. Style elongated. Stigma club-shaped. Western Sikkim. (Kew; Edinburgh B. G.)

Meconopsis Henrici. (*A. B.* xx. 329, 350.) H. Apparently biennial, more or less hairy, or sometimes quite glabrous. Leaves lanceolate, entire. Flowers large, deep purple-violet, 1 or sometimes 2 on each stem. Petals 6–8, broadly obovate, clawed at the base. Western China. (J. Veitch & Sons.)

Meconopsis pseudointegrifolia. (*A. B.* xx. 353, t. 25.) H. Closely allied to *M. integrifolia* under which name it has been cultivated [*see* note in list of 1904 under *M. integrifolia* and *Flora and Sylva*, 1905, 80, t. col.], but it differs in all the scapes being simple, radical, and 1-flowered, and in having a distinct style with a narrower stigma. South-west Tibet. (A. K. Bulley; Kew.)

Medinilla chionantha. (*K. B.* 1906, 73.) Melastomaceae. S. A glabrous shrub. Leaves subsessile, lanceolate-oblong, to 6 in. long. Flowers in axillary cymes. Calyx snow-white, $4\frac{1}{2}$ lin. long. Petals elliptic, snow-white, fleshy, about $\frac{2}{3}$ in. long, obtuse. Perak. (J. Veitch & Sons.)

Miltonia Clowesii rosefieldiensis. (*G. C.* 1906, xl. 265; *G. M.* 1906, 697.) Orchidaceae. S. A well-marked variety, with very large flowers. Sepals and petals Indian yellow, with broad chestnut-brown bands. Lip tinged with lilac at the base, changing to white on the broad front lobe. (De B. Crawshay.)

Miltonia Hyeana. (*O. R.* 1906, 276.) S. A garden hybrid between *M. Bleuana* and *M. vexillaria Leopoldi*. (J. Hye de Crom, Ghent.)

Mimosa Denhardti. (*G. C.* 1906, xxxix. 45.) Leguminosae. G. A species with leaves almost as sensitive as those of *M. pudica*. (M. Buysman, Middelburg, Holland.)

Myoporum rosmarinifolium. (*G. C.* 1906, xl. 216.) Myoporaceae. G. or H? A new name for *M. parviflorum*, an old garden plant. (S. W. Fitzherbert.)

Nepeta Veitchii. (*G. C.* 1906, xl. 334, ff. 133, 134.) Labiatae. H. A new species. A handsome herbaceous perennial covered with minute rather

hispid hairs. Stem up to 1½ ft. high. Leaves narrowly oblong, lanceolate, 1–2 in. long, acute, cordate at the base, crenate-dentate, rugose, the lower stalked, the upper sessile. Flowers in distant whorls. Corolla light blue, about 1¼ in. long, with a long narrow deflexed tube. Western China. (J. Veitch & Sons.)

*Nepeta Wilsoni. (*G. C.* 1906, xl. 334.) H. A new species allied to *N. macrantha*. It is a herbaceous perennial, 2–2½ ft. high. Leaves shortly stalked, the upper subsessile, ovate-oblong, 2½–3¼ in. long, obtuse, crenate. Flowers in distant whorls, shortly stalked. Corolla violet, about 1 in. long, with a slender tube white at the base, curved and enlarged above. Western China. (J. Veitch & Sons.)

Nephrolepis cordata tessellata. (*G. C.* 1906, xl. 298; *G. M.* 1906, 724.) Filices. S. A variety in which some of the pinnae are pinnate, giving the fronds a tessellated appearance. (G. Prickett & Sons.)

Nephrolepis exaltata canaliculata. (*G. C.* 1906, xl. 198, f. 82.) S. A distinct variety with the fronds bearing a large terminal crest, and all the pinnae with somewhat congested and curly multifid tassels. The pinnae are incurved, giving the frond a half-tube-like appearance. (H. B. May.)

Nephrolepis exaltata elegantissima. (*G. C.* 1906, xxxix. 354; *J. of H.* 1906, liii. 15, f.; *G. M.* 1906, 365, 366, f.) S. The fronds are loose and finely divided, broad at the base, tapering to a point; pinnae broad, overlapping. (W. J. Godfrey.)

Nephrolepis exaltata superba. (*G. C.* 1906, xxxix. 354; *G. M.* 1906, 366, f.) S. A very fine variety with arching fronds 1½–2 ft. long; pinnae irregularly waved and cut along each margin, crested at the tips. (H. B. May.)

Nephrolepis todeaoides. (*G. C.* 1906, xl. 265; *G. M.* 1906, 697, 710, f.) S. The much divided plumose fronds resemble those of *Todea superba*. (T. Rochford & Sons.) [*N. exaltata* var. *todeaoides*, *G. C.* 1906, xl. 444. f. (Suppl.)]

*Nicandra violacea. (*R. H.* 1906, 208, t.) Solanaceae. H.H. A vigorous branched annual herb, glabrous, or sometimes with long hairs on the upper side of the leaves. Leaves subtriangular, the cauline up to 10 in. long and 5 in. broad, coarsely and irregularly toothed or lobed. Flowers solitary, axillary, shortly stalked. Calyx large, with cordate lobes, dark violet on the lower half. Corolla campanulate, 1¼–1½ in. broad, white in the lower half, violet-blue above. South America? (Tours B. G.)

Nymphaea ampla Gerardiana. (*Gartenwelt*, x. 275.) Nymphaeaceae. S. Leaves about 2 ft. across, red-brown above, blue-red and strongly net-veined beneath. Flowers raised above the water, very large, white or cream-white, with yellow anthers. Mexico. (Darmstadt B. G.)

Nymphaea dentata magnifica. (*R. H.* 1906, 534.) S. The flowers are larger than those of the type, being as much as 10–12 in. across. (H. Dreer.) [*N. Lotus* var.]

Nymphaea Zenkeri. (*Gn.* 1906, 519.) S. Rhizome small, conical. Leaves long-stalked, deeply cordate, sinuate-dentate, glabrous above, densely and shortly hairy beneath. Flowers 2–3 in. across. Sepals 4, oval-lanceolate, acute, dark green, reddish at the base and on the nerves. Petals 7 or 8, narrower than the sepals, white, with a reddish tint, greenish at the tips. Cameroons. (Breslau B. G.)

Odontioda Bohnhoffiae. (*G. C.* 1906, xl. 234; *G. M.* 1906, 661.) Orchidaceae. G. A garden hybrid between *Cochlioda vulcanica* and *Odontoglossum cirrhosum*. (Charlesworth & Co.)

*Odontioda heatonensis. (*G. C.* 1906, xxxix. 158; *O. R.* 1906, 118.) G. A garden hybrid between *Odontoglossum cirrhosum* and *Cochlioda sanguinea*. (Charlesworth & Co.)

Odontoglossum caliginosum. (*O. R.* 1906, 317; *T. H.* 1906, i. 48, 56.) Orchidaceae. G. Supposed to be a hybrid between *O. luteopurpureum* or *O. sceptrum* and *O. crispum*. (Duchesne, Lanthorne & Co., Watermael, Brussels.)

Odontoglossum crispum Berti. (*R. H.* 1906, 243; *J. H. F.* 1906, 249.) G. Similar to the variety *Mariae*. (Et. Bert, Bois-Colombes, France.)

Odontoglossum crispum illustratum. (*G. W.* 1906, 749, f.) G. Sepals nearly covered with a brownish-purple blotch. Petals with a very large blotch of the same colour in the centre of a white ground. Lip blotched with cinnamon-brown. (L. Linden & Co., Moortebeek, Brussels.)

Odontoglossum crispum Karthausi. (*R. H. B.* 1906, 146.) G. Flowers very large and flat, with copious intensely-coloured blotches. (F. Lambeau, Brussels.)

Odontoglossum crispum Whateleyae. (*G. C.* 1906, xxxix. 254.) G. Flowers well-formed, white, evenly and profusely spotted with dark purple. (H. Whateley.)

Odontoglossum Fletcherianum. (*G. C.* 1906, xl. 98; *O. R.* 1906, 255.) G. A garden hybrid betwen *O. Edwardi* and *O. cirrhosum*. (F. Sander & Sons.)

Odontoglossum Fowlerianum. (*G. C.* 1906, xxxix. 158, 163, f. 65; *O. R.* 1906, 108; *Gard.* 1906, lxix. 156, 173, f.) G. A garden hybrid between *O. Rossii rubescens* and *O. cirrhosum*. (F. Sander & Sons.)

Odontoglossum Hudsoni. (*O. R.* 1906, 143.) G. A natural hybrid between *O. gloriosum* and *O. Hunnewellianum*. Colombia. (L. de Rothschild.)

Odontoglossum Ossulstoni. (*G. M.* 1906, 418, 419, f.) G. A garden hybrid between *O. crispo-Harryanum* and *O. Pescatorei*. (Charlesworth & Co.)

Odontoglossum Stewartianum. (*O. R.* 1906, 120, f. 14.) G. A garden hybrid between *O. Andersonianum magnificum* and *O. crispum heliotropium*. (R. Stewart.)

Oncidium Claesii. (*O. R.* 1906, 191; *K. B.* 1906, 376.) Orchidaceae. G. A striking new species of the *Microchila* group. It resembles *O. macranthum* in habit, with flowers about the size of those of *O. superbiens*. Sepals bright chocolate-red. Petals and lip deep carmine, shaded with violet. Colombia. (Fl. Claes, Brussels.)

Oncidium illustre. (*O. R.* 1906, 150.) G. A supposed natural hybrid between *O. leucochilum* and *O. maculatum*. (F. Sander & Sons.)

Oncidium Johnianum. (*Orch.* i. 4.) G. A new species allied to *O. Wentworthianum* and *O. pergamenеum*, differing from both in having 1-leaved pseudobulbs and in the shape of the lip, which is 3-lobed, shorter than the sepals, with subcuneate-oblong very obtuse lateral lobes about ¼ in. long, and a semi-orbicular median lobe lacerated at the margin. Brazil. (K. W. John, Andernach, Germany.)

Oncidium sarcodes ornatum. (*G. C.* 1906, xl. 23.) G. Differs from the type in the colour of the flowers. Sepals and petals chestnut-brown, margined with yellow. Lip yellow, with three large red-brown blotches in front of the purple-spotted crest, and smaller chestnut-brown blotches over the whole of the front lobe to the margin, which is bright yellow. Brazil. (Hon. N. C. Rothschild.)

Oncidium Stanleyi. (*G. C.* 1906, xl. 169; *O. R.* 1906, 286; *J. of H.* 1906, liii. 267, f.) G. A natural hybrid of which *O. Marshallianum* and *O. curtum* are supposed to be parents. (Stanley & Co.)

Ophiopogon Regnieri. (*R. H.* 1906, 370, ff. 146–149.) Haemodoraceae. G. A new species allied to *O. Griffithii*. Plant stemless. Leaves in a rosette, erect or more or less reflexed, lanceolate, up to 1 ft. long including the slender petiole, marbled with pale green and yellow. Peduncle 2-edged, about 8 in. high including the several-flowered racemose inflorescence. Flowers ⅔–¾ in. across, violet-white, greenish at the tips of the segments. Cochinchina. (Paris B. G.)

Opuntia cervicornis. (*Späth Cat.* 1906–07, 156). Cactaceae. G. Probably a hybrid of which *O. fragilis* is a parent. It is a curious plant, with cylindric strongly tubercled decumbent joints about 5 in. long, furnished with golden-brown spines. Flowers deeply cup-shaped, about 2½ in. broad, yellow, fading to a chamois colour. Colorado. (L. Späth, Berlin.)

Osmunda palustris var. **Mayi.** (*G. C.* 1906, xl. 35, 161, f. 65; *G. M.* 1906, 480, as *O. Mayi*.) Filices. H. The pinnae are cristate and the pinnules contracted and crispate, with linear markings of creamy-white. (H. B. May.)

***Oxalis adenophylla.** (*B. M.* t. 8054; *G. C.* 1906, xl. 14.) Geraniaceae. H. Closely allied to *O. enneaphylla*, from which it differs in having a bulb-like rootstock covered with matted fibres, instead of a rhizome. The flowers are rosy purple and have deeper coloured veins, with a deep crimson centre; 2 or 3 are borne on each stem instead of only one as in *O. enneaphylla*. Chili. (Kew.)

***Palisota Pynaerti.** (*T. H.* 1906, i. 21, t. 2.) Commelinaceae. Very similar to *P. Barteri*, but the ovary is more densely velvety. The flowers are pure white. Congo Free State. (Brussels B.G.)

Paphiopedilum affine. (*T. H.* 1906, i, 57.) Orchidaceae. S. A new species allied to *P. villosum*, differing, amongst other characters, in the staminode, which forms at the summit a subacute angle. The upper sepal is white on the upper part, green in the middle and at the base, striped with green and spotted with violet on the lower third. Petals and lip green, tinted with violet. Tonquin.

***Parrya Menziesii.** (*G. C.* 1906, xxxix. 238.) Cruciferae. H. A perennial herb 9–12 in. high, with a branching habit. Leaves spathulate, 1–4 in. long, covered with a silvery tomentum. Flowers freely produced in racemes, purple, or rich rose-purple, sometimes flaked with white. California. (Kew.)

***Passiflora punctata.** (*B. M.* t. 8101.) Passifloraceae. S. A pretty species with semicircular or lunate shallowly 3-lobed leaves, blotched with purple, and rather small flowers, having pale yellow sepals and petals, and the segments of the corona yellow at the base and violet at the apex. This is the true *P. punctata*, Linn. South America. (Kew.)

Pennisetum macrophyllum atropurpureum. (*Gard.* 1906, lxix. 51; *Jard.* 1906, 95.) Gramineae. H. H. A very ornamental grass with elegant deep red-brown foliage and silvery rose spikelets. (Darmstadt B.G.)

Pescatorea cochlearis. (*K. B.* 1906, 33.) Orchidaceae. S. Leaves oblanceolate-oblong, acute, 5–9 in. long, ¾–1¼ in. broad. Scapes horizontal, 3–3½ in. long. Sepals and petals elliptic-oblong or oblong, 1¼ in. long, the lower halves ivory-white, the upper reddish maroon. Lip 3-lobed, 1 in. long, white, the median lobe bearing a large horseshoe-shaped callus ornamented with 17 maroon crests and tubercles. Column maroon. Andes. (Mrs. Ida Brandt, Zurich.)

Phoenix Menieri. (*R. H.* 1906, 373.) Palmae. G. A name proposed for a *Phoenix* grown in the South of France under the name of *P. senegalensis*. It is probably a form of *P. sylvestris* or a hybrid between *P. sylvestris* and *P. canariensis*. (Villa Ménier, Cannes.)

***Physaria didymocarpa.** (*G. C.* 1906, xxxix. 306.) Cruciferae. H. A pretty perennial herb, having a rosette of spathulate leaves covered with a white stellate pubescence. Stems many, leafy, about 3 in. high, each bearing a raceme of bright yellow flowers. North-Western America. (Kew.)

Picea complanata. (*G. C.* 1906, xxxix. 146, f. 57.) Coniferae. H. A new species belonging to the section *Omorika*, having the blue surface of the leaves uppermost. It is a handsome tree attaining a height of 100 ft. Younger branches glabrous, orange-brown. Leaves about ¾ in. long, linear, acute, somewhat flattened. Ripe cones oblong-cylindric, narrowed at apex and base, 4–5 in. long; scales slightly convex, transversely oblong or rounded. Western China. (J. Veitch & Sons.)

Picea montigena. (*G. C.* 1906, xxxix. 146, f. 56.) H. A new species having the general characters of a Spruce. It reaches a height of 60 ft. Older branches grey, the younger slightly setose and of an orange colour. Leaves scarcely ½ in long, linear, curved, 4-sided. Ripe cones cylindric-oblong, obtuse, about 5 in. long and 2 in. broad; scales oblong-ovate, undulate, light brown, flushed with purple. Western China. (J. Veitch & Sons.)

Picea orientalis nutans. (*M. D. G.* 1905, 212.) H. The branches hang gracefully without being exactly pendulous. (W. F. Niemetz, Temesvár, Hungary.)

Picea pungens aurea. (*M. D. G.* 1905, 212.) H. A form with constantly golden-yellow foliage. (W. F. Niemetz, Temesvár, Hungary.)

Picea pungens flavescens. (*M. D. G.* 1905, 212.) H. The foliage on the parts of the plant most exposed to the light is of a whitish-yellow colour. (W. F. Niemetz, Temesvár, Hungary.)

***Platylepis australis.** (*K. B.* 1906, 378.) Orchidaceae. G. Stem ascending, leafy. Leaves ovate, 2–4 in. long, 15–21-nerved; petiole 1¼–2 in. long. Scapes erect, 6–12 in. long, bearing an oblong or elongated many-flowered raceme 2–5 in. long. Flowers small, green, with the upper half of the lip white. Natal. (Kew.)

Platylepis densiflora. (*K. B.* 1906, 378.) S. Differs from *P. australis* in having narrower sepals, the lateral not reflexed in the middle, narrower petals, and a lip not constricted in the middle. Mascarene Islands. (Kew.)

***Pleione yunnanensis.** (*B. M.* t. 8106; *G. C.* 1906, xxxix. 115; *O. R.* 1906, 81, f. 10; *J. of H.* 1906, lii. 251, f.) Orchidaceae. G. An elegant little plant flowering before the leaves appear. Flowers 2¼ in. across, on erect scapes 3–4 in. high. Sepals and petals oblong, gracefully recurved, light rosy-purple. Lip beautifully fringed, lilac, with numerous irregular bright purple blotches; side lobes striped with purple towards the base. Yunnan, China. (Sutton & Sons.)

Pleurothallis Barbosana. (*G. C.* 1906, xxxix. 244.) Orchidaceae. G. A new species allied to *P. pluriflora*. Plant small, tufted. Leaves small, thick at the edges, oblong-lanceolate, emarginate, apiculate. Stems very short, roundish. Flowers small, yellow, rather nodding, in plurifiorous distichous racemes. Brazil. (Brussels B. G.)

Pleurothallis gracilis var. **Binoti.** (*T. H.* 1906, i. 3.) G. Differs from the type in having the lateral sepals connate up to the apex. Brazil.

Pleurothallis venosa. (*K. B.* 1906, 30.) G. Stems round, 6–9 in. long. Leaves shortly stalked, lanceolate-oblong, 5½–8 in. long, 1¼–1¾ in. broad. Racemes 2 or 3, fascicled, or rarely solitary, slender, many-flowered, 4–6 in. long. Flowers very small, greenish, with 3 dusky brown longitudinal nerves on the sepals and a single one on each petal. Tropical America. (F. Sander & Sons.)

Poliothyrsis sinensis. (*G. C.* 1906, xxxix. 13.) Bixaceae. H. A tree similar to *Idesia polycarpa*, but having a capsular instead of a baccate fruit. Central China. (J. Veitch & Sons.)

Polygonum Auberti. (*R. H.* 1906, 506.) Polygonaceae. Name only. (Cayeux & Le Clerc, Paris.)

Polypodium glaucum speciosum. (*Gartenwelt*, x. 624.) Filices. S. The fronds are prettily undulated, but are shorter than in the type. (F. Jank.)

Polypodium Phymatodes corymbosum. (*G. C.* 1906, xxxix. 157; *Gard.* 1906, lxix. 168.) G. Fronds long and drooping, heavily crested. (H. B. May.)

***Polystachya bicolor.** (*K. B.* 1906, 114.) Orchidaceae. S. A very small plant with tufted stems, lanceolate-oblong leaves, and scapes 3–5 in. long. Flowers small. Sepals light purple. Petals, lip and column cream-white. Seychelles. (Kew.)

***Primula cognata.** (*G. C.* 1906, xxxix. 358, f. 145; *Gard.* 1906, lxix. 303, f.) Primulaceae. H. Leaves in a dense rosette, pale green, obovate-oblong, rounded at the apex, 1½–3 in. long, mealy on the under side. Scapes 4–9 in. high, mealy. Flowers in umbels, fragrant. Pedicels slender, erect, 1–2 in. long. Calyx 4 lin. long, with angular tube and linear obtuse lobes. Corolla light bluish-purple; limb about 1 in across. A new species related to *P. stenocalyx*, Maxim. Western China. (J. Veitch & Sons.)

***Primula deflexa.** (*G.C.* 1906, xxxix. 229; *Veitch Nov.* 1906, 5, f.) H. A new species belonging to the *Capitata* group. Leaves in basal rosettes, thin, narrowly oblanceolate, 5–11 in. long, 1 in. broad, more or less clothed on both sides with minute white hairs. Scape often nearly 2 ft. high. Flower-heads subglobose, about 1 in. across. Flowers crowded, sessile, deflexed. Corolla about ½ in. long, funnel-shaped, dark blue or rose-purple, with a delicate blue centre; segments cuneate-oblong, broadly emarginate. Western China. (J. Veitch & Sons.)

Primula hazarica. (*Jard.* 1906, 212.) H. A very elegant plant. Leaves petiolate, obovate or spathulate, 1¼–3 in. long, toothed, farinose, covered on the

underside with a dense white pubescence. Scape 3–3½ in. long, 1-flowered or bearing a many-flowered umbel. Pedicels slender, ½–1 in. long. Corolla purple, with a pale yellow tube; limb about ¾ in. across; lobes emarginate. Western Himalayas.

Primula obconica superba. (*R. H.* 1906, 448, f. 176, and t.) G. A fine variety with large brightly coloured flowers. (A. Nonin, Chatillon-sous-Bagneux, France.)

Primula orbicularis. (*G. C.* 1906, xxxix. 290, 403, f. 164.) H. A new species having some resemblance to *P. sikkimensis*. Leaves rather leathery, oblong-lanceolate, 2–6 in. long, obtuse, minutely toothed, at first slightly mealy. Scape about 1 ft. high, round, yellow- or white-mealy as well as the flowers. Flowers 5–7, in umbels, fragrant. Calyx thick, campanulate, scarcely ½ in. long. Corolla yellow, salver-shaped; limb orbicular, about 1 in. across, flat, with almost orbicular lobes. Western China. (J. Veitch & Sons.)

Prunus domestica elegans. (*R. H.* 1906, 128; *M. D. G.* 1905, 209.) Rosaceae. H. Leaves narrower than in the type, with a narrow white margin. (E. Beterams, Geldern, Germany.) [=*Prunus communis*, Huds. var.]

Pseudotsuga Douglasii f. Fretsii. (*M. D. G.* 1905, 74, t. 8.) Coniferae. H. A compact pyramidal plant with vigorous branches and terminal shoot. Leaves very much shortened, ⅓–½ in. long, 1 lin. broad, rounded at the apex. It was included in the list of 1904 under the name of *Pseudotsuga Fretsi*. (C. Frets & Sons, Boskoop, Holland.)

Pseudotsuga Douglasii f. globosa. (*M. D. G.* 1905, 75, t. 9.) H. In this form the plant assumes a regular loose spherical shape. (C. Luz & Son, Stuttgart.)

Pyrenacantha malvifolia. (*Gartenwelt*, x. 353, ff.) Olacaceae. S. A climbing plant with a fleshy root-stock more than a yard across. Stems slender, 6–10 ft. long. Leaves deeply 3-lobed, 6 in. long, 5 in. broad. Flowers small, unisexual, the male crowded on a cylindric spadix 1¼–1¾ in. long, the female on the end of shoots about 8 in. long. Fruits crowded, orange-red, about ⅔ in. long. East Tropical Africa. (Berlin B. G.)

Quekettia Jenmani. (*G. C.* 1906, xxxix. 394; *O. R.* 1906, 211.) Orchidaceae. S. A tufted little plant, with hard narrow leaves about 2 in. long, and very slender panicles of numerous small whitish flowers. British Guiana. (Sir Trevor Lawrence.)

Quercus rubra bullosa. (*M. D. G.* 1905, 209.) Cupuliferae. H. Leaves narrow, 5–6 in. long, only about ½ in. broad, thickened, leathery, often twisted and blistered, dark green, with yellow ribs. (C. Gebbers, senr., Wiesenburg, Germany.)

***Ramondia leucopetala, R. peregrina, & R. quercifolia.** (*G. C.* 1906, xl. p. 28.) Gesneraceae. H. Apparently only forms of *R. pyrenaica*. (S. Arnott.)

***Renanthera annamensis.** (*K. B.* 1906, 377.) Orchidaceae. S. Resembles *R. Imschootiana*, but the flowers are only half the size, and the yellow sepals, as well as the spur and base of the petals, are much spotted with crimson. The lobes of the lip and apex of the petals are deep crimson. Column yellow, striped with crimson. Annam. (F. Sander & Sons; Kew.)

***Rhipsalis Wercklei.** (*M. K.* 1906, 64.) Cactaceae. G. An epiphytic plant freely branched, forming dense drooping fascicles, altogether 3¼–5 ft. long; basal branches divaricate, triangular; apical flattened, 2-edged, often in twos or threes, 6–8 in. long, ½–¾ in. broad; margins straight, scarcely sinuate at the small unarmed areolae. Flowers small; segments elliptic-lanceolate, 2 sepaloid, 4 cream-white. Costa Rica. (Sir T. Hanbury, La Mortola.)

Rhododendron Annae. (*R. H.* 1906, 318.) Ericaceae. H. A very distinct species, with lanceolate coriaceous leaves and medium-sized white flowers. The corolla is remarkable in being flat and disk-like. Western China. (M. de Vilmorin, Les Barres, France.)

Rhododendron Augustinii. (*R. H.* 1906, 273.) H. A shrub 4–10 ft. high. Leaves lanceolate, 1½–4 in. long. Flowers about 2½ in. across, varying in colour from white to pink and pale purple. Lobes of the corolla undulate. Central and Western China. (M. L. de Vilmorin, Les Barres, France; J. Veitch & Sons.) [See *Flora and Sylva*, 1905, 162, t.]

Ribes bracteosum flore fusco. (*Gfl.* 1906, 162, f. 15.) Saxifragaceae. H. A form with smaller bracts and brownish flowers. (L. Späth, Berlin.)

***Ribes cruentum.** (*B. M.* t. 8105.) Saxifragaceae. H. A species of the section *Grossularia*. It is a dwarf straggling bush, with spiny branches. Leaves suborbicular, 3- or 5-lobed. Flowers solitary, crimson, the calyx-segments long and reflexed. Berries subglobose, about ⅜ in. in diam., dull red, covered with long slender straight spines. Western United States. (Kew.)

***Ribes viburnifolium.** (*B. M.* t. 8094.) H. A very distinct evergreen species, freely resin-dotted. Leaves ovate-orbicular, leathery, shining, ¾–1¾ in. long, shortly toothed, rounded at the base. Flowers small, rosy, with a short calyx-tube. Berries red, ellipsoid, persistent. Lower California and Santa Catalina Island. (Kew.)

Rodgersia sambucifolia. (*G. C.* 1906, xxxix. 115.) Saxifragaceae. H. A. new species distinguished from those previously described by having truly pinnate leaves with 9 or 11 leaflets. A herb 2–3 ft. high, very sparingly hirsute. Cauline leaves 1 or 2, long-stalked, 1–2 ft. long including the petiole; leaflets subsessile, oblong-lanceolate, 4–6 in. long. Flowers inconspicuous, in a cymose-paniculate inflorescence about 3 in. long. Western China. (J. Veitch & Sons.)

***Rosmarinus officinalis prostratus.** (G. C. 1906, xxxix. 381, 423.) Labiatae. H. Distinguished from the type by its prostrate habit. Mediterranean Region. (S. Arnott; Edinburgh B. G.)

Rudbeckia fulgida variabilis. (*R. H.* 1906, 120, f. 60.) Compositae. H. A very floriferous plant about a yard high, having numerous rigid stems bearing flower-heads with yellow and brown ray-florets and dark purple disk-florets. (Cayeux & Le Clerc, Paris.)

***Saccolabium rubescens.** (*K. B.* 1906, 114.) Orchidaceae. S. Stem erect, robust, about 10 in. high. Leaves oblong, 4½–6 in. long, very shortly two-lobed. Scapes suberect. Racemes 3–4 in. long, many-flowered. Flowers uniformly light rose-purple. Sepals and petals scarcely 2 lin. long. Lip 3-lobed. Spur straight or incurved, scarcely ½ in. long. Annam. (F. Sander & Sons.)

***Saponaria bellidifolia,** (*G. C.* 1906, xxxix. 237.) Caryophyllaceae. H. A handsome perennial about 6 in. high, forming tufts of long Daisy-like leaves, and bearing heads of yellow flowers surrounded by an involucre. Central Europe to Greece. (Kew.)

Saponaria depressa. (*G. C.* 1906, xxxix. 237.) H. A perennial having tufted spathulate leaves and heads of rather large purplish flowers. Sicily. (Kew.)

***Saponaria pulvinaris.** (*G. C.* 1906. xxxix. 237.) H. A small tufted perennial not unlike *Silene acaulis*. Its flowers are rather small, bright rose-coloured, borne on very short stems. Asia Minor and Syria. (Kew.)

***Saponaria Sundermanni.** (*G. C.* xxxix. 237.) H. Closely resembles *S. bellidifolia*, but it is more floriferous, and the flowers are somewhat larger. (Kew.)

***Saponaria Weinmanni.** (*G. C.* 1906, xxxix 237.) H. Closely allied to *S. caespitosa* and possibly only a form of that species. It differs in having paler purple flowers with a shorter calyx. (Kew.)

Sarcanthus inflatus. (*K. B.* 1906, 115.) Orchidaceae. S. Differs from all the other known species in the inflated spur, which is much longer than the segments of the lip. Sepals and petals green, with 2 dark brown stripes. Front lobe of the lip light yellow, and the side lobes white, with a purple stain on the side next the column. Annam. (F. Sander & Sons, Glasnevin B. G.)

Saxifraga oppositifolia var. **coccinea.** (*G. C.* 1906, xxxix. 253) Saxifragaceae. H. The flowers are of a richer shade of purple than those of the type. (J. Backhouse & Son.)

Schizanthus retusus trimaculatus. (*R. H. B.* 1906, 61, f. 23.) Solanaceae. G. Flowers purple-crimson, with three distinct golden-yellow spots bordered with bright purple. (Haage & Schmidt, Erfurt.)

Scilla bifolia ruberrima. (*G. C.* 1906, xxxix. 165.) Liliaceae. H. One of the earliest-flowering forms, with the flowers much brighter in the bud than those of the type; they open rather red than blue. The leaves are chocolate-coloured. (S. Arnott.)

Scilla bifolia splendens. (*G. M.* 1906, 224.) H. A form with intense cobalt blue flowers. (M. Leichtlin, Baden-Baden ; S. Arnott.)

Scilla sibirica amoenula. (*G. C.* 1906, xxxix. 235.) H. Dwarfer than the type, and the brighter blue flowers are produced earlier in the year. (S. Arnott.) [Syn. *S. amoenula*, Hornem.]

Senecio Faberi. (*G. C.* 1906, xl. 43.) Compositae. H. A robust fleshy coarse herb growing in clumps, 4–5 ft. high, glabrous or glabrescent. Stems many-angled, hollow. Leaves pinnatifid, coarsely toothed, similar to those of the sow-thistle, the radical ones up to 2 ft. long. Inflorescence a dense compound flat-topped corymb, 6-8 in. across. Flower-heads very numerous, small, deep yellow, with 3–5 ray, and 8–12 disk-florets. Western China. (J. Veitch & Sons.)

Sonerila laeta. (*K. B.* 1906, 73.) Melastomaceae. G. A new species allied to *S. maculata* from which it differs in having a very slender and short dense indumentum, an entirely terete stem, and the margins of the leaves destitute of cilia. The leaves are deep green above, with white spots, and purple beneath, with green spots. South China. (J. Veitch & Sons.)

Spathoglottis Colmanii. (*O. R.* 1906, 80.) Orchidaceae. S. A garden hybrid between *S. aurea* var. and *S. aureo-Vieillardii*. (J. Colman.)

***Stachys citrina.** (*G. C.* 1906, xl. 23.) Labiatae. H. Plant about 1 ft. high, with white woolly leaves, and sulphur-yellow flowers in whorls. Asia Minor. (Kew.)

Stapelia Engleriana. (*M. K.* 1906, 176.) Asclepiadaceae. S. Stems 4-angled, finely pubescent, with small spreading teeth. Flowers solitary, rather long-stalked, dark brown. Corolla-lobes triangular, sharply recurved, about ½-in. long, undulate-rugose on the upper side, ciliate on the margins. Probably East Tropical Africa. (Berlin B.G.) [See *Engler, Bot. Jahrb.* xxxviii. 49, f. 8.]

***Stokesia cyanea praecox.** (*G. C.* 1906, xl. 97 ; *G. M.* 1906, 563, 564, f.) Compositae. H. H. An early-flowering variety. (A. Perry ; R. Wallace & Co.)

Syringa pinnatifolia. (*G. C.* 1906, xxxix. 68.) Oleaceae. H. A new species resembling *S. persica* var. *laciniata*. It is an elegant bush, 6–8 ft. high, with distinctly pinnate leaves, and white flowers about ½ in. long. Western China. (J. Veitch & Sons.)

Tainia Fuerstenbergiana. (*Orch.* i. 4.) Orchidaceae. S. A new species nearly allied to *T. penangiana*. A tall plant with ovoid pseudobulbs about 2 in long, each bearing 1 leaf. Leaf erect, stalked, lanceolate, about 2 ft. long. Scape slender, erect, 2½–3 ft. long, bearing a lax 10–15-flowered raceme. Flowers about 2 in. across, with oblong-ligulate sepals and petals and an oblong 3-lobed lip, resembling those of *T. penangiana*. Native country unknown. (Baron von Fuerstenberg, Schloss Hugenpoet, near Mintard, Germany.)

***Tecoma Brycei.** (*G. C.* 1906, xxxix. 344, f.) Bignoniaceae. G. A handsome quick-growing plant, with dense masses of light green pinnate leaves, and very large panicles of rich rose-crimson flowers as large as those of *T. grandiflora*, and delicately scented. Mashonaland. (Dr. F. Franceschi, Santa Barbara, California. [Syn. *T. Reginae-Sabae*, Franceschi.]

Thunia Marshalliana alba. (*O. R.* 1906, 214 ; *Gard.* 1906, lxix. June 30, vi.) Orchidaceae. S. Flowers white with a sulphur-yellow disk to the lip. (Sir Trevor Lawrence.)

Trachycarpus Takil. (*B. T. O.* 1906, 105, ff. 9–13.) Palmae. G. or H.H. A new species closely resembling *T. Martiana*. It has a tall stout stem which rises obliquely from the base and afterwards becomes erect, covered with a fibrous network, which is almost destitute of free pannose filaments. Leaves all persistent, the lower marcescent, deeply divided into 45–50 bifid sword-shaped segments. Western Himalayas. [See *Beccari in Webbia*, 52.]

Trigonidium subrepens. (*K. B.* 1906. 377.) Orchidaceae. S. Allied to *T. tenue* from which it differs in having larger pseudobulbs, and broader leaves and sepals. The latter are greenish-yellow, faintly lined with brown. Petals whitish, with 3 brown lines and a brown blotch at the apex. Lip greenish-yellow, with brown veins on the side lobes. Native country unknown. (F. Sander & Sons ; H. Low & Co.)

Tritonia bracteata. (*G.C.* 1906, xxxix. 2.) Iridaceae. An inconspicuous little plant with a flexuose much-branched scape bearing 30 to 40 scentless tawny-red flowers, which open singly or in pairs, and large foliose bracts. Flowers irregular, about 1 in. across; outer segments ¼ in. broad; inner segments ⅛ in. broad, recurved. South Africa. (A. Worsley.)

***Tsuga yunnanensis.** (*G.C.* 1906, xxxix. 236, f. 93.) Coniferae. H. "Readily distinguishable from its near allies by its spreading branches, its entire not ciliated leaves, its sessile horizontally spreading subglobose and relatively large cones." South-western to Central China. (J. Veitch & Sons.) [Syn. *Abies yunnanensis*, Franch.]

Tulipa Greigi alba. (*G.C.* 1906, xxxix. 285.) Liliaceae. H. A form in which the perianth segments are white on the margin. (C. G. van Tubergen, Haarlem.)

Ulmus cornubiensis Dicksoni. (*Gard.* 1906, lxx. July 14, vi.) Urticaceae. H. A golden-leaved form of *U. glabra* var. *cornubiensis*. (Dicksons, Chester.)

***Viburnum Opulus aureum.** (*Gfl.* 1906, 322.) Caprifoliaceae. H. A pretty form with golden-yellow leaves.

***Wistaria multijuga rosea.** (*Gard.* 1906, lxix. 282, 289.) Leguminosae. H. A variety with rose-coloured flowers. (L. Chenault, Orleans; W. E. Gumbleton.)

Xantedeschia Rehmanni coccinea. (*Gfl.* 1906, 337, t. 1552.) Araceae. G. Raised from seed of the variety *violacea*. It has a compact habit of growth and scarlet-red spathes. (C. Sprenger, Naples.) [*Richardia Rehmanni* var.]

***Xanthosoma cordatum.** (*K. B.* 1906, 7.) Araceae. S. A new species allied to *X. blandum*. Leaves glabrous; petiole 2 ft. long or more; blade cordate, up to 1¾ ft. long, 1¼ ft. broad, acute, with the basal lobes semi-orbicular. Tube of the spathe subglobose, 1¾ in. across, green; blade 6 in. long, acuminate, yellow-green outside, rose-tinted at the base, whitish inside. British Guiana. (Kew.)

Xylobium brachystachyum. (*G. C.* 1906, xl. 302.) Orchidaceae. S. A new species chiefly of botanical interest. The bulbs, leaves and habit of growth are like those of a *Stanhopea*. Flowers few, in a very short raceme, about 1¼ in. across, purplish outside. Dorsal sepal broadly ovate-oblong, smaller than the lateral. Petals oblong, a quarter smaller than the sepals, yellowish, with sordid purple spots. Lip simple, obovate-oblong. South Brazil. (W. Hennis, Hildesheim, Germany.)

***Yucca nitida.** (*G. C.* 1906, xxxix. 154, f. 61; *Gard.* 1906, lxix. 161, f.) Liliaceae. G. Not specifically distinct from *Y. Whipplei*. (Kew.)

Yucca. (B. T. O. 1906, 45–49, 70–72, 131–134, 225–230.) Liliaceae. H. The following garden hybrids are enumerated: *Alexandrae* (filamentosa × aloifolia), *Arnottiana* (flaccida var. × gloriosa), *chinensis* (filamentosa × gloriosa), *coelestis* (flaccida var. × recurvifolia), *colombiana* (flaccida var. × gloriosa), *Elvesiana* (treculeana var. × recurvifolia), *Engelmanni* (filamentosa × gloriosa), *ensata* (filamentosa × gloriosa), *exsultans* (filamentosa × recurvifolia), *floribunda* (filamentosa × gloriosa), *Fosteriana* (Treculeana var. × recurvifolia), *Imperator* (filamentosa × recurvifolia), *Koelleana* (flaccida × recurvifolia), *lanceolata* (filamentosa × recurvifolia), *Lawrenceana* (Treculeana var. × recurvifolia), *lilacea* (filamentosa × rupestris), *margaritacea* (filamentosa × gloriosa), *Mariae* (flaccida × aloifolia), *praecox* (filamentosa × gloriosa), *princeps* (filamentosa × recurvifolia), *robusta* (filamentosa × gloriosa), *Sieheana* (aloifolia × flexilis), *smaragdina* (aloifolia × rupestris), *vomerensis* (aloifolia × pendulifolia). (C. Sprenger, Naples.)

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1907.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. D. Prain, I.M.S., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A.
Assistant (Office) - - -	*John Aikman.
" " - - -	*William Nicholls Winn.

Keeper of Herbarium and Library	*William Botting Hemsley, F.R.S., F.L.S.
Principal Assistant (Phanerogams)	Otto Stapf, Ph.D., F.L.S.
" " (Cryptogams) -	George Massee, F.L.S.
Assistant (Herbarium) - -	Nicholas Edward Brown, A.L.S.
" " - -	*Robert Allen Rolfe, A.L.S.
" " - -	Charles Henry Wright, A.L.S.
" " - -	*Sidney Alfred Skan.
" " - -	Thomas Archibald Sprague, B.Sc., F.L.S.
" " - -	Arthur Disbrowe Cotton, F.L.S.
" for India - - -	J. F. Duthie, B.A., F.L.S.

Assistant (Jodrell Laboratory) - Leonard Alfred Boodle, F.L.S.

1375 Wt 87 10/07 D & S 29 30093

Royal Botanic Gardens, Kew—*continued.*

Keeper of Museums - - -	John Masters Hillier.
Assistant (Museums) - - -	*John H. Holland, F.L.S.
Preparer - - - - -	George Badderly.

Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Arboretum - - - -	*William Dallimore.
Greenhouse and Ornamental Department.	*Arthur Osborn.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - - -	*George Dear.

Cambridge.—University Botanical Department :—

Professor - - -	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	R. H. Lock, M.A.
Curator, University Museum.	E. R. Burdon, M.A.
Curator of Garden -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - -	Frederick W. Moore, A.L.S.
Assistant - - -	*C. F. Ball.

Trinity College Botanic Gardens :—

Professor - - -	H. H. Dixon, Sc.D.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	Isaac Bayley Balfour, M.D., Sc.D., F.R.S., F.L.S.
Assistant (Museum) -	H. F. Tagg, F.L.S.
,, (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	James Whitton.

Liverpool.—University Botanical Department :—

Professor - - -	R. J. Harvey Gibson, M.A., F.L.S.

Institute of Commercial Research in the Tropics (Public Museums) :—

Director - - -	Viscount Mountmorres.

Oxford.—University Botanic Garden :—

Professor - - -	SydneyH.Vines,M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	*William Baker.

AFRICA.

British East Africa Protectorate.—

Nairobi	-	Director of Agriculture.	——
		Assistant - - -	*Henry Powell.
		Conservator of Forests	D. E. Hutchins.

Cape Colony.—

Cape Town	-	Hon. Curator, Government Herbarium.	Prof. Pearson, M.A., F.L S.
		Conservator of Forests	J. S. Lister.

Gardens and Public Parks :—

Superintendent - -	H. J. Chalwin.

Grahamstown.—Albany Museum :—

Director - - -	S. Schönland, Ph.D., F.L.S.

Gardens and Public Parks :—

	Curator - - -	Edwin Tidmarsh.
Port Elizabeth -	Superintendent - -	John T. Butters.
King Williamstown.	Curator - - -	George Lockie.
Graaff-Reinet -	„ - - -	*C. J. Howlett.
Uitenhage -	„ - -	H. Fairey.

Egypt.—

Cairo.—Khedivial Agricultural Society :—

Secretary - - -	G. P. Foaden, B.Sc.

Gold Coast.—Botanic and Agricultural Department :—

	Director of Agriculture.	——
Aburi - -	Curator - -	- *Alfred E. Evans.
Tarkwa - -	,, - -	- *James Anderson.
Kumasi (Ashanti)	,, - -	- *K. G. Burbridge.

Natal.—Botanic Gardens :—

Durban - -	Director - -	- John Medley Wood, A.L.S.
	Curator - -	- *James Wylie.
Pietermaritzburg	Curator - -	- *Alexander Hislop.
	Conservator of Forests -	- *T. R. Sim, F.L.S.

Northern Nigeria.—

Conservator of Forests *W. R. Elliott.

Nyasaland Protectorate.—

Forestry and Botanical Department :—

Zomba - -	Head of Department -	*J. M. Purves.
	Forester - -	- *E. W. Davy.

Orange River Colony.—Department of Agriculture :—

Chief of Forestry Division. K. A. Carlson.

Rhodesia.—

Bulawayo.—Rhodes Matopo Park :—

Curator - - - W. E. Dowsett.

Victoria Falls.—

Conservator of Forests *C. E. F. Allen.

Sierra Leone.—Botanic Station :—

Curator - - - *C. W. Smythe.

Soudan.—

Khartoum -	Director of Woods and Forests.	A. F. Broun.
	Superintendent of Palace Gardens.	*F. S. Sillitoe.

Southern Nigeria.—Botanic Garden :—

Old Calabar -	Curator - -	- *William Don.
Onitsha -	,, - -	- *H. Dodd.
Lagos - -	,, - -	- *J. L. Williams.
	Assistant - -	- *T. B. Dawodu.
	Conservator of Forests -	- H. N. Thompson.

Transvaal.—Department of Agriculture :—

Pretoria - -	Botanist - - -	J. Burtt Davy, F.L.S.
	Mycologist - -	†I. B. Pole Evans, B.Sc.

Uganda.—Scientific and Forestry Department :—

Entebbe - -	Director - - -	*M. T. Dawe.
	Assistant - - -	*Ernest Brown.

Zanzibar - -	Director of Agriculture	R. N. Lyne, F.L.S.

Dunga Experimental Station :—

Superintendent -	W. Buzzacott.

AUSTRALIA.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.

Technological Museum :—

Curator - - -	R. T. Baker, F.L.S.

Queensland.—

Brisbane - -	Colonial Botanist -	F. M. Bailey, F.L.S.

Botanic Gardens :—

Director - - -	J. F. Bailey.

Acclimatisation Society's Gardens :—

Secretary - - -	H. J. Johnson.
Overseer - - -	James Mitchell.

Forest Department :—

Director - - -	*Philip MacMahon.

Cairns.—Kamerunga State Nursery :—

Manager - - -	Howard Newport.
Overseer - - -	J. G. Malcolm.

Rockhampton -	Superintendent - -	R. Simmons.

South Australia.—Botanic Gardens :—

Adelaide - -	Director - - -	Maurice Holtze, Ph.D., F.L.S.
Port Darwin -	Curator - - -	Nicholas Holtze.

Woods and Forests :—

Conservator - -	Walter Gill, F.L.S.

Tasmania.—

Hobart Town -	Government Botanist	Leonard Rodway.
	Chief Forests Officer -	J. C. Penny.
	Botanic Gardens :—	
	Director - - -	Alex. Morton.

Victoria.—Botanic Gardens :—

Melbourne -	Director - - -	W. R. Guilfoyle.
	National Herbarium :—	
	Government Botanist -	A. J. Ewart, D.Sc., Ph.D., F.L.S.
	Acting Conservator of Forests -	A. W. Crooke.

BERMUDA.

Botanic Station :—

Superintendent - - - -	*Thomas J. Harris.

BRITISH HONDURAS.

Botanic Station :—

Curator - - - - - -	Eugene Campbell.

CANADA.

Ottawa - -	Dominion Botanist -	Prof. John Macoun, M.A., F.R.S.C.
	Assistant ,,	Jas. M. Macoun.
	Director of Government Experimental Farms.	Prof. Wm. Saunders, C. M. G., LL.D., F.R.S.C., F.L.S.
	Director's Assistant and Superintendent of Botanic Garden.	W. T. Macoun.
	Botanist and Entomologist.	James Fletcher, F.R.S.C., F.L.S.
Montreal -	Professor of Botany, McGill University.	Prof. D. P. Penhallow B.Sc., F.R.S.C.

CEYLON.

Peradeniya.—Royal Botanic Gardens :—

Director - - - - - -	†John C. Willis, Sc.D., F.L.S.
Government Mycologist - -	†T. Petch, B.A., B.Sc.
Scientific Assistant - - -	A. M. Smith, B.A.
Controller, Experiment Station -	——
Curator - - - - - -	*Hugh F. Macmillan, F.L.S.
Superintendent of School Gardens -	C. Drieberg, B.A.

Hakgala - -	Curator - - -	J. K. Nock.
Heneratgoda -	Conductor - -	H. W. Perera.

Maha-iluppalama.—Experiment Station :—

	Superintendent - - C. J. C. Mee.
Nuwara Eliya -	Conductor - - D. Michael.
Conservator of Forests - - -	T. J. Campbell.

CYPRUS.

Principal Forest Officer - -	A. K. Bovill.
Director of Agriculture - -	D. Saracomenos.

FALKLAND ISLANDS.

Government House Garden :—

Head Gardener - - - - - *Albert Linney.

FIJI.

Superintendent of Agriculture - - Charles H. Knowles.

Botanic Station :—

Curator - - - - - - *Daniel Yeoward.

HONG KONG.

Botanic and Afforestation Department :—

Superintendent - - -	*S. T. Dunn, B.A., F.L.S.
Assistant Superintendent - -	*W. J. Tutcher, F.L.S.

MALTA.

Argotti Botanic Garden :—
Director - - - - - - Dr. Francesco Debono.

MAURITIUS.

Pamplemousses.—Department of Forests and Botanic Gardens :—

Director	- - - - - -	——
1st Assistant	- - - - -	Paul Koenig.
2nd „	- - - - -	S. E. Pougnet.
Curepipe - -	Overseer - - -	F. Bijoux.
Reduit - -	„ - - -	W. A. Kennedy.
Forest Officer	- - - - -	F. Gleadow.

NEW ZEALAND.

Wellington.—Department of Agriculture :—

Biologist	- - - -	T. W. Kirk.
State Forest Department :—		
Chief Forester	- - -	Henry John Matthews.
Colonial Botanic Garden :—		
Head Gardener	- - -	——
Dunedin - -	Superintendent - -	*D. Tannock.
Napier - -	„ - -	W. Barton.
Invercargill -	Head Gardener - -	——
Auckland -	Ranger - - -	William Goldie.
Christchurch -	Head Gardener - -	*Ambrose Taylor.

SEYCHELLES.

Botanic Station :—
Curator - - - - - - R. Dupont.

STRAITS SETTLEMENTS.

Straits Settlements.—Botanic Gardens :—

Singapore -	Director - - -	†H. N. Ridley, M.A., F.R.S., F.L.S.
	Assistant Superintendent.	*R. Derry.
Penang - -	Superintendent - -	*Walter Fox.

Federated Malay States.—Forest Department :—

Chief Forest Officer -	A. M. Burn-Murdoch.

Kuala Lumpur.—Agricultural Department :—

Director of Agriculture.	J. B. Carruthers, F.L.S.
Mycologist - -	†W. J. Gallagher.

Experimental Plantations :—

Superintendent -	*T. W. Main.

Perak (Taiping).—Government Gardens and Plantations :—

Superintendent - -	*J. W. Campbell.

WEST INDIES.

Imperial Department of Agriculture :—

Barbados - -	Commissioner - -	Sir Daniel Morris, K.C.M.G., D.Sc., D.C.L., M.A., F.L.S.
	Scientific Assistant -	Walter Biffen, B.Sc.
	Mycologist and Agricultural Lecturer.	†F. A. Stockdale, B.A.
Antigua.—Superintendent of Agriculture for the Leeward Islands.		Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.

Botanic Station :—

Curator - - -	*T. Jackson.

Barbados.—Botanic Station :—

Superintendent -	John R. Bovell, F.L.S., F.C.S.
Assistant Superintendent.	C. T. Murphy.

Dominica.—Botanic Station :—

Curator - - -	*Joseph Jones.

Agricultural School :—

Officer in Charge -	*Archibald Brooks.

Grenada.—Botanic Garden :—

Agricultural Superintendent.	R. D. Anstead, B.A.

Montserrat.—Botanic Station :—

Curator - - -	*W. Robson.

St. Kitts-Nevis.—Botanic Station :—

Agricultural Superintendent.	F. R. Shepherd.

St. Lucia.—Botanic Station :—

	Agricultural Superintendent.	*John Chisnall Moore.

St. Vincent.—Botanic Station :—

	Curator - - -	*W. N. Sands.
	Agricultural School :—	
	Officer in Charge -	*W. H. Patterson.

Virgin Islands.—

	Agricultural Instructor.	*W. C. Fishlock.

Bahamas.—Botanic Station :—

	Curator - - -	W. M. Cunningham.

British Guiana.—Botanic Gardens :—

Georgetown -	Superintendent - - -	A. W. Bartlett, B.A., B.Sc., F.L.S.
	Head Gardener -	†John F. Waby, F.L.S.
	Assistant Gardener -	——
	Agricultural Assistant	*Robert Ward.
Berbice - -	Keeper - - -	J. Nardamoonie.

Jamaica.—Department of Public Gardens and Plantations :—

	Director - - -	†William Fawcett, B.Sc., F.L.S.
	Travelling Instructor	*William Cradwick.
	,, ,,	James Briscoe.
Hope Gardens and Experiment Station, Hill Gardens, and Castleton Gardens.	Superintendent -	*William Harris, F.L.S.
Castleton Gardens	Assistant Superintendent.	John Campbell.
Hope Gardens and Experiment Station.	Assistant Superintendent.	*William J. Down.
Kingston Parade Garden.	Superintendent - -	James Briscoe.
King's House Garden.	,, - -	*William J. Thompson.

Tobago.—Botanic Station :—

Curator - - - - -	*Henry Millen.

Trinidad.—Botanic and Agricultural Department :—

Superintendent -	†John H. Hart, F.L.S.
Assistant Superintendent.	*F. Evans.
Agricultural Instructor.	——
,, ,,	H. A. Nurse.
Curator, Government House Gardens.	——

Forest Officer - - - - C. S. Rogers.

INDIA.

Botanical Survey of India :—

Director - - - - - Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Officers associated with Survey :—

Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.	Superintendent, Royal Botanic Garden, Calcutta.
G. A. Gammie, F.L.S. - - -	Economic Botanist, Bombay.
†C. A. Barber, M.A., F.L.S. - -	Government Botanist, Madras.
†H. M. Leake, M.A., F.L.S. - -	Economic Botanist, United Provinces.

Departments of Agriculture, Botanical Officers attached to :—

Imperial Agricultural Research Institute, Pusa, Bengal :—

Mycologist - - -	†E. J. Butler, M.B., F.L.S.
Economic Botanist -	A. Howard, M.A., F.L.S.
Supernumerary Botanist	†R. J. D. Graham, M.A., B.Sc.

Bombay Agricultural College, Poona :—

Economic Botanist - - G. A. Gammie, F.L.S.

Madras Agricultural Department :—

Government Botanist - †C. A. Barber, M.A., F.L.S.

Cawnpur Agricultural College :—

Economic Botanist - - †H. M. Leake, M.A., F.L.S.

Department of Economic Products :—

Reporter on Economic Products to the Government of India (officiating).	*I. H. Burkill, M.A., F.L.S.,Superintendent, Industrial Section, Indian Museum, Calcutta.

BENGAL.

Calcutta.—Royal Botanic Garden :—

Superintendent - - - -	Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator of Herbarium - - -	†W. W. Smith, M.A.
Curator of Garden - - -	*G. T. Lane.
Assistant Curator - - - -	*R. Badgery.
" " - - - -	*E. G. Stroud.
Probationer - - - - -	*F. H. Butcher.

Agri-Horticultural Society of India :—

Secretary - - - - -	F. Abbott.
Superintendent - - - -	*J. H. Stephen.

Darjeeling.—Lloyd Botanic Garden :—

Superintendent - - - -	Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator - - - - - -	*G. H. Cave.

Cinchona Department.—

Superintendent of Cinchona Cultivation and Government Quinologist.	Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Mungpoo Plantation :—

Assistant Superintendent - -	*R. Pantling.
1st Assistant - - - - -	*W. A. Kennedy.
2nd " - - - - -	*P. T. Russell.

Munsong Plantation :—

Assistant Superintendent - -	*J. Parkes.
1st Assistant - - - - -	*H. F. Green.

BOMBAY.

Bombay City.—Municipal Garden :—

Superintendent - - - - C. D. Mahaluxmivala.

Ghorpuri.—Botanic Garden :—

Superintendent - - - - P. G. Kanetkar.

Poona.—Government Gardens :—

Superintendent - - - - *E. Little.

CENTRAL PROVINCES.

Nagpur.—Public Gardens :—

Superintendent - - - - *J. E. Leslie.

MADRAS.

Madras City.—Agri-Horticultural Society :—

Hon. Secretary - - - - L. E. Kirwan.
Superintendent - - - - *B. Cavanagh.

Ootacamund.—Government Gardens and Parks :—

Curator - - - - - *R. L. Proudlock.

Cinchona Department.—

Director of Cinchona Plantations - W. M. Standen.
Superintendent, Dodabetta Planta- H. V. Ryan.
tion.
Superintendent, Nedivattam and E. Collins.
Hooker Plantations.

PUNJAB.

Delhi.—Historic and other Gardens :—

Superintendent - - - - *R. H. Locke.

Lahore.—Government Gardens :—

Superintendent - - - - *W. R. Mustoe.

Agri-Horticultural Gardens :—

Superintendent - - - - *W. R. Brown.

Simla.—Vice-regal Estate Gardens :—

Superintendent - - - - *Ernest Long.

UNITED PROVINCES OF AGRA AND OUDH.

Agra.—*Taj and other Gardens* :—

Superintendent - - - - *A. E. P. Griessen.

Allahabad.—*Government Gardens* :—

Superintendent - - - - *Norman Gill.

Cawnpur.—Memorial and other Gardens :—

Superintendent - - - - *J. T. Johnson.

Fyzabad.—Fyzabad Park and Gardens :—

Superintendent - - - - *A. E. Brown.

Lucknow.—Horticultural Gardens :—

Superintendent - - - - *H. J. Davies.
Probationer - - - - - *W. Head.

Saharanpur.—Government Botanic Gardens :—

Superintendent - - - - *A. C. Hartless.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX V.—1907.

LIST OF KEW PUBLICATIONS, 1896-1906.

In the *Kew Bulletin* for 1897 a list was given of publications, by members of the Kew staff or by other botanists working at Kew, which appeared during the period from the first devotion of the Royal Botanic Gardens to public use in 1841 till the close of the year 1895. That list, compiled with much care by Mr. B. Daydon Jackson, takes the form of a chronological catalogue. It has proved so useful that it seems desirable to bring the subject matter up to date.

In the *Kew Bulletin* for 1905 will be found a select list of works prepared at Kew either by members of the staff or by other botanists working there. In order to minimise as far as possible the risk of repeating information already easily accessible, it has therefore been considered advisable to restrict the entries contained in the present list to works or articles written by those who are and have been actually members of the staff.

As in the case of the list issued in 1897, it is not contended that every contribution has been catalogued ; it has indeed been decided to exclude, as a rule, articles of merely ephemeral interest. Some articles which might have found a place may therefore have been omitted ; on the other hand, it may quite legitimately be judged, by some who consult the list, that certain articles given here might have been left out. In doubtful cases, it may be stated, an article has received the benefit of the doubt ; it is therefore hoped that errors of judgment of the former kind may prove to be less numerous than those of the latter.

The chronological method of arrangement, so valuable as to be practically essential in a catalogue covering a period so prolonged as that dealt with in the list drawn up by Mr. Daydon Jackson, is less necessary when what is little more than a decade is passed

1375 Wt 87 12/07 D & S 29 30253

under review. It has therefore been possible to make use in the present list of the convenient system of classification by authors, under whose names are catalogued (i.) separate works, (ii.) contributions to separate works, and (iii.) articles in scientific and technical journals, given in each case in chronological sequence. The practical utility of the list will, it is hoped, be found to have been considerably enhanced from the fact that in cases where authors have made themselves responsible for the proposal of previously undescribed species this is duly indicated.

BAKER, J. G.

THISELTON-DYER, FLORA CAPENSIS :—

1896. Vol. VI.

Haemodoraceae, pp. 1–7.

Iridaceae, pp. 7–171, and 529–531.

Acidanthera brevicaulis; Antholyza laxiflora, A. pulchrum; Aristea montana; Gladiolus aureus, G. erectiflorus [non Baker in *Kew Bull.* 1895, 293], G. Flanagani, G. fusco-viridis; Hesperantha subexserta; Homeria simulans; Lapeyrousia macrospatha.

Amaryllidaceae, pp. 171–246, and 531–533.

Brunsvigia natalensis, B. sphaerocarpa; Crinum acaule; Curculigo namaquensis; Cyrtanthus Elliotii, C. Flanagani, C. rectiflorus, C. stenanthus; Gethyllis pusilla; Haemanthus montanus; Hessea brachyscypha; Hypoxis brevifolia, H. Flanagani, H. Galpini, H. parvifolia, H. rubella; Nerine angustifolia, N. brachystemon.

Dioscoreaceae, pp. 246–253.

Dioscorea microcuspis, D. Rehmanni.

1896–1897. Vol. VI.

Liliaceae, pp. 253–528, and 533–536.

Albuca Baurii, A. collina, A. crinifolia, A. exuviata, A. Macowani, A. minima, A. namaquensis, A. pachychlamys, A. tortuosa; Aloe desmetiana, A. rupestris; Androcymbium natalense; Anthericum Bolusii, A. brachypodum, A. capitatum, A. chlamydophyllum, A. Galpini, A. multisetosum, A. nudicaule, A. Pappei, A. patulum, A. pilosum, A. polyphyllum, A. robustum, A. Saundersiae, A. serpentinum, A. subcontortum, A. tabulare, A. transvaalense, A. trichophlebium; Bulbine brunsvigiaefolia, B. caespitosa, B. concinna, B. flexicaulis, B. natalensis, B. parviflora; Chlorophytum delagoense, C. drepanophyllum, C. vaginatum; Dipcadi elatum, D. gracillimum, D. polyphyllum, D. Readii, D. volutum; Drimia angustifolia, D. capitata, D. chlorantha, D. neriniformis, D. sphaerocephala; Drimiopsis maxima, D. Saundersiae, D. Woodii; Eriospermum alcicorne, E. Burchellii, E. cernuum, E.

BAKER, J. G.—*continued.*

THISELTON-DYER, FLORA CAPENSIS :—

Haygarthii, E. luteo-rubrum, E. microphyllum, E. natalense, E. Schlechteri, E. tenellum, E. thyrsoideum, E. villosum ; Gasteria elongata ; Haworthia Cassytha, H. sessiliflora, H. xiphiophylla ; Kniphofia Baurii, K. Evansii, K. fibrosa, K. Galpini, K. primulina, K. Thodei ; Lachenalia Bowkeri, L. rhodantha, L. Youngii ; Massonia concinna, M. Dregei, M. Greenii, M. longipes, M. namaquensis ; Notosceptrum natalense ; Ornithogalum Baurii, O. elatum, O. Flanagani, O. Galpini, O. gracilentum, O. inandense, O. inconspicuum, O. leptophyllum, O. lineare, O. monophyllum, O. Monteiroi, O. oliganthum, O. oostachyum, O. pauciflorum, O. polyphlebium, O. Rogersii, O. Saltmarshei, O. tortuosum, O. tulbaghense, O. xanthochlorum ; Rhadamanthus cyanelloides ; Scilla Baurii, S. diphylla, S. Galpini, S. globosa, S. inandensis, S. lachenalioides, S. Leichtlinii, S. leptophylla, S. megaphylla, S. Nelsoni, S. oostachys, S. Rogersii, S. sphaerocephala, S. Tysoni ; Tulbaghia leucantha ; Urginea Burkei, U. delagoensis, U. Dregei, U. echinostachya, U. Forsteri, U. kniphofioides, U. lilacina, U. multisetosa, U. natalensis, U. riparia, U. rubella, U. tenella.

1897. Vol. VII., Sect. 1.

Juncaceae, pp. 16–28.

1904. Vol IV., Sect. 2.

Convolvulaceae, pp. 45–87.

(With C. H. Wright.)

Cuscuta Gerrardii, C. natalensis ; Falkia dichondroides ; Ipomoea Atherstonei, I. petunioides, I. Saundersiana, I. tetraptera, I. undulata, I. xiphosepala.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1898. Vol. VII.

Scitamineae, pp. 293–331.

Amomum Elliotii, A. zambesiacum ; Costus lateriflorus, C. ligularis, C. nudicaulis ; Kaempferia Carsoni, K. macrosiphon ; Phrynium Benthami, P. coriscense, P. Hensii, P. holostachyum, P. inaequilaterum, P. sulphureum, P. velutinum ; Renealmia grandiflora.

Haemodoraceae, pp. 331–336.

Sansevieria Schimperi.

Iridaceae, pp. 337–376, and 575–577.

Acidanthera ukambanensis ; Aristea longifolia, A. nandiensis, A. nyikensis, A. zombensis ; Ferraria bechuanica ; Gladiolus Antunesii, G. aphanophyllus, G. macrophlebius,

BAKER, J. G.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

G. mosambicensis, G. oliganthus, G. pallidus, G. quilimanensis, G. subulatus, G. Whytei ; Lapeyrousia Monteiroi, L. porphyrosiphon ; Moraea aurantiaca, M. kitambensis, M. macrantha.

Amaryllidaceae, pp. 376–413, and 577–578.

Buphane Fischeri ; Crinum majakallense, C. Menyharthi, C. rhodanthum, C. tanganyikense, C. Stuhlmanni ; Haemanthus zambesiacus ; Hypoxis brachyandrus, H. camerooniana, H. kilimanjarica, H. Nicholsoni.

Taccaceae, p. 413.

Dioscoreaceae, pp. 414–421.

Liliaceae, pp. 421–568.

Albuca Lugardi, A. nyikensis, A. Schinzii ; Aloe concinna, A. macrosiphon, A. megalacantha, A. Menyharthi, A. otallensis, A. Rivae, A. ruspoliana, A. Schinzii, A. Stuhlmanni, A. vituensis ; Anthericum Buchanani, A. flavoviride, A. Jamesii, A. malosanum, A. matabelense, A. triphyllum, A. usseramense, A. Whytei ; Asparagus bechuanicus, A. conglomeratus, A. Lugardi, A. nudicaulis, A. shirensis ; Chlorophytum brevipes, C. brunneum, C. Carsoni, C. floribundum, C. Mannii, C. scabrum, C. Schweinfurthii, C. ukambense ; Dasystachys crassifolia, D. debilis, D. decorata, D. gracilis, D. magnum, D. platyphyllum, D. polyphylla, D. vaginatum, D. zambesiacum ; Dipcadi arenarium, D. firmifolium ; Dracaena Elliotii, D. Hanningtoni, D. phanerophlebia, D. ugandensis ; Drimia brevifolia, D. Fischeri, D. zombensis ; Drimiopsis Stuhlmanni ; Eriospermum bechuanicum, E. elatum, E. linearifolium, E. sphaerophyllum ; Iphigenia bechuanica, I. strumosa ; Littonia Lindeni ; Ornithogalum cernuum, O. gambosanum ; Scilla chlorantha, S. cordifolia, S. Hildebrandtii, S. modesta, S. setifera ; Urginea Johnstoni, U. pauciflora, U. viridula.

1900. Vol. V.

Verbenaceae, pp., 273–332, and 515–521.

Clerodendron aurantiacum, C. Barteri, C. eupatorioides, C. Greyi, C. Guerkei, C. hysteranthum, C. Kalbreyeri, C. Kirkii, C. Mannii, C. orbiculare, C. thyrsoideum, C. toxicarium, C. zambesiacum ; Lippia Burtonii, L. plicata, L. Radula ; Premna longipes, P. macrodonta, P. Milnei, P. oligotricha, P. somaliensis ; Vitex aesculifolia, V. andongensis, V. divaricata, V. diversifolia, V. golungensis, V. gomphophylla, V. grisea, V. holocalyx, V. Kirkii, V. laevigata, V. oligantha, V. oxycuspis, V. pachyphylla, V. polyantha, V. puberula, V. shirensis, V. Schweinfurthii, V. sulphurea, V. Vogelii, V. zambesiaca.

BAKER, J. G.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

Labiatae, pp. 332–502, and 521–526.

Achryospermum laterale, A. nyasanum, A. oblongifolium ; Acrocephalus centratheroides, A. dissitifolius, A. galeopsifolius, A. hyptoides, A. lippioides, A. monocephalus, A. polytrichus, A. porphyrophyllus, A. succisaefolius ; Aeolanthus conglomeratus, A. cryptanthus, A. cuneifolius, A. Medusa, A. myrianthus, A. serpiculoides ; Coleus assurgens, C. betonicoides, C. Briquetii, C. cunenensis, C. elatus, C. floribundus, C. leptophyllus, C. Mahonii, C. nyikensis, C. orbicularis, C. ruwenzoriensis, C. Schweinfurthii, C. tetensis ; Elsholtzia Carsonii ; Geniosporum discolor, G. paludosum, G. paniculatum ; Leonotis Elliotii, L. Melleri ; Leucas Carsonii, L. cephalantha, L. concinna, L. cuneifolia, L. Elliotii, L. fasciculata, L. kondowensis, L. lamioides, L. lanata, L. leucotricha, L. menthaefolia, L. microscypha, L. mollis, L. nepetoides, L. shirensis, L. stricta, L. venulosa, L. Whytei ; Moschosma urticifolium ; Nepeta petitiana ; Ocimum Buchananii, O. capitatum, O. Hanningtonii, O. Johnstonii, O. laxiflorum, O. punctatum, O. Rothii, O. thymoides, O. tortuosum ; Orthosiphon bartsioides, O. dissitifolius, O. Elliotii, O. Hildebrandtii, O. Johnstonii, O. Kirkii, O. longipes, O. malosanus, O. mombasicus, O. nyasicus, O. salagensis, O. shirensis, O. Wakefieldii ; Plectranthus biflorus, P. longensis, P. brevipes, P. Buchananii, P. chiradzulensis, P. fragilis, P. hoslundioides, P. Johnstonii, P. kondowensis, P. Lastii, P. longipes, P. mandalensis, P. manganjensis, P. Mannii, P. masukensis, P. matabelensis, P. microphyllus, P. moschosmoides, P. nyikensis, P. paniculatus, P. pauciflorus, P. porpeodon, P. pubescens, P. rupestris, P. schizophyllus, P. sphaerophyllus, P. stenophyllus, P. stenosiphon, P. triflorus, P. urticoides, P. Whytei, P. zombensis ; Pycnostachys Batesii, P. decussata, P. deflexifolia, P. Hanningtonii, P. Kirkii, P. nepetaefolia, P. oblongifolia, P. Petherickii, P. ruwenzoriensis, P. stenostachys, P. Whytei ; Salvia Hochstetteri ; Solenostemon calaminthoides, S. cymosus, S. zambesiacus.

Plantaginaceae, pp. 502–505.

1901. Vol. VIII.

Juncaceae, pp. 91–97.

1902. Vol. IV., Sect. 1.

Oleaceae, pp. 1–21.

Linociera angolensis, L. congesta, L. Johnsoni ; Olea Hochstetteri, O. somaliensis.

Salvadoraceae, pp. 21–24.

BAKER, J. G.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1903. Vol. IV., Sect. 1.

Loganiaceae, pp. 503–544.

Gaertnera rhodantha; Mostuea Batesii; Strychnos emarginata, S. malifolia, S. Marquesii, S. penduliflora.

1903–1904. Vol. IV., Sect. 1.

Gentianaceae, pp. 544–587.

(With N. E. Brown.)

1905. Vol. IV., Sect. 2.

Hydrophyllaceae, pp. 1–5.

(With N. E. Brown.)

Boraginaceae, pp. 5–62.

(With C. H. Wright.)

Cordia Johnsoni; Cynoglossum geometricum, *Baker & Wright*, C. Mannii, *Baker & Wright*; Heliotropium Vatkei; Trichodesma Bentii, *Baker & Wright*, T. hispidum, *Baker & Wright*, T. Schimperi.

1905–1906. Vol. IV., Sect. 2.

Convolvulaceae, pp. 62–206.

(With Dr. A. B. Rendle.)

1906. Vol. IV., Sect. 2.

Lentibulariaceae.

Utricularia Schweinfurthii, 482, ex Stapf.

Gesneraceae, pp. 499–512.

(With C. B. Clarke.)

Streptocarpus ruwenzoriensis.

Pterodiscus Elliotii, p. 542, P. somaliensis, p. 544.

Sesamothamnus Smithii, p. 568.

BOTANICAL MAGAZINE :—

1896, tt. 7459–60, 7465, 7477, 7488, 7500, 7505, 7511.
Agave laxifolia; Fritillaria nobilis; Haworthia xiphiophylla; Iris albopurpurea.

1897, tt. 7527, 7532, 7547, 7549, 7558, 7565, 7567, 7570.
Drimia Coleae.

1898, tt. 7580, 7592, 7597, 7604, 7606, 7623, 7627, 7631.
Crinum Woodrowi.

1899, tt. 7634, 7644, 7650, 7653, 7658.
Moraea sulphurea.

GARDENERS' CHRONICLE :—

1897. Vol. xxi., p. 214.
Galanthus cilicicus.

1898. Vol. xxiii., p. 321.
Lilium rubellum.

BAKER, J. G.—*continued.*

HOOKER'S ICONES PLANTARUM :—

1896. Vol. xxv., pt. 4, tt. 2492, 2493, 2499.
Melanophylla crenata ; Rhodocodon urgineoides ; Stenolirion Elliotii.

1897. Vol. xxvi., pt. 1, tt. 2501, 2513, 2514, 2523.
Aloe Nuttii ; Echinops bromeliaefolius ; Furcraea macrophylla.

KEW BULLETIN :—

1896.

Decades Kewenses.

Acrostichum clarenceanum ; Arthrophyllum borneense ; Asplenium Gregoriae, A. microxiphion, A. Natunae ; Bauhinia brachyscypha, B. Creaghi, B. macropoda, B. stenostachya ; Cyathea dulitensis ; Didymocarpus crenata ; Fagraea macroscypha, F. spicata ; Homalium myrianthum ; Lindsaya Natunae ; Nephrodium Everettii, N. oosorum ; Polypodium cyclobasis, P. Newtoni ; Uncaria grandifolia ; Vitex holophylla ; Xanthophyllum macrophyllum.

1897.

Diagnoses Africanae.

Achyranthes breviflora, A. Carsoni ; Acrostichum subsessile ; Aeschynomene dissitiflora, A. nyikensis, A. sparsiflora ; Albuca Adlami, A. nyikensis ; Alsophila Batesii ; Anthericum malosanum, A. Whytei ; Argyrolobium ? deflexiflorum, A. leucophyllum ; Aristea nyikensis, A. zombensis ; Athrixia stenophylla ; Belmontia divaricata ; Berlinia densiflora ; Celosia chenopodiifolia, C. cuneifolia, C. loandensis, C. minutiflora, C. nana, C. pandurata, C. semperflorens ; Chlorophytum floribundum ; Cleome epilobioides ; Crassula nyikensis, C. zombensis ; Crinum parvum ; Crotalaria argyrolobioides, C. caespitosa, C. gymnocalyx, C. Johnstoni, C. karongensis, C. leucotricha, C. nyikensis, C. oocarpa, C. pauciflora, C. pilosiflora, C. phyllostachys, C. sparsifolia, C. valida ; Cyathula Mannii, C. polycephala ; Deinbollia nyikensis ; Dicoma megacephala, D. nyikensis ; Dissotis Whytei ; Dolichos malosanus, D. shuterioides, D. trinervatus ; Dombeya tanganyikensis ; Eriosema cryptanthum ; Eugenia masukuensis ; Geissapsis drepanocephala ; Geranium vagans ; Gladiolus Johnstoni, G. masukuensis, G. nyikensis, G. stenophyllus, G. venulosus, G. Whytei ; Gymnosporia ferruginea ; Hermannia nyasica ; Hermstaedtia Welwitschii ; Hibiscus Carsoni ; Hypoxis malosana, H. nyasica, H. oligophylla ; Impatiens zombensis ; Indigofera fusco-setosa, I. karongensis, I. lonchocarpifolia, I. lupulina, I. macra, I. masukuensis, I. microcalyx, I. microscypha, I. nyikensis, I. patula ;

BAKER, J. G.—*continued.*

KEW BULLETIN :—

Lathyrus intricatus, L. malosanus ; Memecylon flavovirens ; Ochna longipes, O. shirensis ; Parinarium floribundum ; Pelargonium Whytei ; Peucedanum Buchanani, P. heracleoides, P. valerianaefolium ; Pilea floribunda ; Pittosporum malosanum ; Plantago tanalensis ; Polygonum nyikense, P. tanalense ; Polypodium efulense, P. forsythianum, P. microphyllum ; Psilostachys Kirkii ; Psilotrichum concinnum, P. debile, P. rubellum, P. trichophyllum ; Rhynchosia divaricata, R. floribunda, R. imbricata, R. nyasica, R. nyikensis, R. sphaerocephala ; Schistostephium artemisiaefolium, S. microcephalum ; Senecio antilensis, S. nyikensis ; Sericocoma Welwitschii ; Smithia congesta, S. drepanophylla. S. sphaerocephala ; Swertia nummularifolia ; Syringodea luteo-nigra ; Tachiadenus parviflorus ; Tephrosia dissitiflora, T. melanocalyx, T. nyikensis, T. periculosa, T. zombensis ; Trianthema nyasica ; Trichocladus malosanus ; Vigna malosana ; Vitis apodophylla, V. masukuensis, V. variifolia ; Weihea malosana.

1898.

Decades Kewenses.

Acrostichum yunnanense ; Adiantum myriosorum ; Alpinia strobilifera ; Alsophila Henryi ; Antrophyum obovatum, A. stenophyllum ; Davallia platylepis ; Gymnogramme peutaphylla ; Hesperaloe Davyi ; Hippeastrum Arechavaletae ; Nephrodium Creaghii, N. diffractum ; Nothoscordum uniflorum ; Polypodium aspersum, P. oligolepis, P. palmatopedatum, P. stenolepis, P. subintegrum, P. triglossum, P. trisectum ; Zephyranthes longipes, Z. stenopetala.

Diagnoses Africanae.

Achyrospermum cryptanthum ; Acrocephalus oligocephalus, A. venosus ; Aeolanthus nyikensis, A. salicifolius ; Ageratum polyphyllum ; Aspilia monocephala, A. zombensis ; Athrixia diffusa ; Berkheya echinopsoides, B. parvifolia, B. polyacantha ; Canscora ramosissima ; Clerodendron macrostachyum, C. syringaefolium ; Coreopsis aspilioides ; Cyphia nyasica ; Dombeya Johnstonii ; Emilia basifolia ; Eriospermum tulbaghioides ; Faroa axillaris ; Geranium Whytei ; Gerbera Lasiopus ; Guizotia nyikensis ; Haemanthus Nelsonii ; Helichrysum luteo-rubellum, H. monocephalum, H. nanum, H. nyasicum, H. patulifolium, H. rhodolepis, H. sulphureo-fuscum, H. syncephalum, H. xanthosphaerum ; Jaumea Johnstoni ; Leucas masukuensis, L. megasphaera, L. myriantha ; Lightfootia capitata ; Lobelia Buchanani, L. intertexta, L. nyikensis, L. squarrosa ; Moraea macrantha ; Nidorella malosana ; Ornithogalum subspicatum ; Phylica tropica ; Pulicaria tanganyikensis ; Pycnostachys leptophylla,

BAKER, J. G.—*continued.*

KEW BULLETIN :—

P. remotifolia, P. sphaerocephala ; Scutellaria Livingstonei ; Selago thyrsoidea ; Senecio exsertiflorus, S. nyikensis, S. pergamentaceus, S. rectiramus, S. subpetitianus, S. tabulicolus ; Swertia pleurogynoides, S. porphyrantha ; Tecoma nyikensis ; Tinnea physaloides ; Vernonia amblyolepis, V. asterifolia, V. Buchanani, V. chloropappa, V. exsertiflora, V. karongensis, V. leptolepis, V. malosana, V. myriotricha, V. polysphaera ; Vitis zombensis.

1899, pp. 118-122, Flora of British New Guinea :—

Filices.

Davallia bipinnatifida, D. lanceolata ; Nephrodium dissitifolium ; Todea alpina.

Lycopodiaceae.

Selaginellaceae.

Isoetes neoguineensis

1901.

Decades Kewenses.

Acrostichum celebicum ; Asplenium macrodictyon, A. Wallisii ; Cheilanthes trifurcata ; Polypodium Bangii.

Diagnoses Africanae.

Aloe Galpini, A. Lastii, A. lugardiana ; Anagallis Hanningtonii ; Asparagus longipes ; Asplenium efulense, A. ruwenzoriense ; Bobartia gracilis ; Dipcadi brevipes ; Gleichenia elongata ; Kniphofia longiflora ; Lygodium Brycei.

1906.

Decades Kewenses.

Acrostichum sinense ; Alsophila costularis ; Antrophyum petiolatum ; Asplenium leptophyllum, A. parallelosorum, A. Sanderi, A. sinense ; Cheilanthes subrufa ; Davallia henryana, D. rigidula ; Lomaria decurrens ; Lycopodium Henryi ; Nephrodium cyclodioides, N. microlepis, N. Morsei, N. subelatum, N. yunnanense ; Polypodium convolutum, P. crinitum, P. intramarginale, P. mengtzeanum, P. micropteris, P. simulans, P. trichophyllum, P. xiphiopteris ; Selaginella Tansleyi.

Diagnoses Africanae.

Acidanthera Schinzii ; Anthericum recurvifolium ; Aristea parviflora ; Babiana orthosantha ; Eriospermum Cecili ; Geissorhiza inconspicua, G. parva, G. violacea ; Haemanthus Cecilae ; Hesperantha Pentheri ; Lapeyrousia Pentheri ; Moraea diphylla, M. fusca, M. monophylla ; Romulea rubrolutea, R. torta ; Scilla ciliata ; Watsonia caledonica.

BEAN, W. J.

CENTURY BOOK OF GARDENING.—Trees and Shrubs in Garden and Woodland, 1899, p. 371.

GARDENER'S ASSISTANT.—Trees and Shrubs, 1902, p. 283

FLORA AND SYLVA :—

1903. Vol. i., p. 73, Eucryphias.

1905. Vol. iii., p. 162, Chinese Rhododendrons.

GARDEN :—

1896. Vol. l., p. 122, The Genus Hydrangea ; p. 125, Hardy Shrubby Araliads ; p. 312, The Genus Prunus.

1897. Vol. li., p. 24, Hardy Ligustrums ; p. 72, The Genus Robinia ; p. 151, The Genus Akebia ; p. 302, The Genus Laburnum ; p. 375, The Judas Tree and its Allies (Cercis) ; p. 432, Colletias and Discarias.

Vol. lii., p. 28, The Genus Ledum ; p. 77, The Genus Kalmia ; p. 479, The Bamboo Garden at Kew ; p. 499, Hardy Clematis.

1898. Vol. liii., p. 66, The Elders (Sambucus) ; p. 130, Cistuses ; p. 242, the Genus Pterocarya ; p. 276, The Lilacs (Syringa) ; p. 381, The Birches (Betula) ; p. 470, Wistarias.

Vol. liv., p. 5, Buddleias ; p. 25, Climbing Honeysuckles ; p. 182, Himalayan Rhododendrons near London ; p. 242, The Species of Camellia ; p. 282, The Species of Azalea ; p. 349, The Hazels (Corylus) ; p. 490, The Shrubby Hypericums ; p. 505, The Hardy Sumachs.

1899. Vol. lv., p. 141, The Genus Stephanandra ; p. 185, The Genus Cotoneaster ; p. 267, The Beeches.

Vol. lvi., p. 77, The Viburnums ; p. 177, The Caraganas.

1900. Vol. lvii., p. 179, The Catalpas ; p. 361, The Halesias.

1902. Vol. lxi., p. 430, The Hardy Heaths.

1903. Vol. lxiii., p. 71, The Barberries.

GARDENERS' CHRONICLE :—

1896. Vol. xix., p. 423, Catalpas.

1897. Vol. xxi., p. 87, The Genus Crataegus ; p. 265, Amelanchiers.

Vol. xxii., p. 130, The Horse Chestnut and its Allies (Aesculus).

1898. Vol. xxiii., p. 305, Weeping Willows.

1901. Vol. xxix., p. 24, Arundinaria anceps (origin of) ; p. 363, The Planes (Platanus).

Vol. xxx., p. 334, The Walnuts (Juglans).

1902. Vol. xxxi., p. 187, Horse Chestnuts (Aesculus).

1903. Vol. xxxiv., p. 434, The Cydonias.

1904. Vol. xxxvi., p. 161, The Segrez Arboretum.

BEAN, W. J.—*continued.*

KEW BULLETIN :—

1906, p. 258, Trees and Shrubs in Scottish Gardens ; p. 379, South American Beeches.

BOODLE, L. A.

ANNALS OF BOTANY :—

1906. Vol. xx., pp. 293–299, with four figs. in text, The Monoecism of Funaria hygrometrica, *Sibth.* ; pp. 319–321, Lignification of Phloem in Helianthus.

KEW BULLETIN :—

1906, pp. 281–282, H. Marshall Ward (obituary notice).

BROWN, N. E.

THISELTON-DYER, FLORA CAPENSIS :—

1897. Vol. VII.

Pontederiaceae, pp. 1–2.

Xyrideae, pp. 2–7.

Xyris decipiens, X. Gerrardi.

Flagellarieae, pp, 15–16.

Typhaceae, pp. 30–32.

Aroideae, pp. 32–39.

Richardia Rehmanni.

Lemnaceae, pp. 39–41.

Eriocauleae, pp. 51–59.

Eriocaulon Bauri, E. transvaalicum, E. Woodii.

1900. Vol. VII., Addenda.

Restiaceae, pp. 751–758.

Elegia fusca, E. Galpinii, E. gracilis ; Hypolaena decipiens ; Restio comosus, R. foliosus, R. multicurvus, R. scaberulus, R. strictus ; Willdenovia decipiens, W. fraterna, W. Galpinii, W. peninsularis, W. simplex.

1905. Vol. IV., Sect. 1.

Vacciniaceae, pp. 1–2.

1905–1906. Vol. IV., Sect. 1.

Ericaceae, pp. 315–418.

Acrostemon concinnus, A. eriocephalus, A. Schlechteri, A. viscidus ; Aniserica gracilis ; Anomalanthus anguliger, A. collinus, A. curviflorus, A. Galpini, A. Marlothii, A. parviflorus, A. puberulus, A. turbinatus ; Blaeria

BROWN, N. E.—*continued.*

THISELTON-DYER, FLORA CAPENSIS :—

affinis, B. grandis; Coccosperma areolatum, C. subcapitatum; Eremiopsis curvistyla; Grisebachia alba, G. apiculata, G. Bolusii, G. minutiflora, G. Nivenii, G. nodiflora, G. pilifolia, G. rigida, G. similis, G. solivaga; Lagenocarpus ciliatus; Lepterica tenuis; Philippia Evansii; Platycalyx pumila; Salaxis major, S. pumila; Scyphogyne biconvexa, S. Burchellii, S. glandulifera, S. longistyla, S. micrantha, S. remota, S. rigidula, S. viscida, S. Schlechteri, S. trimera; Simocheilus acutangulus, S. albiramens, S. consors, S. dispar, S. globiferus, S. patulus, S. piquetbergensis, S. quadrisulcus, S. subrigidus; Sympieza articulata, S. breviflora, S. pallescens, S. vestita; Syndesmanthus breviflorus, S. elimensis, S. Erinus, S. globiceps, S. gracilis, S. Niveni, S. pulchellus, S. pumilus, S. Schlechteri, S. similis, S. sympiezoides, S. venustus, S. viscosus; Thoracosperma Galpinii, T. interruptum, T. Marlothii, T. nanum, T. puberulum.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1898. Vol. VII.

Orchideae, pp. 275–288.

Brownleea alpina, B. apetala; Disa aperta, D. Carsoni, D. concinna, D. robusta, D. Schimperi, D. zombica.

1901. Vol. VIII.

Pontederiaceae, pp. 1–6.

Monochoria africana.

Xyrideae, pp. 6–25.

Xyris angularis, X. aristata, X. Barteri, X. batokana X. decipiens, X. dispar, X. humpatensis, X. makuensis, X. multicaulis, X. obscura, X. zombana.

Rapateaceae, pp. 88–89.

Flagellarieae, pp. 90–91.

Typhaceae, pp. 133–137.

Aroideae, pp. 137–200.

Amorphophallus abyssinicus, A. accrensis, A. angolensis, A. Barteri, A. Baumannii, A. calabaricus, A. dracontioides, A. Fischeri, A. flavovirens, A. gallaensis, A. Goetzei, A. gratus, A. Johnsoni, A. laxiflorus, A. leopoldianus, A. maculatus, A. Mannii, A. maximus, A. Preussii, A. Schweinfurthii, A. Staudtii, A. Teuszii, A. Zenkeri; Anubias congensis, A. lanceolata; Arisaema ruwenzoricum; Cercestis kamerunianus, C. stigmaticus; Culcasia barombensis, C. gracilis, C. insulana, C. lancifolia, C. parviflora; Gonatopus angustus; Nephthytis constricta, N. Poissoni; Rhektophyllum mirabile;

BROWN, N. E.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

Sauromatum angolense ; Stylochiton Barteri, S. borumensis, S. gabonicus, S. grandis, S. kerensis, S. lobatus, S. puberulus, S. salaamicus, S. similis ; Zyganthera Buttneri.

Lemnaceae, pp. 200–206.

Eriocauleae, pp. 230–264.

Eriocaulon decipiens, E. fulvum, E. Hanningtonii, E. Heudelotii, E. infaustum, E. Mannii, E. mutatum, E. plumale, E. senegalense, E. Stuhlmanni, E. subulatum ; Paepalanthus pulvinatus.

1902. Vol. VIII.

Restiaceae, pp. 264–266.

Hypolaena Mahoni.

Mayaceae, Addenda, p. 525.

1902–1903. Vol. IV., Sect. 1.

Asclepiadeae, pp. 231–503.

Anisopus bicoronata ; Asclepias abyssinica, A. angustata, A. coccinea, A. crinita, A. densiflora, A. dependens, A. foliosa, A. gigantiflora, A. laurentiana, A. lisianthoides, A. longissima, A. modesta, A. muhindensis, A. nutans, A. odorata, A. pachyclada, A. pubiseta, A. pulchella, A. rhacodes, A. robusta, A. rostrata, A. rubella, A. semilunata, A. sphacelata ; Brachystelma Schinzii ; Caralluma atrosanguinea, C. caudata, C. lateritia, C. Lugardi, C. maculata, C. robusta, C. vittata ; Ceropegia calcarata, C. floribunda, C. humilis, C. infausta, C. Johnsoni, C. kroboensis, C. kwebensis ; Cryptolepis Baumii, C. decidua, C. Hensii, C. nigritana, C. obtusa, C. producta, C. suffruticosa, C. triangularis ; Cynanchum Mannii, C. somaliense, C. validum ; Echidnopsis somalensis ; Fockea Lugardi ; Hoodia Lugardi ; Huernia concinna, H. macrocarpa ; Kanahia consimilis, K. glaberrima ; Marsdenia rubicunda ; Pachycarpus rhinophyllus ; Pentatropis fasciculatus ; Raphionacme denticulata, R. jurensis ; Schizoglossum aciculare, S. Carsoni, S. chlorojodinum, S. distinctum, S. dolichoglossum, S. eximium, S. gwelense, S. simulans, S. spurium, S. Welwitschii, S. Whytei ; Secamone floribunda, S. leonense, S. mombasica, S. usambarica, S. Whytei ; Sphaerocodon melananthus ; Stapelia kwebensis ; Stomatostemma Monteiroae ; Tacazzea africana, T. conferta, T. Kirkii, T. nigritana, T. rosmarinifolia, T. volubilis ; Tavaresia Barklyi ; Tenaris somalensis, T. subaphylla ; Toxocarpus brevipes, T. parviflorus, T. racemosus ; Tylophora anfracta; Xysmalobium barbigerum, X. bellum, X. Cecilae, X. dispar, X. grande, X. spathulatum, X. trilobatum.

BROWN, N. E.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1904. Vol. IV., Sect. 1.

Addenda, pp. 615–622.

Asclepias Buchwaldii, A. macropetala, A. stolzianus ; Caralluma tombuctuensis ; Xysmalobium leucotrichum.

BOTANICAL MAGAZINE :—

1900, tt. 7704, 7705.

1904, t. 7987.

Kalanchoe Dyeri.

1905, tt. 7993, 8001, 8013, 8024, 8030, 8036, 8042.

Cotyledon elegans, C. insignis ; Plectranthus crassus ; Streptocarpus grandis.

1906, tt. 8066, 8071, 8079, 8082, 8096, 8104.

Cotyledon devensis x.

GARDENERS' CHRONICLE :—

1896. Vol. xix., p. 392, Acalypha Sanderi.

Vol. xx., p. 70, Aglaonema oblongifolium.

1897. Vol. xxii., p. 45, Stapelia cupularis.

1898. Vol. xxiii., p. 79, Coleus thyrsoideus, *Baker*.

Vol. xxiv., p. 210, Lonicera Hildebrandiana, *Collet and Hemsl.*

1901. Vol. xxix., p. 2, f. 1, Anthurium Bakeri, *Hk. f.*

Vol. xxx., p. 11, The flowering of Amorphophallus Titanum at Kew ; p. 302, Ceropegia Lugardae ; p. 318, Sempervivum velutinum ; p. 405, Stapelia incomparabilis ; p. 425, Stapelia atrosanguinea.

1902. Vol, xxxi., p. 106, Crassula conjuncta ; p. 387, Kalanchoe kewensis x.

Vol. xxxii., p. 110, Kalanchoe Kirkii ; p. 171, Crassula congesta ; p. 190, Mesembryanthemum Mahoni ; p. 210, Kalanchoe diversa ; p. 350, Mesembryanthemum racemosum ; Richardia Sprengeri, *Comes* ; p. 411, f. 140, Epiphyllum delicatum ; p. 429, Crassula sedifolia.

1903. Vol. xxxiii., p. 3, Crassula decipiens ; p. 18, Rhipsalis gracilis ; p. 354, Caralluma inversa ; p. 370, Euphorbia Phillipsiae.

Vol. xxxiv., p. 49, Crinum Lugardae ; p. 93, Sauromatum brevipes ; p. 123, Corydalis tomentosa and C. Wilsoni ; p. 131, Mesembryanthemum mirabile; p. 414, Caralluma Marlothii.

1904. Vol. xxxv., p. 50, Huernia Pillansii ; p. 211, Pectinaria saxatilis ; Kalanchoe prasina ; p. 242, f. 100, Stapelia Pillansii ; Trichocaulon Pillansii.

BROWN, N. E.—*continued.*

GARDENERS' CHRONICLE :—

Vol. xxxvi., p. 162, Crassula "Justus Corderoy" x; p. 206, A remarkable flower of Stapelia revoluta; p. 304, Helicophyllum Alberti, *Regel;* p. 362, Anthurium pendulifolium.

1905. Vol. xxxvii., p. 49, Stapelia divergens; p. 370, Kalanchoe magnidens; K. angolensis.

1906. Vol. xxxix., p. 130, Aloe laxiflora; p. 161, Anthurium Forgeti.

Vol. xl., pp. 122 and 124, f. 49, Haplocarpha scaposa; pp. 383–4, ff. 145–148, Ceropegia similis and C. hybrida x.

HOOKER'S ICONES PLANTARUM :—

1896. Vol. xxv., pt. 4, tt. 2488, 2489, 2497, 2500.

Batesanthus purpureus; Marsdenia efulensis.

1897. Vol. xxvi., pt. 2, tt. 2526, 2527, 2528, 2529, 2530–32.

Cadaba termitaria; Stilbe mucronata.

1900. Vol. xxvii., pt. 2, tt. 2629, 2636A, 2636B.

Acicarpha rosulata; Benthamiella Nordenskioldii, *Dusen;* Genlisea guianensis.

1901. Vol. xxvii., pt. 4, t. 2692.

Lobostephanus palmatus.

1901. Vol. xxviii., pt. 1, tt. 2702, 2709–10.

Caesalpinia rostrata; Hermannia Johansseni.

1902. Vol. xxviii., pt. 2, tt. 2744, 2750.

Parapodium crispum.

1903. Vol. xxviii., pt. 3, t. 2754.

Brachystelma Johnstoni.

JOURNAL OF THE LINNEAN SOCIETY :—

1903. Vol. xxxvi. Index Florae Sinensis :—

Pontederiaceae, pp. 148–150.

Philydraceae, p. 150.

Xyrideae, pp. 150–151.

Commelinaceae, pp. 147–160.

Aveilema augustifolium, A. paucifolium; Forrestia chinensis.

Flagellariaceae, p. 160.

Juncaceae, pp. 160–166.

Luzula chinensis.

BROWN, N. E.—*continued.*

JOURNAL OF THE LINNEAN SOCIETY :—

Typhaceae, pp. 171–173.

Aroideae, pp. 173–188.

Alocasia hainanica ; Amorphophallus Henryi ; Arisaema asperatum, A. cordatum, A. pictum ; Pinellia cordata.

KEW BULLETIN :—

1896.

Decades Kewenses.

Alepidea setifera ; Crassula aloides ; Lyperia punicea ; Strychnos Gerrardi ; Trichilia alata ; Uvaria virens ; Xysmalobium obscurum.

1897.

Diagnoses Africanae.

Argyrolobium longipes ; Ceropegia fusiformis ; Cynanchum cucullatum, C. lineare, C. longipes ; Helichrysum concinnum ; Hermannia depressa, H. erecta ; Microcharis Galpini ; Rhaphidophora africana, R. pusilla.

1898.

Decades Kewenses.

Macroscepis elliptica.

Diagnoses Africanae.

Asclepias Nuttii ; Ceropegia papillata, C. paricyma, C. Perrottetii, C. pumila ; Huernia somalica ; Secamone Whytei.

1899, p. 55, Stapelia gigantea.

1901.

Diagnoses Africanae.

Arthrosolen fraternus ; Berkheya bilabiata, B. nivea, B. spinulosa ; Buchenroedera glabriflora ; Chaenostoma subnudum ; Cliffortia alata, C. Galpini ; Crassula variabilis ; Euryops floribundus ; Felicia lutea ; Geranium Brycei, G. multisectum ; Hyobanche Barklyi, H. rubra ; Lachnaea passerinoides ; Macowania glandulosa, M. pulvinaris ; Melolobium Burchellii ; Osteospermum glabrum ; Pentas Wyliei ; Phyllopodium alpinum ; Plectranthus albocoeruleus ; Protea curvata, P. subvestita ; Rhamphicarpa montana ; Salvia Burchellii ; Sebaea humilis, S. laxa ; Senecio viscidus ; Stachys albiflora, S. parilis ; Synadenium Cameronii ; Tecoma Brycei ; Tulbaghia campanulata ; Ursinia alpina ; Vigna nuda.

Decades Kewenses.

Caralluma torta ; Ceropegia perforata ; Echidnopsis Bentii ; Oxalis dispar.

P. 170, Dr. Peter Cormack Sutherland (obituary notice),

BROWN, N. E.—*continued.*

KEW BULLETIN :—

1906.

Decades Kewenses.

Spathanthus Jenmani ; Xanthosoma cordatum.

1906.

Diagnoses Africanae.

Abutilon Cecili ; Androcymbium decipiens ; Argyrolobium reflexum, A. variopile ; Asclepias fornicata ; Aspilia vulgaris ; Bothriocline inyangana ; Carissa Wyliei ; Celastrus albatus, C. concinnus ; Crassula Barklyi, C. sedifolia ; Cucumis Cecili ; Cyphia alba ; Dolichos lupiniflorus ; Dyschoriste matopensis ; Eriosema distinctum, E. longipes ; Euryops setiloba, E. striata ; Fadogia obovata ; Felicia Burchellii ; Gardenia Saundersiae ; Geophila Cecilae ; Helichrysum Galpinii, H. retortoides, H. Woodii ; Hermannia Gilfillani, H. longifolia ; Hibiscus mutatus ; Impatiens Cecili ; Indigofera Cecili, I. inyangana, I. longipes, I. notata ; Ipomoea Cecilae ; Kaempferia Cecilae ; Lapeyrousia rhodesiana ; Lotononis adpressa, L. Haygarthii ; Loranthus Cecilae, L. virescens ; Marsdenia rostrifera ; Melhania obtusa ; Muraltia ecornuta ; Orthosiphon dissimilis ; Otiophora inyangana ; Oxalis densa ; Pavetta Cecilae, P. pumila ; Pelargonium reliquifolium ; Plectranthus selukwensis ; Plectronia Gilfillani ; Polygala latipetala ; Pterocelastrus echinatus ; Pteronia sordida ; Rhus cuneata ; Rhynchosia reptabunda ; Schizoglossum altum ; Senecio vitalis ; Trichocaulon Alstoni ; Vernonia mashonica ; Wahlenbergia mashonica ; Zygophyllum Gilfillani.

TRANSACTIONS OF THE LINNEAN SOCIETY :—

1901. Ser. 2, Vol. VI., pp. 18–58 and 66–76, Report on two Botanical Collections from Roraima.

[Omitted from former list, *K.B.*, 1897, p. 1.]

TRANSACTIONS AND PROCEEDINGS OF THE BOTANICAL SOCIETY OF EDINBURGH :—

1894. Vol. xx., pp. 44–78. The Botany of the Pilcomayo Expedition.

Acalypha apicalis ; Beloperone Kerrii ; Diplokeleba floribunda ; Indigofera retrusa ; Ipomoea argentina, I. nuda, I. villicalyx ; Jacquemontia alba ; Passiflora Giberti ; Paullinia angusta ; Pavonia consobrina ; Pfaffia tenuis ; Piptadenia quadrifolia ; Solanum multispinum ; Stigmaphyllon calcaratum ; Tillandsia tomentosa ; Wedelia Kerrii, W. subvaginata ; Xylosma venosum.

BURKILL, I. H.

FITZGERALD, THE HIGHEST ANDES.—Botany, 1899, pp. 361–375.

JOHNSTON, BRITISH CENTRAL AFRICA.—List of the Known Plants occurring in British Central Africa, 1897, Appx. 2, pp. 233–284.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1899, Vol. V.

Acanthaceae, pp. 1–44.

Brillantaisia debilis, B. leonensis, B. Nyanzarum, B. subulugurica ; Hygrophila acutisepala, H. Gigas, H. linearis, H. pilosa ; Synnema brevitubum ; Thunbergia crispa, T. Hanningtonii, T. lathyroides, T. mellinocaulis, T. sericea, T. stellarioides.

ANNALS OF BOTANY :—

1898. Vol. xii., p. 557, Changes in the Sex of Willows.
1899. Vol. xiii., p. 181, On Pelargonium rapaceum.
1901. Vol. xv., p. 186, Ovary of Parnassia palustris.
1903. Vol. xvii., p. 313, Flowers and Insects in Great Britain. Part 2 (with J. C. Willis).
P. 539, Flowers and Insects in Great Britain. Part 3 (with J. C. Willis).

ANNALS OF SCOTTISH NATURAL HISTORY :—

1903. Pp. 29–37, 99–103, Notes on the Anthophilous Insect Fauna of the Clova Mountains. (With J. C. Willis.)
1904. Pp. 166–168, Notes on the Anthophilous Insect Fauna of the Clova Mountains. Part 2 (with J. C. Willis).

HOOKER'S ICONES PLANTARUM :—

1898. Vol. xxvi., pt. 3, t. 2561.
Pittosporum spathaceum.
1899. Vol. xxvi., pt. 4, t. 2585.
Limacia monilifera.
1900. Vol. xxvii., pt. 2, t. 2630.
Dolicholobium acuminatum.

JOURNAL OF BOTANY :—

1897. Pp. 92–99, 138–145, 184–189, Fertilization of Spring Flowers on the Yorkshire Coast.
1901. Pp. 235–236, Trifolium pratense, var. parviflorum (Reprint).

BURKILL, I. H.—*continued.*

JOURNAL OF THE LINNEAN SOCIETY :—

1899. Vol. xxvi., Index Florae Sinensis :—

Cupuliferae : Betulae, pp. 496–500.

Cupuliferae : Coryleae, pp. 501–505.

Salicaceae, pp. 526–538.

Vol. xxxiv., pp. 268–276, On some African Labiatae with alternate Leaves. (With C. H. Wright.)

1901. Vol. xxxv., pp. 20–65, Flora of Vavau.

KEW BULLETIN :—

1898.

Diagnoses Africanae.

Trimeria tropica.

1899. Flora of British New Guinea.

Loranthus pachypus ; Pittosporum berberidoides, P. pullifolium ; Saurauja rufa.

1901.

Diagnoses Africanae.

Euphorbia calabarica.

Decades Kewenses.

Acomis Lesteri ; Boea hians ; Hoya subcalva ; Pterospermum Proteus.

1902. P. 4, Ginseng in China.

1906.

Decades Kewenses.

Dissochaeta pentamera ; Eugenia Prora.

P. 68, Bambarra Ground-Nut.

PROCEEDINGS OF THE CAMBRIDGE PHILOSOPHICAL SOCIETY :—

1896. Vol. ix., ii., p. 91, On a Collection of Plants from New Britain.

TRANSACTIONS OF THE LINNEAN SOCIETY :—

1901. Ser. 2, vol. vi., pp. 1–17, Report on Two Botanical Collections from Mt. Roraima, Introduction.

TRANSACTIONS AND PROCEEDINGS OF THE BOTANICAL SOCIETY OF EDINBURGH :—

1901. Vol. lxvi., pp. 109–125, The Phanerogamic Flora of the Clova Mountains. (With J. C. Willis.)

COTTON, A. D.

JOURNAL OF THE BOARD OF AGRICULTURE :—

1903. Vol. x., pp. 166–170, A Cucumber Leaf Disease.

JOURNAL OF THE LINNEAN SOCIETY :—

1906. Vol. xxxvii., pp. 288-297, On some Endophytic Algae.

KEW BULLETIN :—

1906. Pp. 367–373, Marine Algae from Corea.

Ceramium hamatum ; Dumontia simplex.

DUNN, S. T.

PRELIMINARY LIST OF THE ALIEN FLORA OF BRITAIN.—1903, pp. 30.

ALIEN FLORA OF BRITAIN.—1905, pp. xvi, 208.

GARDENERS' CHRONICLE :—

1902. Vol. xxxii., p. 210, New Chinese Leguminosae.

HOOKER'S ICONES PLANTARUM :—

1901. Vol. xxvii., pt. 4, t. 2700.

Lespedeza velutina.

Vol. xxviii., pt. 1, tt. 2712–4.

Clematis pterantha ; Illicium micranthum ; Parvatia decora.

1902. Vol. xxviii., pt. 2, tt. 2727, 2737, 2739, 2743B.

Carlesia sinensis ; Cryptotaeniopsis vulgaris ; Hartia sinensis ; Paradombeya sinensis.

JOURNAL OF THE LINNEAN SOCIETY :—

1903. Vol. xxxv., pp. 483–518, Descriptions of New Chinese Plants.

KEW BULLETIN :—

1906.

Decades Kewenses.

Actinidia curvidens, A. Henryi, A. rubricaulis ; Evodia colorata.

DUTHIE, J. F.

FLORA OF THE UPPER GANGETIC PLAIN :—

1905. Vol. i., pt. 2, **Caprifoliaceae, Campanulaceae**, pp. 401–500.

STRACHEY, CATALOGUE OF THE PLANTS OF KUMAON. Revised with supplement by J. F. D., 1906, pp. vii., 269.

ANNALS OF THE ROYAL BOTANIC GARDEN, CALCUTTA :—

1906. Vol. ix., pt. 2, pp. 81–211, tt. 58, Orchids of the N.-W. Himalayas.

DUTHIE, J. F.—*continued.*

BOTANICAL MAGAZINE :—

1905. tt. 8043, 8051.

1906. t. 8083, Deutzia Wilsoni.

GARDENERS' CHRONICLE :—

1905. Vol. xxxvii., p. 178, Caltha elata ; p. 344, Primula Veitchii.

Vol. xxxviii., p. 42, Primula Tangutica ; p. 259, Primula pulverulenta ; p. 275, Buddleia nivea.

1906. Vol. xxxix., p. 52, Geranium platyanthum ; p. 229, Primula deflexa ; p. 358, Primula cognata.

Vol. xl., p. 238, Deutzia mollis, D. globosa, D. reflexa ; p. 334, Nepeta Wilsoni, N. Veitchii.

FARMAR, L.

BOTANICAL MAGAZINE :—

1905. tt. 8028, 8035.

1906. tt. 8054, 8060.

BULLETIN DE L'HERBIER BOISSIER :—

1905. Sér. ii., vol. v., pp. 1085–1091, Contributions to our Knowledge of Australian Amarantaceae.

HEMSLEY, W. B.

COLLETT, FLORA SIMLENSIS, Introduction, 1902, pp. i.–lxviii.

FORBES AND HEMSLEY, INDEX FLORAE SINENSIS, 1886–1905.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1906. Vol. IV., Sect. 2.

Scrophulariaceae, pp. 261–462. (With S. A. Skan.)

Bartsia Mannii, B. similis ; Pseudosopubia ambigua, P. elata, P. procumbens.

ANNALS OF BOTANY :—

1896. Vol. x., pp. 221-284, Flora of Lord Howe Island.

1903. Vol. xvii., pp. 443–446, Diagnosis Specierum Generis Juliania ; pp. 743–760, On the Genus Corynocarpus, *Forst.*

1904. Vol. xviii., pp. 179–180, On the Genus Corynocarpus, Supplementary Note.

BOTANICAL MAGAZINE :—

1903, Co-editor. tt. 7907–10, 7914–17, 7919–22, 7924–31.

Agapetes Moorei ; Aloe Cameroni.

HEMSLEY, W. B.—*continued.*

BOTANICAL MAGAZINE :—

1904, Co-editor. tt. 7932–36, 7938, 7942–46, 7948–55, 7957–59, 7961–63, 7965, 7968–69, 7971–72, 7974–76, 7978–81, 7983–85, 7988, 7990.

Chrysanthemum ornatum ; Helipterum splendidum ; Marsdenia Imthurnii ; Pyrus niedzwetzkyana ; Thunbergia primulina ; Vellozia Kirkii, V. trichophylla.

1905. tt. 7997, 8002, 8004, 8006, 8008, 8010, 8014, 8016–19, 8022–23, 8027, 8029, 8032, 8037, 8039, 8045.

Derris alborubra, D. Hancei ; Nicotiana forgetiana ; Rosa Hugonis.

1906. t. 8067.

1906. The History of the Botanical Magazine, 1787–1904, prefixed to the Index to the Botanical Magazine, 1787–1904.

BOTANICAL MAGAZINE OF TOKYO :—

1901. Vol. xv., pp. 1–2, On Itoa.

GARDEN :—

1902. Vol. lxii., pp. 167–168, History of the Cherokee Rose.

1903. Vol. lxiii., pp. 246–247, The Herbarium Buildings of the Royal Botanic Gardens, Kew.

GARDENERS' CHRONICLE :—

1896. Vol. xix., pp. 43-44, Recent Botanical Discoveries in New Zealand ; p. 389, Some old Botanical Magazine Wrappers ; p. 579, Salernian School of Medicine ; p. 681, Campanula Regina ; pp. 731-732, Displacement and Replacement of the Native Vegetation of New Zealand.

Vol. xx, p. 464, Baron von Mueller (obituary notice) ; p. 651, Some more Botanical Magazine Wrappers.

1897. Vol. xxi., pp. 15 and 36, Sir Joseph Banks ; p. 36, Vegetation of Western Australia ; p. 320, Lilium peregrinum.

1898. Vol. xxiii., p. 93, William Cattley ; p. 110, Coriaria terminalis ; p. 301, Mr. John Weir (obituary notice) ; p. 321, Recent Botanical Discoveries in New Zealand ; p. 340, Sydenham Teast Edwards.

Vol. xxiv., p. 32, Dr. George Baur (obituary notice) ; p. 265, Cactaceae of the Galapagos Islands.

1899. Vol. xxv., p. 33, Flora of China.

Vol. xxvi., pp. 324 and 342, Recent Earthquakes in Darjeeling ; p. 353, Richard Weston, Esq., Author.

1900. Vol. xxvii., p. 177, Vegetation of the Galapagos Islands ; p. 399, Panax mastersianum, additional note only.

Vol. xxviii., p. 7, Cactaceae of the Galapagos Islands ; p. 220, Opuntia myriacantha ; p. 254, Spiraea Aitchisoni ; p. 286, Begonia Augustinei ; p. 349, Lysionotus carnosa ; p. 378, Fitchia speciosa.

HEMSLEY, W. B.—*continued.*

GARDENERS' CHRONICLE :—

1901. Vol. xxix., p. 417, The Tree-Lobelias of Tropical Africa.
Vol. xxx., p. 66, Begonia forgetiana ; pp. 85–86, Dr. Augustine Henry.

1902. Vol. xxxi., p. 289, A second edition of the Botanical Magazine.

1903. Vol. xxxiii., p. 81, Two new plants from China ; p. 258, Two new Spiraeas from China.
Vol. xxxiv., p. 370, The Chinese Tulip-Tree.

1904. Vol. xxxvi , p. 262, Fuchsias with white corollas.

1905. Vol. xxxvii., pp. 241–242 and 260, The Pitchers of Nepenthes ; p. 331, Primula cockburniana.
Vol. xxxviii., pp. 212–213, Senecio veitchianus and S. wilsonianus.

1906. Vol. xxxix., pp. 18–19 and 220, The genus Corylopsis ; p. 68, A new Chinese Lilac with pinnate leaves ; p. 115, A new species of Rodgersia ; p. 230, Primula orbicularis.
Vol. xl., p. 43, Senecio Faberi.

GARDENERS' MAGAZINE :—

1899. Vol. xlii., pp. 807–808 and 842–843, Ornamental Plants of China.

GEOGRAPHICAL JOURNAL :—

1903. Vol. xxi., p. 198, The Crozets.

HOOKER'S ICONES PLANTARUM :—

1896. Vol. xxv., pts. 3, 4, tt. 2467-72, 2485, 2487, 2491, 2495, 2498.
Littledalea tibetica ; Nepeta decolorans ; Oreosolen unguiculatus ; Polygonum tibeticum ; Sedum rotundatum ; Senecio Prattii.

1897. Vol. xxvi., pts. 1, 2, tt. 2503–12, 2515–16, 2519–22, 2524, 2533–38, 2540, 2542–50.
Anona Prestoei ; Cacoucia splendens ; Campylogyne exannulata ; Dorstenia arabica ; Eryngium columnare, E. cryptanthum, E. Galeottii, E. leptopodum, E. longipetiolatum, E. paucisquamosum, E. reptans, E. Schaffneri, E. sparganophyllum, E. spiculosum ; Ficus heteromorpha, F. kingiana, F. stenophylla ; Impatiens Flanaganae ; Omphalea megacarpa ; Tacca viridis ; Tradescantia orchidophylla.

1898. Vol. xxvi., pt. 3, tt. 2551–57, 2559–60, 2562–67, 2569–75.
Bassia Thurstonii ; Hevea confusa, H. minor ; Laportea longifolia ; Loeselia cordifolia ; Lucuma Hartii ; Passiflora fuchsiiflora ; Phyllanthodendron mirabilis ; Poupartia Fordii ; Tachiadenus elatus.

HEMSLEY, W. B.—*continued.*

HOOKER'S ICONES PLANTARUM :—

1899. Vol. xxvi., pt. 4, tt. 2576-77, 2579–84, 2586–95, 2598–2600.

Dicrastylis Carnegiei ; Eryngium Rosei, E. tenuissimum ; Fraxinus malacophylla ; Hevea similis ; Moseleya pinnata ; Oreomyrrhis linearis ; Petrocosmea iodioides, P. minor ; Quercus Carlesii ; Ranunculus similis ; Reinwardtia sinensis ; Saussurea Wellbyi ; Senecio Deasyi ; Smilax utilis ; Zanthoxylum multifoliolatum.

Vol. xxvii., pt. 1, tt. 2618–25.

Actinostemma biglandulosum ; Lespedeza diversifolia ; Passiflora franchetiana, P. Henryi ; Shortia sinensis.

1900. Vol. xxvii., pts. 2, 3, tt. 2626–29, 2631–35, 2637–39, 2642, 2644–45, 2647–51, 2653–58, 2663–65, 2668–75.

Aspidopterys obcordata ; Begonia bretschneideriana, B. Warpuri ; Botryopleuron venosum ; Castilloa Tunu ; Clerodendron subscaposum ; Cydonia cathayensis ; Dischidia Cominsii ; Eryngium Goldmani ; Helicia grandis ; Impatiens grandiflora ; Koelreuteria minor ; Leycesteria sinensis ; Lonicera calcarata ; Lysimachia insignis ; Onosma exsertum ; Pandanus Cominsii ; Plectranthus calcaratus ; Quercus fordiana, Q. Rex ; Sapium Jenmani, S. paucinervium, S. verum ; Shuteria sinensis ; Sloanea hongkongensis.

1901. Vol. xxvii., pt. 4, tt. 2676–84, 2688.

Castilloa australis ; Itoa orientalis ; Sapium ciliatum, S. cupuliferum, S. lateriflorum, S. mexicanum, S. Poeppigii, S. subsessile.

Vol. xxviii., pt. 1, tt. 2703, 2707–8, 2715–20, 2722–25.

Bretschneidera sinensis ; Embelia procumbens, E. saxatilis ; Juliania mollis ; Lepinia solomonensis ; Lysimachia trientalioides ; Scalesia retroflexa.

1902. Vol. xxviii., pt. 2, tt. 2726, 2728, 2730–32, 2734–36, 2738, 2740–41, 2747.

Ainsliaea elegans ; Archidendron solomonense ; Carolinella Henryi ; Diplopeltis eriocarpa ; Diuranthera major ; Excoecaria benthamiana ; Radermachera pentandra ; Thomassetia seychellana.

1903. Vol. xxviii., pt. 3, tt. 2751–52, 2757, 2761, 2765–68, 2774–75.

Aniba megacarpa ; Carolinella cordifolia, C. obovata ; Eryngium crassisquamosum, E. globosum, E. guatemalense, E. medium, E. Palmeri, E. stenolobum ; Eurya Henryi, E. obliquifolia ; Rhopalocarpus longipetiolatus, R. similis ; Wahlenbergia brevipes.

HEMSLEY, W. B.—*continued.*

HOOKER'S ICONES PLANTARUM :—

1905. Vol. xxviii., pt. 4, tt. 2776–83, 2785–92.

Erichsenia uncinata ; Grisollea Thomassetii ; Justicia patentiflora ; Microcorys Dielsii ; Micromyrtus Erichsenii ; Phyllota Georgii ; Thiseltonia Dyeri.

1906. Vol. xxix., pt. 1, tt. 2801–2, 2801–21.

Aleurites Fordii ; Clematoclethra disticha, C. grandis, C. Wilsoni ; Corylopsis glandulifera, C. Henryi, C. manipurensis, C. Wilsoni ; Diospyros sinensis ; Eryngium pilularioides ; Gardenia cornuta ; Geopanax procumbens ; Indokingia crassa ; Neoschimpera heterophylla ; Stevia rebaudiana ; Sinowilsonia Henryi ; Toxocarpus schimperianus ; Tristiropsis Ridleyi.

JOURNAL OF BOTANY :—

1906. Pp. 329–332, William Mitten.

JOURNAL OF THE LINNEAN SOCIETY :—

1896. Vol. xxxi., pp. 306–311, Some Remarkable Phanerogamous Parasites.

1899–1905. Vol. xxvi., *p.* 457–*end*, and Vol. xxxvi., Index Florae Sinensis. *Editor.*

1899. Vol. xxvi., Index Florae Sinensis :—

Urticaceae (to end of Ficus), pp. 457–469.

1900. Vol. xxxiv., pp. 474–478, Notes on an Exhibition of Plants from China recently collected by Dr. A. Henry and Mr. W. Hancock.

1901. Vol. xxxv., pp. 78–90, On a small collection of dried plants obtained by Sir Martin Conway in the Bolivian Andes. (With H. H. W. Pearson.)

1902. Vol. xxxv., pp. 124–265, Flora of Tibet.

1903. Vol. xxxv., pp. 515–518, Descriptions of New Chinese Plants by S. T. Dunn.

Aeschynanthus buxifolius, A. humilis ; Rhabdothamnopsis sinensis.

Pp. 556–559, On the Germination of the Seeds of Davidia involucrata.

KEW BULLETIN :—

1896.

Decades Kewenses.

Begonia bonthainensis, B. Somervillei, B. Weigallii ; Clematis Everettii ; Cremaspora coffeoides ; Diclis tenella ; Elaeocarpus fauroensis, E. floridanus, E. rarotongensis ; Freycinetia Beccarii, F. caudata, F. Creaghii,

HEMSLEY, W. B.—*continued.*

KEW BULLETIN :—

F. formosana, F. humilis, F. marantifolia, F. philippinensis, F. rigidifolia, F. sumatrana, F. Vidalii ; Gentiana lateriflora ; Loranthus celebicus ; Ophiorrhiza pileoides ; Osmanthus Cooperi ; Podocarpus celebica ; Scaevola similis ; Senecio Everettii ; Strobilanthes Everettii ; Trachymene celebica.

1897.

Diagnoses Africanae.

Cacoucia Barteri.

1899. Flora of British New Guinea.

Gentiana Giulianettii, G. Macgregorii ; Havilandia papuana ; Myrsine papuana ; Pygeum costatum, P. papuanum ; Symplocos Englishii, S. orbicularis ; Triplostegia repens.

1901.

Decades Kewenses.

Aristolochia gracillima ; Elatostema peltatum.

1901. P. 84, Ormonde House.

1906. Pp. 119–121, Revision of the Synonymy of the Species of Aleurites ; pp. 147–163, Some new Chinese Plants (with E. H. Wilson) ; pp. 177–179, Collection of Drawings of Orchids by the late John Day ; p. 232, Rhododendron aucubifolium ; pp. 283–284, William Mitten, A.L.S., Bryologist ; pp. 293–294, Discovery of Goodyera repens in Norfolk ; pp. 365–366, A new Fruit from Uruguay ; pp. 392–393, F. W. Burbidge (obituary notice).

KNOWLEDGE :—

1896. Some Curious Facts in Plant Distribution. A series of six articles.

1897. On the Vegetation and some of the Vegetable Productions of Australasia. A series of four articles, illustrated.

NATURE :—

1903. Vol. lxvii., p. 223, Local Floras of India ; p. 498, Progress of the New Vegetation of Krakatoa.

Vol. lxviii., pp. 58–59, Enlargement of the Kew Herbarium.

PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON :—

1906. Ser. B, Vol. lxxviii., pp. 231–236, On the Julianiaceae.

SCIENCE PROGRESS :—

1894–96. Insular Floras. A series of seven articles.

TRANSACTIONS OF THE LINNEAN SOCIETY :—

1903. Ser. 2, Vol. vi., pp. 261–313, Cheeseman's Flora of Rarotonga.

Meryta pauciflora ; Pittosporum rarotongensis ; Weinmannia rarotongensis ; Xylosma gracile.

HILLIER, J. M.

GARDENERS' MAGAZINE :—

1901. Vol. xliv., p. 794, Bananas and Plantains.

KEW BULLETIN :—

1898. P. 86, Botanical Museums in Belgium and Holland.
1899. P. 219, Lungan Pulp.
1900. P. 1, Botanical Museums in France.
1904. P. 6, Alder clog soles.
1906. P. 109, Persian Gum ; p. 117, Chinese Wood Oil ; p. 171, Miraculous Fruits of West Africa ; p. 197, East Indian Dragon's Blood ; p. 199, Ogea Gum ; p. 218, Colorado Rubber ; p. 373, Barwood.

HOLLAND, J. H.

RUBBER CULTIVATION IN WEST AFRICA :—1901, p. 7, tt. 5.

JOURNAL OF THE AFRICAN SOCIETY :—

1905. No. xv., p. 310, Scirpus lacustris.

KEW BULLETIN :—

1906. Pp. 172–173, The Eben Tree of Old Calabar ; pp. 241–242, with chart, The Rise and Fall in Prices of Para Rubber.

NATURALIST :—

1903, pp. 51–54 ; 1904, pp. 114–119 ; 1905, pp. 93–96, 121, 125, Economic Fungi.

HUTCHINSON, J.

KEW BULLETIN :—

1906.

Diagnoses Africanae.

Anisopappus Junodi ; Guarea Thompsoni, *Sprague et Hutchinson* ; Pentanisia Sykesii ; Sphacophyllum flexuosum.

Decades Kewenses.

Gurania Eggersii, *Sprague et Hutchinson*, G. phanerosiphon, *Sprague et Hutchinson*.

MASSEE, G.

A TEXT BOOK OF PLANT DISEASES.—

1899, pp. 443, 93 figs. ; Ed. 2, 1903, pp. 472, 95 figs.

EUROPEAN FUNGUS-FLORA.—1902, pp. 274.

A TEXT BOOK OF FUNGI.—1906, pp. 427, 141 figs.

THE FUNGUS-FLORA OF YORKSHIRE.—1906, pp. 396.
(With Charles Crossland.)

THE VICTORIAN COUNTY HISTORY : SURREY :—
Fungi, p. 431.

MASSEE, G.—*continued.*

ANNALS OF BOTANY :—

1896. Vol. x., pp. 123–184, pl. 10–11, A Revision of the Genus Coprinus.

1897. Vol. xi., pp. 225–306, pl. 11–13, A Monograph of the Geoglosseae.

1901. Vol. xv., pp. 313–357, pl. 17–18, Researches on Coprophilous Fungi. (With E. S. Salmon.)

1902. Vol. xvi., pp. 57–93, pl. 4–5, Researches on Coprophilous, Fungi, II. (With E. S. Salmon.)

1904. Vol xviii., pp. 319–320, On the Origin of Parasitism in Fungi ; pp. 459–504, pl. 32, A Monograph of the Genus Inocybe, *Kursten.*

1905. Vol. xix., p. 325, 1 fig., On the presence of binucleate cells in the Ascomycetes.

BULLETIN OF THE TORREY BOTANICAL CLUB :—

1901. Vol. xxviii., p. 519, Dacryopsis Ellisiana.

GARDENERS' CHRONICLE :—

1898. Vol. xxiii., p. 293, 1 fig., Bean canker.
Vol. xxiv., pp. 124–125, A Paeony disease ; p. 269, 1 fig., Chrysanthemum Rust.

1899. Vol. xxv., p. 351, A Paeony disease.
Vol. xxvi., p. 291, 1 fig., A fungus parasite on Aloe.

1900. Vol. xxvii., p. 101, 1 fig., A disease of Conifers.
Vol. xxviii., p. 143, 1 fig., Appearance of American Gooseberry Mildew in Ireland.

1902. Vol. xxxii., p. 235, 1 fig., A disease of Nursery Stock.

1903. Vol. xxxiii., p. 14, 1 fig., An introduced Parasite on Grass.
Vol. xxxiv., p. 347, 1 fig., Diseases of Seedling Conifers.

1904. Vol. xxxvi., p. 4, 1 fig., Cluster Cups on Anemones ; p. 349, Discovery of the fruit of the Apple Mildew in England.

1905. Vol. xxxviii., p. 125, 1 fig., Cactus scab.
P. 153, 1 fig., A new Orchid disease.
Hemileia americana.
Pp. 433–434, Legislation and the Spread of Plant Diseases caused by Fungi.—Continued p. 458 and 1906, vol. xxxix., p. 12.

1906. Vol. xxxix., p. 107, Legislation and the Spread of Fungus Disease.

JOURNAL OF BOTANY :—

1896. Vol. xxxiv., pp. 145–154, pl. 357, New or Critical Fungi.
Barlaea subaurantiaca ; Clavaria Kewensis ; Clypeum peltatum ; Dasyscypha aurea, D. Eupatorii, D. trabinelloides ; Dothidea Alyxiae ; Erinella novae-zelandiae ; Geoglossum

JOURNAL OF BOTANY :—

lignicolum ; Hypocrella ochracea, H. oxyspora ; Microthyrium Psychotriae ; Mollisia chionea ; Ombriophila aterrima ; Pluteus giganteus ; Polyporus diminutus ; Pyrenopeziza Ellisii ; Scleroderris virescens ; Scutularia gallica ; Sporotrichum arabicum ; Spragueola americana.

JOURNAL OF THE BOARD OF AGRICULTURE :—

1900–01. Vol. vii., pp. 10–16, 1 pl., Fungoid Diseases of the Roots of Fruit Trees.

1902–03. Vol. ix., pp. 176–188, pl. 1–3, Larch and Spruce Fir Canker.

JOURNAL OF THE LINNEAN SOCIETY :—

1896. Vol. xxxi., pp. 462–525, pl. 16–18, Redescriptions of Berkeley's types of Fungi.

1900. Vol. xxxiv., pp. 438–448, pl. 15–16, On the Origin of the Basidiomycetes.

1901. Vol. xxxv., pp. 90–119, pl. 4–5, Redescriptions of Berkeley's Types of Fungi.

JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY :—

1896. Vol. xix., p. 21. The "Sleepy Disease" of Tomatoes.

1903. Vol. xxvii., pp. 142–145, On a Method of rendering Cucumber and Tomato plants immune against Fungus Parasites ; pp. 172–173, Diseased Pelargoniums from the Transvaal.

1904–05. Vol. xxix., p. 139, Some Diseases of the Potato.

KEW BULLETIN :—

1896. Pp. 1–5, 1 pl., Root Diseases caused by Fungi.

1897. Pp. 87–90, 1 pl., A Lily Bulb Disease.
Rhizopus necans.
Pp. 115–167, 2 pl., Mycologic Flora of the Royal Gardens, Kew.
P. 423, Slime-Flux.

1898. Pp. 105–112, Tea Blights.
Exobasidium vexans ; Stilbum nanum.
Pp. 113–136.

Fungi Exotici, I.

Aleurina tasmanica ; Catinula leucoxantha ; Chlorophyllum esculentum ; Clitocybe lilacina ; Collybia rupicola ; Daldinia aspera ; Dimerosporium tasmanicum ; Diplodina Arenariae ; Epiclinium Cumminsii ; Erinella corticola ; Eutypa erumpens ; Fusarium pannosum ; Gambleola cornuta ; Genabea tasmanica, *Mass. et Rod.;* Geopyxis elata ; Gibbera fulvella ; Gymnomyces pallidus, *Mass. et Rodw.*, G. seminudus, *Mass. & Rodw.;* Hymenogaster albellus, *Mass. & Rodw.;* H. Rodwayi, H. violaceus, *Mass. & Rodw.;* Hypholoma glutinosum; Hypocrea

MASSEE, G.—*continued.*

KEW BULLETIN :—

nebulosa ; Hysterangium affine, *Mass. & Rodw.*, H. fusisporum, *Mass. et Rodw.*, H. viscidum, *Mass. et Rodw.* ; Lachnocladium himalayense ; Lentinus crenulatus ; Lepiota altissima ; Leptonia Rodwayi ; Libertella aurantiaca ; Marasmius erumpens, M. tinctorius ; Necator decretus ; Nidularia fusispora ; Parodiella maculata ; Patellaria Maura ; Polystictus obliquus ; Quaternaria aspera ; Rosellinia picacea ; Russula coccinea ; Stagonospora chalybea ; Triglyphium niveum ; Uredo Oldenlandiae ; Xylaria Ridleyi.

Pp. 321–326, 1 pl., Gummosis of Prunus japonicus, *Thunb.*

1899. Pp. 1–6, 1 pl., Cacao Disease in Trinidad.
Nectria Bainii.

Pp. 25–27, 1 pl., Plant diseases, I.—Tree root Rot.

P. 91, Colletotrichum Camelliae.

P. 141–159, 1 pl., A revision of the genus Tilletia.
Tilletia Berkeleyi, T. hyalospora, T. mixta.

Pp. 164–185.

Fungi Exotici, II.

Aposphaeria Alpiniae ; Aulographum maximum ; Bolbitius longipes ; Boletus Rodwayi ; Botryosphaeria Anthuriicola ; Ceuthospora innumera ; Cladoderris cartilaginea ; Claudopus griseus ; Clavaria Candelabra, C. Ridleyi ; Clypeolum sparsum ; Collybia Eucalypti ; Coprinus coffeicola, C. leviceps ; Cordyceps lignicola, C. Ridleyi ; Crepidotus Ridleyi ; Diplodia Tragiae ; Favotus purpureus ; Flammula ornata ; Geaster lilacinus, G. Maurus ; Gloeosporium Araucariae ; Gyrocephalus luteus ; Helminthosporium obclavatum ; Hydnum crinigerum, H. Gleadonii, H. tapienum ; Hygrophorus Rodwayi ; Hymenogaster nanus, *Mass. & Rodw.* ; Hymenopsis Cudraniae ; Hypholoma bermudiense ; Hypocrella Panici, H. Zingiberis ; Hysterangium neglectum *Mass. & Rodw.* ; Inocybe violacea ; Lembrosia geographica ; Lentinus sericeus ; Leptonia obscura ; Marasmius excentricus ; Mollisia albo-flava, M. cinnabarina, M. rosea ; Mycena crassipes, M. gigantospora, M. repertitia ; Myxomycidium pendulum ; Ombrophila aurantiaca ; Omphalia tenera ; Paxillus Osteopaeon ; Peziza martialis, P. tomentosa ; Phoma Podocarpi ; Phyllachora ulcerata ; Pleurotus cretaceus ; Pluteus phaeus ; Polyporus albellus, P. tasmanicus ; Polystictus licmophorus ; Psathyra campanulata, P. cyclospora ; Psathyrella albida ; Psilocybe oedipus ; Puccinia decipiens ; Sphacelia Oryzae ; Stereum aterrimum ; Tremella picea, T. vinosa ; Tremellodon aurantiacum ; Trichosporium aterrimum, T. purpureum ; Ustilago goniospora, U. Stenotaphri ; Xerotus atrovirens ; Xylaria aspera.

Pp. 214–215, Report on Maromba Vine Disease in Portugal.

MASSEE, G.—*continued.*

KEW BULLETIN :—

1900. Pp. 87–89, 1 pl., Plant Diseases, II.—Leaf Curl ; III.—Sycamore Leaf Blotch ; pp. 94–99, 1 pl., South African Locust Fungus.

1907. Pp. 150–169.

Fungi Exotici, III.

Agaricus Woodrowii; Amanita grisea, *Mass. & Rodw.*; Asterina Systema-solare; Auerswaldia maxima; Battarrea laevispora; Boletus Ridleyi; Bulgaria turbinata; Cerion coccineum; Clavaria bicolor, C. ornithopoda; Collybia olivacea; Coniothecium Acanthophylli; Cyphella lilacina; Dendryphium effusum; Diplodia Ochrosiae; Gloeocalyx Bakeri; Haplosporella violacea; Helminthosporium Coffeae; Helotium prasinum; Heterosporium Calandriniae; Humaria coccinea; Hydnum pexatum; Hymenogaster albidus *Mass. & Rodw.*; Hypochnus chlorinus; Hysterium vermiforme; Irpex depauperatus; Isaria acervata; Karschia Atherospermae; Laestadia insidiosa; Leciodiographa Brownii; Lentinus flavidus; Lepiota Johnsonii; Leptonia bicolor, L. tricolor; Lycoperdon tasmanicum; Melanconium Eucalypti; Mycena sphaerospora; Nectria verrucosa; Pestalozzia vermiformis; Peziza plicata; Phaeopezia ochracea; Pholiota indica; Phoma sycophila; Pilobolus pullus; Pistillaria Johnsonii; Pleurotus macilentus, P. membranaceus; Polyporus Hollandii; Polystictus Gleadowii, P. nigripes; Psathyra nana; Psilocybe citrina; Puccinia pallida; Rhinocladium corticolum; Rosellinia echinata; Secotium Rodwayi; Sporodesmium Brassicae; Stilbum albipes; Trogia hispida; Ustilago microspora; Uromyces Bolusii.

1906. Pp. 35–42, 1 pl., Revision of the Genus Hemileia, *Berk.* Hemileia indica.

Pp. 46–47, 1 pl., New and Additional Species of Fungi occurring in the Royal Botanic Gardens, Kew.

Bolbitius umbonatus; Dasyscypha abscondita; Marasmius opalinus.

Pp. 49–60, fig. 1–5, Plant Diseases, IV.—Diseases of Beet and Mangold.

Pp. 91–94.

Fungi Exotici, IV.

Auricularia Butleri; Daedalea suberosa; Lepiota microspora; Leptonia altissima; Omphalia Rogersi; Panus ochraceus; Polystictus villosus; Poria chlorina; Psilocybe tibetensis; Stereum papyraceum.

Pp. 110–112. Perpetuation of "Potato Disease" and Potato "Leaf Curl" by means of hybernating mycelium; pp. 193–196, Plant Diseases, V.—Diseased Apples and Melons from the Cape of Good Hope; pp. 242–245, Plant Diseases, VI.—Potato Leaf Curl.

MASSEE, G.—*continued.*

KEW BULLETIN :—

Pp. 256–258.

Fungi Exotici, V.

Aposphaeria Canavaliae ; Calonectria gigaspora ; Colletotrichum echinatum ; Craterellus verrucosus ; Hydnum lateritium ; Polystictus Ridleyi ; Stilbospora Cacao ; Tryblidiella tetraspora ; Xylaria fibula.

NATURAL SCIENCE :—

1898. Vol. iii., pp. 204–209, The Cereal Rust problem : Does Eriksson's Mycoplasma exist in Nature ?

NATURALIST :—

1906. Pp. 6–10, New and Rare British Fungi.

NATURE :—

1903. Vol. lxviii., p. 296, Distribution of Calostoma.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY :—

1905. Ser. B. Vol. 197, pp. 7–24, On the Origin of Parasitism in Fungi.

TORREYA :—

1906. Vol. vi., pp. 48–50, figs. 1–5, A Fungus parasitic on a moss.

Epicoccum torquens.

TRANSACTIONS OF THE NEW ZEALAND INSTITUTE :—

1898. Vol. xxxi., pp. 282–348, pl. 22–24, The Fungus-Flora of New Zealand.

TRANSVAAL AGRICULTURAL JOURNAL :—

1905. P. 130, Mildew of Vegetable Marrow ; p. 318, Eelworms in Tobacco roots ; p. 567, Disease of Kaffir-Corn.

PEARSON, H. H. W.

THISELTON-DYER, FLORA CAPENSIS :—

1901. Vol. V.

Verbenaceae (unfinished), pp. 180–224.

Bouchea glandulifera, B. longipetala ; Clerodendron simile ; Lantana galpiniana ; Lippia bazeiana, L. pretoriensis, L. Rehmanni, L. Wilmsii ; Vitex geminata, V. guerkeana, V. harveyana, V. reflexa.

ANNALS OF BOTANY :—

1903. Vol. xvii., pp. 617–618, The Double Pitchers of Dischidia Shelfordii.

HOOKER'S ICONES PLANTARUM :—

1900. Vol. xxvii.. pt. 2, t. 2643.

Cochlearia Hobsoni.

PEARSON, H. H. W.—*continued.*

HOOKER'S ICONES PLANTARUM :—

1901. Vol. xxvii., pt. 4, t. 2691.
Geophila pilosa.

1901. Vol. xxviii., pt. 1, tt. 2704–6.
Cuscuta Hygrophilae; Pentaphragma albiflorum; Vitex mooiensis.

JOURNAL OF THE LINNEAN SOCIETY :—

1899. Vol. xxxiv., pp. 300–365, Botany of the Ceylon Patanas. Part I.

1901. Vol. xxxv., pp. 78–90, On a Small Collection of Dried Plants obtained by Sir Martin Conway in the Bolivian Andes (With W. B. Hemsley).

1902. Vol. xxxv., pp. 124–265, Flora of Tibet (With W. B. Hemsley).

1902. Vol. xxxv., pp. 375–390, On some Species of Dischidia with double Pitchers.

1903. Vol. xxxv., pp. 430–463, Botany of the Ceylon Patanas. Part II. (With J. Parkin).

KEW BULLETIN :—

1901. **Decades Kewenses.**
Clerodendron Curtisii.

1906. **Decades Kewenses.**
Connaropsis acuminata; Cuscuta Upcraftii; Euthemis ciliata; Semecarpus cinerea; Swintonia puberula.

PRAIN, D.

ANNALS OF BOTANY :—

1906. Vol. xx., pp. 323–370, A Review of the Genera Meconopsis and Cathcartia.

BOTANICAL MAGAZINE :—

1906, t. 8092.
Ficus Krishnae.

HOOKER'S ICONES PLANTARUM :—

1906. Editor. Vol. ix., pt. 1.

JOURNAL OF BOTANY :—

1906. Pp. 4–8, The Genus Ceratostigma.
Pp. 370–375, Charles Baron Clarke (obituary notice).

KEW BULLETIN :—

1906. Pp. 271–281, C. B. Clarke (obituary notice).
Pp. 384–392, G. C. Churchill (obituary notice).

NATURE :—

1906. Vol. lxxiv., p. 495, Charles Baron Clarke (obituary notice).

ROLFE, R. A.

AMES, STUDIES IN THE ORCHIDACEAE, 1905.

Acoridium Whitfordii ; Bulbophyllum cuneatum, B. dasypetalum, B. lasioglossum, B. Whitfordii ; Ceratostylis philippinensis ; Dendrobium acuminatum ; Eria graciliscapa ; Phreatia luzoniensis ; Trichoglottis flexuosa.

THISELTON-DYER, FLORA CAPENSIS :—

1901. Vol. V.

Myoporineae and **Selagineae**, pp. 92–180.

Dischisma crassum ; Hebenstreitia Cooperi, H. Dregei, H. minutiflora, H. pubescens, H. Rehmanni, H. Sutherlandi, H. Watsoni ; Selago aggregata, S. Atherstonei, S. Bolusii, S. brevifolia, S. Burchelli, S. Burkei, S. compacta, S. Cooperi, S. corrigioloides, S. curvifolia, S. diosmoides, S. elata, S. ferruginea, S. Flanagani, S. foliosa, S. Forbesii, S. fruticulosa, S. humilis, S. lepidioides, S. linearifolia, S. linearis, S. lithospermoides, S. longiflora, S. longipedicellata, S. longituba, S. lydenbergensis, S. Morrisii, S. Muddii, S. Mundii, S. natalensis, S. Nelsoni, S. ovata, S. pachypoda, S. pubescens, S. punctata, S. ramosissima, S. Rehmanni, S. rigida, S. robusta, S. Rustii, S. Sandersoni, S. Saundersiae, S. Schlechteri, S. setulosa, S. speciosa, S. Thomii, S. transvaalensis, S. Tysoni, S. villicalyx, S. villicaulis, S. villosa, S. Wilmsii, S. Woodii, S. Zeyheri ; Walafrida crassifolia, W. gracilis, W. Macowani, W. minuta, W. polystachya, W. pubescens, W. squarrosa, W. tenuifolia, W. zuurbergensis.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1897. Vol. VII.

Orchideae, pp. 12–192.

Ancistrochilus Thomsonianus ; Angraecum Batesii, A. caespitosum, A. clavatum, A. dives, A. Kirkii, A. lagosense, A. Moloneyi, A. mombasense, A. pachyurum, A. Thomsoni, A. Wakefieldii ; Calanthe Volkensii ; Epipactis somaliensis ; Eulophia aurantiaca, E. Bainesii, E. brevipetala, E. Buchananii, E. Carsoni, E. Coleae, E. crinita, E. dichroma, E. Elliotii, E. Holubii, E. Johnstoni, E. Kirkii, E. lanceolata, E. lata, E. leonensis, E. macrantha, E. manganensis, E. monticola, E. Nuttii, E. Phillipsiae, E. Smithii, E. speciosa, E. stricta, E. tanganyikensis, E. Thomsoni ; Liparis ruwenzoriensis ; Lissochilus Carsoni, L. congoensis, L. elatus, L. Erythraeae, L. Holubii, L. Johnstoni, L. Kirkii, L. Kraenzlinii, L. latus, L. Millsoni, L. Monteiroi, L. Nyasae, L. Rendlei, L. Smithii, L. Thomsoni, L verrucosus, L. Volkensii, L. Wilsoni ; Listrostachys acuminata, L. Batesii, L. bistorta, L. Erythraeae, L. gabonensis, L. Hookeri, L. iridifolia, L. Kirkii, L. multiflora, L. Whytei ; Megaclinium Lindleyi, M. Millenii, M. platyrhachis ; Mystacidium Batesii, M. curvatum, M. longicaudatum, M. pedunculatum, M. Walleri ; Pogonia

ROLFE, R. A.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

Buchanani, P. shirensis ; Polystachya confusa, P. Johnstoni, P. Kraenzlinii, P. Mannii, P. Rendlei, P. Ridleyi, P. zanguebarica ; Pteroglossaspis Carsoni ; Stenoglottis zambesiaca ; Zeuxine Batesii.

1898. Vol. VII., pp. 193–275, 288–292, 569–575.

Brachycorythis Lastii, B. parviflora ; Cynorchis Buchanani, C. Hanningtoni, C. Johnstoni, C. Kirkii, C. Usambarae ; Deroemera triloba ; Disperis Preussii ; Habenaria calva, H. clarencensis, H. confusa, H. Erythraeae, H. Holubii, H. insignis, H. Johnsoni, H. longistigma, H. Lugardii, H. lykipiensis, H. Nicholsoni, H. Rendlei, H. rhopalostigma, H. Schinzii, H. villosa ; Holothrix Lastii, H. Nyasae ; Mystacidium angustum ; Platanthera uncata ; Podandria macrandra ; Satyrium breve, S. Buchananii, S. Carsoni, S. cheirophorum, S. densum, S. elongatum, S. Johnsoni, S. Kirkii, S. Kraenzlinii, S. longissimum, S. minax, S. Nuttii, S. occultum, S. orbiculare, S. saccatum, S. shirense, S. zombense.

1900. Vol. V.

Myoporineae and **Selagineae**, pp. 262–272.

Hebenstreitia Holubii ; Selago amboensis, S. angolensis, S. blantyrensis, S. Buchanani, S. coerulea, S. Dinteri, S. Hoepfneri, S. Holstii, S. Holubii, S. Melleri, S. Nyasae, S. tenuicaulis, S. viscosa.

BOTANICAL MAGAZINE :—

1904. t. 7964.

1905. tt. 7996, 8000, 8003, 8007, 8020, 8026, 8031, 8033, 8041, 8044, 8047.

Bulbophyllum crenulatum ; Cirrhopetalum breviscapum ; Lissochilus Mahoni, L. Ugandae.

1906. tt. 8053, 8057, 8062, 8070, 8074, 8084, 8088, 8093, 8097, 8100, 8103, 8106, 8109.

Listrostachys hamata.

ENGLER'S JAHRBUCHER :—

1901. Vol. xxx., p. 402.

Selago Goetzei.

GARDENERS' CHRONICLE :—

1896. Vol. xix., pp. 105–6, 198–9, 232–4, Natural Hybrid Orchids.

1904. Vol. xxxv., p. 258, Dendrobium bellatulum ; p. 259, Coelogyne venusta ; p. 338, Cymbidium Parishii var. Sanderae ; p. 387, Cymbidium insigne.

Vol. xxxvi., p. 49, Potentilla nepalensis var. Willmottiae ; p. 141, Cochlioda brasiliensis ; p. 266, Bulbophyllum Gentilii.

ROLFE, R. A.—*continued.*

GARDENERS' CHRONICLE :—

1905. Vol. xxxvii., p. 227, Coelogyne Lawrenceana; p. 243, Cymbidium Schroederi; p. 391, Arachnanthe annamensis.

Vol. xxxviii., p. 197, Eulophia paniculata; p. 198, Eulophia undulata; p. 427, Cymbidium erythrostylum; p. 449, Eria globifera; p. 450, Bonatea antennifera.

1906. Vol. xxxix., p. 115, Pleione yunnanensis; p. 185, Dendrobium Wilsoni; p. 274, Mexican Eupatoriums.

HOOKER'S ICONES PLANTARUM :—

1896. Vol. xxv., pt. 2, t. 2445.

Pt. 3, t. 2461.

Homalopetalum jamaicense.

Pt. 4, t. 2496.

Habenaria polytricha.

1899. Vol. xxvii., pt. 1, tt. 2616, 2617.

Giulianettia tenuis.

1901. Vol. xxvii., pt. 4, tt. 2686, 2699.

Gymnopodium floribundum.

JOURNAL OF HORTICULTURE :—

1906. Vol. lii., pp. 201–2 and 252, The Orchid Revolution.

JOURNAL OF THE LINNEAN SOCIETY :—

1896. Vol. xxxii., pp. 439–478, A Revision of the genus Vanilla.

V. acuminata, V. acuta, V. borneensis, V. carinata, V. columbiana, V. crenulata, V. Eggersii, V. Hostmanni, V. madagascariensis, V. ovalifolia, V. organensis, V. ovata, V. philippinensis, V. ramosa, V. Sprucei, V. Vellozii.

1903. Vol. xxxvi., Index Flora Sinensis :—

Orchidaceae, pp. 5–67.

Arethusa sinensis; Bulbophyllum yunnanense; Calanthe yunnanensis; Cirrhopetalum Henryi; Coelogyne Delavayi, C. grandiflora, C. yunnanensis; Dendrobium bellatulum, D. Hancockii, D. zonatum; Eria hainanensis; Eulophia yunnanensis; Habenaria yunnanensis; Hancockia uniflora; Herminium Souliei, H. tanguticum; Liparis latilabris, L. yunnanensis; Luisia Morsei; Myrmechis chinensis; Oberonia yunnanensis; Odontochilus yunnanensis; Pholidata yunnanensis; Sarcanthus elongatus; Tropidia hongkongensis.

JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY :—

1903. Vol. xxiv., pp. 181–202, Hybridisation viewed from the standpoint of Systematic Botany.

ROLFE, R. A.—*continued.*

KEW BULLETIN :—

1896.

Decades Kewenses.

Dianthera celebica ; Geophila picta ; Strobilanthes Everettii.

New Orchids.

Bulbophyllum attenuatum, B. longiscapum, B. macrochilum ; Calanthe arcuata, C. ensifolia, C. Hancockii, C. Henryi, C. lamellosa ; Cheirostylis yunnanensis ; Cirrhopetalum Fordii ; Coelogyne Delavayi, C. Henryi, C. pogonioides ; Cymbidium Faberi ; Cypripedium ebracteatum ; Cyrtopera formosana ; Dendrobium hainanense, D. quadrilobum ; Diplomeris chinensis ; Epidendrum atrorubens ; Eria caespitosa, E. formosana ; Eulophia Faberi ; Galeola Faberi ; Goodyera Henryi ; Habenaria Faberi, H. Fordii, H. Hancockii, H. Henryi, H. humidicola, H. omeiensis ; Hemipilia Henryi ; Holothrix Johnstoni ; Lanium subulatum ; Liparis Henryi, L. pauciflora ; Listera grandiflora ; Luisia Hancockii ; Macodes Sanderiana ; Nephelaphyllum chinense, N. cristatum ; Pholidota cantoniensis ; Physurus chinensis ; Restrepia sanguinea ; Sarcochilus hainanensis ; Spiranthes exigua, S. metallica ; Tainia hongkongensis ; Thelasis hongkongensis ; Vanda hainanensis.

1898.

New Orchids.

Bulbophyllum spectabile ; Chondrorhyncha albicans ; Coelogyne pulchella ; Dendrobium cymbiforme, D. hirtulum ; Epidendrum organense ; Eria latibracteata ; Hetaeria samoensis ; Jenmania elata ; Lycaste Dyeriana ; Maxillaria dichroma, M. elegantula ; Oncidium gracillimum ; Platyclinis rufa ; Pleurothallis rufa ; Sarcanthus hongkongensis ; Sievkingia Reichenbachiana ; Sobralia luteola ; Stanhopea impressa ; Trichocentrum alatum.

1899.

New Orchids.

Appendicula longipedunculata ; Calanthe celebica ; Cirrhopetalum Koordersii ; Cleisostoma Koordersii ; Dendrobium parvulum ; Eria celebica, E. tricuspidata ; Macodes celebica ; Microstylis cordifolia, M. repens ; Peristylus bilobus ; Phreatia celebica, P. Koordersii ; Taeniophyllum celebicum ; Trichoglottis celebica, T. Koordersii, T. oblongifolia ; Vanda celebica ; Vanilla fimbriata, V. Hartii.

1901.

New Orchids.

Aeranthes caudata ; Catasetum quadridens ; Cirrhopetalum appendiculatum ; Dendrobium capituliflorum, D. inaequale, D. puniceum, D. quinarium ; Masdevallia venosa ; Ornithocephalus multiflorus ; Panisea tricallosa.

Decades Kewenses.

Dioclea megacarpa.

ROLFE, R. A.—*continued.*

KEW BULLETIN :—

1906.

New Orchids.

Aëranthes ramosa ; Bulbophyllum calabaricum, B. capituliflorum, B. Kerrii, B. Mahoni ; Calanthe madagascariensis, C. Warpuri ; Catasetum eburneum ; Cattleya Jenmani ; Coelia densiflora ; Colax tripterus ; Cryptophoranthus Moorei ; Cynorchis villosa ; Cypripedium Wilsoni ; Dendrobium annamense, D. compactum, D. convolutum, D. Hodgkinsoni, D. Madonnae, D. Schinzii ; Gomesa scandens ; Habenaria triquetra ; Liparis Lloydii ; Listrostachys Brownii, L. fimbriata ; Masdevallia peruviana ; Mystacidium Mahoni ; Oncidium Claesii ; Pescatorea cochlearis ; Platylepis australis, P. densiflora ; Pleurothallis venosa ; Polystachya bicolor ; Pteroglossaspis argentina ; Renanthera annamensis ; Saccolabium rubescens ; Sarcanthus inflatus ; Trigonidium subrepens ; Vanilla zanzibarica ; Zygopetalum Ballii.

Additional Series, V.—Wild Fauna and Flora of the Royal Botanic Gardens, Kew : Oak Galls.

MEMOIRS OF THE TORREY BOTANICAL CLUB :—

1895–1896. Vol. IV., pp. 259–266 ; Vol. VI., pp. 121–123, Orchidaceae collected by Mr. Miguel Bang in Bolivia.

Altensteinia boliviensis ; Camaridium boliviense ; Dichaea hamata ; Elleanthus yungasensis ; Epidendrum yungasense ; Govenia boliviensis ; Hexadesmia boliviensis ; Maxillaria nervosa ; Oncidium Rusbyi ; Pleurothallis complicata, P. densifolia, P. scabridula, P. yungasensis ; Rusbyella caespitosa ; Spiranthes Bangii, S. yungasensis ; Stelis Bangii, S. Brittoniana, S. Rusbyi.

ORCHID REVIEW :—

1894. Editor. Numerous original contributions to Synonymy, Geographical Distribution, and the History of Natural Hybrid Orchids.

PROCEEDINGS OF THE BIOLOGICAL SOCIETY OF WASHINGTON :—

1904, pp. 119, 120.

Dendrobium Micholitzii ; Epidendrum oaxacanum, E. Pringlei.

VIERTELJAHRSSCHR. NAT. GES. ZÜRICH :—

1904. Vol. xlix., p. 196.

Selago Junodii.

SCOTT, D. H.

AN INTRODUCTION TO STRUCTURAL BOTANY, PART II. (FLOWERLESS PLANTS), 1896, pp. 312, with 114 illustrations. London. A. and C. Black.

SCOTT, D. H.—*continued.*

STUDIES IN FOSSIL BOTANY, 1900, pp. 533, with 151 illustrations. London. A. and C. Black.

ENCYCLOPÆDIA BRITANNICA, Palaeobotany (Palaeozoic). 1902. 10th Edition, Vol. 31, pp. 408–421.

RÉSULTATS SCIENTIFIQUES DU CONGRÈS INTERNATIONAL DE BOTANIQUE, WIEN, 1905. Ueber die wichtigsten neueren Ergebnisse der Phytopaläontologie. The Fern-like Seed-Plants of the Carboniferous Flora, 1906, pp. 279–296, with 17 figs. in text.

ANNALS OF BOTANY :–

1897. Vol. xi., pp. 168–175, On Cheirostrobus, a new type of Fossil Cone from the Calciferous Sandstones; pp. 327–332, tt. 15 and 16, On two new instances of Spinous Roots; pp. 399–419, tt. 20 and 21, The Anatomical Characters presented by the peduncle of Cycadaceae; pp. 590–593, On Spencerites, a new Genus of Lycopodiaceous Cones from the Coal-Measures.

1899. Vol. xiii., pp. 183–187, On Medullosa anglica, a new representative of the Cycadofilices; pp. 615–619, On the Primary Wood of certain Araucarioxylons.

1900. Vol. xiv., pp. 413–454, tt. 23 and 24, and two figs. in text, The Structure of *Isoetes Hystrix* (With T.G. Hill); pp. 713–717, On the Occurrence of a Seed-like Fructification in cerfain Palaeozoic Lycopods.

1901. Vol. xv., pp. 773–774, On a primitive type of Structure in Calamites.

1903. Vol. xvii., pp. 625–629, On Lagenostoma Lomaxi, the Seed of Lyginodendron (With F. W. Oliver).

1904. Vol. xviii., pp. 321–322, On the Structure of the Palaeozoic Seed Lagenostoma Lomaxi, with a statement of the Evidence upon which it is referred to Lyginodendron; pp. 519–521, On the Occurrence of Sigillariopsis in the Lower Coal-Measures of Britain.

1905. Vol. xix., pp. 168–169, On a New Type of Sphenophyllaceous Cone (*Sphenophyllum fertile*) from the Lower Coal-Measures.

1906. Vol. xx., pp. 109–112, Note on the Structure of Trigonocarpon olivaeforme (With A. J. Maslen); pp. 317–319, The Structure of Lepidodendron obovatum, *Sternb.*

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY :—

1905, pp. 137–149, tt. 1–3, with two figs. in text, What were the Carboniferous Ferns? Presidential Address.

1906, pp. 129–145, tt. 4 and 5, Life and Work of Bertrand Renault, Presidential Address; pp. 519–521, On the Structure of some Carboniferous Ferns.

SCOTT, D. H.—*continued.*

MEMOIRS AND PROCEEDINGS OF THE MANCHESTER LITERARY AND PHILOSOPHIC SOCIETY :—

1905. Vol. xlix., pp. 1–32, tt. 1–3, with three figs. in text, The Early History of Seed-bearing Plants, as recorded in the Carboniferous Flora. Wilde Lecture.

NEW PHYTOLOGIST :—

1902. Vol. i., pp. 25–30, The Old Wood and the New ; pp. 207–212, Professor Jeffrey's Theory of the Stele.

1903. Vol. ii., pp. 19–22, Professor Bommer on Lepidocarpon.

1904. Vol. iii., pp. 18–23, with two figs. in text, Germinating Spores in a fossil Fern-Sporangium.

1905. Vol. iv., pp. 114–120, with two figs. in text, The Sporangia of Stauropteris oldhamia, *Binney* (*Rachiopteris oldhamia*, Will.).

1906. Vol. v., pp. 170–172, with two figs. in text, The Occurrence of Germinating Spores in Stauropteris oldhamia.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY. SERIES B :—

1896. Vol. 186, pp. 703–779, tt. 18–29, Further observations on the Organisation of the Fossil Plants of the Coal-Measures : Part III.—Lyginodendron and Heterangium (With W. C. Williamson).

1897. Vol. 189, pp. 1–34, tt. 1–6, and one fig. in text, On the Structure and Affinities of Fossil Plants from the Palaeozoic Rocks : On Cheirostrobus, a new type of Fossil Cone from the Lower Carboniferous Strata (Calciferous Sandstone Series).

1898. Vol. 189, pp. 83–106, tt. 12–15, On the Structure and Affinities of Fossil Plants from the Palaeozoic Rocks : II.—On Spencerites, a new genus of Lycopodiaceous Cones from the Coal Measures, founded on the Lepidodendron Spenceri of Williamson.

1899. Vol. 191, pp. 81–126, tt. 5–13, and one fig. in text, On the Structure and Affinities of Fossil Plants from the Palaeozoic Rocks : III.—On Medullosa anglica, a new representative of the Cycadofilices.

1901. Vol. 194, pp. 291–333, tt. 38–43, On the Structure and Affinities of Fossil Plants from the Palaeozoic Rocks : IV.—The Seed-like Fructification of Lepidocarpon, a genus of Lycopodiaceous Cones from the Carboniferous Formation.

1904. Vol. 197, pp. 193–247, tt. 4–10, and two figs. in text, On the Structure of the Palaeozoic Seed Lagenostoma Lomaxi, with a Statement of the Evidence upon which it is referred to Lyginodendron (With F. W. Oliver).

SCOTT, D. H.—*continued.*

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY. SERIES B :—

1905. Vol. 198, pp. 17–39, tt. 3–5, and three figs. in text, On the Structure and Affinities of Fossil Plants from the Palaeozoic Rocks: V.—On a New Type of Sphenophyllaceous Cone (*Sphenophyllum fertile*) from the Lower Coal-Measures.

PROCEEDINGS OF THE ROYAL SOCIETY :—

1897. Vol. 60, pp. 417–424, On Cheirostrobus, a new type of Fossil Cone from the Calciferous Sandstone.

1900. Vol. 67, pp. 306–309, Note on the Occurrence of a Seed-like Fructification in certain Palaeozoic Lycopods.

1903. Vol. 71, pp. 477–481, On Lagenostoma Lomaxi, the Seed of Lyginodendron (With F. W Oliver).

PROGRESSUS REI BOTANICAE ;—

1906. Vol. i., pp. 139–217, with 37 figs. in text, The Present Position of Palaeozoic Botany.

REPORTS OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE :—

1896, pp. 992–1010, Presidential Address to Botanical Section.

P. 1024, On some Carboniferous Fossils referred to Lepidostrobus.

1899, pp. 1045–1046, On a new Medullosa from the Lower Coal-Measures of Lancashire.

P. 1049, On a Fine Specimen of the Halonial Branch of a Lepidodendron allied to L. fuliginosum (*Will.*).

P. 1050, On an English Botryopteris.

P. 1050, On the Structure of Zygopteris.

1900, p. 945, On the Presence of Seed-like Organs in certain Palaeozoic Lycopods.

Pp. 945-946, The Primary Structure of certain Palaeozoic Stems referred to Araucarioxylon.

1901, p. 849, On a Primitive Type of Structure in Calamites.

1902, p. 810, Sporangiophores as a clue to Affinities among Pteridophyta.

1905, pp. 777–778, A New Type of Sphenophyllaceous Cone from the Lower Coal-Measures.

1905, p. 778, On some New Lagenostomas. (With E. A. N. Arber.)

TRANSACTIONS OF THE LINNEAN SOCIETY :—

1906, 2 Ser. Bot., Vol. VII., pp. 45–68, tt. 7–10, On Sutcliffia insignis, a new Type of Medulloseae from the Lower Coal-Measures.

SCOTT, D. H.—*continued.*

TRANSACTIONS OF THE ROYAL SOCIETY OF EDINBURGH :—

1902. Vol. xl., part 2, pp. 331–365, tt. 1–6, with 5 figs. in text, On the Primary Structure of certain Palaeozoic Stems with the Dadoxylon Type of Wood.

SKAN, S. A.

THISELTON-DYER, FLORA OF TROPICAL AFRICA.

1906. Vol. IV., Sect. 2.

Scrophulariaceae, pp. 216–462. (With W. B. Hemsley.)

Aptosimum Gossweileri, A. molle ; Buchnera albiflora, B. attenuata, B. benthamiana, B. foliosa, B. humilis, B. latibracteata, B. namuliensis, B. nitida, B. Nuttii, B. pulchra, B. ruwenzoriensis, B. similis, B. speciosa, B. trilobata, B. tuberosa, C. scabrida ; Craterostigma lanceolatum ; Cycniopsis obtusifolia ; Dopatrium angolense, D. longidens ; Ilysanthes Barteri, I. gracilis, I. pulchella, I. ugandensis ; Limnophila Barteri ; Linaria Bentii, L. nubica ; Lindernia bifolia, L. brevidens, L. debilis, L. insularis, L. Whytei ; Moniera pubescens ; Rhamphicarpa Jamesii, R. multicaulis ; Sopubia Carsoni, S. densiflora, S. Mannii, S. Monteiroi, S. similis ; Stemodiopsis Buchanani, S. humilis ; S. brachycalyx, S. somaliensis, S. strictissima ; Sutera blantyrensis, S. dubia, S. Gossweileri, S. Welwitschii ; Torenia angolensis, T. Mannii ; Verbascum Schimperi.

BOTANICAL MAGAZINE :—

1905, tt. 7999, 8021, 8038.

1906, tt. 8063, 8064, 8069, 8073, 8077, 8081, 8090, 8094, 8099, 8105, 8110.

GARDENERS' CHRONICLE :—

1904. Vol. xxxvi., p. 3, Sophora viciifolia.

HOOKER'S ICONES PLANTARUM :—

1900. Vol. xxvii., pt. 3, tt. 2661, 2662.
Quercus Blakei, Q. Edithae.

1902. Vol. xxviii., pt. 2, t. 2729.
Tephrosia Clementi.

JOURNAL OF THE LINNEAN SOCIETY :—

1899. Vol. xxvi., Index Florae Sinensis :—

Juglandaceae, pp. 493–495.

Myricaceae, p. 496.

Cupuliferae : Quercineae, pp. 505–525.

Castanopsis Henryi ; Quercus amygdalifolia, Q. Augustinii, Q. Baronii, Q. brevicaudata, Q. calathiformis Q. formosana, Q. Franchetii, Q. Lycoperdon.

Ceratophyllaceae, p, 538.

Gnetaceae, pp. 538–539.

SKAN, S. A.—*continued.*

KEW BULLETIN :—

1898. **Decades Kewenses.**

Jasminum nitidum.

1906, p. 394, John Mahon (obituary notice).

NATURE :—

1902. Vol. lxv., p. 132, Thomas Meehan (obituary notice) ; P. 321, Alfred William Bennett (obituary notice).

SPRAGUE, T. A.

THISELTON-DYER, FLORA CAPENSIS :—

1904. Vol. IV., Sect. 2.

Bignoniaceae, pp. 447–454.

Podranea ricasoliana ; Rhigozum spinosum.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1906. Vol. IV., Sect. 2.

Bignoniaceae, pp. 512–538.

Kigelia acutifolia, K. angolensis, K. Elliotii, K. elliptica, K. impressa, K. lanceolata, K. Moosa ; Markhamia sessilis.

ANNALS OF BOTANY :—

1903. Vol. xvii., pp. 159–166, t. 11.

On the Heteranthus Section of Cuphea.

Cuphea Bombonasae, C. tarapotensis.

BOTANICAL MAGAZINE :—

1904, t. 7970.

1905, tt. 7995, 8048–49.

1906, tt. 8058, 8065, 8085, 8089, 8091, 8101, 8108.

BULLETIN DE L'HERBIER BOISSIER :—

1905. Ser. II. Vol. v., 78–88, Chodat et Hassler, Plantae Hasslerianae :—

Bignoniaceae.

Adenocalymma glomeratum ; Anemopaegma longipetiolatum ; Macfadyena Hassleri ; Mansoa truncata ; Tecoma Hassleri.

Pp. 264–267, Manettiarum pugillus.

Manettia chrysoderma, M. domingensis, M. quinquenervia, M. Smithii.

P. 408, Poupartia gummifera.

Pp. 700–704, Plantarum novarum vel minus cognitarum diagnoses.

Aňona jamaicensis, A. uncinata ; Apeiba Burchellii ; Mollia Burchellii ; Triumfetta Amuletum.

SPRAGUE, T. A.—*continued.*

BULLETIN DE L'HERBIER BOISSIER :—

Pp. 832–836, Manettiarum pugillus alter.

Manettia avenia, M. Lindenii, M. pectinata, M. recurva, M. Schumanniana.

Pp. 1164–1170, Plantarum novarum vel minus cognitarum diagnoses II.

Erythrina edulis, E. esculenta; Oncoba Gilgiana; Sterculia Dawei; Syzygium Rowlandi.

1906. Sér. II., Vol. vi., pp. 371–376, Bignoniaceae americanae novae.

Anemopaegma Parkeri, A. surinamense; Arrabidaea Bangii, A. pachycalyx, A. panamensis, A Pullei, A. Trailii; Crescentia Donnell-Smithii; Memora bilabiata.

GARDENERS' CHRONICLE.

1903. Vol. xxxiii., p. 274, Swainsona ecallosa; p. 307, Eriostemon affinis; p. 354, Ficus Barteri.

1904. Vol. xxxvi., p. 87, Sinningia Regina; p. 141, Wistaria involuta; p. 252, Lobelia heterodonta.

P. 384, The cultivated species of Manettia.

Manettia inflata.

HOOKER'S ICONES PLANTARUM :—

1902. Vol. xxviii., pt. 2, tt. 2748–2749.

Hamadryas sempervivoides.

1903. Vol. xxviii., pt. 3, tt. 2770–2772.

Xylophragma myrianthum, X. pratense.

1905. Vol. xxviii., pt. 4, tt. 2799–2800.

Markhamia platycalyx.

JOURNAL OF BOTANY :—

1906, pp. 192–207, A Revision of Acridocarpus.

Acridocarpus congolensis, A. hemicyclopterus, A. ugandensis.

JOURNAL OF THE LINNEAN SOCIETY :—

1905. Vol. xxxvii., p. 98, Eugenia Whytei.

1906. Vol. xxxvii., pp. 495–544, tt. 21–23, Plantae Novae Daweanae in Uganda lectae (With Otto Stapf and others).

Alsodeia Dawei; Balanites Wilsoniana, *Dawe et Sprague*; Bersama ugandensis; Bombax reflexum; Carapa grandiflora; Dombeya Dawei, D. Mukole; Grewia ugandensis; Lovoa brachysiphon, L. Brownii, L. budongensis, L. Klaineana; Odyendyea longipes; Pseudocedrela excelsa, *Dawe et Sprague*, P. utilis, *Dawe et Sprague*; Rawsonia ugandensis; Triumfetta ruwenzoriensis; Warburgia ugandensis.

SPRAGUE, T. A.—*continued.*

KEW BULLETIN :—

1906.

Decades Kewenses.

Gurania Eggersii, *Sprague et Hutchinson*, G. phanerosiphon, *Sprague et Hutchinson*.

Diagnoses Africanae.

Cissus adenopodus ; Guarea Thompsoni, *Sprague et Hutchinson* ; Gymnosporia condensata, G. deflexa.

TRANSACTIONS AND PROCEEDINGS OF THE BOTANICAL SOCIETY OF EDINBURGH.

1905. Vol. xxii., pp. 425–436, Preliminary Report on the Botany of Captain Dowding's Colombian Expedition, 1898–99.

Anemopaegma grandiflorum ; Begonia Andreana ; Casearia camporum ; Galactia camporum ; Gurania pedata ; Inga gracilior, I. olivacea ; Isertia alba, I. Purdiaei ; Leandra caquetana ; Lecythis praealta ; Matisia Dowdingii ; Meriania hexamera ; Miconia acutipetala, M. perplexans ; Oxalis insignis ; Rhynchanthera orinocensis ; Sabicea camporum ; Saurauja aequatoriensis, S. floribunda, S. pulchra, S. Schlimii, S. Sprucei ; Sipanea acinifolia ; Sterculia colombiana ; Tapirira pilosa ; Tetrapteris tolimensis ; Tococa caquetana ; Vismia floribunda, V. Sprucei.

STAPF, O.

HOOKER FIL., FLORA OF BRITISH INDIA :—

1896. Vol. VII.

Gramineae, pp. 310–327, 337–346, 348–362.

Bromus himalaicus ; Catabrosa sikkimensis ; Eragrostis barbulata, E. brachyphylla, E. coarctata, E. Colletii, E. leioptera, E. malayana, E. phleoides, E. Rottleri ; Festuca Cumminsii, F. kashmiriana, F. leptopogon, F. Levingii, F. lucida, F. nitidula, F. polycolea, F. undata ; Garnotia tenuifolia, G. Thwaitesii ; Glyceria poaeoides, G. Thomsonii ; Oryzopsis Munroi : Poa khasiana, P. polycolea, P. tremula.

JOHNSTON, LIBERIA :—

1906. Vol I., pp. 570–668, with illustrations. The known plants of Liberia.

Clinogyne arcta ; Elaeophorbia drupacea ; Ficus Johnstonii, F. Whytei ; Millettia pallens ; Renealmia maculata.

THISELTON-DYER, FLORA CAPENSIS :—

1898. Vol. VII.

Gramineae, pp. 310–384.

Andropogon auctus, A. Buchananii, A. pleiarthron, A. plurinodia, A. transvaalensis ; Digitaria flaccida, D. setifolia, D. tricholaenoides ; Erianthus junceus ; Ischaemum glaucostachyum.

STAPF, O.—*continued.*

THISELTON-DYER, FLORA CAPENSIS :—

1899. Vol. VII.

Gramineae—*cont.*, pp. 385–576.

Agrostis barbuligera, A. polypogonoides; Aristida angustata, A. Burkei, A. sciurus; Avenastrum Dodii; Chaetobromus Schraderi; Danthonia brachyphylla, D. dura, D. inermis, D. Macowanii, D. macrocephala, D. suffrutescens; Panicum Holubii, P. minus, P. obumbratum, P. perlaxum, P. typhurum; Pennisetum natalense; Pentameris dregeana, P. squarrosa; Pentaschistis acinosa, P. argentea, P. brachyathera, P. Burchellii, P. fibrosa, P. heterochaeta, P. hirsuta, P. imperfecta, P. Jugorum, P. leucopogon, P. natalensis, P. subulifolia, P. tomentella, P. Tysonii, P. Zeyheri; Prionanthium pholiuroides; Setaria flabellata, S. Gerrardii; Tricholaena glabra, T. setifolia.

1900. Vol. VII.

Gramineae—*cont.*, pp. 577–750, 760–765.

Brachypodium Bolusii; Brizopyrum brachystachyum; Bromus firmior, B. natalensis; Ehrharta Dodii, E. subspicata, E. tricostata; Enneapogon scoparius; Entoplocamia aristulata; Eragrostis Atherstonei, E. Burchellii, E. caesia, E. dura, E. echinochoidea, E. elatior, E. heteromera, E. margaritacea, E. nebulosa, E. Poa, E. sporoboloides, E. Wilmsii; Festuca longipes; Melica Bolusii, M. Neesii, M. pumila; Oropetium capense; Poa Atherstonei, P. bidentata; Poagrostis pusilla; Schismus aristulatus, S. koelerioides; Secale africanum; Sporobolus acinifolius.

1904. Vol. IV., Sect. 2.

Lentibulariaceae, pp. 423–427.

Genlisea hispidula; Utricularia transrugosa.

Pedaliaceae, pp. 454–463.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1902. Vol. IV., Sect. 1.

Apocynaceae, pp. 24–231.

Adenium coëtaneum; Alafia Butayei, A. grandis, A. Schumannii; Baissea elliptica; Callichilia Mannii, C. inaequalis; Clitandra alba, C. Staudtii; Conopharyngia Cumminsii, C. Johnstonii, C. jollyana; Diplorhynchus angustifolia; Ervatamia coronaria; Gabunia glandulosa, G. longiflora; Holarrhena Wulfsbergii; Landolphia Cameronis, L. ferruginea, L. leonensis, L. pachyphylla, L. Tayloris; Motandra pyramidalis; Oncinotis glandulosa; Pleiocarpa flavescens, P. micrantha, P. microcarpa, P. salicifolia; Pleioceras Gilletii, P. Zenkeri; Polyadoa Elliotii; Pterotaberna inconspicua; Rauwolfia Cumminsii, R. Goetzei, R. obliquinervis, R. Welwitschii; Tabernanthe Bocca, T. Mannii, T. subsessilis; Vahadenia Laurentii; Voacanga lutescens, V. spectabilis, V. Zenkeri.

STAPF, O.—*continued.*

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1904. Vol. IV., Sect. 1.

Apocynaceae, Addenda, pp. 588–614.

Alafia parciflora, A. Whytei ; Callichilia stenosepala ; Carpodinu oocarpa ; Clitandra membranacea, C. nitida ; Landolphia Dawei, L. ugandensis ; Oncinotis thyrsiflora ; Pleioceras Whytei ; Rauwolfia liberiensis ; Voacanga caudiflora.

1906. Vol. IV., Sect. 2.

Orobanchaceae, pp. 462–468.

Lentibularieae, pp. 468–499, 574–575.

Genlisea subglabra ; Utricularia charoidea, U. Gibbsiae, U. odontosperma, U. platyptera, U. trichoschiza, U. villosula.

Pedalineae, pp. 538–570.

Pterodiscus heterophyllus, P. Wellbyi : Sesamum Baumii, S. Heudelotii.

URBAN & GRAEBNER, FESTSCHRIFT ZUR FEIER DES SIEBZIGSTEN GEBURTSTAGES DES HERRN PROF. DR. P. ASCHERSON :—

1904, pp. 391–412, with map, Die Gliederung der Gräserflora von Südafrika.

ANNALES DU MUSÉE DU CONGO :—

1899. Bot. Sér. II., Vol. I., fasc. 1, De Wildeman & Durand, Contributions à la flore du Congo.

Apocynaceae, pp. 33–43.

ANNALS OF BOTANY :—

1906. Vol. xx., pp. 207–212, 301–310, The Statices of the Canaries of the subgenus Nobiles.

ANNALS OF THE ROYAL BOTANIC GARDENS, CALCUTTA :—

1905. Vol. x., pt. ii., pp. i.-ii., 115–197, tt. 92–116, The Aconites of India, a monograph.

Aconitum Balfourii, A. chasmanthum, A. deinorrhizum, A. Elwesii, A. Falconeri, A. heterophylloides, A. Hookeri, A. laciniatum, A. leucanthum, A. moschatum, A. Nagarum, A. naviculare, A. soongaricum, A. spicatum, A. violaceum.

BOTANICAL MAGAZINE :—

1904. t. 7947.

1905. tt. 7994, 8012, 8034.

1906. tt. 8061, 8075, 8076, 8078, 8086.

STAPF, O.—*continued.*

ENGLER'S JAHRBÜCHER :—

1904. Vol. xxxv., pp. 64-68, fig. 2, Xerochloa (in Diels, Fragmenta Phytographiae Australiae occidentalis).

FLORA AND SYLVA :—

1905. Vol. iii., pp. 171–175, The Pampas Grasses.

GARDENERS' CHRONICLE :—

1897. Vol. xxii., pp. 358, 378, 396, The Botanical History of the Uva, Pampas Grass, and their allies.

Cortaderia araucana, C. rudiuscula.

1904. Vol. xxxv., pp. 305–306, 325–326, 340, 356, Himalayan Bamboos.

HOOKER'S ICONES PLANTARUM :—

1896. Vol. xxv., tt. 2442, 2446, 2448, 2455, 2474, 2494.

Creaghiella purpurea ; Garnotiella philippinensis ; Halopyrum mucronatum ; Hyoscyamus leptocalyx ; Tripogon pauperculus ; Woodrowia diandra.

1897. Vol. xxvi., tt. 2517, 2525.

1898. Vol. xxvi., t. 2568.

1899. Vol. xxvi., tt. 2596–2597 ; Vol. xxvii., tt. 2601–2615.

Danthonia oreoboloides ; Deyeuxia sclerophylla ; Poa minutiflora, P. papuana ; Secale africanum.

1900. Vol. xxvii., tt. 2640, 2641, 2646, 2652, 2660, 2666, 2667.

Allospondias lakonensis ; Chloridion Cameroni ; Didesmandra aspera ; Dracontomelum sinense ; Melinis tenuissima ; Monadenium echinulatum, M. laeve ; Ranalisma rostrata.

1901. Vol. xxvii., tt. 2685, 2689, 2690, 2693–2698 ; Vol. xxviii., tt. 2711, 2721.

Funtumia africana, F. elastica ; Kickxia borneensis ; Panicum phyllopogon ; Sympetalandra borneensis ; Urnularia Beccariana.

1902. Vol. xxviii., tt. 2733, 2742, 2743*a*, 2745, 2746.

Paradombeya burmanica.

1903. Vol. xxviii., tt. 2762, 2764, 2773.

Androtium astylum ; Eucorymbia alba.

1905. Vol. xxviii., tt. 2793–2798.

JOURNAL DE BOTANIQUE :—

1905. Vol. xix., pp. 98–108, Graminées nouvelles de la Guinée Française récoltées par M. Pobéguin.

Andropogon androphilus, A. errectus, A. trepidarius ; Elionurus Pobeguinii ; Leersia drepanothrix ; Panicum drosocarpum, P. lasiopodum ; Rhytachne gracilis ; Trichopteryx crinita, T. ternata.

STAPF, O.—*continued.*

JOURNAL OF THE ASIATIC SOCIETY OF BENGAL :—

1900. Vol. lxix., pt. ii., Materials for a flora of the Malayan Peninsula.

Sonerila, pp. 18–44.

(With Sir G. King.)

Sonerila albiflora, S. andamanensis, S. bicolor, S. brachyantha, S. bracteata, S. caesia, S. calaminthifolia, S. calycula, S. capitata, S. congesta, S. costulata, S. Cyclaminella, S. elatostemoides, S. elliptica, S. epilobioides, S. flaccida, S. glabriflora, S. hyssopifolia, S. lasiantha, S. macrophylla, S. microcarpa, S. mollis, S. muscicola, S. Nidularia, S. pallida, S. populifolia, S. repens, S. rudis, S. saxosa, S. succulenta, S. suffruticosa.

1906. New Ser., Vol. ii., pp. 337, 338, Gentiana Hügelii, *Griseb.*

JOURNAL OF THE LINNEAN SOCIETY :—

1896. Vol. xxxii., pp. 479–489, tt. iv.–vii., On the structure of the female flower and fruit of Sararanga sinuosa.

1900. Vol. xxxiv., pp. 482–495, t. 19, Dicellandra, *Hook. f.*, and Phaeoneuron, *Gilg.*

Phaeoneuron Moloneyi, P. Schweinfurthii.

1905. Vol. xxxvii., pp. 79–115, Contributions to the Flora of Liberia.

Acioa Whytei; Afrodaphne caudata, A. euryneura; Alsodeia Johnstonii, A. prasina, A. Whytei; Ampelocissus gracilipes; Androsiphonia adenostegia; Atroxima liberica, A. Zenkeri; Begonia Simii, B. Whytei; Bersama leiostegia; Cassipourea caesia; Coffea ligustrifolia, C. nudiflora; Connarus libericus, C. Reynoldsii; Dalbergia Heudelotii; Deinbollia polypus; Dissotis paucistellata; Eriocoelum pendulum; Garcinia epunctata; Gomphia amplectens, G. subcordata; Hibiscus Whytei; Homalium molle; Iodea reticulata; Ixora atrata, I. congesta; Kolobopetalum ovatum; Macrolobium obliquum; Memecylon Simii; Modecca tenuispira; Mussaenda conopharyngiifolia, M. macrosepala; Olax major; Oncoba brevipes; Osbeckia liberica; Ostryocarpus major; Oxyanthus tenuis; Popowia Whytei; Sabicea discolor, S. lasiocalyx; Soyauxia grandifolia, *Gilg & Stapf*; Spiropetalum triplinerve; Tetracera leiocarpa; Urobotrya angustifolia, U. latifolia, U. minutiflora; Webera gracilis.

1906. Vol. xxxvii., pp. 495–544, tt. 21, 22, and map, Plantae Novae Daweanae in Uganda lectae.

(With T. A. Sprague and others.)

Acacia prorsispinulosa; Balsamocitrus Dawei; Cordia unyorensis; Dactylopetalum ugandense; Dioscorea fulvida; Euclea latidens; Gabunia odoratissima;

STAPF, O.—*continued.*

JOURNAL OF THE LINNEAN SOCIETY :—

Hymenodictyon scabrum ; Mimusops Dawei, M. ugandensis ; Motandra altissima ; Musa fecunda ; Oldenlandia dolichantha ; Pandanus chiliocarpus ; Panicum bifalcigerum ; Poa glacialis ; Randia nilotica ; Sansevieria Dawei ; Senecio adnivalis.

Vol. xxxvii., p. 478 (in Gibbs, Botany of Southern Rhodesia).

Erianthus teretifolius.

KEW BULLETIN :—

1896.

Decades Kewenses.

Arundinaria nitida ; Nepeta suavis ; Salvia schiedeana.

1897.

Diagnoses Africanae.

Agrostis continuata, A. fissa, A. griquensis, A. natalensis, A. Volckensii ; Andropogon trichopus ; Anthoxanthum madagascariense ; Avena caffra, A. longa, A. muriculata, A. Newtonii, A. Rothii, A. turgidula ; Ehrharta delicatula, E. Rehmannii ; Kalanchoë flammea ; Oncinotis Batesii ; Pennisetum Kirkii ; Trichopteryx acuminata, T. annua, T. camerunensis, T. flavida, T. gigantea, T. hordeiformis, T. nigritiana, T. ramosa ; Tristachya biseriata, T. glabra, T. tuberculata.

1898.

Decades Kewenses.

Diplachne Gatacrei ; Erianthus formosanus ; Miscanthus oligostachyus ; Pellacalyx symphyodiscus ; Spodiopogon Beccarii.

1898.

Diagnoses Africanae.

Alafia major ; Carpodinus congolensis, C. gracilis, C. leptantha, C. ligustrifolia, C. turbinata ; Holarrhena congolensis ; Isonema infundibuliflorum ; Kickxia latifolia ; Oncinotis tenuiloba ; Pleiocarpa tubicina ; Tabernaemontana Smithii, T. Thonneri ; Tabernanthe albiflora, T. tenuiflora.

1898. Pp. 114–118, Flora of British New Guinea.

Festuca monantha, F. papuana ; Microlaena Guilianettii ; Poa callosa.

1901.

Decades Kewenses.

Begonia peristegia.

1905. Pp. 45–49, On Kickxia and Funtumia.

STAPF, O.—*continued.*

KEW BULLETIN :—

1906.

Decades Kewenses.

Achillea sieheana ; Ardisia gigantifolia ; Calathea Gouletii ; Cervantesia glabrata ; Cynoglossum amabile, *Stapf et Drummond* ; Diandrolyra bicolor ; Dichelachne brachyathera ; Digitaria pacifica ; Linaria gerensis, L. Johnstonii ; Medinilla chionantha ; Phytocrene porphyrea ; Sonerila laeta ; Stemonurus evenius, S. labuanensis ; Strombosia latifolia ; Trachelospermum crocostomum.

Diagnoses Africanae.

Aristolochia flagellata ; Begonia calabarica ; Dissotis modesta ; Empogona Allenii ; Eragrostis Dinteri, E. lasiantha, E. poecilantha ; Excoecaria Grahami ; Ferretia aeruginescens ; Ochna tenuissima ; Pavetta luteola ; Pennisetum massaicum.

Pp. 297–363, with plate, The Oil-grasses of India and Ceylon.

MÉMOIRES DE L'HERBIER BOISSIER :—

1900. No. 20, pp. 27–32, tt. 1 and 2, Dintera (in Schinz, Beitrage zur Kenntniss der Afrikanischen Flora, No. XI.).

Dintera pterocaulis.

TRANSACTIONS OF THE LINNEAN SOCIETY :—

1904. 2nd ser., Vol. vi., pp. 401–425, tt. 45–47, The fruit of Melocanna bambusoides, an endospermless viviparous genus of Bambuseae.

THISELTON-DYER, SIR W. T.

COLLETT, FLORA SIMLENSIS. In Memoriam.

1902, pp. xv.–xxii.

FLORA CAPENSIS : Editor.

1896. Vol. VI., pts. 1–2.
1897. Vol. VI., pt. 3 ; Vol. VII., pt. 1.
1898. Vol. VII., pt. 2.
1899. Vol. VII., pt. 3.
1900. Vol. VII., pt. 4.
1901. Vol. V., pt. 1.
1904. Vol. IV., Sect. 2, pts. 1–3.
1905. Vol. IV., Sect. 1, pts. 1-2.
1906. Vol. IV., Sect. 1, pt. 3.

FLORA OF TROPICAL AFRICA : Editor.

1897. Vol. VII., pt. 1.
1898. Vol. VII., pts. 2–3.

THISELTON-DYER, SIR W. T.—*continued*

FLORA OF TROPICAL AFRICA : Editor.

1899. Vol. V., pt. 1.
1900. Vol. V., pts. 2–3.
1901. Vol. VIII., pts. 1–2.
1902. Vol. VIII., pt. 3.
1905. Vol. IV., Sect. 2, pt. 1.
1906. Vol IV., Sect. 2, pts. 2–3.

HAND-LISTS OF THE ROYAL BOTANIC GARDENS, KEW : Editor.

1896. Orchids ; Coniferae ; Arboretum, 2nd part.
1897. Tender Monocotyledons.
1900. Tender Dicotyledons.
1902. Arboretum, Ed. 2 ; Herbaceous Plants, Ed. 2.
1903. Coniferae, Ed. 2
1904. Orchids, Ed. 2.
1906. Ferns and Fern Allies, Ed. 2.
Portraits of Botanists in Museums.

INDEX KEWENSIS, Supplement 2, 1904–1905.

ANNALS OF BOTANY :—

1897. Vol. xi., pp. ix.–xi., Miles Joseph Berkeley.
Pp. 175–177, Note on the Discovery of Mycorhiza.
1900. Vol. xiv., pp. 609–616, Note on the Sugar Cane Disease of the West Indies.
1901. Vol. xv., pp. 423–425, Morphological Notes :—I.—Persistence of Leaf Traces ; pp. 547–550, II.—Persistence of Leaf Traces in Araucarieae ; III.—The Carpophyll of Encephalartos ; pp. 749–757, IV.—The Haustorium of Loranthus aphyllus.
1902. Vol. xvi., pp. 149–155, Morphological Notes :—V.—Abnormal Fruits : Precocious Germination in a Melon ; VI.—Pleiotaxy of Gynaeceum in Orange ; pp. 365–369, VII.—Evolution of Pitchers in Dischidia Rafflesiana ; pp. 553–558, VIII.—On Polycotyledony.
1903. Vol. xvii., pp. 435–441, Morphological Notes :—IX.—A Kalanchoe Hybrid ; pp. 779–787, X.—A proliferous Pinus Cone.
1906. Vol. xx., pp. 123–127, Morphological Notes :—XI.—Protective Adaptations.

BOTANICAL MAGAZINE : EDITOR :—

1905, t. 8050.
1906.

THISELTON-DYER, SIR W. T.—*continued.*

EDINBURGH REVIEW :—

1902. Vol. cxcvi., pp. 366–407, The Rise and Influence of Darwinism.

HOOKER'S ICONES PLANTARUM : Editor.

1896–1906. Vols. xxv.–xxviii., tt. 2755–2756, 2759–2760.

JOURNAL OF THE LINNEAN SOCIETY :—

1902. Vol. xxvi., Index Florae Sinensis :—
Cycadaceae, pp. 559–561.

KEW BULLETIN : Editor.

1896–1905, and Additional Series, Vols. I.–VI.

NATURE :—

1896. Vol. liii., p. 221, The Dying-out of Naturalists ; pp. 412 and 556, The Sacred Tree of Kum-Bum.
Vol. liv., pp. 293–4, 435–6, The Utility of Specific Characters.

1897. Vol. lvi., pp. 65–68, Cultural Evolution of Cyclamen latifolium.

1898. Vol. lviii., pp. 613–614, The first volume of Huxley's Memoirs.

1901. Vol. lxiv., p. 29, Scope of the Royal Society ; pp. 145–151, Huxley ; pp. 211–212, Maxime Cornu (obituary notice).

1902. Vol. lxv., pp. 296–297, 413, Cherry Disease ; pp. 584–585, The Education Bill.
Vol. lxvi., p. 31, Sweet Briar as a Goat Exterminator ; pp. 121–123, The Popular Huxley.

1903. Vol. lxviii., p. 416, Training of Forest Officers.

1906. Vol. lxxiii., p. 246, Insectivorous Water-Plant from Trinidad ; pp. 488–490, Agriculture and the Empire ; p. 534, The Kew Bulletin ; p. 587, Agricultural Research in India.

PROCEEDINGS OF THE ROYAL SOCIETY :—

1897. Vol. lxi., pp. 135–147, Cultural Evolution of Cyclamen latifolium.

1899. Vol. lxv., pp. 361–368, On the Influence of the Temperature of Liquid Hydrogen on the Germinative Power of Seeds.

WATSON, W.

ANNALS OF BOTANY :—

1901. Vol. xv., pp. 99–108, Germination of seeds of Bertholletia excelsa.

WATSON, W.—*continued.*

GARDENERS' CHRONICLE :—

1897. Vol. xxi., p. 166, Polycarpic species of Agave

1900. Vol. xxvii., pp. 1, 17, 34, 52 ; 1903, Vol. xxxiii., pp 49, 84, 102, Gardening under Glass.

1906. Vol. xxxix., p. 20 ; Vol. xl., p. 255, Packing seeds for transport.

KEW BULLETIN :—

1906, pp. 219–224, Irish Gardens.

WILSON, E. H.

GARDENERS' CHRONICLE :—

1905. Vol. xxxviii., p. 426, Astilbe grandis.

KEW BULLETIN :—

1906, pp. 147–163, Some new Chinese Plants.
(With W. B. Hemsley.)

Alniphyllum megaphyllum ; Anemone Millefolium ; Berberis Veitchiorum, B. verruculosa ; Cardamine Prattii ; Clematis Faberi, C. hupehensis ; Cocculus heterophyllus ; Gordonia sinensis ; Hosiea sinensis ; Meliosma Kirkii ; Michelia sinensis ; Ormosia Henryi, O. Hosiei ; Pentaphragma sinense ; Podophyllum difforme, P. Veitchii ; Randia acutidens ; Rosa Moyesii, R. multibracteata, R. setipoda ; Schizandra pubescens ; Styrax Veitchiorum ; Vallaris grandiflora.

P. 382, Huang Ch'i.
With plate.

WRIGHT, C. H.

JOHNSTON, THE UGANDA PROTECTORATE :—

1902. Vol. I., Botany, pp. 325–326 and 329–351.

Anthriscus dissectus ; Asplenium amoenum ; Cynometra Alexandri ; Rubus Doggettii ; Solanum runsoriense.

THISELTON-DYER, FLORA CAPENSIS :—

1897. Vol. VIII.

Palmae, pp. 28–30.

1904. Vol. IV., Sect. 2.

Hydrophyllaceae, pp. 1–2.

Boragineae, pp. 2–45.

Heliotropium Nelsoni ; Lobostemon alopecuroides, L. Galpinii, L. pilicaulis, L. pubiflorus ; Myosotis afropalustris, M. Galpinii.

WRIGHT, C. H.—*continued.*

THISELTON-DYER, FLORA CAPENSIS :—

Convolvulaceae, pp. 45–87.

(With J. G. Baker).

Convolvulus Galpinii ; Cuscuta Medicaginis.

Solanaceae, pp. 87–121.

Lycium pilifolium, L. schizocalyx.

1906. Vol. IV., Sect. 1.

Plumbagineae, pp. 418–426.

Statice amoena, S. avenacea.

Primulaceae, by W. H. Harvey with additions by C. H. Wright, pp. 426–431.

Myssineae, by W. H. Harvey with additions by C. H. Wright, pp. 431–436.

Sapotaceae, by W. H. Harvey with additions by C. H. Wright, pp. 436–444.

Oleaceae, by W. H. Harvey with additions by C. H. Wright, pp. 478–480.

THISELTON-DYER, FLORA OF TROPICAL AFRICA :—

1897–1898. Vol. VII.

Hydrocharideae, pp. 1–10 and 569.

Boottia macrantha, B. muricata.

1897. Vol. VII.

Burmanniaceae, pp. 10–12.

Gymnosiphon congestus, G. squamatus.

1900. Vol. V.

Elsholtzia aquatica, p. 451 ; Leucas velutina, p. 488.

1901. Vol. VIII.

Palmae, pp. 97–127.

Pandaneae, pp. 127–133.

Alismaceae, pp. 206–214.

1905. Vol. IV., Sect. 2.

Boragineae, pp. 5–62.

(With J. G. Baker.)

1905–6. Vol. IV., Sect. 2.

Solanaceae, pp. 207–261, 571–573.

Solanum lykipiense, S. pseudospinosum, S. subulatum, S. Thomsoni.

BOTANICAL MAGAZINE :—

1904, tt. 7955–7, 7959–60, 7963, 7966–7, 7973, 7976–7, 7982, 7986, 7989, 7991.

WRIGHT, C. H.—*continued.*

BOTANICAL MAGAZINE :—

1905, tt. 7992, 7998, 8005, 8009, 8011, 8015, 8025, 8040, 8046.
Aechmea lavandulacea.

1906, tt. 8052, 8055–6, 8059, 8068, 8072, 8080, 8087, 8095, 8102, 8107.
Gladiolus carmineus.

GARDENERS' CHRONICLE :—

1900. Vol. xxvii., p. 350, Turkestan Tulips.

1903. Vol. xxxiii., p. 257, Ipomoea Mahoni ; Viburnum buddleifolia, V. Veitchii.

Vol. xxxiv., p. 397, Cheilanthes undulata, *Hope & Wright.*

HOOKER'S ICONES PLANTARUM :—

1896. Vol. xxv., tt. 2438, 2490.
Luffa ? Batesii ; Vavaea megaphylla.

897. Vol. xxvi., t. 2518.
Efulensia clematoides.

1900. Vol. xxvii., t. 2659.
Lightfootia leptophylla.

1903. Vol. xxviii., t. 2758.
Triplochiton Johnsoni.

JOURNAL OF THE LINNEAN SOCIETY :—

1896. Vol. xxxii., pp. 490–496, On the Genus Stemona, *Lour.*
Stemona acuta, S. australiana, S. parviflora.

1899. Vol. xxxiv., pp. 268–276, On some African Labiatae with alternate leaves. (With I. H. Burkill.)
Plectranthus insolitus.

1899. Vol. xxvi., pp. 471–492, Index Florae Sinensis :—

Urticaceae : Conocephaleae, pp. 471–492.

Boehmeria gracilis ; Conocephalus sinensis ; Debregeasia obovata ; Laportea grossedentata, L. sinensis ; Pellionia viridis ; Pilea notata, P. plataniflora, P. rubriflora.

1903. Vol. xxxvi., Index Florae Sinensis :—

Hydrocharidaceae, pp. 1–3.
Burmanniaceae, pp. 4–5.
Scitamineae, pp. 67–75.
Haemodoraceae, pp. 75–80.
Irideae, pp. 80–86.
Amaryllideae, pp. 86–90.

WRIGHT, C. H.—*continued.*

JOURNAL OF THE LINNEAN SOCIETY :—

Taccaceae, p. 90.

Dioscoreaceae, pp. 90–94.

Dioscorea zingiberensis.

Roxburghiaceae, pp. 94–95.

Liliaceae, pp. 95–148.

Allium Prattii, A. venustum.

Palmae, pp. 167–170.

Pandanaceae, p. 171.

Lemnaceae, pp. 188–189.

Alismaceae, pp. 189–191.

Naiadaceae (excluding Potamogeton), pp. 192–198.

Eriocaulaceae, pp. 198–202.

1903. Vol. xxxv., pp. 483–484, Introductory Note to S. T. Dunn's Descriptions of New Chinese Plants.

Pellaea squamosa, *Hope & Wright.*

1906. Vol. xxxvii., p. 529, Haemanthus cyrtanthiflorus.

KEW BULLETIN :—

1896.

Decades Kewenses.

Buddleia acutifolia ; Caesalpinia bicolor ; Chailletia chartacea ; Chrysophyllum batangense ; Clematis rubifolia ; Ehretia corylifolia ; Gomphia discolor ; Grewia batangensis ; Impatiens Batesii, I. Hancockii ; Ipomoea hirsuticaulis ; Luffa Batesii ; Primula barbicalyx ; Salvia yunnanensis ; Scutellaria amoena ; Vaccinium setosum ; Viburnum ceanothoides.

1897.

Diagnoses Africanae.

Blaeria microdonta ; Gymnosiphon squamatum ; Ipomoea operosa ; Lasiodiscus marmoratus ; Pittosporum oblongifolium ; Solanum nakurense ; Tecoma Whytei.

1898.

Diagnoses Africanae.

Oldenlandia acutidentata ; Psorospermum membranaceum ; Virecta salicoides.

1901.

Diagnoses Africanae.

Aloe somaliensis ; Cassipourea schizocalyx ; Crotalaria minor ; Helichrysum plantaginifolium ; Hugonia obtusifolia ; Ornithogalum tenuipes ; Randia purpureomaculata ; Rhopalandria lobata.

Decades Kewenses.

Hippeastrum teretifolium.

WRIGHT, C. H.—*continued.*

KEW BULLETIN :—

1906.

Decades Kewenses.

Achatocarpus pubescens ; Astragalus brevidentatus ; Bidens simplicifolia ; Euterpe Jenmanii, E. ventricosa ; Guarea syringoides ; Nephrodium leptophyllum ; Polypodium viscosum.

Diagnoses Africanae.

Chlorophytum asphodeloides, C. glabriflorum ; Coleus scaposus ; Cuviera minor ; Gladiolus bellus ; Gnidia mollis ; Helichrysum argyrocephalum ; Hymenophyllum Thomassetii ; Lobelia Johnstoni ; Polypodium prionodes, P. Thomassetii ; Psychotria Mahoni ; Pteris intricata ; Vernonia bothrioclinoides, V. scabrida.

TRANSACTIONS OF THE LINNEAN SOCIETY :—

1901. Vol. vi., pp. 77–88, Pteridophyta, in Report on two Botanical Collections made by Messrs. F. V. McConnell & J. J. Quelch at Mount Roraima in British Guiana.

Polypodium leptodon.